DA00101752-003

WAVE FACTORY

MULTIFUNCTION GENERATOR

WF198x series

Instruction Manual
(Remote Control)

NF Corporation

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 "WF198x series 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

1. Preparation before Use

1.1 Overview of WF198x series GPIB/USB/LAN Interface

The WF198x series can be externally controlled via GPIB (WF1983/WF1984), USB, or LAN.
By sending program messages from the controller (computer), you can control it in the same way as operating the panel, and receive the setting status as a response message.
Prepare the following for the interface you will actually use.

1.2 USB Preparations

Install the USBTMC (Universal Serial Bus Test and Measurement Class) driver on the controller (computer) that will be used for control.
This driver usually supports the subclass USB488, and allows almost the same control over USB as with GPIB.

This driver is included in the hardware and software products of companies that provide the VISA (Virtual Instrument Software Architecture) library. If you do not have a VISA library license, you will need to obtain it separately.

The WF198x series has been confirmed to work with NI-VISA provided by National Instruments.

A terminator is required at the end of a set of commands or responses to indicate its end.
The response message terminator sent by the WF198x is fixed to LF^EOM (END message).

The program message terminator received by the WF198x can be any of the following:
-LF^EOM LF with EOM (END message)
-(last code)^EOM EOM added to the last code

1.3 GPIB Preparations(WF1983/WF1984)

Install a commercially available GPIB controller in the controller (computer) and connect it to the WF1983/WF1984.
For information about GPIB driver software, refer to the manual for the GPIB instruments you are using.

A terminator is required at the end of a set of commands or responses to indicate its end.
The response message terminator sent by the WF198x is fixed to LF^EOM (END message).

The program message terminator received by the WF198x can be any of the following:
-LF Line Feed code
-LF^EOM LF with EOM (END message)
-(last code)^EOM EOM added to the last code

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. It is in decimal notation and cannot be changed.

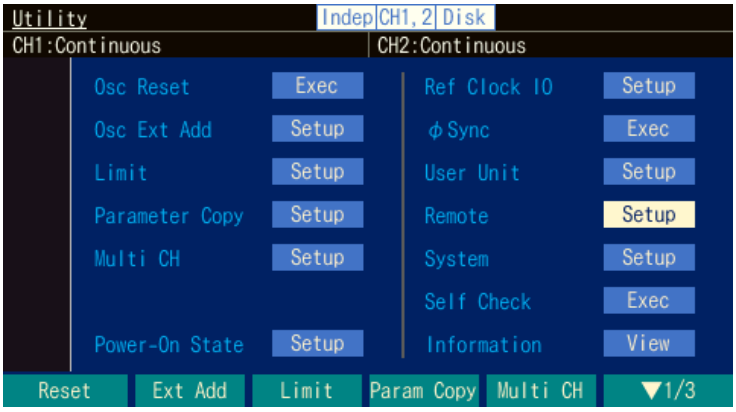
A terminator is required at the end of a set of commands or responses to indicate its end.
The response message terminator sent by the WF198x is fixed to LF for both sending and receiving.

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.

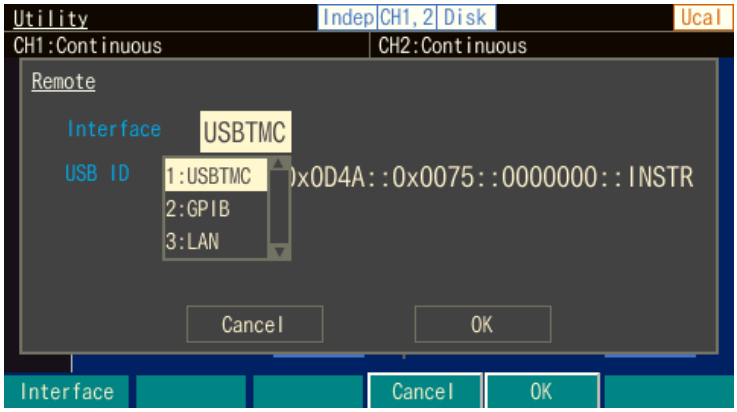
1.5 Interface Selection

You can select whether the USB, GPIB (WF1983/WF1984) 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 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(WF1983/WF1984) or the LAN.

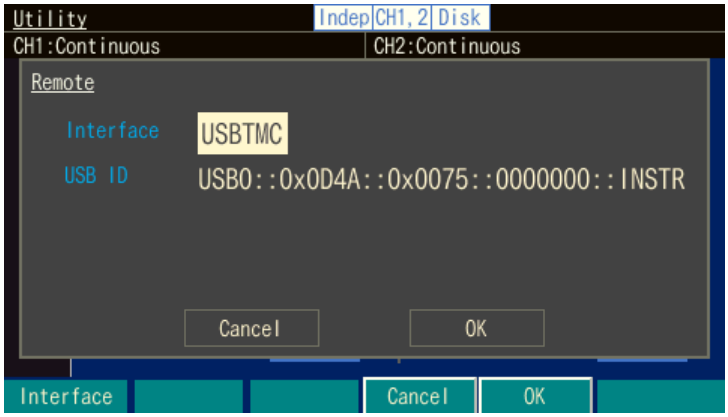


⚠	CAUTION	When the computer recognizes WF198x series, switching the interface or disconnecting the cable may cause unexpected behavior depending on the computer.

1.6 USB Setting

To identify an individual from the application, use the following numbers.

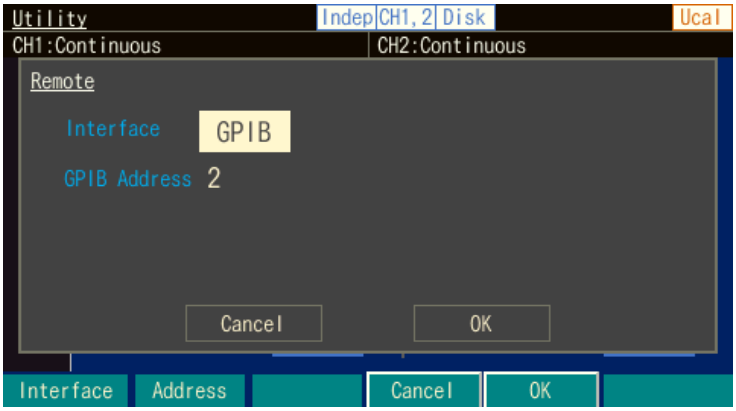
Vendor ID. : 0x0D4A
Product ID. : 0x007D(WF1981), 0x007E(WF1982), 0x0074(WF1983), 0x0075(WF1984),
Serial No. : Product's manufacturing number (serial number)



1.7 GPIB Setting

For the GPIB interface (not selectable for 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 even when the power is turned off.
When at shipping,"2" is selected.

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

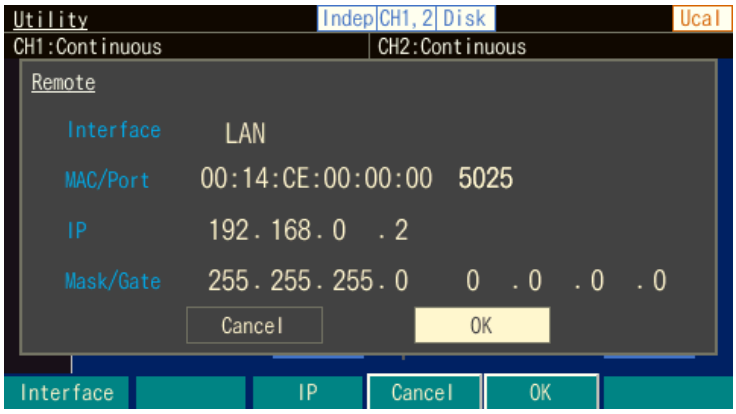
For the LAN interface, the physical (MAC) address, port number, IP address, subnet mask, and default gateway are displayed.
The MAC address is a unique value for each device, and the port number is fixed at 5025 (decimal notation). Neither can be changed.
Set the IP address, subnet mask, default gateway.
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.
- USB and GPIB are interfaces designed to be used in relatively good environments.
  Avoid using in a place that has power fluctuation or environment with much electrical noise.
  Please take measures against power supply fluctuations and noise before using them.
- 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 unit) 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 GPIB, be sure to add EOI.
- When LAN is used, you cannot use the GPIB-specific features, such as SRQ and device clear.
- If the device stops responding while using the LAN due to an abnormality in the communication path or incorrect use of commands, turn the power on. Or switch to another interface and then select 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

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 the standards.

2.1.1 Command Notation

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

< > < > indicates that it is a parameter such as a numerical value or a character string. Do not use < > in an actual program.

[ ] The items enclosed in [ ] are optional. 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
Command keywords can be in short form or long form.
Keywords in uppercase without lowercase are called short form, and keywords containing both uppercase and lowercase are called long form. For details, see "(A) Keyword" in Section 2.1.2.4.

2.1.2 Command Syntax

The program messages of WF198x series consist of common commands defined in IEEE488.2 and subsystem commands specific to this device. 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.

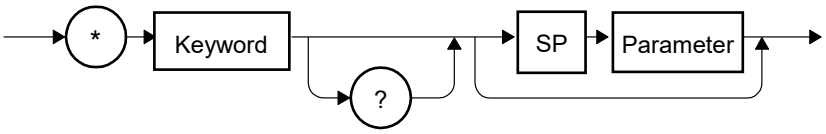


Figure 2.1 Common Command Syntax

The keyword in Figure 2.1 consists of three alphabetic characters. Here, SP is a white space (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 a root-level keyword that combines second-level keywords; STATe is a second-level keyword; ON is a parameter.

2.1.2.3 Subsystem Command Tree

(A) Structure of command tree

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

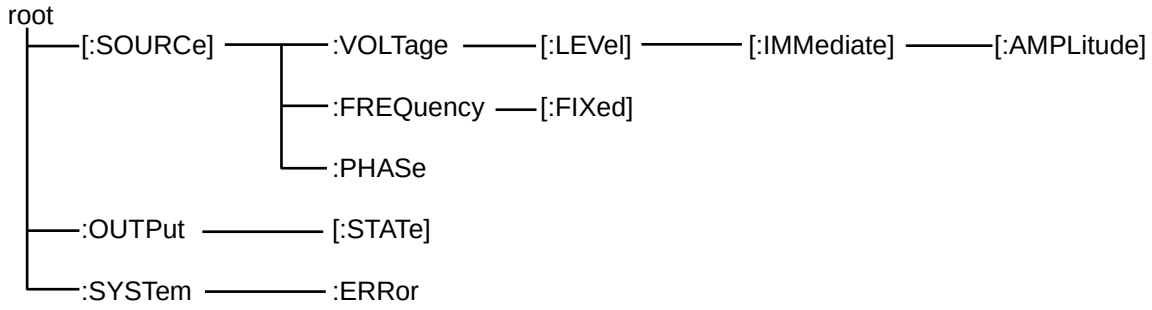


Figure 2.2 Example of Subsystem Command Tree

In Figure 2.2, the keywords directly under "root" ("[:SOURce]", ":OUTPut", and ":SYSTem") are root-level keywords.
To use a keyword at a lower level, concatenate the keywords from the root level to the desired keyword.
For example, to set the amplitude with ":AMPLitude", use
"[:SOURce]:VOLTage[:LEVel][:IMMediate]:AMPLitude <amplitude value>".

(B) Current path movement

The current path is the current level in the command tree. It is the first level that the parser searches when the controller 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
White spaces do not affect to the current path.

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

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

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

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

is same as sending the following two commands:

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

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

```
:VOLTage 1.0
```

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

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

are send as one program message,

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

results in an error. However,

```
:SOURce:VOLTage 1.0; FREQuency:FIXed 1000.0
```

does not result in an error.

2.1.2.4 Subsystem Command Syntax

The syntax of subsystem commands is shown in Figure 2.3.

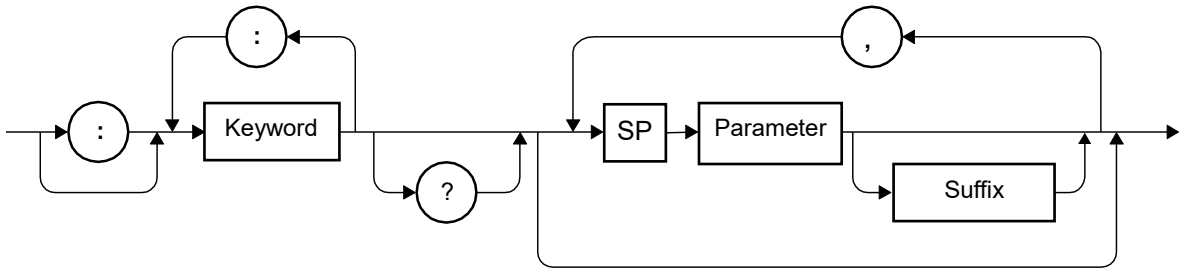


Figure 2.3 Subsystem Command Syntax

(A) Keyword

The keyword in Figure 2.3 is a string of up to 12 characters consisting of uppercase and lowercase alphabetic characters, underscore (_), and numeric characters, beginning with an alphabetic character.
Most of the keywords listed in "2.2 Command List" consist of a mixture of uppercase and lowercase letters. Lowercase letters are optional.
Keywords that are written in uppercase only are called short form, and keywords that contain lowercase letters are called long form.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. The root specifier means that the current path is set 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 (WF1982/WF1984), many commands allow you to specify the channel by using an optional numeric suffix.
For example,

:OUTPut[1|2]:STATe

then [1|2] is the numeric suffix.
means that commands for channel 1 and channel 2 are as follows:

:OUTPut[1]:STATe
:OUTPut2:STATe

If you do not specify a channel number, the command will be interpreted as a channel 1 command. 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>)
<REAL> is a real number, <INT> is an integer. The syntax is as shown in Figure 2.4.

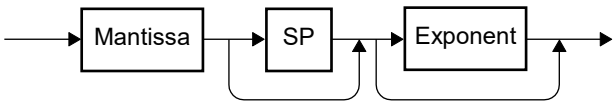


Figure 2.4 Numeric Parameter (<REAL>, <INT>) Syntax

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

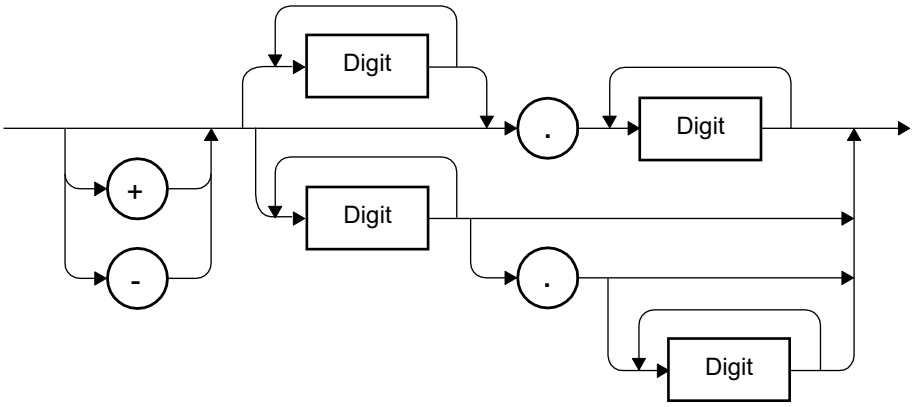


Figure 2.5 Mantissa Syntax

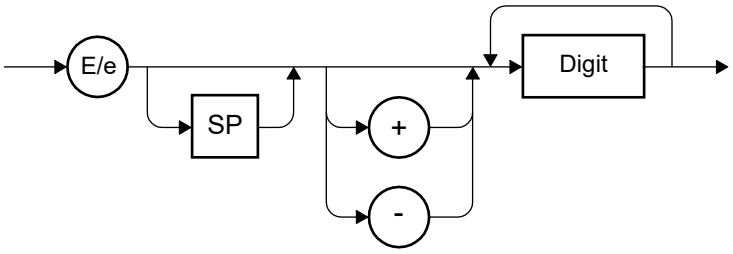


Figure 2.6 Exponent Syntax

(2) Discrete Parameter (<DISC>)
Used to select an item from a set of predefined options. The syntax is shown in Figure 2.7.

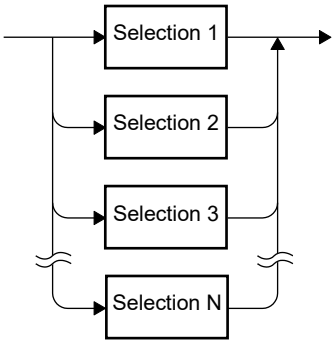


Figure 2.7 Discrete Parameter (<DISC>) Syntax

(3) Boolean Value Parameter (<BOL>)
It is used to set a value as true or false. The syntax is as shown in Figure 2.8.

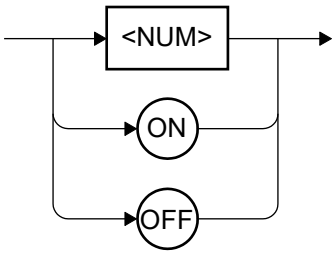


Figure 2.8 Boolean Value Parameter (<BOL>) Syntax

The Boolean value parameter is interpreted as true for values other than 0, and as false for 0 (zero). Any decimal point is interpreted as the value after rounding. So, 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.

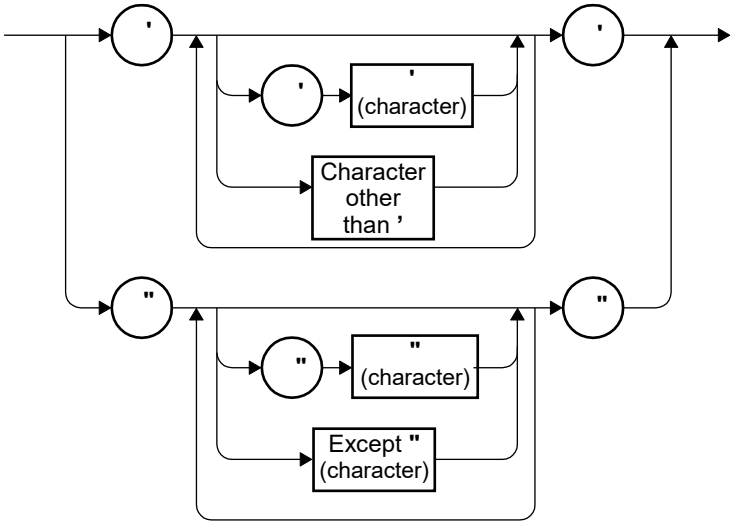


Figure 2.9 String Parameter (<STR>) Syntax

(5) Block parameter (<BLK>)
This is used to transfer arbitrary waveform data and sequence data. The syntax is as shown in Figure 2.10.

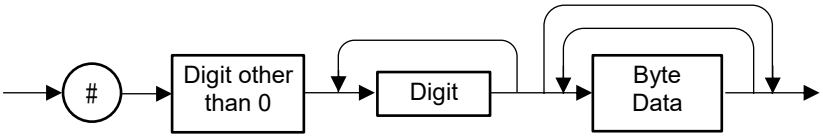


Figure 2.10 Block Parameter (<BLK>) Syntax

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 suffix consists of a unit prefix and a unit.
When an engineering unit prefix (e.g. M, k, m, u) is added to a numeric parameter, the instrument interprets "m" or "M" as mega (10^6) for frequency only.
For other parameters, "m" or "M" is interpreted as milli (10^{-3}), and "ma" or "MA" is interpreted as mega.

The syntax of suffix is shown in Figure 2.11.

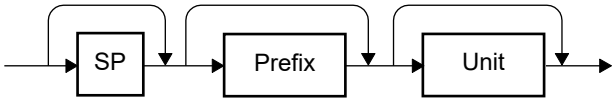


Figure 2.11 Suffix Syntax

The suffix 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 2.0 Vp-p
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0VRMS	Sets the amplitude to 2.0 Vrms
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0	Sets the amplitude to 2.0 Vp-p

2.1.2.5 Program Message Syntax

Multiple common commands and subsystem commands can be combined and sent from the controller to the device as a single program message. The syntax of the program message is shown in Figure 2.12.

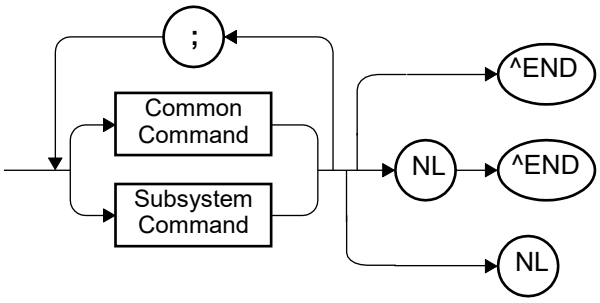


Figure 2.12 Program Message Syntax

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.

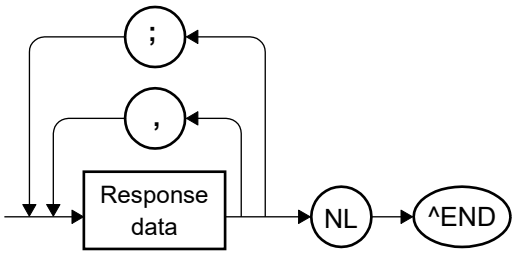


Figure 2.13 Response Message Syntax

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>)

Real response data can be expressed in either decimal notation (NR2) or floating point exponent notation (NR3). The syntax is as shown in Figure 2.14.

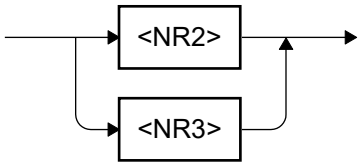


Figure 2.14 Real Number Response Data (<REAL>) Syntax

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

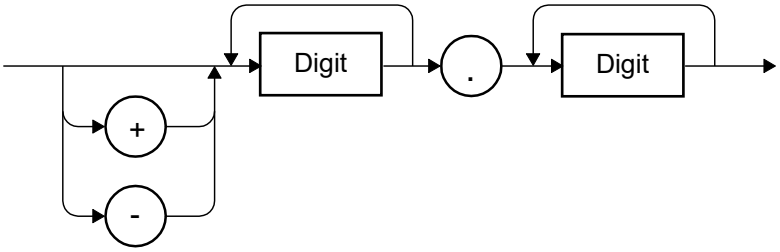


Figure 2.15 NR2 Number Response Data (<NR2>) Syntax

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

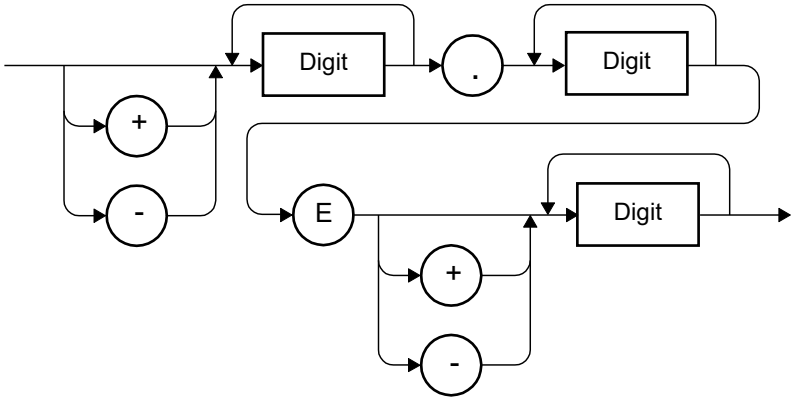


Figure 2.16 NR3 Number Response Data (<NR3>) Syntax

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

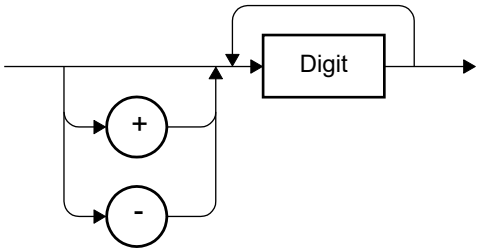


Figure 2.17 Integer Response Data (<INT>) Syntax

(3) Discrete response data (<DISC>)
The syntax for multiple choice response data is shown in Figure 2.18.

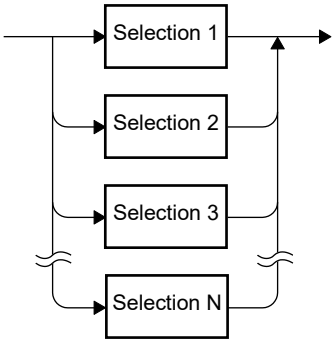


Figure 2.18 Discrete Response Data (<DISC>) Syntax

(4) Numeric Boolean value response data (<NBOL>)
This is a response that assigns true or false to a numeric value. The syntax is shown in Figure 2.19.

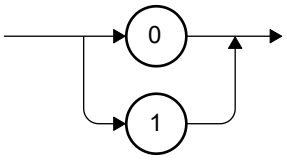


Figure 2.19 Numeric Boolean Value Response Data (<NBOL>) Syntax

(5) String response data (<STR>)
The syntax of the string response data is shown in Figure 2.20.

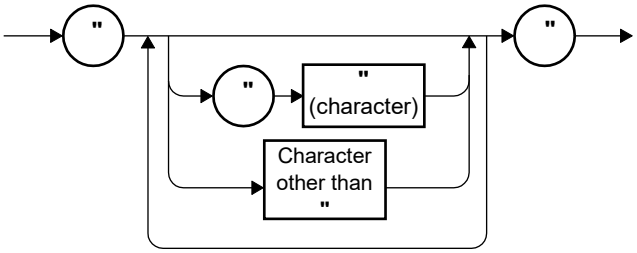


Figure 2.20 String Response Data (<STR>) Syntax

(6) Definite length arbitrary block response data (<DBLK>)
The syntax of the definite length arbitrary block response data is shown in Figure 2.21.

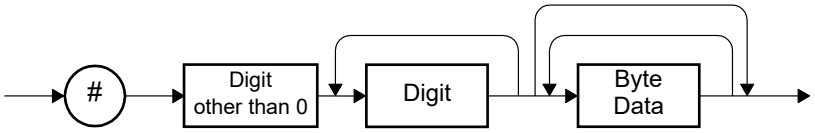


Figure 2.21 Definite Length Arbitrary Block Response Data (<DBLK>) Syntax

2.2 Command List

This section shows the list of the remote control commands of WF198x series.
The lowercase part of each keyword indicates that the part can be omitted.
The meanings of the symbols used in the command list table are as follows.
- Square brackets ([ ]) indicate the optional 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

(3.1 Oscillation Mode)

Operation	Command	R/W	Detail
Continuous Oscillation Mode			
Setting	[:SOURce[1|2]]:CONTinuous[:IMMediate]	W	3-2
Query	[:SOURce[1|2]]:CONTinuous:STATe?	R	3-2
Synchronization signal output	:OUTPut[1|2]:SYNC:TYPE	R/W	3-2
Sweep Oscillation Mode (Common setting)			
Sweep Oscillation Mode	[:SOURce[1|2]]:SWEep:MODE	R/W	3-3
Sweep slope	[:SOURce[1|2]]:SWEep:SPACing	R/W	3-3
Sweep direction	[:SOURce[1|2]]:SWEep:INTernal:FUNCtion	R/W	3-3
Sweep time	[:SOURce[1|2]]:SWEep:TIME	R/W	3-4
Stop lavel value	[:SOURce[1|2]]:SWEep:SLEVel	R/W	3-5
Stop level	[:SOURce[1|2]]:SWEep:SLEVel:STATe	R/W	3-5
Oscillation stop unit	[:SOURce[1|2]]:SWEep:OSTop	R/W	3-6
Multi-connector control on/off	[:SOURce[1|2]]:SWEep:MCONnector:STATe	R/W	3-6
Synchronization signal output	:OUTPut[1|2]:SYNC:SWEep:TYPE	R/W	3-7
Frequency sweep setting			
Frequency sweeo	[:SOURce[1|2]]:FREQuency:MODE	R/W	3-8
Start value	[:SOURce[1|2]]:FREQuency:STARt	R/W	3-8
Stop value	[:SOURce[1|2]]:FREQuency:STOP	R/W	3-9
Center value	[:SOURce[1|2]]:FREQuency:CENTer	R/W	3-9
Span value	[:SOURce[1|2]]:FREQuency:SPAN	R/W	3-10
Marker value	[:SOURce[1|2]]:MARKer:FREQuency	R/W	3-11
Swap start/stop	[:SOURce[1|2]]:FREQuency:SWAP	W	3-11
Output start/stop	[:SOURce[1|2]]:FREQuency:STATe	W	3-12

Operation	Command	R/W	Detail
Phase sweep setting			
Phase sweep	[:SOURce[1|2]]:PHASe:MODE	R/W	3-13
Start value	[:SOURce[1|2]]:PHASe:STARt	R/W	3-13
Stop value	[:SOURce[1|2]]:PHASe:STOP	R/W	3-14
Center value	[:SOURce[1|2]]:PHASe:CENTer	R/W	3-14
Span value	[:SOURce[1|2]]:PHASe:SPAN	R/W	3-15
Marker value	[:SOURce[1|2]]:MARKer:PHASe	R/W	3-15
Swap start/stop	[:SOURce[1|2]]:PHASe:SWAP	W	3-16
Output start/stop	[:SOURce[1|2]]:PHASe:STATe	W	3-16
Amplitude sweep setting			
Amplitude sweep	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :MODE	R/W	3-17
Start value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :STARt	R/W	3-18
Stop value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :STOP	R/W	3-19
Center value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :CENTer	R/W	3-20
Span value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :SPAN	R/W	3-21
Marker value	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate] [:AMPLitude]	R/W	3-22
Swap start/stop	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :SWAP	W	3-22
Output start/stop	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude] :STATe	W	3-23
DC offset sweep setting			
DC offset sweep	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE	R/W	3-24
Start value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt	R/W	3-24
Stop value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP	R/W	3-25
Center value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer	R/W	3-26
Span value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN	R/W	3-26
Marker value	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet	R/W	3-27
Swap start/stop	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP	W	3-27
Output start/stop	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe	W	3-28
Duty sweep setting			
Duty sweep	[:SOURce[1|2]][:PULSe]:DCYCle:MODE	R/W	3-55
Start value	[:SOURce[1|2]][:PULSe]:DCYCle:STARt	R/W	3-30
Stop value	[:SOURce[1|2]][:PULSe]:DCYCle:STOP	R/W	3-31
Center value	[:SOURce[1|2]][:PULSe]:DCYCle:CENTer	R/W	3-32
Span value	[:SOURce[1|2]][:PULSe]:DCYCle:SPAN	R/W	3-33
Marker value	[:SOURce[1|2]]:MARKer:PULSe:DCYCle	R/W	3-34
Swap start/stop	[:SOURce[1|2]][:PULSe]:DCYCle:SWAP	W	3-34
Output start/stop	[:SOURce[1|2]][:PULSe]:DCYCle:STATe	W	3-34

Operation	Command	R/W	Detail
Burst Oscillation Mode (Common setting)			
Burst Oscillation Mode	[:SOURce[1|2]]:BURSt:STATe	R/W	3-35
Burst mode	[:SOURce[1|2]]:BURSt:MODE	R/W	3-35
Stop level value	[:SOURce[1|2]]:BURSt:SLEVel	R/W	3-36
Stop level	[:SOURce[1|2]]:BURSt:SLEVel:STATe	R/W	3-36
Synchronization signal output	:OUTPut[1|2]:SYNC:BURSt:TYPE	R/W	3-37
Auto burst			
Mark wave number	[:SOURce[1|2]]:BURSt:AUTO:NCYCles	R/W	3-37
Space wave number	[:SOURce[1|2]]:BURSt:AUTO:SPACe	R/W	3-38
Trigger burst			
Mark wave number	[:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles	R/W	3-38
Trigger delay time	[:SOURce[1|2]]:BURSt[:TRIGger]:TDELay	R/W	3-39
Gate/trigged gate			
Oscillation stop unit	[:SOURce[1|2]]:BURSt:{GATE|TGATe}:OSTop	R/W	3-40

(3.2 Modulated Function)

Operation	Command	R/W	Detail
Modulation Function (Common setting)			
Phase of internal modulation	[:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:INTernal:PHASe[:ADJust]	R/W	3-41
Frequency of internal modulation	[:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FREQuency	R/W	3-42
Synchronization signal output	:OUTPut[1|2]:SYNC:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:TYPE	R/W	3-43
FSK/PSK (Common setting)			
Modulation source	[:SOURce[1|2]]:{FSKey|PSKey}:SOURce	R/W	3-44
Polarity of external modulation	[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe	R/W	3-44
Except FSK/PSK (Common setting)			
Modulation source	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:SOURce	R/W	3-45
Internal modulation waveform	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion[:SHAPe]	R/W	3-46
Arbitrary waveform for internal modulation	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:USER	R/W	3-47
Noise bandwidth for internal modulation	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:NOISe:BW	R/W	3-48
FSK (Frequency shift keying)			
FSK	[:SOURce[1|2]]:FSKey:STATe	R/W	3-49
Hop frequency	[:SOURce[1|2]]:FSKey[:FREQuency]	R/W	3-50
PSK (Phase shift keying)			
PSK	[:SOURce[1|2]]:PSKey:STATe	R/W	3-51
Deviation	[:SOURce[1|2]]:PSKey[:DEViation]	R/W	3-52
FM (Frequency modulation)			
FM	[:SOURce[1|2]]:FM:STATe	R/W	3-53
Peak deviation	[:SOURce[1|2]]:FM[:DEViation]	R/W	3-54
PM (Phase modulation)			
PM	[:SOURce[1|2]]:PM:STATe	R/W	3-55
Peak deviation	[:SOURce[1|2]]:PM[:DEViation]	R/W	3-56
AM (Amplitude modulation)			
AM	[:SOURce[1|2]]:AM:STATe	R/W	3-57
Modulation depth	[:SOURce[1|2]]:AM[:DEPTh]	R/W	3-57
AM(DSB-SC)			
AM(DSB-SC)	[:SOURce[1|2]]:AMSC:STATe	R/W	3-58
Modulation depth	[:SOURce[1|2]]:AMSC[:DEPTh]	R/W	3-57
DC offset modulation			
DC offset modulation	[:SOURce[1|2]]:OFSM:STATe	R/W	3-59
Peak deviation	[:SOURce[1|2]]:OFSM[:DEViation]	R/W	3-60
PWM (Pulse width modulation)			
PWM	[:SOURce[1|2]]:PWM:STATe	R/W	3-61
Peak deviation	[:SOURce[1|2]]:PWM[:DEViation]:DCYCle	R/W	3-62

(3.3 Waveform Setting)

Operation	Command	R/W	Detail
Waveform (Common setting)			
Waveform	[:SOURce[1|2]]:FUNCtion[:SHAPe]	R/W	3-63
Waveform polarity	:OUTPut[1|2]:POLarity	R/W	3-65
Amplitude scale range	:OUTPut[1|2]:SCALe	R/W	3-67
Square wave			
Duty range extension	[:SOURce[1|2]]:FUNCtion:SQUare:EXTend	R/W	3-69
Duty	[:SOURce[1|2]]:FUNCtion:SQUare:DCYCle	R/W	3-69
Pulse wave			
Duty	[:SOURce[1|2]][:PULSe]:DCYCle	R/W	3-70
Pulse width	[:SOURce[1|2]][:PULSe]:WIDTh	R/W	3-71
Rising time	[:SOURce[1|2]][:PULSe]:TRANsition[:LEADing]	R/W	3-72
Falling time	[:SOURce[1|2]][:PULSe]:TRANsition:TRAiling	R/W	3-73
Transition wave of pulse rising/falling edge	[:SOURce[1|2]][:PULSe]:TRANsition:FUNCtion	R/W	3-74
Ramp wave			
Symmetry	[:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry	R/W	3-76
Noise			
Noise bandwidth	[:SOURce[1|2]]:FUNCtion:NOISe:BW	R/W	3-77

(3.3.6 Parameter-Variable Waveform)

The Parameter-Variable Waveform (PWF) can be used for the main output (FCTN OUT), as well as for internal modulation waveforms, pulse wave transition waveforms, and sub waveforms. Furthermore, their parameters are independent of each other.
The commands are also common except for some character strings, so for ease of explanation, non-common parts (called selection keywords) are denoted with [★].
For the keywords in the [★], see "3.3.6 Parameter-Variable Waveform."

Operation	Command	R/W	Detail
Parameter-Variable Waveform (Steady sine wave group)			
Unbalanced sine first half amplitude	[:SOURce[1|2]][★]:FUNCtion:USINe:AMPLitude[1]	R/W	3-78
Unbalanced sine latter half amplitude	[:SOURce[1|2]][★]:FUNCtion:USINe:AMPLitude2	R/W	3-79
Clipped sine clip ratio	[:SOURce[1|2]][★]:FUNCtion:CSINe:CLIP	R/W	3-79
CF controlled sine crest factor	[:SOURce[1|2]][★]:FUNCtion:CFCSine:CFACtor	R/W	3-80
Angle controlled sine conduction angle	[:SOURce[1|2]][★]:FUNCtion:ACSine:ANGLe	R/W	3-80
Staircase sine number of Y-steps	[:SOURce[1|2]][★]:FUNCtion:SSINe:STEPs	R/W	3-81
Staircase sine number of X-steps	[:SOURce[1|2]][★]:FUNCtion:SSINe:TSTEPs	R/W	3-81
Multi-cycle sine number of cycle	[:SOURce[1|2]][★]:FUNCtion:MCSine:CYCLes	R/W	3-82
Multi-cycle sine start phase	[:SOURce[1|2]][★]:FUNCtion:MCSine:PHASe	R/W	3-82
Parameter-Variable Waveform (Transient sine wave group)			
On-phase controlled sine on-phase	[:SOURce[1|2]][★]:FUNCtion:ONPSine:ONPHase	R/W	3-83
On-phase controlled sine on-slope time	[:SOURce[1|2]][★]:FUNCtion:ONPSine:STIMe	R/W	3-83
Off-phase controlled sine off-phase	[:SOURce[1|2]][★]:FUNCtion:OFPSine:OFPHase	R/W	3-84
Off-phase controlled sine off-slope time	[:SOURce[1|2]][★]:FUNCtion:OFPSine:STIMe	R/W	3-84
Chattering-on sine on-phase	[:SOURce[1|2]][★]:FUNCtion:CONSine:ONPHase	R/W	3-85
Chattering-on sine number of chattering	[:SOURce[1|2]][★]:FUNCtion:CONSine:NCHattering	R/W	3-85
Chattering-on sine on time	[:SOURce[1|2]][★]:FUNCtion:CONSine:TON	R/W	3-86
Chattering-on sine off time	[:SOURce[1|2]][★]:FUNCtion:CONSine:TOFF	R/W	3-86
Chattering-off sine off-phase	[:SOURce[1|2]][★]:FUNCtion:COFSine:OFPHase	R/W	3-87
Chattering-off sine number of chattering	[:SOURce[1|2]][★]:FUNCtion:COFSine:NCHattering	R/W	3-87
Chattering-off sine on time	[:SOURce[1|2]][★]:FUNCtion:COFSine:TON	R/W	3-88
Chattering-off sine off time	[:SOURce[1|2]][★]:FUNCtion:COFSine:TOFF	R/W	3-88

For the keywords in the [★], see "3.3.6 Parameter-Variable Waveform."

Operation	Command	R/W	Detail
Parameter-Variable Waveform (Pulse wave group)			
Gaussian pulse standard deviation	[:SOURce[1|2]][★]:FUNCtion:GAUSsian:SIGMa	R/W	3-89
Lorentz pulse half value of width	[:SOURce[1|2]][★]:FUNCtion:LORentz:HWIDth	R/W	3-89
Haversine width	[:SOURce[1|2]][★]:FUNCtion:HAVersine:WIDTh	R/W	3-90
Half-sine pulse width	[:SOURce[1|2]][★]:FUNCtion:HSPulse:WIDTh	R/W	3-90
Trapezoid pulse slope width	[:SOURce[1|2]][★]:FUNCtion:TPULse:RFALl	R/W	3-91
Trapezoid pulse upper base width	[:SOURce[1|2]][★]:FUNCtion:TPULse:UBASe	R/W	3-91
Sin(x)/x number of zero crossings	[:SOURce[1|2]][★]:FUNCtion:SINC:ZCRossing	R/W	3-92
Parameter-Variable Waveform (Transient response waveform group)			
Exponential rise time constant	[:SOURce[1|2]][★]:FUNCtion:ERISe:TCONstant	R/W	3-93
Exponential fall time constant	[:SOURce[1|2]][★]:FUNCtion:EFALl:TCONstant	R/W	3-93
2nd-order LPF step response natural frequency	[:SOURce[1|2]][★]:FUNCtion:SOLStep:NFRequency	R/W	3-94
2nd-order LPF step response Q-value	[:SOURce[1|2]][★]:FUNCtion:SOLStep:Q	R/W	3-94
Damped oscillation oscillation frequency	[:SOURce[1|2]][★]:FUNCtion:DOSCillation:OFRequency	R/W	3-95
Damped oscillation damped oscillation time constant	[:SOURce[1|2]][★]:FUNCtion:DOSCillation:DTConstant	R/W	3-95
Parameter-Variable Waveform (Surge waveform group)			
Oscillation surge oscillation frequency	[:SOURce[1|2]][★]:FUNCtion:OSURge:OFRequency	R/W	3-96
Oscillation surge damped oscillation time constant	[:SOURce[1|2]][★]:FUNCtion:OSURge:DTConstant	R/W	3-96
Oscillation surge trailing time constant	[:SOURce[1|2]][★]:FUNCtion:OSURge:TTConstant	R/W	3-97
Pulse surge rising time	[:SOURce[1|2]][★]:FUNCtion:PSURge:TR	R/W	3-97
Pulse surge duration time	[:SOURce[1|2]][★]:FUNCtion:PSURge:TD	R/W	3-98

For the keywords in the [★], see "3.3.6 Parameter-Variable Waveform."

Operation	Command	R/W	Detail
Parameter-Variable Waveform (Other waveform group)			
Trapezoid wave with offset leading delay	[:SOURce[1|2]][★]:FUNCtion:TOFFset:DELay	R/W	3-99
Trapezoid wave with offset rising-slope width	[:SOURce[1|2]][★]:FUNCtion:TOFFset:RISe	R/W	3-99
Trapezoid wave with offset upper base width	[:SOURce[1|2]][★]:FUNCtion:TOFFset:UBASe	R/W	3-100
Trapezoid wave with offset falling-slope width	[:SOURce[1|2]][★]:FUNCtion:TOFFset:FALL	R/W	3-100
Trapezoid wave with offset offset	[:SOURce[1|2]][★]:FUNCtion:TOFFset:OFFSet	R/W	3-101
Half-sine edge pulse leading edge time	[:SOURce[1|2]][★]:FUNCtion:HSEPulse:LE	R/W	3-101
Half-sine edge pulse trailing edge time	[:SOURce[1|2]][★]:FUNCtion:HSEPulse:TE	R/W	3-102
Half-sine edge pulse duty	[:SOURce[1|2]][★]:FUNCtion:HSEPulse:DCYCle	R/W	3-102
Double pulse upper base width1	[:SOURce[1|2]][★]:FUNCtion:DPULse:UBT1	R/W	3-103
Double pulse upper base width2	[:SOURce[1|2]][★]:FUNCtion:DPULse:UBT2	R/W	3-103
Double pulse lower base width1	[:SOURce[1|2]][★]:FUNCtion:DPULse:LBT1	R/W	3-104
Double pulse lower base width2	[:SOURce[1|2]][★]:FUNCtion:DPULse:LBT2	R/W	3-104
Double pulse leading time	[:SOURce[1|2]][★]:FUNCtion:DPULse:LE	R/W	3-105
Double pulse trailing time	[:SOURce[1|2]][★]:FUNCtion:DPULse:TE	R/W	3-105
Bottom-referenced ramp symmetry	[:SOURce[1|2]][★]:FUNCtion:BRRamp:SYMMetry	R/W	3-106
Polarity/amplitude range of Sub Waveform and internal modulating waveforms.			
Polarity	:OUTPut[1|2]{★}:POLarity	R/W	3-107
Amplitude scale range	:OUTPut[1|2]{★}:SCALe	R/W	3-108

(3.3.7 Arbitrary Waveform)

Operation	Command	R/W	Detail
Select arbitrary waveform	[:SOURce[1|2]]:FUNCtion:USER	R/W	3-110
Arbitrary waveform data	{:TRACe|:DATA}[:DATA]	R/W	3-111
Story	{:TRACe|:DATA}:STORe	W	3-114
Recall	{:TRACe|:DATA}:RECall	W	3-114
Copy	{:TRACe|:DATA}:COPY	W	3-115
Delete	{:TRACe|:DATA}:DELete	W	3-116
Information acquisition	{:TRACe|:DATA}:INFormation?	R	3-117
Setting arbitrary waveform memory name	:MEMory{:TRACe|:DATA}:DEFine	R/W	3-117

(3.4 Output Signal Parameter Setting)

Operation	Command	R/W	Detail
Frequency			
Frequency	[:SOURce[1|2]]:FREQuency[:CW|:FIXed]	R/W	3-118
External synchronization source (Synclator)	[:SOURce[1|2]]:FREQuency:SYNC	R/W	3-120
Signal polarity of external synchronization source	[:SOURce[1|2]]:FREQuency:SYNC:SLOPe	R/W	3-121
Frequency ratio at external synchronization mode	[:SOURce[1|2]]:FREQuency:SYNC:HARMonic	R/W	3-121
Period			
Period	[:SOURce[1|2]]:PHASe[:ADJust]	R/W	3-119
Phase			
Phase	[:SOURce[1|2]]:PHASe[:ADJust]	R/W	3-122
Amplitude			
Amplitude	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	R/W	3-123
DC offset			
DC offset	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet	R/W	3-124
High level/Low level			
High level	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH	R/W	3-125
Low level	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW	R/W	3-126
Sub Waveform operation			
Waveform	[:SOURce[1|2]]:SCHannel:FUNCtion[:SHAPe]	R/W	3-127
Amplitude	[:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate] [:AMPLitude]	R/W	3-128
DC offset	[:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate] :OFFSet	R/W	3-129
Frequency	[:SOURce[1|2]]:SCHannel:FREQuency	R/W	3-130
Phase	[:SOURce[1|2]]:SCHannel:PHASe[:ADJust]	R/W	3-130
Select arbitrary waveform	[:SOURce[1|2]]:SCHannel:FUNCtion:USER	R/W	3-131
Noise bandwidth	[:SOURce[1|2]]:SCHannel:FUNCtion:NOISe:BW	R/W	3-132

(3.5 Signal Output Operation)

Operation	Command	R/W	Detail
Output on/off	:OUTPut[1|2][:STATe]	R/W	3-133
Output on at power-on	:OUTPut[1|2]:PON	R/W	3-133
Output auto-range	[:SOURce[1|2]]:VOLTage:RANGe:AUTO	R/W	3-134
Query setting range	[:SOURce[1|2]]:VOLTage:RANGe?	R	3-134
ΦSync	[:SOURce[1|2]]:PHASe:INITiate	W	3-135
External addition input	[:SOURce[1|2]]:COMBine:FEED	R/W	3-135
Load impedance	:OUTPut[1|2]:LOAD	R/W	3-136

(3.6 Trigger Operation)

Operation	Command	R/W	Detail
Trigger source	:TRIGger[1|2]:{SWEep|BURSt}:SOURce	R/W	3-138
Internal trigger period	:TRIGger[1|2]:{SWEep|BURSt}:TIMer	R/W	3-139
External trigger signal polarity	:TRIGger[1|2]:{SWEep|BURSt}:SLOPe	R/W	3-140
Manual trigger (TRIG Key operation)	*TRG	W	3-140
Manual trigger	:TRIGger[1|2][:SEQuence][:IMMediate]	W	3-140
Modulation/Sweep/Sequence	:TRIGger[1|2]:SELected:EXECute	W	3-141
External trigger threshold level	:TRIGger[1|2]:{SWEep|BURSt|FSKey|PSKey|SYNC}:LEVel	W	3-142

(3.7 Setting Memory Operation)

Operation	Command	R/W	Detail
Clear	:MEMory:STATe:DELete	W	3-143
Setting memory name	:MEMory:STATe:DEFine	R/W	3-143
Store	*SAV	W	3-143
Recall	*RCL	W	3-143

(3.8 USB Storage Operation)

Operation	Command	R/W	Detail
Information acquisition	:MMEMory:CATalog[:ALL]?	R	3-144
File delete	:MMEMory:DELete	W	3-144
Recall setting	:MMEMory:STATe:RECall	W	3-145
Store current setting	:MMEMory:STATe:STORe	W	3-145
Import arbitrary waveform	:MMEMory:{TRACe|DATA}:IMPort	W	3-146
Export arbitrary waveform	:MMEMory:{TRACe|DATA}:EXPort	W	3-146
Import sequence data	:MMEMory:{TRACe|DATA}:SEQuence:RECall	W	3-147
Export sequence data	:MMEMory:{TRACe|DATA}:SEQuence:STORe	W	3-147

(3.9 Status Operation)

Operation	Command	R/W	Detail
Status operations (Common command)			
Status register and error queue clear	*CLS	W	3-148
Register preset	:STATus:PRESet	W	3-149
Power on status clear	*PSC	R/W	3-150
Status byte register	*STB?	R	3-150
Service request enable register	*SRE	R/W	3-151
Standard event status register	*ESR?	R	3-151
Standard event status enable register	*ESE	R/W	3-151
Operation status register group			
Condition register	:STATus:OPERation[:CH1|:CH2]:CONDition?	R	3-152
Transition filter register (Negative)	:STATus:OPERation[:CH1|:CH2]:NTRansition	R/W	3-152
Transition filter register (Positive)	:STATus:OPERation[:CH1|:CH2]:PTRansition	R/W	3-153
Event resister	:STATus:OPERation[:CH1|:CH2][:EVENt]?	R	3-153
Event enable resister	:STATus:OPERation[:CH1|:CH2]:ENABle	R/W	3-153
Questionable status register group			
Condition resister	:STATus:QUEStionable[:CH1|:CH2]:CONDition?	R	3-154
Transition filter register (Negative)	:STATus:QUEStionable[:CH1|:CH2]:NTRansition	R/W	3-154
Transition filter register (Positive)	:STATus:QUEStionable[:CH1|:CH2]:PTRansition	R/W	3-155
Event register	:STATus:QUEStionable[:CH1|:CH2][:EVENt]?	R	3-155
Event enable resister	:STATus:QUEStionable[:CH1|:CH2]:ENABle	R/W	3-155
Warning event resister group			
Event register	:STATus:WARNing[:CH1|:CH2][:EVENt]?	R	3-156
Event enable resister	:STATus:WARNing[:CH1|:CH2]:ENABle	R/W	3-156

(3.10 Channel Operation, Channel-Link)

Function	Command	R/W	Detail
Channel mode	:CHANnel:MODE	R/W	3-157
Constant frequency difference frequency difference	:CHANnel:DELTa	R/W	3-158
Constant frequency ratio frequency ratio	:CHANnel:RATio	R/W	3-159
Channel-link	:INSTrument:COUPle	R/W	3-159

(3.11 Sequence)

Operation	Command	R/W	Detail
Sequence oscillation	[:SOURce[1|2]]:SEQuence:STATe	R/W	3-160
Sequence data	{:TRACe|:DATA}:SEQuence	R/W	3-161
Compile sequence data	:TRIGger[1|2]:COMPile[:IMMediate]	W	3-162
Acquisition of current step	[:SOURce[1|2]]:SEQuence:CSTep?	R	3-162
Initialization of sequence data	{:TRACe|:DATA}:SEQuence:CLEar	W	3-162
Store sequence data	{:TRACe|:DATA}:SEQuence:STORe	W	3-163
Recall sequence data	{:TRACe|:DATA}:SEQuence:RECall	W	3-163
Setting sequence memory name	:MEMory{:TRACe|:DATA}:STATe:SEQuence:DEFine	R/W	3-164
Power-on operating mode	[:SOURce[1|2]]:SEQuence:PON	R/W	3-164

(3.12 Setting Range Limit Operation)

Operation	Command	R/W	Detail
Frequency setting range limit	[:SOURce[1|2]]:FREQuency:LIMit:{HIGH|LOW}	R/W	3-172
Voltage setting range limit	[:SOURce[1|2]]:VOLTage:LIMit:{HIGH|LOW}	R/W	3-173
Phase setting range limit	[:SOURce[1|2]]:PHASe:LIMit:{HIGH|LOW}	R/W	3-174
Duty setting range limit	[:SOURce[1|2]][:PULSe]:DCYCle:LIMit:{HIGH|LOW}	R/W	3-175

(3.13 Other Operations)

Operation	Command	R/W	Detail
Equipment-specific information	*IDN?	R	3-176
Error message	:SYSTem:ERRor?	R	3-176
Initialization of setting	*RST	W	3-176
Set *OPC on operation completes	*OPC	W	3-177
Query current operation completed	*OPC?	R	3-177
Wait for command processing	*WAI	W	3-177
External reference frequency input	[:SOURce[1|2]]:ROSCillator:SOURce	R/W	3-178
External reference frequency output	[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]	R/W	3-178
Query input state of multi i/o connector	:SYSTem:AUXiliary:INPut?	R	3-179
Set output state of multi i/o connector	:SYSTem:AUXiliary:OUTPut	R/W	3-179
Enable of multi i/o connector	:SYSTem:AUXiliary:OUTPut:ENABle	R/W	3-180
User-defined unit	[:SOURce[1|2]]:{DCYCle|PERiod|FREQuency|PHASe|VOLTage[:OFFSet]}:USER	R/W	3-181
Theme Color of Display	:DISPlay:THEMe	R/W	3-182
Theme Color of Graph	:DISPlay:THEMe:GRAPh	R/W	3-182
Read Display Capture Data	:HCOPy:DATA?	R	3-183
Save Display Capture Data File to USB Storage	:HCOPy:FILE	W	3-183
License Inquiry	:SYSTem:LICense?	R	3-183

3. Command Reference

3.1 Oscillation Mode

3.1.1 Continuous Oscillation Mode

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.

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.

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 the signal to be output to the SYNC/SUB OUT in Continuous Oscillation Mode.

Setting parameter

SYNC|SBSYnc|SFCTn|OFF

SYNC → Reference Phase Synchronization
SBSYnc → Sub Waveform Reference Phase Synchronization
SFCTn → Sub Waveform
OFF → Output off (0 Vdc)

Query parameter

None

Response format

<DISC>

<DISC> → SYNC|SBSY|SFCT|OFF

The meaning of each response data is the same as the setting parameters.

Example

:OUTPut1:SYNC:TYPE SYNC

Sets the synchronous output of CH1 in Continuous Oscillation Mode to the reference phase synchronous signal.

3.1.2 Sweep Oscillation Mode

3.1.2.1 Common Setting of Sweep

Start/stop/hold/resume of sweep can be setting by "3.6.7 Execution Control of Modulation/Sweep/Sequence (W)."

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

■[:SOURce[1|2]]:SWEep:MODE

□[:SOURce[1|2]]:SWEep:MODE?

Description

Set/query the Sweep Oscillation Mode.

Setting parameter

SINGle|CONTinuous|GATed

SINGle → Single
CONTinuous → Continuous
GATed → Gated single

Query parameter

None

Response format

<DISC>

<DISC> → SING|CONT|GAT

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SWEep:MODE SINGle

Set the Sweep Oscillation Mode of CH1 to the single.

Remarks

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

3.1.2.1.2 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

<DISC>

<DISC> → LIN|LOG

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SWEep:SPACing LINear

Set the sweep slope of CH1 to linear.

3.1.2.1.3 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

<DISC>

<DISC> → RAMP|TRI

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SWEep:INTernal:FUNCtion RAMP

Set the sweep direction of CH1 to one-way.

3.1.2.1.4 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|U

(K:Kilo, M:Mili, U:Micro)

<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.

3.1.2.1.5 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.

3.1.2.1.6 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

3.1.2.1.7 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

<DISC>

<DISC> → HALF|CYCL

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SWEep:OSTop HALF

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

3.1.2.1.8 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.

3.1.2.1.9 Synchronization signal 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 → Sub Waveform Reference Phase Synchronization
MFCTc → Internal modulation waveform
SFCTc → Sub Waveform
OFF → Output stop (0 Vdc)

Query parameter

None

Response format

<DISC>

<DISC> → SYNC|SSYN|MARK|MSYN|SBSY|MFCT|SFCT|OFF

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SYNC:SWEep:TYPE SYNC

Set the Sweep Synchronization output of CH1 to the Reference Phase Synchronization.

3.1.2.2 Frequency Sweep Setting

3.1.2.2.1 Frequency Sweep (W/R) [:SOURce[1|2]]:FREQuency:MODE

■[:SOURce[1|2]]:FREQuency:MODE

□[:SOURce[1|2]]:FREQuency:MODE?

Description

Set to Sweep Oscillation Mode and Frequency Sweep

Query whether to set to Sweep Oscillation Mode and Frequency Sweep

Setting parameter

CW|FIXed|SWEep

CW|FIXed → Switch to Continuous Oscillation Mode.

SWEep → Switch to Sweep Oscillation Mode and Frequency Sweep.

Query parameter

None

Response format

<DISC>

<DISC> → CW|SWE

CW → Continuous Oscillation Mode.

SWE → Sweep Oscillation Mode and Frequency Sweep.

Example

:SOURce1:FREQuency:MODE SWEep

Set CH1 to Sweep Oscillation Mode and Frequency Sweep.

3.1.2.2.2 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 (<50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

3.1.2.2.3 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 (<50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

3.1.2.2.4 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 (< 50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

3.1.2.2.5 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 (<50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

3.1.2.2.6 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 (<50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

3.1.2.2.7 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.

3.1.2.2.8 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

3.1.2.3 Phase Sweep Setting

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

■[:SOURce[1|2]]:PHASe:MODE

□[:SOURce[1|2]]:PHASe:MODE?

Description

Set to Sweep Oscillation Mode and Phase Sweep

Query whether to set to Sweep Oscillation Mode and Phase Sweep

Setting parameter

FIXed|SWEep

FIXed → Switch to Continuous Oscillation Mode.

SWEep → Switch to Sweep Oscillation Mode and Phase Sweep.

Query parameter

None

Response format

<DISC>

<DISC> → FIX|SWE

FIX → Continuous Oscillation Mode.

SWE → Sweep Oscillation Mode and Phase Sweep

Example

:SOURce1:PHASe:MODE SWEep

Set CH1 to Sweep Oscillation Mode and Phase Sweep.

3.1.2.3.2 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°.

3.1.2.3.3 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°.

3.1.2.3.4 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°.

3.1.2.3.5 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°.

3.1.2.3.6 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°.

3.1.2.3.7 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.

3.1.2.3.8 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.

3.1.2.4 Amplitude Sweep Setting

3.1.2.4.1 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 to Sweep Oscillation Mode and Amplitude Sweep

Query whether to set to Sweep Oscillation Mode and Amplitude Sweep

Setting parameter

FIXed|SWEep

FIXed → Switch to Continuous Oscillation Mode.

SWEep → Switch to Sweep Oscillation Mode and Amplitude Sweep.

Query parameter

None

Response format

<DISC>

<DISC> → FIX|SWE

FIX → Continuous Oscillation Mode.

SWE → Sweep Oscillation Mode and Amplitude Sweep

Example

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

Set CH1 to Sweep Oscillation Mode and Amplitude Sweep.

3.1.2.4.2 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/50 Ω
Resolution : 0.1 mVp-p (3 Vp-p below),
1 mVp-p (3 Vp-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 5 Vp-p

Remarks

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

3.1.2.4.3 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/50 Ω
Resolution : 0.1 mVp-p (3 Vp-p below),
1 mVp-p (3 Vp-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 5 Vp-p.

Remarks

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

3.1.2.4.4 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/50 Ω
Resolution : 0.1 mVp-p (3 Vp-p below),
1 mVp-p (3 Vp-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 5 Vp-p.

Remarks

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

3.1.2.4.5 Span Value (W/R) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN

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

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

Description

Set/query the span value of the amplitude sweep.

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Span value : 0 Vp-p to 21 Vp-p/open
: 0 Vp-p to 10.5 Vp-p/50 Ω
Resolution : 0.1 mVp-p (3 Vp-p below),
1 mVp-p (3 Vp-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:SPAN 5VPP

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

Remarks

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

3.1.2.4.6 Marker Value (W/R) [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]

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

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

Description

Set/query the marker value of the amplitude sweep

Setting parameter

<amplitude>|CENTer|MINimum|MAXimum

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

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

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

<eunits> ::= M (milli)

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

CENTer → Center value of the amplitude sweep

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 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 5 Vp-p.

3.1.2.4.7 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.

3.1.2.4.8 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.

3.1.2.5 DC Offset Sweep Setting

3.1.2.5.1 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 to Sweep Oscillation Mode and DC offset Sweep

Query whether to set to Sweep Oscillation Mode and DC offset Sweep

Setting parameter

FIXed|SWEep

FIXed → Switch to Continuous Oscillation Mode.

SWEep → Switch to Sweep Oscillation Mode and DC offset Sweep.

Query parameter

None

Response format

<DISC>

<DISC> → FIX|SWE

FIX → Continuous Oscillation Mode.

SWE → Sweep Oscillation Mode and DC offset Sweep

Example

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

Set CH1 to Sweep Oscillation Mode and DC offset Sweep.

3.1.2.5.2 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> → Start value : -10.5 V to +10.5 V

Resolution : 0.1 mV (|Setting value|＜3 V),

1 mV (|Setting value| ≥ 3 V)

<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 2.5 V.

3.1.2.5.3 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> → Stop value : -10.5 V to +10.5 V

Resolution : 0.1 mV (|Setting value|＜3 V),

1 mV (|Setting value| ≥ 3 V)

<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 2.5 V.

3.1.2.5.4 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> → Center value : -10.5 V to +10.5 V
Resolution : 0.1 mV (|Setting value| < 3 V),
1 mV (|Setting value| ≥ 3 V)

<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 2.5 V.

3.1.2.5.5 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> → Span value : 0 V to 21 V
Resolution : 0.1 mV (3 V below), 1 mV (3 V 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 2.5 V.

3.1.2.5.6 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> → Marker value : Start value to stop value

Resolution : 0.1 mV (|Setting value|＜3 V),

1 mV (|Setting value| ≥ 3 V)

<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 2.5 V.

3.1.2.5.7 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.

3.1.2.5.8 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.

3.1.2.6 Duty Sweep Setting

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

■[:SOURce[1|2]][:PULSe]:DCYCle:MODE

□[:SOURce[1|2]][:PULSe]:DCYCle:MODE?

Description

Set to Sweep Oscillation Mode and Duty Sweep

Query whether to set to Sweep Oscillation Mode and Duty Sweep

Setting parameter

FIXed|SWEep

FIXed → Switch to Continuous Oscillation Mode.

SWEep → Switch to Sweep Oscillation Mode and Duty Sweep.

Query parameter

None

Response format

<DISC>

<DISC> → FIX|SWE

FIX → Continuous Oscillation Mode.

SWE → Sweep Oscillation Mode and Duty Sweep

Example

:SOURce1:PULSe:DCYCle:MODE SWEep

Set CH1 to Sweep Oscillation Mode and Duty Sweep.

3.1.2.6.2 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 : 0.000 1% to 99.999 9%
(Square wave/normal duty range)
: 0.000 0% to 100.000 0%
(Square wave/extended duty range)
: 0.000 1% to 99.999 9%
(Pulse wave)

Resolution : 0.000 1%

<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.

3.1.2.6.3 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 : 0.000 1% to 99.999 9%
(Square wave/normal duty range)
: 0.000 0% to 100.000 0%
(Square wave/extended duty range)
: 0.000 1% to 99.999 9%
(Pulse wave)
Resolution : 0.000 1%

<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.

3.1.2.6.4 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 : 0.000 1% to 99.999 9%
(Square wave/normal duty range)
: 0.000 0% to 100.000 0%
(Square wave/extended duty range)
: 0.000 1% to 99.999 9%
(Pulse wave)
Resolution : 0.000 1%

<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.

3.1.2.6.5 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 : 0.000 0% to 99.999 9%
(Square wave/normal duty range)
: 0.000 0% to 100.000 0%
(Square wave/extended duty range)
: 0.000 0% to 99.999 9%
(Pulse wave)

Resolution : 0.000 0%

<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.

3.1.2.6.6 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 : 0.000 1%

<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.

3.1.2.6.7 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.

3.1.2.6.8 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.

3.1.3 Burst Oscillation Mode

3.1.3.1 Common Setting of Burst

For the trigger related settings, see the section for "3.6 Trigger Operation".

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

■[:SOURce[1|2]]:BURSt:STATe

□[:SOURce[1|2]]:BURSt:STATe?

Description

Switch to Burst Oscillation Modes.

Queries whether Burst Oscillation Mode is enabled

If the trigger burst oscillation is reset to burst, the oscillation will stop immediately.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Not Burst Oscillation Modes

1/ON : Burst Oscillation Modes

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Oscillation mode is not the Burst Oscillation Modes

1 : Oscillation mode is the Burst Oscillation Mode

Example

:SOURce1:BURSt:STATe ON

Set the Oscillation Modesof CH1 to Burst Oscillation Modes.

3.1.3.1.2 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.

If the Trigger burst is reset during trigger burst oscillation, oscillation will stop after waiting for the phase setting value or the phase setting value + 180°.

Setting parameter

AUTO|TRIGger|GATE|TGATe

AUTO → Auto burst

TRIGger → Trigger burst

GATE → Gate oscillation

TGATe → Triggered gate oscillation

Query parameter

None

Response format

<DISC>

<DISC> → AUTO|TRIG|GATE|TGAT

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:BURSt:MODE AUTO

Set the burst mode of CH1 to the auto burst.

3.1.3.1.3 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%.

3.1.3.1.4 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.

3.1.3.1.5 Synchronization signal 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 signal output from the SYNC/SUB OUT terminal in Burst Oscillation Mode.

Setting parameter

SYNC|BSYNc|MSYNc|SBSYnc|MFCTn|SFCTn|OFF

SYNC → Reference Phase Synchronization
BSYNc → Burst synchronization
MSYNc → Internal modulation synchronization
SBSYnc → Sub Waveform Reference Phase Synchronization
MFCTn → Modulation function
SFCTn → Sub Waveform
OFF → Output stop (0 Vdc)

Query parameter

None

Response format

<DISC>

<DISC> → SYNC|BSYN|MSYN|SBSY|MFCT|SFCT|OFF

The meaning of each response data is the same as the setting parameters.

Example

:OUTPut1:SYNC:BURSt:TYPE SYNC

Sets the signal output to the CH1 SYNC/SUB OUT in Burst Oscillation Mode to reference phase sync.

3.1.3.2 Auto Burst

3.1.3.2.1 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.

3.1.3.2.2 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.

3.1.3.3 Trigger Burst

3.1.3.3.1 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|INFinity

<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>|INF

Example

:SOURce1:BURSt:TRIGger:NCYCles 10

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

3.1.3.3.2 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.

3.1.3.4 Common setting of Gate / Triggered gate

3.1.3.4.1 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.

Keywords in {}

GATE|TGATe

GATE → Gate

TGATe → Triggered gate

Setting parameter

HALF|CYCLe

HALF → 0.5 cycle

CYCLe → 1 cycle

Query parameter

None

Response format

<DISC>

<DISC> → HALF|CYCL

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:BURSt:TGATe:OSTop HALF

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

3.2 Modulated Function

Some modulation are available in Burst Oscillation Mode and Sweep Oscillation Mode.
To set "modulation" alone, rather than "Burst Oscillation Mode and modulation" or "Sweep Oscillation Mode and modulation", it is necessary to set it to "Continuous Oscillation Mode" beforehand.

3.2.1 Common Setting of Modulation Function

Start or stop of modulation can be setting by "3.6.7 Execution Control of Modulation/Sweep/Sequence (W)."

3.2.1.1 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.

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 Sub Waveform setting in the Continuous Oscillation Mode is internally common..

3.2.1.2 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.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → frequency : 0 Hz to 5 MHz,
Resolution : 11 digits or 100 μHz

<eunits> ::= M|K|U|N
(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 1 kHz

Remarks

Same as the Sub Waveform phase setting in Continuous Oscillation Mode.

3.2.1.3 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 signal to be output to the SYNC/SUB OUT in Continuous Oscillation Mode and modulated oscillation

Setting parameter

SYNC|MSYNc|SBSYnc|MFCTn|SFCTn|OFF

SYNC → Reference Phase Synchronization
MSYNc → Internal modulation synchronization
SBSYnc → Sub Waveform Reference Phase Synchronization
MFCTn → Internal modulation waveform
SFCTn → Sub Waveform
OFF → Output Off (0 Vdc)

Query parameter

None

Response format

<DISC>

<DISC> → SYNC|MSYN|SBSY|MFCT|SFCT|OFF

The meaning of each response data is the same as the setting parameters.

Example

:OUTPut1:SYNC:FSKey:TYPE SYNC

Sets the signal output to the CH1 SYNC/SUB OUT in Continuous Oscillation Mode and FM to reference phase sync

Remarks

In Burst Oscillation Mode, use ":OUTPut[1|2]:SYNC:BURSt:TYPE".
In Sweep Oscillation Mode, use ":OUTPut[1|2]:SYNC:SWEep:TYPE".

3.2.2 Common Setting of FSK/PSK

3.2.2.1 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 (WF1982/WF1984)

Query parameter

None

Response format

<DISC>

<DISC> → INT|EXT1|EXT2

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:FSKey:SOURce INTernal

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

3.2.2.2 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

<DISC>

<DISC> → POS|NEG

The meaning of each response data is the same as the setting parameters.

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

In this command, "[1|2]" specifies the external trigger input terminal rather than the channel.Valid for WF1982/WF1984.If omitted, the TRIG IN 1 terminal is specified.

3.2.3 Common Setting Except for FSK/PSK

3.2.3.1 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 for FM/PM/AM/AM(DSB-SC)/DC offset modulation/PWM.

Setting parameter

INTernal|EXTernal[1]|EXTernal2

INTernal → Internal
EXTernal[1] → MOD/ADD IN CH1 input connector
EXTernal2 → MOD/ADD IN CH2 input connector (WF1982/WF1984)

Query parameter

None

Response format

<DISC>

<DISC> → INT|EXT1|EXT2
The meaning of each response data is the same as the setting parameters.

Example

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

Remarks

The input to the MDD/ADD IN CH1 terminal is reflected to CH1 FCTN OUT.
The input to the MDD/ADD IN CH2 terminal is reflected to CH2 FCTN OUT.

3.2.3.2 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 of FM/PM/AM/AM(DSB-SC)/DC offset modulation/PWM.

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	→	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

<DISC>

<DISC> → 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

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid

Set the internal modulation waveform of CH1 to sine wave.

Remarks

The Sub Waveform setting in the Continuous Oscillation Mode is internally common.

3.2.3.3 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 arbitrary waveform for FM/PM/AM/AM(DSB-SC)/DC offset modulation/PWM internal modulation waveform.

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 Sub Waveform setting in the Continuous Oscillation Mode is internally common.

3.2.3.4 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.

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number : 1 to 6

1	→	100 kHz
2	→	300 kHz
3	→	1 MHz
4	→	3 MHz
5	→	10 MHz
6	→	Full (WF1983/WF1984)
MINimum	→	1 (100 kHz)
MAXimum	→	5 (10 MHz) (WF1981/WF1982)
		6 (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 100 kHz.

Remarks

The Sub Waveform setting in the Continuous Oscillation Mode is internally common.

3.2.4 FSK (Frequency Shift Keying)

3.2.4.1 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.

3.2.4.2 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 setting range is limited to the frequency setting range of each carrier waveform.

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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.

3.2.5 PSK (Phase Shift Keying)

3.2.5.1 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.

3.2.5.2 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>|MINimun|MAXimum

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

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

<units> ::= DEG

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameter

[MINimum|MAXimum]

MINimum → 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 reduce depending on the current settings.

3.2.6 FM (Frequency Modulation)

3.2.6.1 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.

3.2.6.2 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|K|U|N

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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.

3.2.7 PM (Phase Modulation)

3.2.7.1 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.

3.2.7.2 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 reduce depending on the current settings.

3.2.8 AM (amplitude modulation)

3.2.8.1 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.

3.2.8.2 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%

3.2.9 AM (DSB-SC)

3.2.9.1 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.

3.2.9.2 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%

3.2.10 DC Offset Modulation

3.2.10.1 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.

3.2.10.2 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.

Remarks

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

3.2.11 PWM (Pulse Width Modulation)

3.2.11.1 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.

3.2.11.2 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 : 0.000 0% to 49.999 9%
(Square wave/normal duty range)
: 0.000 0% to 50.000 0%
(Square wave/extended duty range)
: 0.000 0% to 49.999 9%
(pulse wave)
Resolution : 0.000 1%

<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 of the carrier frequency or duty setting.

3.3 Waveform Setting

3.3.1 Common Setting of Waveform

3.3.1.1 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

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:FUNCtion:SHAPe RAMP

Set the waveform of CH1 to ramp wave.

3.3.1.2 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|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
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 <shape> of setting parameter.

Response format

NORM|INV

The meaning of each response data is the same as the <polarity> of setting parameters.

Example

:OUTPut1:POLarity SINusoid,NORMal

Set the polarity of sine wave of CH1 to normal.

3.3.1.3 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
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

<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|EFALl|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|DPULse|BRRamp
|USER

For the meaning of each parameter, see the <shape> of setting parameter.

Response format

MFS|FS|PFS

The meaning of each response data is the same as the <scale> of setting parameters.

Example

:OUTPut1:SCALe SINusoid,FS

Set the Amplitude Scale Range of sine wave of CH1 to ±FS.

3.3.2 Square Wave

3.3.2.1 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.

3.3.2.2 Duty (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 : 0.000 1% to 99.999 9% (Normal range)

: 0.000 0% to 100.000 0% (Extended range)

Resolution : 0.000 1%

<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.

3.3.3 Pulse Wave

3.3.3.1 Duty (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 : 0.000 1% to 99.999 9%

Resolution : 0.000 1%

<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.

3.3.3.2 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 : 0.000 1% or less of the cycle or 0.01 ns

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

(MA:Mega, K:Kilo, M:Mili, U:Micro, N:Nano)

<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>|INF

Example

:SOURce1:PULSe:WIDTh 1MS

Sets the pulse width of CH1 to 1ms.

Remarks

The setting range varies depending on the currently setting.

3.3.3.3 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|K|M|U|N
(MA:Mega, K:Kilo, M:Mili, U:Micro, N:Nano)

<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>|INF

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.

3.3.3.4 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|K|M|U|N
(MA:Mega, K:Kilo, M:Mili, U:Micro, N:Nano)

<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>|INF

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.

3.3.3.5 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|EFALl|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
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

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

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:PULSe:TRANsition:FUNCtion LINear

Set the transition wave of CH1 to linear wave.

3.3.4 Ramp Wave

3.3.4.1 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%.

3.3.5 Noise

3.3.5.1 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	→	100 kHz	
2	→	300 kHz	
3	→	1 MHz	
4	→	3 MHz	
5	→	10 MHz	
6	→	30 MHz	
7	→	Full	(WF1983/WF1984)
MINimum	→	1 (Narrowband 100 kHz)	
MAXimum	→	6 (Wideband 30 MHz)	(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 100 kHz.

3.3.6 Parameter-Variable Waveform

The Parameter-Variable Waveform (PWF) can be used for the main output (FCTN OUT), as well as for internal modulation waveforms, pulse wave transition waveforms, and sub waveforms. Furthermore, their parameters are independent of each other.

The commands are also common except for some character strings, so for ease of explanation, non-common parts (called selection keywords) are denoted with [★].
In place of [★], specify a keyword from the table below according to the setting target.

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

3.3.6.1 Steady Sine Wave Group

3.3.6.1.1 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%.

3.3.6.1.2 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 Sub Waveform to 20%.

3.3.6.1.3 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%.

3.3.6.1.4 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.

3.3.6.1.5 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 conduction angle control 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°.

3.3.6.1.6 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>|INF

Example

:SOURce1:FUNCtion:SSINe:STEPs 10

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

3.3.6.1.7 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>INF

Example

:SOURce1:FUNCtion:SSINe:TSTEps 10

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

3.3.6.1.8 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.

3.3.6.1.9 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°.

3.3.6.2 Transient Sine Wave Group

3.3.6.2.1 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°.

3.3.6.2.2 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%.

3.3.6.2.3 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°.

3.3.6.2.4 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%.

3.3.6.2.5 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°.

3.3.6.2.6 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.

3.3.6.2.7 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%.

3.3.6.2.8 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%.

3.3.6.2.9 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°.

3.3.6.2.10 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.

3.3.6.2.11 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%.

3.3.6.2.12 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%.

3.3.6.3 Pulse Waveform Group

3.3.6.3.1 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%.

3.3.6.3.2 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%.

3.3.6.3.3 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%.

3.3.6.3.4 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%.

3.3.6.3.5 Trapezoid Pulse Slope Width (W/R) [:SOURce[1|2]][★]:FUNCtion:TPULse:RFALl

■[:SOURce[1|2]][★]:FUNCtion:TPULse:RFALl

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

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:RFALl 20PCT

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

3.3.6.3.6 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%.

3.3.6.3.7 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.

3.3.6.4 Transient Response Waveform Group

3.3.6.4.1 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 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%.

3.3.6.4.2 Exponential Fall Time Constant (W/R) [:SOURce[1|2]][★]:FUNCtion:EFALl:TCONstant

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

□[:SOURce[1|2]][★]:FUNCtion:EFALl: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:EFALl:TCONstant 20PCT

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

3.3.6.4.3 2nd-Order LPF Step Response Natural frequency (W/R) [:SOURce[1|2]][★]:FUNCtion:SOLStep:NFRequency

■[:SOURce[1|2]][★]:FUNCtion:SOLStep:NFRequency

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

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:NFRequency 10

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

3.3.6.4.4 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.

3.3.6.4.5 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.

3.3.6.4.6 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%.

3.3.6.5 Surge Waveform Group

3.3.6.5.1 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.

3.3.6.5.2 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%.

3.3.6.5.3 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%.

3.3.6.5.4 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%.

3.3.6.5.5 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%.

3.3.6.6 Other Waveform Group

3.3.6.6.1 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%.

3.3.6.6.2 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%.

3.3.6.6.3 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%.

3.3.6.6.4 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%.

3.3.6.6.5 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%.

3.3.6.6.6 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%.

3.3.6.6.7 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%.

3.3.6.6.8 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%.

3.3.6.6.9 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%.

3.3.6.6.10 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%.

3.3.6.6.11 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%.

3.3.6.6.12 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%.

3.3.6.6.13 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%.

3.3.6.6.14 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%.

3.3.6.6.15 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%.

3.3.6.7 Polarity/Amplitude Scale Range of Sub Waveform and internal modulating waveforms

3.3.6.7.1 Polarity (W/R)
:OUTPut[1|2]{★}:POLarity

■:OUTPut[1|2]{★}:POLarity

□:OUTPut[1|2]{★}:POLarity?

{★} will change depending on the setting target as shown in the table below.

Setting target	Keyword
Sub Waveform	:SCHannel
Internal modulated waveform	:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal

Description

Set/query the polarity when the parameter variable waveform (PWF) is used for the sub waveform and internal modulation waveform

Setting parameter

<shape>,<polarity>

<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

- 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

<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|EFALl|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|DPULse|BRRamp

For the meaning of each query parameter, see the <shape> of setting parameter.

Response format

NORM|INV

The meaning of each response data is the same as the <polarity> of setting parameters.

Example

:OUTPut1:FM:INTernal:POLarity USINe,NORMal

Set the polarity of internal modulated waveform(unbalanced sine wave) of CH1 to normal.

3.3.6.7.2 Amplitude Scale Range (W/R) :OUTPut[1|2]{★}:SCALe

■:OUTPut[1|2]{★}:SCALe

□:OUTPut[1|2]{★}:SCALe?

{★} will change depending on the setting target as shown in the table below.

Setting target	Keyword
Sub Waveform	:SCHannel
Internal Modulated Waveform	:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal

Description

Set/query the amplitude range when a parameter-variable waveform (PWF) is used for the secondary waveform and internal modulation waveform.

Setting parameter

<shape>,<scale>

<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

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

<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 <shape> of setting parameter.

Response format

MFS|FS|PFS

The meaning of each response data is the same as the <scale> of setting parameters.

Example

:OUTPut1:FM:INTernal:SCALe USINe,FS

Set the Amplitude Scale Range of internal modulated waveform(unbalanced sine wave) of CH1 to full-scale.

3.3.7 Arbitrary Waveform

3.3.7.1 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.

3.3.7.2 Arbitrary Waveform Data (W/R) {:TRACe|:DATA}[:DATA]

■{:TRACe|:DATA}[:DATA]

□{:TRACe|:DATA}[:DATA]?

Description

Write arbitrary waveform data to the specified memory number.
Read arbitrary waveform data from the specified memory number.

Setting parameter

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

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

<name> ::= <STR>
<STR> → Arbitrary waveform name
20 characters or less. Optional. If omitted, the setting will not be changed.)
For the characters that can be used, see "Characters that can be used in "<name>".

<data> ::= <BLK>
<BLK> → See the "Data format of arbitrary waveform" below.

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>
See the "Data format of arbitrary waveform" bellow.

Remarks

(1) Arbitrary waveform memory number 0 is the edit memory.
(2) The arbitrary waveform name of memory number 0 is "<Edit␣Memory>␣␣␣␣␣␣␣" (␣is a white space).
(3) Array format data cannot be set to the arbitrary waveform memory number 0.
(4) Arbitrary waveform name cannot be set for the arbitrary waveform memory number 0. If specified, it is ignored.

Characters that can be used in "<name>"

The following characters can be used in the names of configuration memories and files. However, if you use ",", you must be careful when separating parameters in a program that receives the name of the configuration memory by remote command.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9
! # $ % & ’ ( ) + , − . ; = @ [ ] ^ _ ` { } ~ and white space.

Data format of arbitrary waveform

There are two data formats for arbitrary waveform data: array format and control point format. Select one of them.Array format is a method of arranging waveform data corresponding to addresses in the waveform memory. For example, time series data captured by an AD converter is an example of this.The specified data will always be played back.
In the array format, the upper limit of the output frequency is limited by the number of data items divided by the maximum sampling frequency.
Control point format is a method of specifying points that characterize the arbitrary waveform with <x,y>.The control point format is a method in which the points that characterize the arbitrary waveform are specified by <x,y>. The MU111100A generates the waveform by linearly interpolating those points.

Array Format

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

- # → Start character
- <digit> → A number between 1 and 9 indicating the number of digits in the following <bytes>.
- <bytes> → A decimal string representing the number of bytes of data that follows.
- <format> → Specify 4-byte hexadecimal number "00 00 00 00".
- <number> → Specify the number of data points in 4-byte hexadecimal from the most significant byte to the least significant byte.
  16 to 33 554 432 (WF1981/WF1982)
  16 to 67 108 864 (WF1983/WF1984)
- <data[i]> → The i-th data (2-byte hexadecimal number in the order of upper byte and lower byte)
  Specify in two's complement notation, in the range of -32767 (8001 in hexadecimal) to 32767 (7FFF in hexadecimal).
  Do not specify -32768 (8000 in hexadecimal).

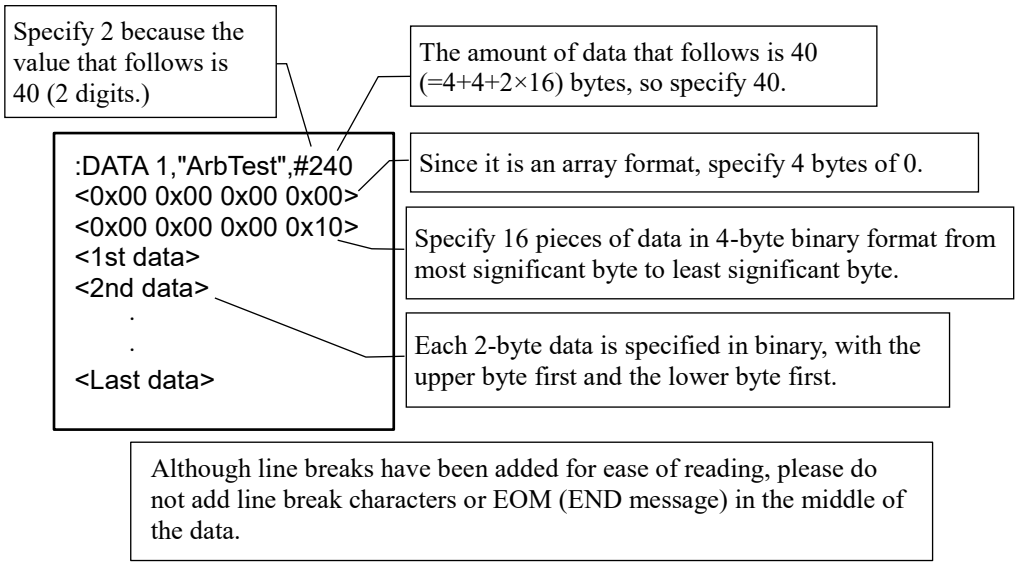
Control Point Format

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

- # → Start character
- <digit> → A number from 1 to 9 indicating the number of <bytes> that follow.
- <bytes> → A numeric string representing the number of bytes of data that follow in decimal.
- <format> → Specify 4-byte hexadecimal number "00 00 00 01".
- <number> → The number of data points is specified in 4-byte hexadecimal, starting from the most significant byte.
  2 to 10 000
- <x[i]> → The x value of the i-th control point (Specify 4 bytes starting from the most significant byte.)
  Specify 0 to the maximum value of the X-axis converted to 0 to 2^{32}-1.
  For example, if the original x[i] are x[0]=0, x[1]=0.5, x[2]=2.0, they will be converted to x[0]=0, x[1]=1 073 741 823 (3FFF FFFF in hexadecimal), x[2]=4 294 967 295 (FFFF FFFF in hexadecimal).
  <x[i]> must be sorted in ascending order.
- <y[i]> → The y value of the i-th control point (Specify 2 bytes starting from the most significant byte.)
  Specify a value in the range of −32767 (8001 in hexadecimal) to 32767 (7FFF in hexadecimal).
  Do not specify −32768 (8000 in hexadecimal)

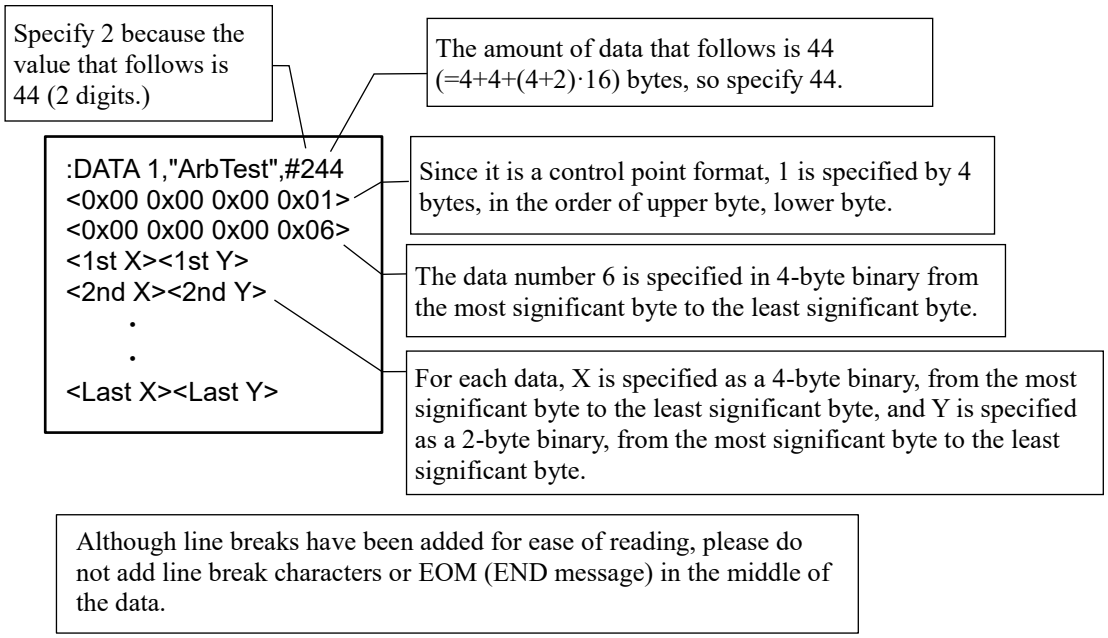
Array format example

Below is an example of writing 16 words of array format data to arbitrary waveform memory number 1 with the name "ArbTest".



Control point example

Below is an example of writing 16 words of array format data to arbitrary waveform memory number 1 with the name "ArbTest".



3.3.7.3 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 or less. Optional. If omitted, the setting will not be changed.)

For the characters that can be used, see "Characters that can be used in "<name>".

Example

:TRACe:STORe 2,"name"

Save arbitrary waveform data in edit memory as the arbitrary waveform name "name" to the memory number 2.

3.3.7.4 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.

3.3.7.5 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 or less. Optional. If omitted, the Arbitrary waveform name will not be changed.)

For the characters that can be used, see "Characters that can be used in "<name>".

<chan> ::= <INT>

<INT> → Channel number : 1 to 2

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

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>␣␣␣␣␣␣␣(␣is a white space).
(3) When copying the arbitrary waveform from specified memory number, see "3.3.7.1 Set Arbitrary Waveform (W/R)."

3.3.7.6 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.

3.3.7.7 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 (␣is a white space).

3.3.7.8 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)
For the characters that can be used, see "Characters that can be used in "<name>".

<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>␣␣␣␣␣␣␣" (␣is a white space).

3.4 Output Signal Parameter Setting

3.4.1 Frequency

3.4.1.1 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 output (FCTN OUT).

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 μHz (< 50 MHz), 0.1 μHz(≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 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 1 MHz.

Remarks

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

3.4.1.2 Period (W/R) [:SOURce[1|2]][:PULSe]:PERiod

■[:SOURce[1|2]][:PULSe]:PERiod

□[:SOURce[1|2]][:PULSe]:PERiod?

Description

Set/query the period.

Setting parameter

<period>|MINimum|MAXimum|INFinity

<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|K|M|U|N

(MA:Mega, K:Kilo, M:Mili, U:Micro, N:Nano)

<units> ::= S|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

INFinity → Infinity

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>|INF

Example

:SOURce1:PULSe:PERiod 1US

Set the period of CH1 to 1μs.

Remarks

The setting range varies depending on the currently setting.

3.4.1.3 Syncrator (W/R) [:SOURce[1|2]]:FREQuency:SYNC

■[:SOURce[1|2]]:FREQuency:SYNC

□[:SOURce[1|2]]:FREQuency:SYNC?

Description

Set/query the Syncrator (a function that outputs a waveform synchronized with an externally input signal)

Setting parameter

0|OFF|1|EXTernal[1]|2|EXTernal2

0|OFF → Syncrator off

1|EXTernal[1] → Syncrator on
(Synchronization source is TRIG IN1 connector)

2|EXTernal2 → Syncrator on
(Synchronization source is TRIG IN2 connector)

Query parameter

None

Response format

<sync_mode>

<sync_mode> ::= <INT>

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:FREQuency:SYNC OFF

Turn off the CH1 Syncrator.

3.4.1.4 Signal Polarity of Syncrator (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 Syncrator source.

Setting parameter

POSitive|NEGative

POSitive → Positive

NEGative → Negative

Query parameter

None

Response format

POS|NEG

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:FREQuency:SYNC:SLOPe NEGative

Set the polarity of the sync source of the CH1 Syncrator to negative polarity.

3.4.1.5 Frequency Ratio of Syncrator (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 of the Synclator.

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 factor m to 2 and the division factor n to 3 of CH1 syncrator.

3.4.2 Phase

3.4.2.1 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 main output (FCTN OUT).

Setting parameter

<phase>|MINimum|MAXimum

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

<REAL> → Phase : -1800.000° to 1800.000°

Resolution : 0.001°

<units> ::= DEG|USER

MINimum → Set the minimum value

MAXimum → Set the maximum value

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°.

3.4.3 Amplitude

3.4.3.1 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 the main output (FCTN OUT).

Setting parameter

<amplitude>|MINimum|MAXimum|-INFinity

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

<REAL> → Amplitude : 0 Vp-p to 21 Vp-p/open
: 0 Vp-p to 10.5 Vp-p/50 Ω
Resolution : 0.1 mVp-p (3 Vp-p below),
1 mVp-p (3 Vp-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

-INFinity Negative Infinity

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>|-INF

Example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 10VPP

Set the amplitude of CH1 to 10 Vp-p.

3.4.4 DC Offset

3.4.4.1 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 the main output (FCTN OUT).

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10.5 V/open, ±5.25 V/50 Ω

Resolution : 0.1 mV (|Setting value|＜3 V),

1 mV (|Setting value| ≥ 3 V)

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.

3.4.5 High Level/Low Level Voltage

3.4.5.1 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 of the main output (FCTN OUT).

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

3.4.5.2 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 of the main output (FCTN OUT).

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.

3.4.6 Sub Waveform operatio

3.4.6.1 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 Sub 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

The meaning of each response data is the same as the setting parameters.

Example

:SOURce1:SCHannel:FUNCtion:SHAPe SINusoid

Set the Sub Waveform of CH1 to sine wave.

Remarks

The setting of each Parameter-Variable Waveform wave parameter, see the "3.3.6 Parameter-Variable Waveform".

3.4.6.2 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 Sub Waveform 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 Sub Waveform output of CH1 to 3 Vp-p.

3.4.6.3 DC 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 Sub Waveform 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 Sub Waveform output of CH1 to 2.5V.

3.4.6.4 Frequency (W/R) [:SOURce[1|2]]:SCHannel:FREQuency

■[:SOURce[1|2]]:SCHannel:FREQuency

□[:SOURce[1|2]]:SCHannel:FREQuency?

Description

Set/query the Frequency of Sub Waveform output.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Frequency : 0 Hz to 5 MHz
Resolution : 15 digits or 10 nHz

<eunits> ::= M|K|U|N
(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 Sub Waveform of CH1 to 1 kHz.

Remarks

The setting range varies depending on the waveform and Oscillation Mode.

3.4.6.5 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 Sub Waveform .

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 Sub Waveform phase of CH1 to 90°.

3.4.6.6 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 Sub Waveform .

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 Sub Waveform of CH1

Remarks

Memory number 0 is the edit memory.

3.4.6.7 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 Sub Waveform .

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number: 1 to 6

1	→	100 kHz	
2	→	300 kHz	
3	→	1 MHz	
4	→	3 MHz	
5	→	10 MHz	
6	→	Full	(WF1983/WF1984)
MINimum	→	1 (Narrowband 100 kHz)	
MAXimum	→	5 (Wideband 10 MHz)	(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 Sub Waveform of CH1 to 100 kHz.

3.5 Signal Output Operation

3.5.1 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.

3.5.2 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

If there is a power loss that is not caused by the power switch, the output will be turned off.

Query parameter

None

Response format

ON|OFF|LAST

The meaning of each response data is the same as the setting parameters.

Example

:OUTPut1:PON ON

Set the output on of CH1 at power-on.

3.5.3 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.

In the Auto mode, the range will automatically change 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.

3.5.4 Query Range (R) [:SOURce[1|2]]:VOLTage:RANGe?

□[:SOURce[1|2]]:VOLTage:RANGe?

Description

Query the current Maximum output voltage rangerange.

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

3.5.5 Execution of ΦSync (W) [:SOURce[1|2]]:PHASe:INITiate

■[:SOURce[1|2]]:PHASe:INITiate

Description

The main output (FCTN OUT), sub waveform, and internal modulation waveform are re-oscillated from the set phase value.

This operation is called ΦSync. This operation maintains a constant phase relationship when the main output (FCTN OUT), sub waveform, and internal modulation waveform are the same frequency.

The presence or absence of [1|2] does not affect operation.

Setting parameter

None

Example

:SOURce1:PHASe:INITiate

Exucution of ΦSync (phase syncronization.)

Remarks

This is valid when the operation mode is normal oscillation and when the operation mode is sequence oscillation and editing.

3.5.6 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 gain from external addition input to main output (FCTN OUT).

The gain can be set depends on the current maximum output voltage range.

X0.4 → When the maximum output voltage range is 0.8V and auto range.
X2 → When the maximum output voltage range is 4V/0.8V and auto range.
X10 → When in auto range.

Setting parameter

OFF| X0.4|X2|X10

OFF → Disable the external addition.
X0.4 → 0.4 times (Maximum output voltage range is forced to 0.8V)
X2 → 2 times (Maximum output voltage range is forced to 4V)
X10 → 10 times (Maximum output voltage range is forced to 20V)

Query parameter

None

Response format

OFF|X0.4|X2|X10

Example

:SOURce1:COMBine:FEED X2

Set CH1 external input gain to 2.

3.5.7 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 : 0.1 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 50 Ω.

3.6 Trigger Operation

3.6.1 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 3.1, some of these commands are not available depending on the oscillation mode. Invalid command will be ignored.

Table 3.1 Commands available for trigger/oscillation state control for each oscillation mode

Oscillation Mode / Operational 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).

3.6.2 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 in Burst Oscillation Mode and Sweep Oscillation Mode

Keywords in {}

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 (TRIG IN #1)
EXTernal2 → External trigger source2 (TRIG IN #2)

Query parameter

None

Response format

TIM1|TIM2|EXT1|EXT2

The meaning of each response data is the same as the setting parameters.

Example

:TRIGger2:SWEep:SOURce EXT

Set the trigger source of CH2 sweep to external trigger source 1.

3.6.3 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.

Keywords in {}

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|K|M|U|N

(MA:Mega, K:Kilo, M:Mili, U:Micro, N:Nano)

<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.

3.6.4 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 mode.

Keywords in {}

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

The meaning of each response data is the same as the setting parameters.

Example

:TRIGger:SWEep:SLOPe NEGative

Set the external trigger polarity during sweep to falling edge.

Remarks

In this command, "[1|2]" specifies the external trigger input terminal rather than the channel.Valid for WF1982/WF1984.If omitted, the TRIG IN 1 terminal is specified.

3.6.5 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 on CH2, see "3.6.6 Execution of Manual Trigger (W)" below.

3.6.6 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

3.6.7 Execution Control of Modulation/Sweep/Sequence (W) :TRIGger[1|2]:SELected:EXECute

■:TRIGger[1|2]:SELected:EXECute

Description

Execution control of each oscillation mode.

The setting parameters change depending on the oscillation mode as follows:

Setting parameter

<value1>[,<value2>]

<value2> is valid only in Sweep Oscillation Mode and modulation are enabled.

Continuous 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 Oscillation Mode and modulation are enabled

<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 oscillation

<value1> ::= STARt|STOP|ISTop|HOLD|RESume|EBRanch|EDIT

STARt → Sequence oscillation start

STOP → Sequence oscillation stop

ISTop → Forced termination

HOLD → Hold

RESume → Resume

EBRanch → Event branch

EDIT → Enter edit mode

Remarks

In sequence oscillation, "[1|2]" does not affect operation.

This command cannot be used in the Burst Oscillation Mode.

3.6.8 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.

Setting parameter

<threshold>|TTL|MINimum|MAXimum

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

<REAL> → Setting range : -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

In this command, "[1|2]" specifies the external trigger input terminal rather than the channel.Valid for WF1982/WF1984.If omitted, the TRIG IN 1 terminal is specified.

3.7 Setting Memory Operation

3.7.1 Clear (W) :MEMory:STATe:DELete

■:MEMory:STATe:DELete

Description

Clear the specified setting memory.

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

3.7.2 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)
For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

Query parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

Response format

"<name>"

3.7.3 Store *SAV

■*SAV

Description

Store the current setting to the specified memory number.

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

3.7.4 Recall *RCL

■*RCL

Description

Recall the setting from the specified memory number.

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

3.8 USB Storage Operation

3.8.1 Acquire USB Storage Information (R) :MMEMory:CATalog[:ALL]?

□:MMEMory:CATalog[:ALL]?

Description

Acquires information about USB storage and a list of files in a specified 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 "\".

To specify the BBB folder in the AAA folder, specify "\AAA\BBB\" (the first and last "\" can be omitted).

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.

3.8.2 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

For the characters that can be used, see "Characters that can be used in "<name>".

Remarks

To delete the file "BBB.ccc" in the root path, specify "\BBB.ccc" (the "\" can be omitted).

To delete the file BBB.ccc folder in the AAA folder, specify "\AAA\BBB.ccc" (the first "\" can be omitted).

3.8.3 Recall Setting (W) :MMEMory:STATe:RECall

■:MMEMory:STATe:RECall

Description

Recall the setting data from the USB storage.

Setting parameter

"<path>""[,<memory>]

<path> ::= <STR>

<STR> → Full path of USB storage

For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Number of wave form memory : 1 to 10

Optional. If omitted, memory number 1 will be read.

Remarks

To recall the file "BBB.WFset" in the root path, specify "\BBB.WFset" (the "\" can be omitted).

To recall the file "BBB.WFset" in the AAA folder, specify "\AAA\BBB.WFset" (the first "\" can be omitted).

3.8.4 Store Current Setting (W) :MMEMory:STATe:STORe

■:MMEMory:STATe:STORe

Description

Store the current setting for the USB storage.

Setting parameter

"<path>"[,<memory>]

<path> ::= <STR>

<STR> → Full path of USB storage

For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Number of wave form memory : 1 to 10

Optional. If omitted, memory number 1 will be read.

Remarks

Full path include file name.

To save the file as "BBB.WFset" in the root path, specify "\BBB.WFset" (the "\" can be omitted).

To save the file as "BBB.WFset" in the AAA folder, specify "\AAA\BBB.WFset" (the first "\" can be omitted).

3.8.5 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
For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Memory number : 1 to 4096

Remarks

To read the file "BBB.WFwfm" in the root path, specify "\BBB.WFwfm" (the "\" can be omitted).

To recall the file "BBB.WFwfm" in the AAA folder, specify "\AAA\BBB.WFwfm" (the first "\" can be omitted).

3.8.6 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
For the characters that can be used, see "Characters that can be used in "<name>".

Remarks

Full path include file name.

To save the file as "BBB.WFwfm" in the root path, specify "\BBB.WFwfm" (the "\" can be omitted).

To save the file as "BBB.WFwfm" in the AAA folder, specify "\AAA\BBB.WFwfm" (the first "\" can be omitted).

3.8.7 Import Sequence Data (W) :MMEMory:{TRACe|DATA}:SEQuence:RECall

■:MMEMory:{TRACe|DATA}:SEQuence:RECall

Description

Import the sequence data from the USB storage to the unit.

Setting parameter

"<path>"[,<memory>]

<path> ::= <STR>

<STR> → Full path of USB storage

For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Number of wave form memory : 1 to 10

Optional. If omitted, current memory will be read.

Example

:MMEMory:TRACe:SEQuence:RECall "/abc.WFseq",3

Read the sequence data file named "abc.WFseq" saved in the root directory of the USB storage to memory number 3.

Remarks

To read the file "BBB.WFseq" in the root path, specify "\BBB.WFseq" (the "\" can be omitted).

To recall the file "BBB.WFseq" in the AAA folder, specify "\AAA\BBB.WFseq" (the first "\" can be omitted).

3.8.8 Export Sequence Data (W) :MMEMory:{TRACe|DATA}:SEQuence:STORe

■:MMEMory:{TRACe|DATA}:SEQuence:STORe

Description

Export the sequence data to the USB storage from the unit.

Setting parameter

"<path>"[,<memory>]

<path> ::= <STR>

<STR> → Full path of USB storage

For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Number of wave form memory : 1 to 10

Optional. If omitted, current memory will be read.

Example

:MMEMory:TRACe:SEQuence:STORe "/abc.WFseq",3

The contents of memory number 3 will be saved as "abc.WFseq" in the root directory of the USB storage.

Remarks

Full path include file name.

To save the file as "BBB.WFseq" in the root path, specify "\BBB.WFseq" (the "\" can be omitted).

To save the file as "BBB.WFseq" in the AAA folder, specify "\AAA\BBB.WFseq" (the first "\" can be omitted).

3.9 Status Operation

This section describes detail of each command.

See "4 Status System" for the explanation of the status system.

3.9.1 Common Command of Status Operation

3.9.1.1 Status Register and Error Queue Initializetion (W) *CLS

■***CLS**

Description

The error queue is cleared and the following registers are set to 0.

- Status byte register
- Standard event status register
- Operation status event register
- CH1 operation status event register
- CH2 operation status event register
- Questionable status event register
- CH1 Questionable status event register
- CH2 Questionable status event register
- Warning event register
- CH1 warning event register
- CH2 warning event register
- Error queue

Setting parameter

None

3.9.1.2 Status reporting related preset setting (W) :STATus:PRESet

■:STATus:PRESet

Description

Preset the registers.

The registers and their values are as shown in Table 3.2.

Setting parameter

None

Table 3.2 Initial value of each register

Name	Value
Operation Status Transition Filters (Positirve)	1536
Operation Status Transition Filters (Negative)	0
Operation Status Enable Register	0
CH1 Operation Status Transition Filter (Positirve)	24527
CH1 Operation Status Transition Filter (Negative)	0
CH1 Operation Status Enable Register	0
CH2 Operation Status Transition Filter (Positirve)	24527
CH2 Operation Status Transition Filter (Negative)	0
CH2 Operation Status Enable Register	0
Questionable Status Transition Filter (Positive)	1361
Questionable Status Transition Filter (Negative)	0
Questionable Status Enable Register	0
CH1 Questionable Status Tansition Filter (Positive)	3
CH1 Questionable Status Transition Filter (Negative)	0
CH1 Questionable Status Enable Register	0
CH2 Questionable Status Transition Filter (Positive)	3
CH2 Questionable Status Transition Filter (Negative)	0
CH2 Questionable Status Enable Register	0
Warning Status Enable Register	1536
CH1 Warning Status Enable Register	19455
CH2 Warning Status Enable Register	19455

3.9.1.3 Power On Status Clear (W/R) *PSC

■*PSC

□*PSC?

Description

Power-on status clear setting/query

When this setting is enabled, the following registers will automatically be set to their initial values when the power is turned on.

- 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 status transition filter (negative)
- Questionable status transition filter (positive)
- Questionable status enable register
- CH1 questionable status transition filter (negative)
- CH1 questionable status transition filter (positive)
- CH1 questionable status enable register
- CH2 questionable status transition filter (negative)
- CH2 questionable status transition filter (positive)
- CH2 questionable status enable register
- Warning event enable register
- CH1 warning event enable register
- CH2 warning event enable register

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.

3.9.1.4 Status Byte Register (R) *STB?

□*STB?

Description

Query the status byte register.

Query parameter

None

Response format

<NR1>

3.9.1.5 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.

3.9.1.6 Standard Event Status Register (R) *ESR?

□*ESR?

Description

Query the standard event status register.

Query parameter

None

Response format

<NR1>

3.9.1.7 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 255

Query parameter

None

Response format

<NR1>

Example

*ESE 8

Set 8 to the standard event status enable register.

3.9.2 Operation Status Register Group

The operation status resister group on this unit includes three resisters set(common/CH1/CH2).
The resister set can be selected from the [:CH1|:CH2] keyword.
CH2 resister set exists only 2ch model.

Setting target	Keyword
Common resister set	None
CH1 resister set	:CH1
CH2 resister set	:CH2

3.9.2.1 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>

3.9.2.2 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).

3.9.2.3 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).

3.9.2.4 Event Register (R) :STATus:OPERation[:CH1|:CH2][:EVENt]?

□:STATus:OPERation[:CH1|:CH2][:EVENt]?

Description

Query the operation status event register.

Query parameter

None

Response format

<NR1>

3.9.2.5 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.

3.9.3 Questionable Status Register Group

The questionable status resister group on this unit includes three resisters set(common/CH1/CH2).
The resister set can be selected from the [:CH1|:CH2] keyword.
CH2 resister set exists only 2ch model.

Setting target	Keyword
Common resister set	None
CH1 resister set	:CH1
CH2 resister set	:CH2

3.9.3.1 Condition Register (R) :STATus:QUEStionable[:CH1|:CH2]:CONDition?

□:STATus:QUEStionable[:CH1|:CH2]:CONDition?

Description

Query the questionable status condition register.

Query parameter

None

Response format

<NR1>

3.9.3.2 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 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 status transition filter(negative).

3.9.3.3 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 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 status transition filter(positive).

3.9.3.4 Event Register (R) :STATus:QUEStionable[:CH1|:CH2][:EVENt]?

□:STATus:QUEStionable[:CH1|:CH2][:EVENt]?

Description

Query the questionable status event register.

Query parameter

None

Response format

<NR1>

3.9.3.5 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 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 status event enable register.

3.9.4 Warning event register group

The warning event resister group on this unit includes three resisters set(common/CH1/CH2).
The resister set can be selected from the [:CH1|:CH2] keyword.
CH2 resister set exists only 2ch model.

Setting target	Keyword
Common resister set	None
CH1 resister set	:CH1
CH2 resister set	:CH2

3.9.4.1 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>

3.9.4.2 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.

3.10 Channel Operation, Channel-Link

These commands are only enabled for the 2-channel model (WF1982/WF1984).

3.10.1 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 1
DIFF2	→	Differential 2

Query parameter

None

Response format

IND|PHAS|TONE|RAT|DIFF|DIFF2

The meaning of each response data is the same as the setting parameters.

Example

:CHANnel:MODE INDependent

Set the channel mode to independent

3.10.2 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 (<50 MHz), 0.1 μHz (≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 between CH1 main output (FCTN OUT) and CH2 main output (FCTN OUT) to 1 kHz

Remarks

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

It is not possible to set a frequency difference that is out of frequency setting range.

3.10.3 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 of CH1 main output (FCTN OUT) and CH2 main output (FCTN OUT) to 2:3

Remarks

The setting range may be narrowed depending on the CH1 settings and the current setting status.

A frequency ratio cannot be set that would result in a frequency outside the setting range.

3.10.4 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

The meaning of each response data is the same as the setting parameters.

Example

:INSTrument:COUPle ALL

Set the channel-link function on.

3.11 Sequence Oscillation

For details on sequence oscillation execution control, see "3.6.7 Execution Control of Modulation/Sweep/Sequence (W)" for the sequence oscillation execution control.

For details on sequence data, see 3.6.7 Modulation/Sweep/Sequence Oscillation Execution Control. For details about sequence data, see "3.11.10 Specification of Sequence Data."

3.11.1 Sequence Oscillation (W) [:SOURce[1|2]]:SEQuence:STATe

■[:SOURce[1|2]]:SEQuence:STATe

□[:SOURce[1|2]]:SEQuence:STATe?

Description

Sets whether the operation mode is sequence oscillation or not (normal oscillation)

Queries whether the operation mode is sequence oscillation or not (normal oscillation)

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Set the operating mode to normal oscillation

1/ON : Set the operating mode to sequence oscillation

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : The operating mode is normal oscillation.

1 : The operating mode is sequence oscillation.

Example

:SOURce1:SEQuence:STATe ON

Set the operation mode to sequence oscillation

Remarks

Whether or not "[1|2]" is specified does not affect the operation.

An error will occur if used during sequence oscillation execution.

3.11.2 Sequence Data (W/R) {:TRACe|:DATA}:SEQuence

■{:TRACe|:DATA}:SEQuence

□{:TRACe|:DATA}:SEQuence?

Description

Set/query 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 Sequence name will not be changed.)

For the characters that can be used, see "Characters that can be used in "<name>".

<data> ::= <BLK>

<BLK> → #<digit><byte><seq data>

→ Start character

<digit> → Indicates the number of digits in <byte> and is a non-zero number.

<byte> → Indicates the number of bytes in <byte>

<seq data> → Sequence data

For details about <seq data>, see "3.11.10 Specification of Sequence Data."

Query parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number : 0 to 99

Response format

"<name>",<data>

For details about <seq data>, see "3.11.10 Specification of Sequence 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>␣␣␣␣" (␣is a white space.)

When sequence data created with WF1982/WF1984 is loaded into WF1981/WF1983, the CH2 data is ignored.

hen sequence data created with WF1981/WF1983 is loaded into WF1982/WF1984, the channel parameters of CH2 will be set to the default values.

When this command is set, the device returns to sequence data editing mode.

3.11.3 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.
To enter edit mode, use the :TRIGger[1|2]:SELected:EXECute command.

3.11.4 Acquisition of Current Step Number (R) [:SOURce[1|2]]:SEQuence:CSTep?

□[:SOURce[1|2]]:SEQuence:CSTep?

Description

When editing sequence data, queries the step being edited. When a sequence oscillation is running, queries the step being output.

Query parameter

None

Response format

<NR1>

Remarks

Whether or not "[1|2]" is specified does not affect the operation.

3.11.5 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 you execute this command while a sequence oscillation is running and in the RUN or HOLD state, an error will occur.
If you execute this command while a sequence oscillation is running and in the READY state, the device will enter sequence data edit mode and the sequence data will be initialized.

3.11.6 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. Optional. If omitted, the setting will not be changed.)
For the characters that can be used, see "Characters that can be used in "<name>".

Example

:TRACe:SEQuence:STORe 2,"name"

Save the sequence data with the sequence name "name" in the memory number 2.

3.11.7 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.

Remarks

When this command is set, the device returns to sequence editing mode.

3.11.8 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)
For the characters that can be used, see "Characters that can be used in "<name>".

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

Query parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

Response format

"<name>"

<name> ::= <STR>

<STR> → Setting memory name (fixed to 20 characters)
If the sequence memory name is shorter than 20 characters, spaces will be added to make it 20 characters.

3.11.9 Power-on operating mode (W/R) [:SOURce[1|2]]:SEQuence:PON

■[:SOURce[1|2]]:SEQuence:PON

□[:SOURce[1|2]]:SEQuence:PON?

Description

Sets/queries whether the operation mode at power-on is sequence oscillation or not.

Setting parameter

ON|OFF|LAST

ON → Start in sequence oscillation.
OFF → Start in nomarl oscillator mode.
LAST → Setting from the previous power-off operation

Query parameter

None

Response format

ON|OFF|LAST

The meaning of each response data is the same as the setting parameters.

Example

:SEQuence:PON ON

Sets the operating mode at power-on to sequence oscillation

Remarks

Whether or not "[1|2]" is specified does not affect the operation.

3.11.10 Specification of Sequence Data

This section explains the specifications of the "<seq data>" parameter of the "3.11.2 Sequence Data (W/R)" command.
A simple example is also provided at the end.

3.11.10.1 Description of <seq data> part

Sequence data is written as a set of "key" and "value" pairs connected with an equal sign (=).
Each pair belongs to a unique section whose name is enclosed in square brackets [ ].
Sections and keys are explained in more detail in the following sections.

A) Section: [FILE]

This sets the parameter related to the file format. This section cannot be omitted.

1) Key: VERSION

Description

File version.

Key

VERSION.

Value

"1.00"
Specify "1.00" as the version.

B) Section: [SYSTEM]

This sets the system information of the unit. This section cannot be omitted.

1) Key: MODEL

Description

Model name.

Key

MODEL

Value

Specify the model name of the destination from "WF1981", "WF1982", "WF1983" or "WF1984".

2) Key: NCHAN

Description

Channel numbers.

Key

NCHAN

Value

<INT> → 1 to 2

3) Key: VERSION

Description

Firmware version.

Key

VERSION

Value

"1.00"
† Specify ""1.00"" as the version.

C) Section: [DATA]

This section sets the sequence data.
All keys in this section can be omitted if they do not need to be set.

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:Step sync code
(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) 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.

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)
(1:100 kHz, 2:300 kHz, 3:1 MHz, 4:3 MHz, 5:10 MHz, 6:30

MHz, 7:Full)

4) Key: EXTADD

Description

External addition gain.

Key

EXTADD#<chan>

(Setting channel)

<chan> ::= <INT>

<INT> → Range : 1 to 2

Value

OFF|X0.4|X2|X10

OFF → Disable the external addition.

X0.4 → 0.4 times (Maximum output voltage range is forced to 0.8V)

X2 → 2 times (Maximum output voltage range is forced to 4V)

X10 → 10 times (Maximum output voltage range is forced to 20V)

5) Key: OUTPUT

Description

Sets whether to automatically turn on the output when sequence oscillation starts.

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.

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 : 0.1 Ω

INFinity → High-Z Setting

7) Key: TRACE

Description

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>

8) Key: STEP

Description

Sequence step control settings.

Key

STEP#<step>

(Setting step)

<step> ::= <INT>

<INT> → Range : 0 to 1023

Value

<time>, <sterm>, <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)

<sterm> ::= <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

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

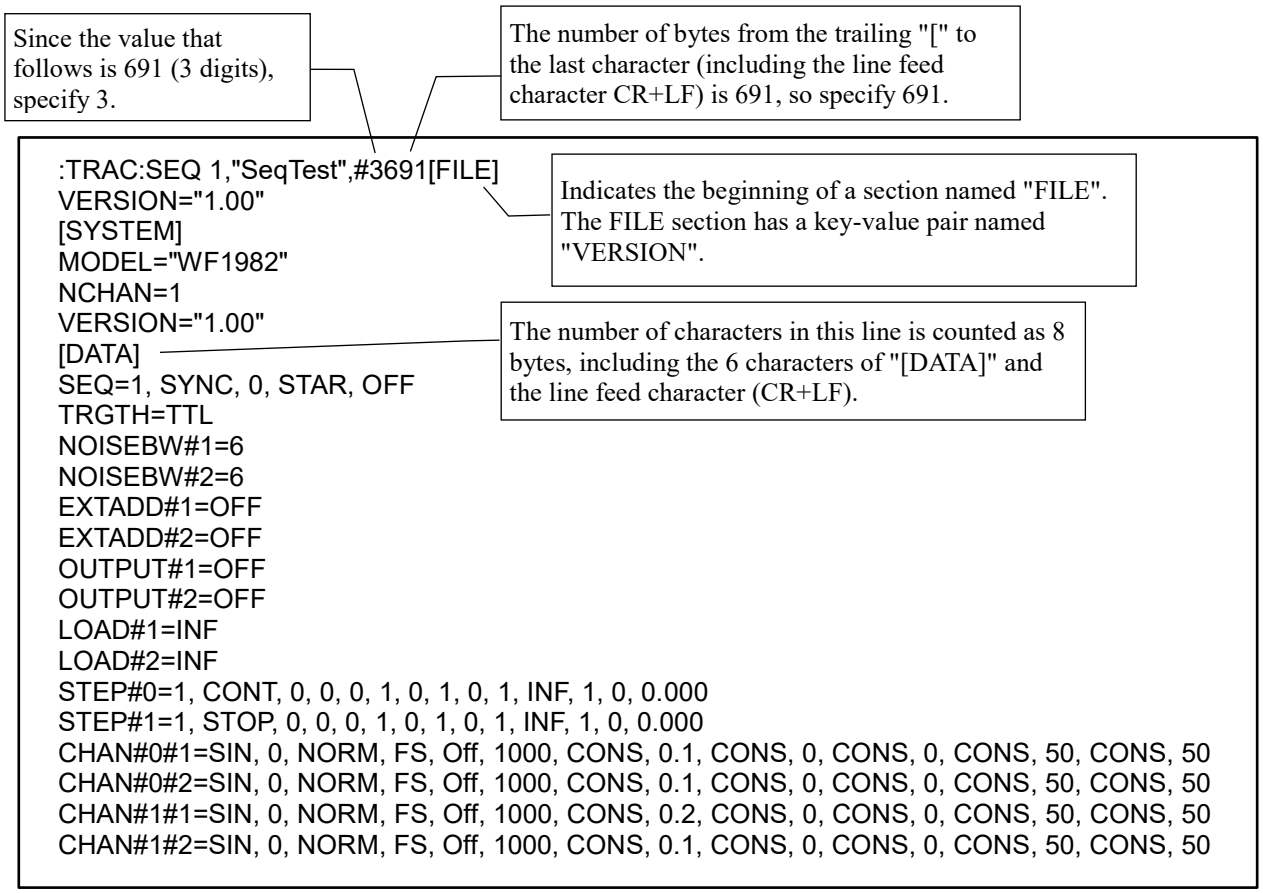
<wf_type>, <wf_arb_no>, [<wf_polarity>], [<wf_scale>], [<wf_squex>],
<freq_val>, <freq_actn>, <amptd_val>, <amptd_actn>, <ofs_val>, <ofs_actn>,
<ph_val>, <ph_actn>, <dy_val>, <dy_actn>, <symm_val>

(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 Scale Range 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>

3.11.10.2 Example

Below is an example of setting sequence data named "SeqTest" in sequence memory number 1, which consists of two steps, step 0 and step 1.



3.12 Setting Range Limit Operation

3.12.1 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 upper and lower limits of the main output (FCTN OUT) frequency setting range

Selection Keywords

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 μHz (< 50 MHz), 0.1 μHz(≧50 MHz)

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

(M:Mega, K:Kilo, U:Micro, N:Nano)

<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 upper limit of the CH1 main output (FCTN OUT) frequency setting to 30 MHz.

3.12.2 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 upper and lower limits of the main output (FCTN OUT) voltage setting range

Selection Keywords

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 (|Setting value|＜3 V),

1 mV (|Setting value| ≥ 3 V)

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 upper limit of the voltage setting for CH1 main output (FCTN OUT) to 7V.

3.12.3 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 upper and lower limits of the main output (FCTN OUT) phase setting range

Selection Keywords

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 upper limit of the CH1 main output (FCTN OUT) phase setting to 360°

3.12.4 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 upper and lower limits of the main output (FCTN OUT) duty setting range

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0% to 100%

Resolution : 0.000 1%

<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 upper limit of the CH1 main output (FCTN OUT) duty setting to 60%

3.13 Other Operations

3.13.1 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

3.13.2 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.

3.13.3 Initialization of Setting (W) *RST

■*RST

Description

Initializing

Setting parameter

None

Remarks

The parameters that are initialized are the same as those that are initialized by the Osc Reset operation on the panel.

If the operation mode is sequence oscillation, it transitions to normal oscillation.

For initialization of sequence parameters, see "3.11.5 Initialization of Sequence Data (W)."

3.13.4 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

Remarks

This unit does not have any overlap commands, so it does not affect the unit's operation.

3.13.5 Query Current Operation Completed (R) *OPC?

□*OPC?

Description

When all command processing is completed, set the message queue to 1.

Query parameter

None

Response format

<INT>

Always responds with 1

Remarks

The "*OPC" and "*OPC?" command are generally used to check whether the measurement process has completed.

Since this device does not have an overlap command, the response to this command is always 1.

3.13.6 Wait for Command Processing (W) *WAI

■*WAI

Description

Wait subsequent commands executed until all waiting commands have been processed.

Setting parameter

None

Remarks

This command does not affect the operation of the device, as the device does not have an overlap command.

3.13.7 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.

3.13.8 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.

3.13.9 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

3.13.10 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

3.13.11 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

To change the state of the output terminals, see "3.13.10 Set Output State of Multi I/O Connector (W/R)."

3.13.12 User-Defined Unit (W/R) [:SOURce[1|2]]:{DCYCle|PERiod|FREQuency|PHASe|VOLTage[:OFFSet]}:USER

■[: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 unit.

Keywords in {}

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)
For the characters that can be used, see "Characters that can be used in "<name>".

(Conversion format)

<form> ::= LINear|LOGarithmic

LINear → Linear
LOGarithmic → Log

(m-value (scale))

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

<REAL> → Range : ±9.999 999 999 999 99 $e^{\pm 9}$
Resolution : 15 digits

(n-value (offset))

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

<REAL> → Range : ±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>

The meaning of each response data is the same as the setting parameters.

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.

3.13.13 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

The meaning of each response data is the same as the setting parameters.

3.13.14 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

The meaning of each response data is the same as the setting parameters.

3.13.15 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.

3.13.16 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.
For the characters that can be used, see "Characters that can be used in "<name>".

Remarks

To save the file as "BBB.bmp" in the root path, specify "\BBB.bmp" (the "\" can be omitted).
To save the file as "BBB.bmp" in the AAA folder, specify "\AAA\BBB.bmp" (the first "\" can be omitted).

3.13.17 Customization Information Inquiry (R) :SYSTem:LICense?

□:SYSTem:LICense?

Description

Querying customization information.

Query parameter

None

Response format

[GP][,HP][,|RT]

GP → GPIB Interface available (WF1983 / WF1984)
RT → Resonance tracking function can be used
HP → Output up to ±31.75V possible

Remarks

If there is no corresponding item, "" will be returned.

4. Status System

WF198x series provide the status reporting function defined in IEEE488.2.

4.1 Status Byte Register and Service Request Enable Register

The status system of the WF198x series is shown in Figure 4.1.

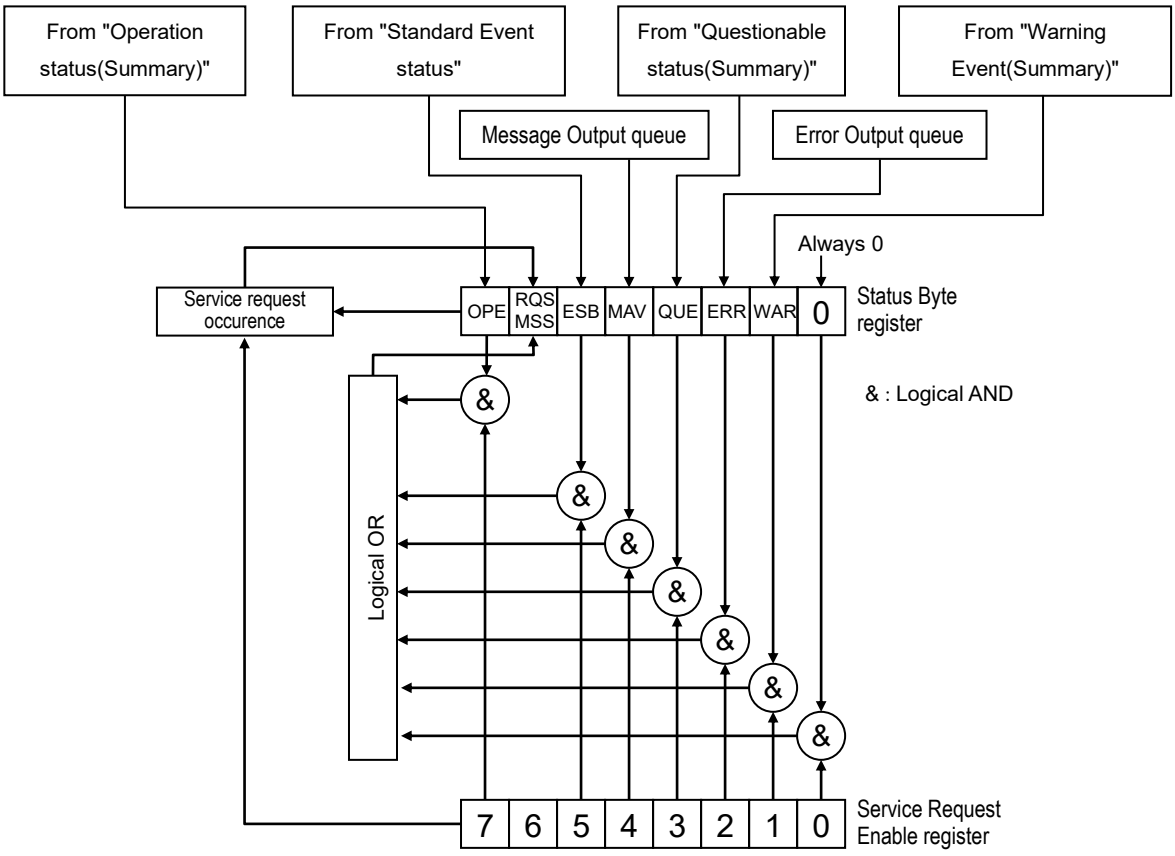


Figure 4.1 Status System

4.1.1 Status Byte Register

Each bit of the status byte register is described in Table 4.1.
The parameters of the setting messages and response messages for each register are the sum of all bit weights with a value of 1.

Table 4.1 Status Byte Register

Symbol	Bit	Weight	Condition for setting 1	Condition for setting 0 †
OPE	7	128	When any of the effective bits in the Operation Status Event register (Summary) becomes 1	When all valid bits in the Operation Status Event Register (Summary) become 0.
RQS / MSS ††	6	64	When SRQ is send.	・ Upon receiving Device Clear ・ RQS is cleared when the Status Byte is read by serial polling. ・ MSS is cleared when the original summary bits are all cleared to 0.
ESB	5	32	When any of the effective bits in the Standard Event Status register becomes 1	When all of the effective bits in the Standard Event Status register become 0
MAV	4	16	When the response to a query has been prepared and is ready for output	When all responses have been output and there are no further responses to output
QUE	3	8	When any of the effective bits in the Questionable Event register (Summary) becomes 1	When all of the effective bits in the Questionable Event register (Summary) become 0
ERR	2	4	When an error message is placed in the error queue.	When all error messages in the error queue are cleared.
WAR	1	2	When any valid bit in the warning status event register (Summary) becomes 1.	When all valid bits in the warning status event register (Summary) become 0
—	0	1	—	Always 0 (not used)

† When a *CLS command is received, the register is also set to 0.
†† When accessed by the query *STB?, this bit functions as the Master Summary Status (MSS) bit. It indicates that a factor that may cause a service request has occurred. The MSS bit is not cleared by the query *STB?.
When the instrument is accessed by a serial poll command, this bit functions as the Request Service (RQS) bit, indicating to the controller that a service request has occurred (the SRQ line on the GPIB bus is "L"). The RQS bit is cleared when the serial poll is completed.

4.1.2 Service Request Enable Register

To generate a service request when a cause assigned to each bit of the Status Byte Register occurs, set the Service Request Enable Register corresponding to that bit to 1.
A service request is generated when any one of the enable bits is set to 1.
The Service Request Enable register is set to 0 when power is turned on with the Service Request Enable register enabled by the Power-On Status Clear command (*PSC ON).

4.2 Standard Event Status Register Group

The standard event status register group is shown in Figure 4.2.
When a bit in the Standard Event Status Enable register is set to 1, the corresponding bit in the Standard Event Status register is enabled; if any of the enabled bits is set to 1, the ESB bit in the Status Byte register is set to 1.

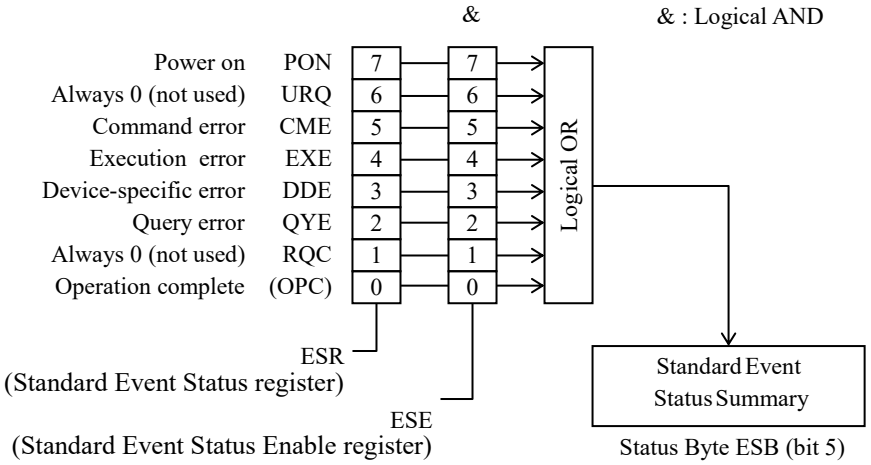


Figure 4.2 Standard Event Status Register Group

4.2.1 Standard Event Status Register

Content of each bit of the standard event status register is shown in Table 4.2.
The parameters of the setting messages and response messages for each register are the sum of all bit weights with a value of 1.

Table 4.2 Standard Event Status Register

Symbol	Bit	Weight	Content
PON	7	128	Power on 1 is set when the power is turned on. Once this register has been cleared to 0 by reading it, it remains 0 after the power is turned back on.
URQ	6	64	User request Always 0 (not used)
CME	5	32	Command error Set to 1 when there is a syntax error in the program code.
EXE	4	16	Execution error Set to 1 if a parameter is out of range or if there is a inconsistency in settings.
DDE	3	8	Device-specific error Always 0 (not used)
QYE	2	4	Query error This bit becomes 1 when an attempt is made to read the message queue storing the response message when there is no data in the message queue, or when data in the message queue storing the response message is lost.
RQC	1	2	Request control Always 0 (not used)
OPC	0	1	Operation complete Always 0 (not used)

The standard event status register is cleared when the *ESR? query or *CLS command is received.

4.2.2 Standard Event Status Enable Register

To have the Status Byte Register reflect the occurrence of a cause assigned to each bit in the Standard Event Status Register, set the Standard Event Status Enable register corresponding to that bit to 1.
When any one of the enable bits is 1, ESB in the Status Byte Register becomes 1.

The Standard Event Status Enable register is set to 0 when the power is turned on with the Standard Event Status Enable register enabled by the Power-On Status Clear command (*PSC ON).

4.3 Operation status register group

The configuration of the operation status register group is shown in Figure 4.3. This register group indicates the status of the WF198x series.
Each channel has the following five sets of registers. A similar hierarchical structure with five sets of registers is used to aggregate the results of each channel (hereafter called the summary).

- Operation condition register
- Positive transition filter register
- Negative transition filter register
- Operation event register
- Operation event enable register

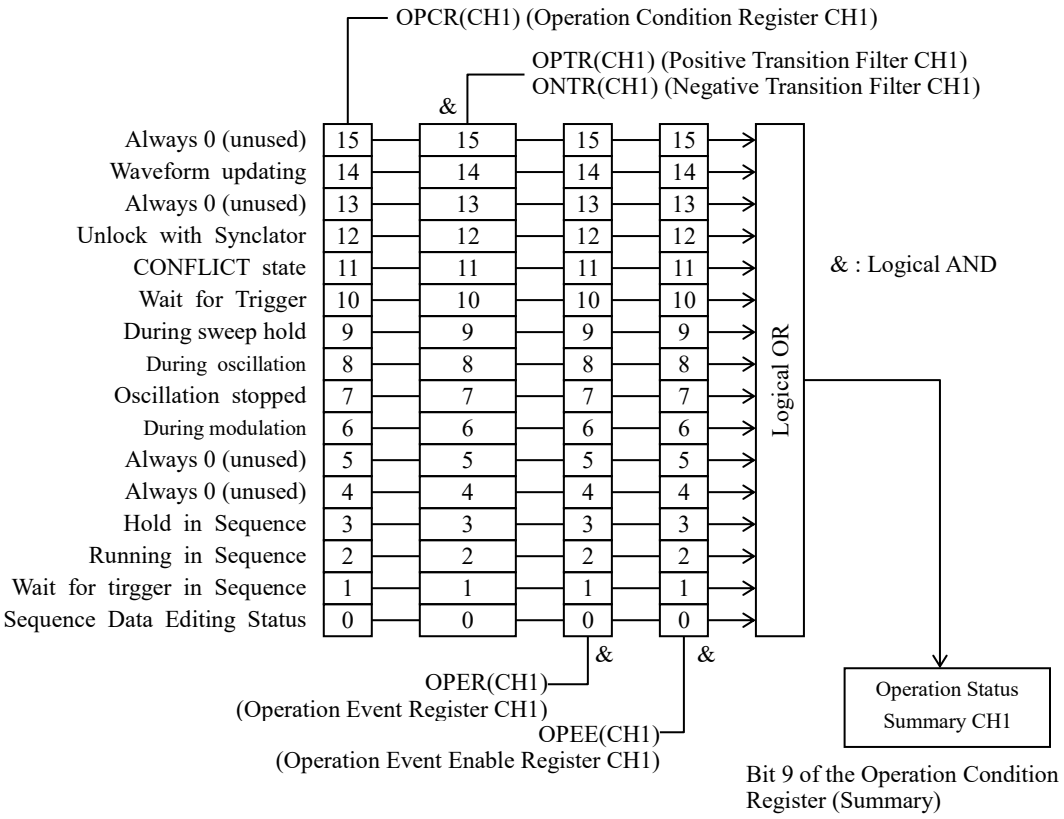


Figure 4.3 Operation Status Register Group/Questionable Status Register Group

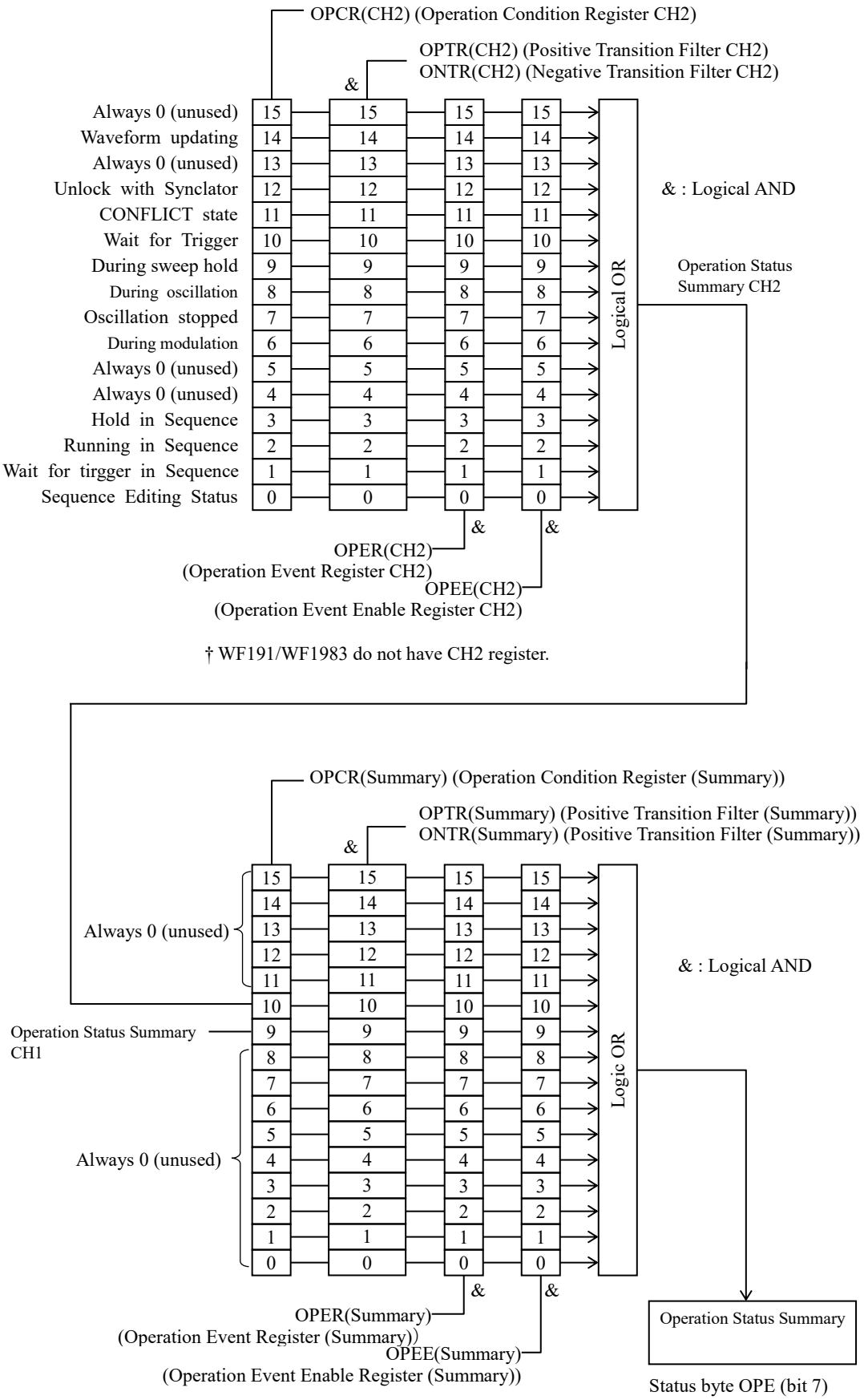


Figure 4.3 Operation Status Register Group/Questionable Status Register Group (Continued)

4.3.1 Overview of Registers

4.3.1.1 Operation Condition Register

The operation condition register shows the current status of WF198x series. This register is not cleared even when a query addressed to the operation condition register is received.

The status of each channel is shown in Table 4-3, and a summary is shown in Table 4-4.
For specific status, see "4.3.1.5 Example of Resister State."

Table 4.3 Contents of the operation condition register and event register (each channel)

Bit	Weight	Operation condition register contents (conditions for becoming 1)
15		Always 0 (unused)
14	16384	Waveform updating
13		Always 0 (unused)
12	4096	The synclator is in the UNLOCK state or is searching for resonance point tracking.
11	2048	Always 0 (unused)
10	1024	CONFLICT state in modulation/sweep/burst
9	512	HOLD state in sweep
8	256	RUN state in continuous oscillation/modulation/sweep/burst
7	128	STOP state in modulation/sweep/burst
6	64	Modulating
5		Always 0 (unused)
4		Always 0 (unused)
3	8	HOLD state in sequence
2	4	RUN state in sequence
1	2	READY state in sequence
0	1	EDIT state in sequence

Table 4.4 Contents of the operation condition register and event register (each channel)

Bit	Weight	Operation condition register contents (conditions for becoming 1)
15		Always 0 (unused)
14		Always 0 (unused)
13		Always 0 (unused)
12		Always 0 (unused)
11		Always 0 (unused)
10	1024	CH2 Operation Status Summary
9	512	CH1 Operation Status Summary
8		Always 0 (unused)
7		Always 0 (unused)
6		Always 0 (unused)
5		Always 0 (unused)
4		Always 0 (unused)
3		Always 0 (unused)
2		Always 0 (unused)
1		Always 0 (unused)
0		Always 0 (unused)

4.3.1.2 Operation Transition Filter Register

The transition filter detects changes in conditions and determines the transition of the event register.
Table 4.5 shows the relationship between the transition filter settings and the transition of the event register.

Table 4.5 Transition Filter and Event Register Transition

Each bit setting of positive transition filter	Each bit setting of negative transition filter	Transition of operation condition register to make each bit of operation 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 set to 0 when the :STATus:PRESet command is received or when the power is turned on with the transition filter register enabled (*PSC ON) by the power-on status clear command.

4.3.1.3 Operation Event register

The event register is a register that reflects the changes of the operation condition register according to the setting of the transition filter register. The event register is set to 0 when a query to the event register or a *CLS command is received.

4.3.1.4 Operation Event enable register

The Event Enable register reflects the state of the selected bit in the higher-level register.

- Event Enable Register (each channel)
  When a bit in the Event Enable register is set to 1, each bit in the corresponding Operation Event register is enabled.
  When any one of the enabled bits is set to 1, the result for each channel is that bit 9 (CH1) or bit 10 (CH2) in the Operation Condition register (summary) is set to 1.

- Event Enable Register (Summary)
  When a bit in the Event Enable register is set to 1, each bit in the corresponding Operation Event register is enabled.
  When any one of the enabled bits is set to 1, OPE (bit 7) in the Status Byte register is set to 1.

The Event Enable register is set to 0 when the :STATus:PRESet command is received, or when the power is turned on with the event enabled (*PSC ON) by the power-on status clear command.

4.3.1.5 Example of Resister State

As a example, the state of the output waveform and the state of the operation status register (Figer 4.5 at that time are shown below.

4.3.1.5.1 Continuous oscillation

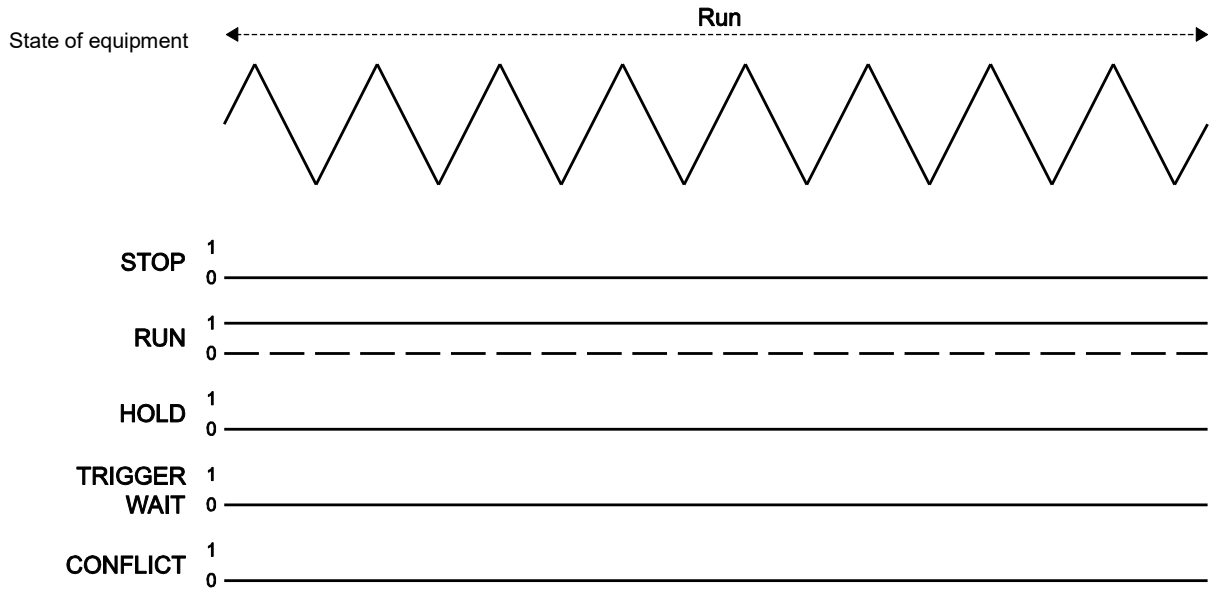


Figure 4.4 Relationship between Output and Operation Status Register (Bit 6-11)

4.3.1.5.2 Modulation

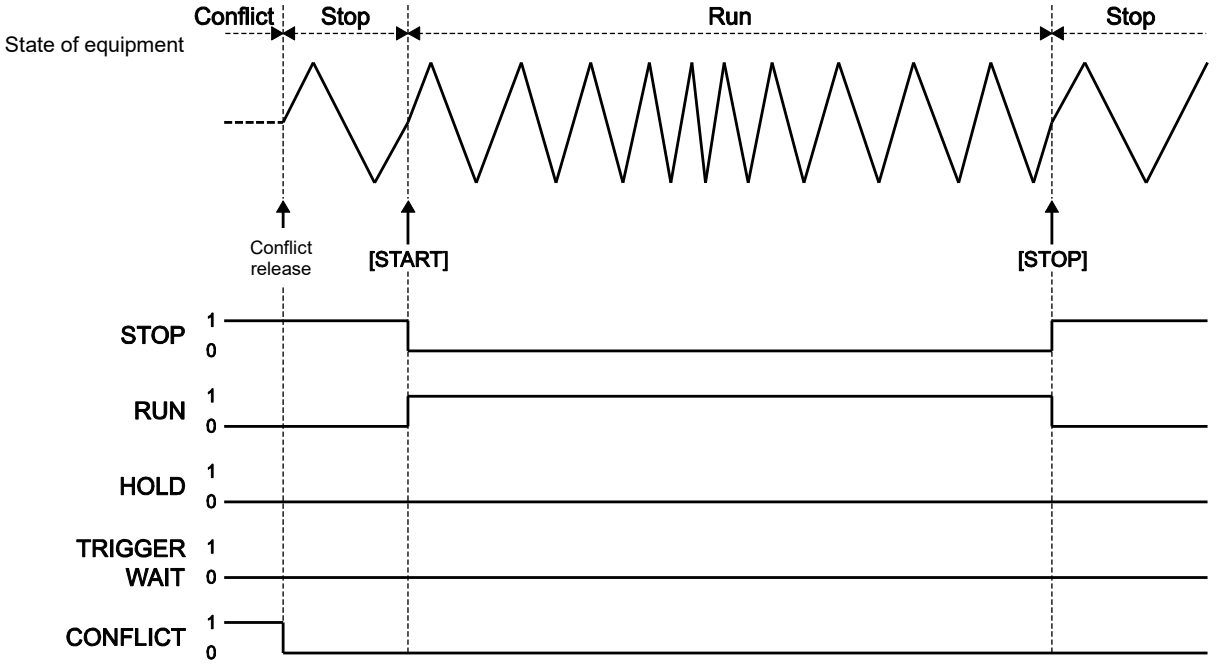


Figure 4.5 Relationship between Output and Operation Status Register (Bit 6 to 11)

4.3.1.5.3 Sweep

○ Sweep oscillation (Single, Gated)

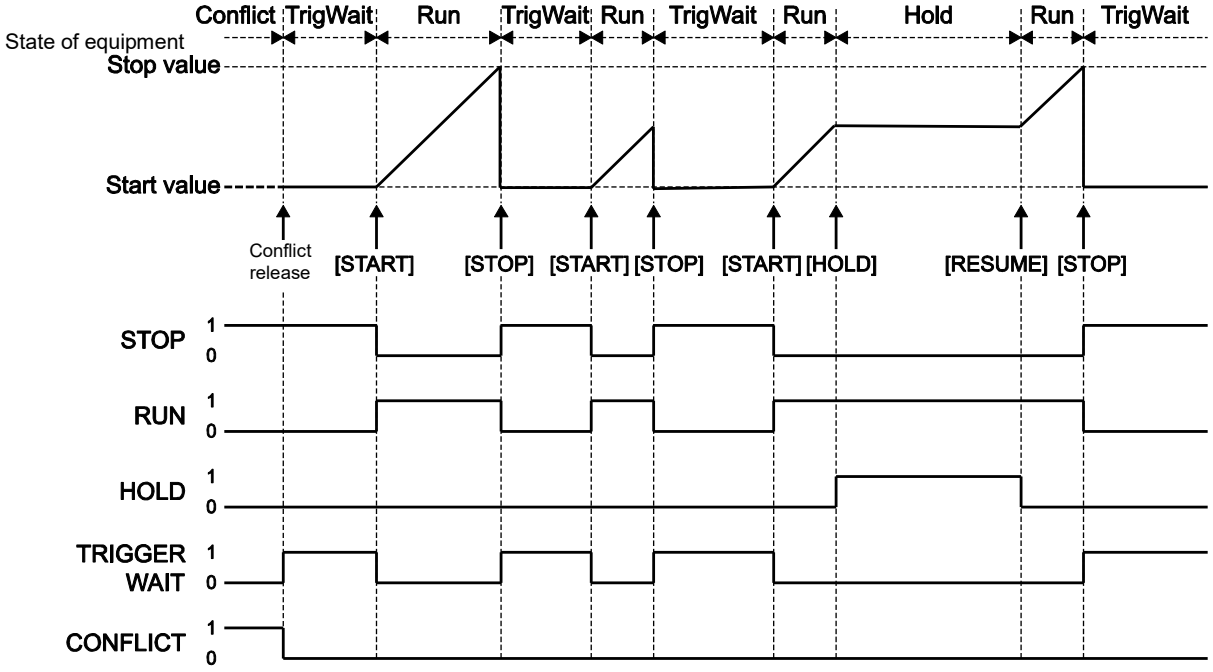


Figure 4.6 Relationship between Output and Operation Status Register (Bit 7 to 11)

○ Sweep oscillation (Continuous)

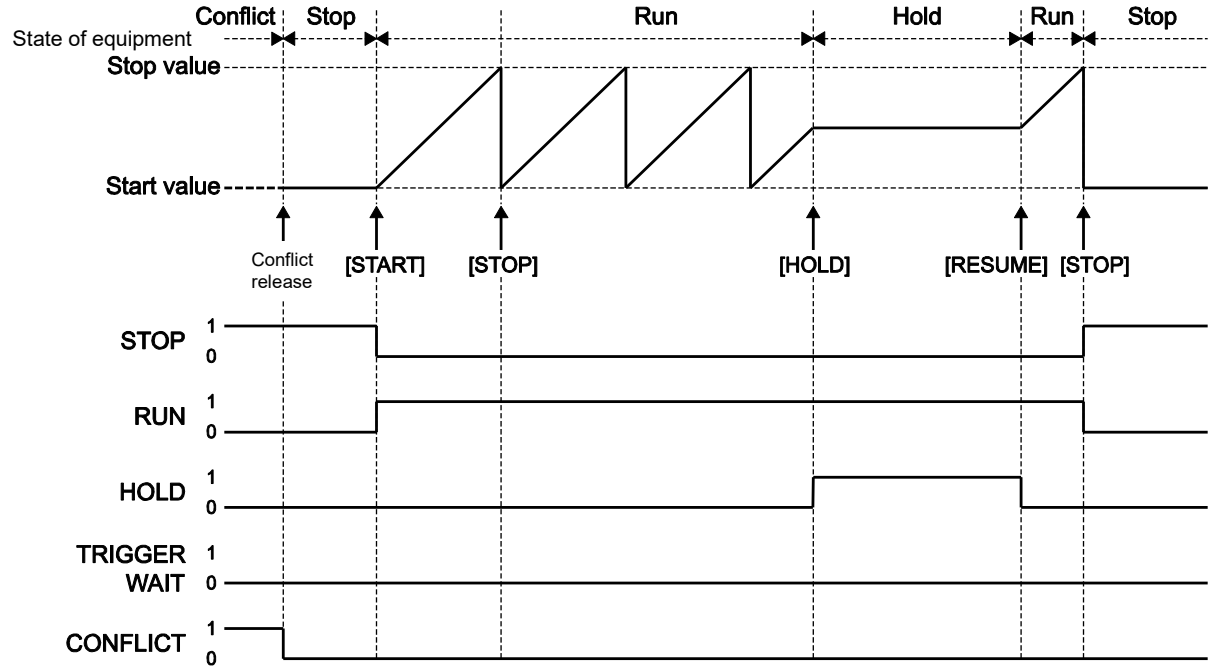


Figure 4.7 Relationship between Output and Operation Status Register (Bit 7-11)

4.3.1.5.4 Burst

○ Burst oscillation (Auto burst)

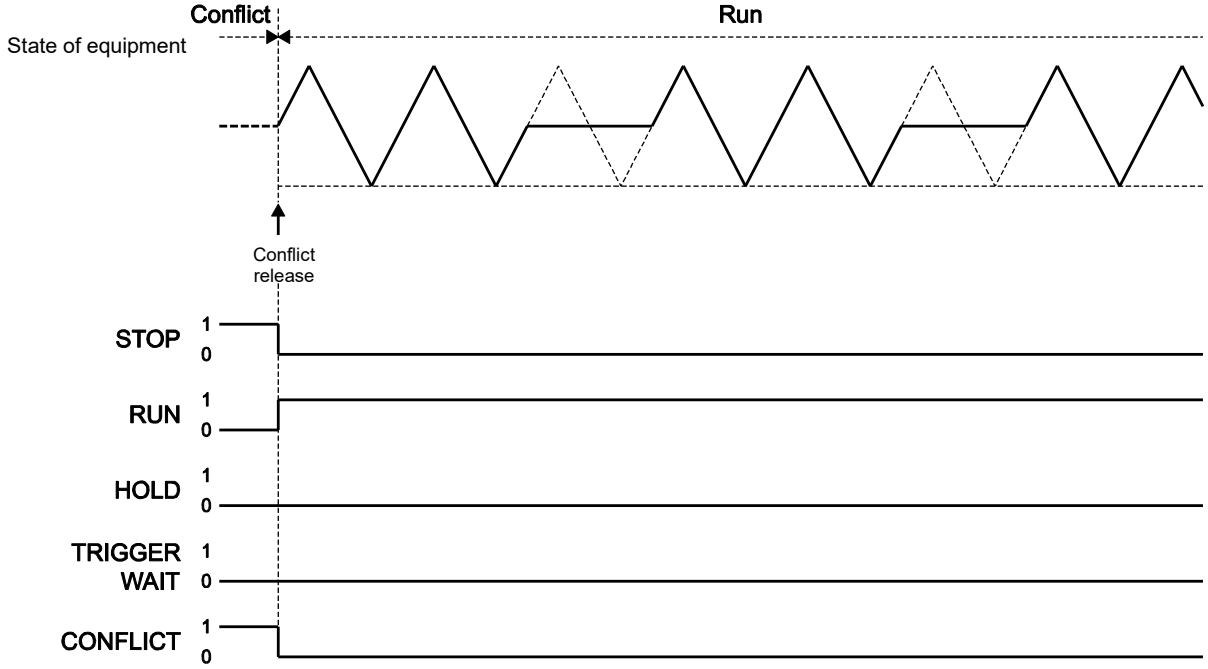


Figure 4.8 Relationship between Output and Operation Status Register (Bit 7-11)

○ Burst oscillation (Trigger burst)

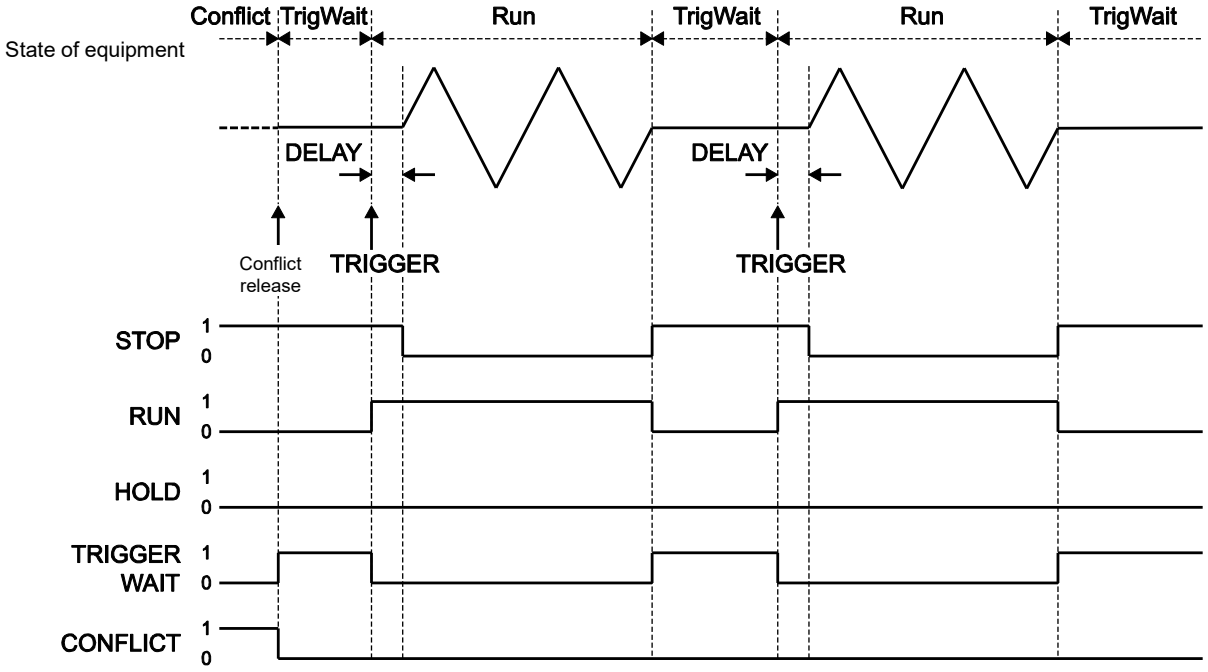


Figure 4.9 Relationship between Output and Operation Status Register (Bit 7-11)

○ Burst oscillation (Gate)

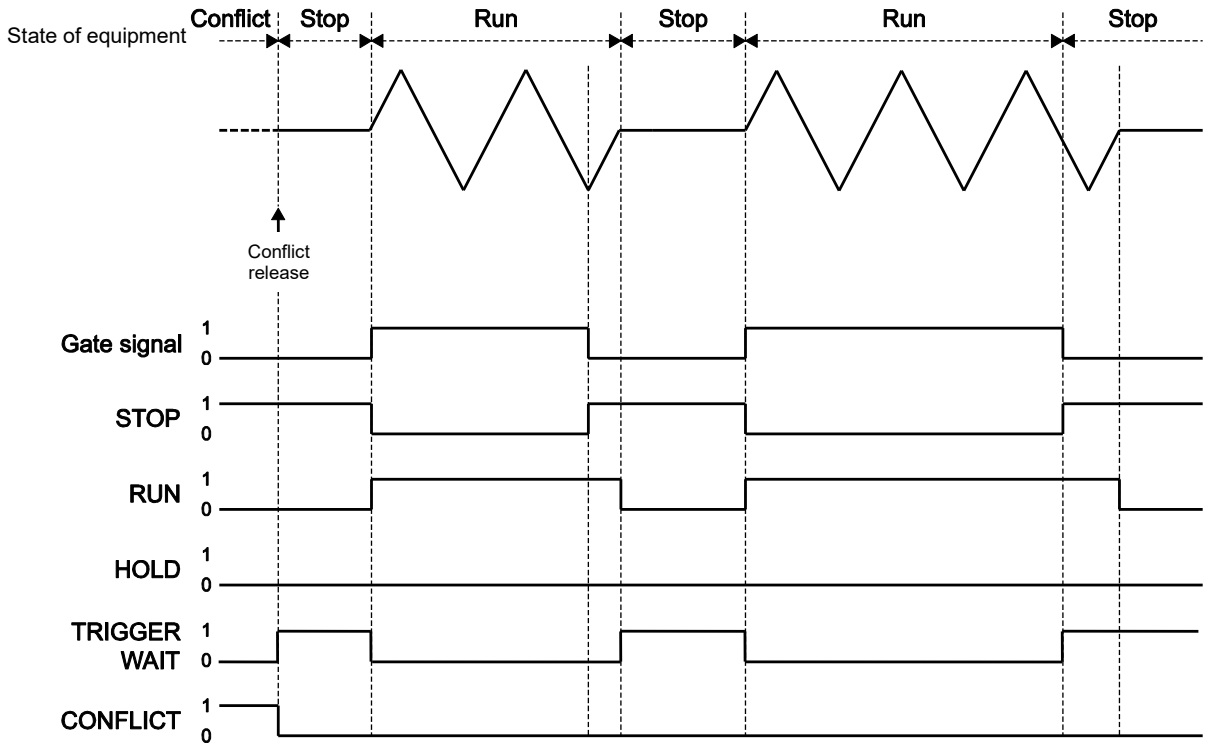


Figure 4.10 Relationship between Output and Operation Status Register (Bit 7 to 11)

○ Burst oscillation (Triggered gate)

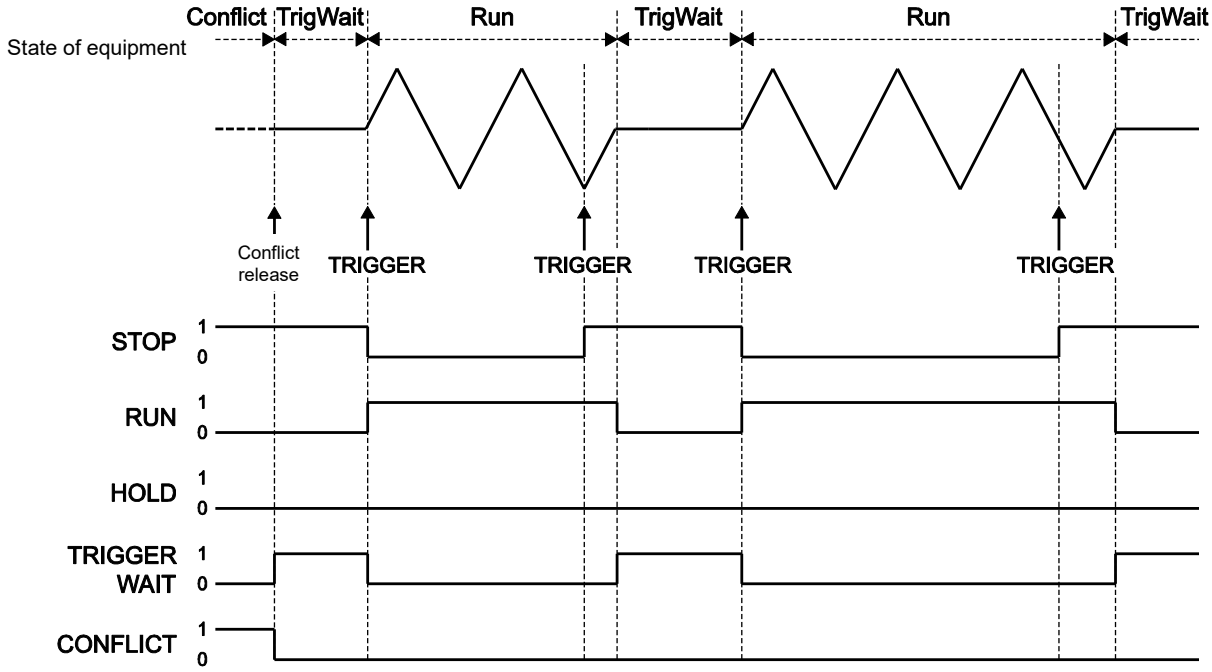


Figure 4.11 Relationship between Output and Operation Status Register (Bit 7 to 11)

4.3.1.5.5 Sequence

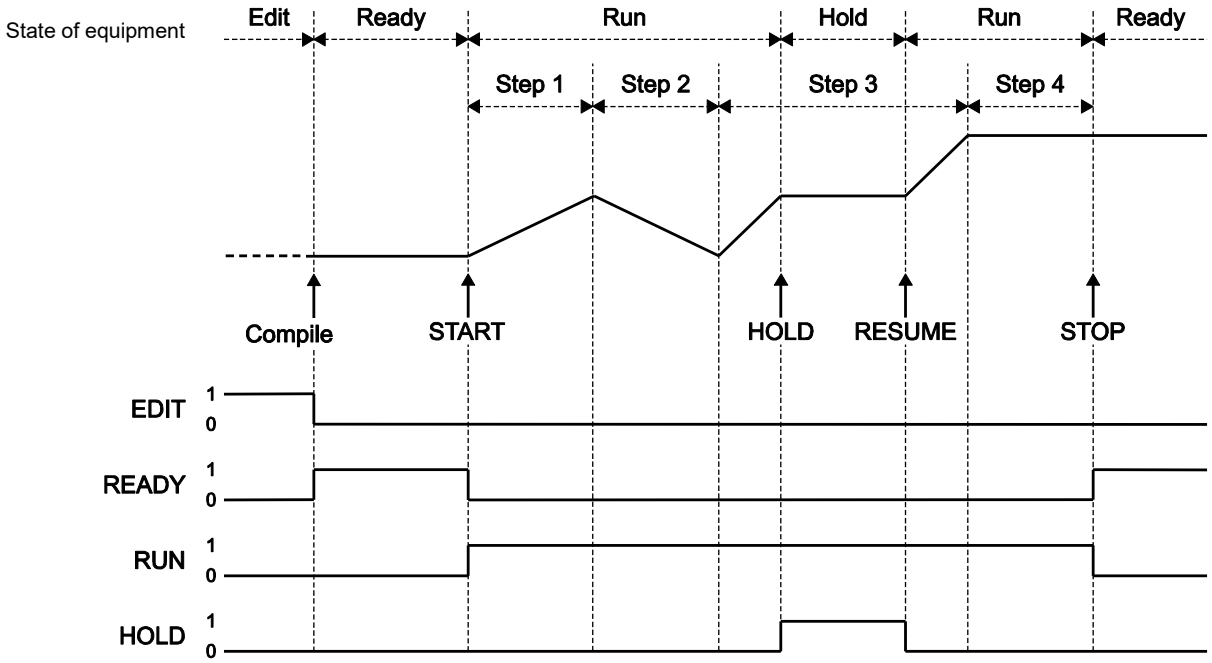


Figure 4.12 Relationship between Output and Operation Status Register (Bit 0 to 3)

4.4 Questionable status register group

The Questionable Status register group has the same structure as the Operation Status register group, and is shown in Figure 4.13.
This register group indicates the abnormal status of the WF198x series.
Each channel has the following five sets of registers. A similar hierarchical structure with five sets of registers is used to aggregate the results of each channel (hereafter called the summary).

- Questionable Condition Register
- Positive Transition Filter Register
- Negative Transition Filter Register
- Questionable Event Register
- Questionable Event Enable Register

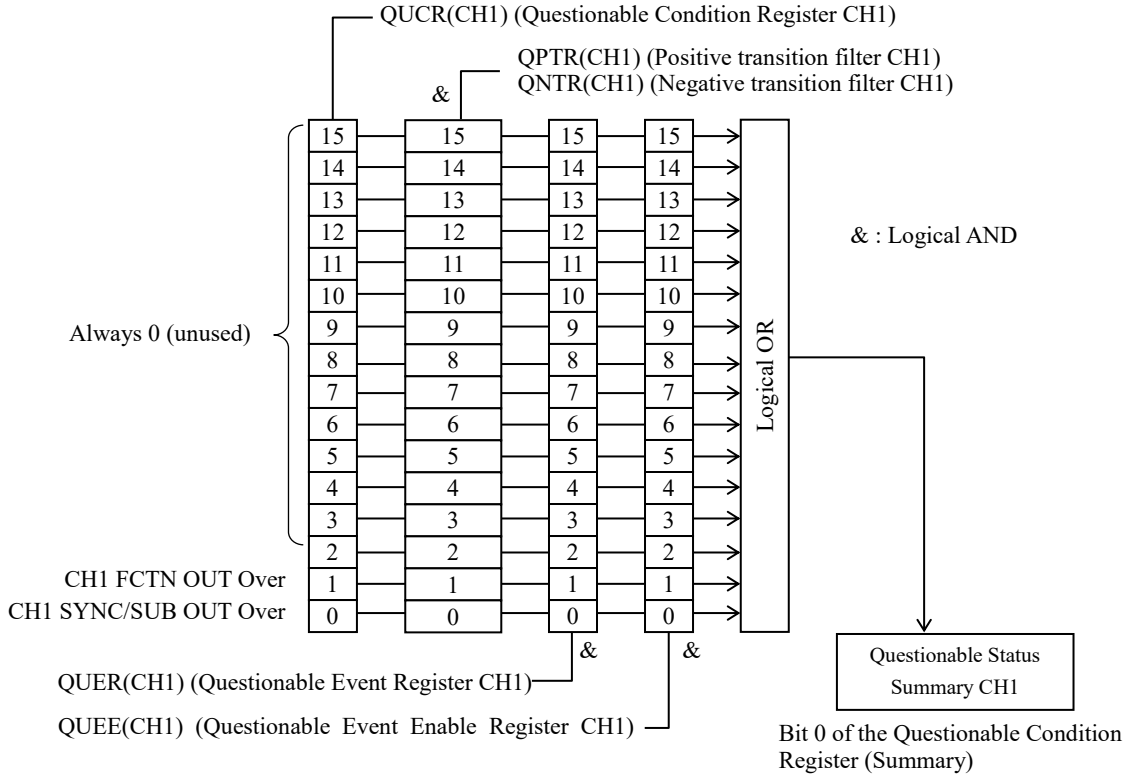


Figure 4.13 Questionable Status Register Group

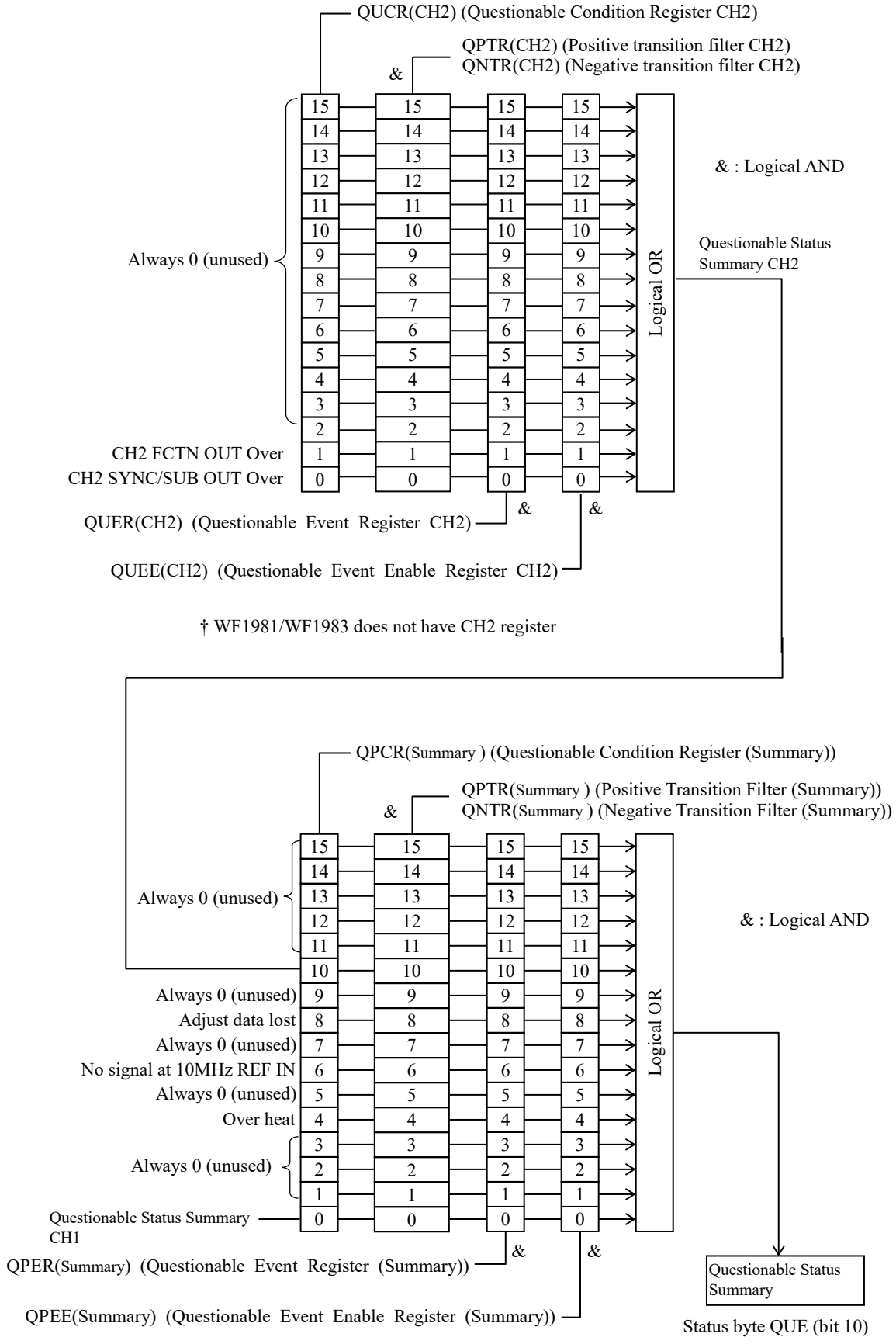


Figure 4.13 Questionable Status Register Group (Continued)

4.4.1 Overview of Questionable Registers

4.4.1.1 Questionable Condition Register

The Questionable Condition Register indicates the current abnormal status of the WF198x series.
It will not become 0 even if a query to the Questionable Condition Register is received.

The status of each channel is shown in Table 4.6, and a summary is shown in Table 4.7.

Table 4.6 Contents of the questionable condition register and event register (CH1/CH2)

Bit	Weig ht	Description
15		Always 0 (unused)
14		Always 0 (unused)
13		Always 0 (unused)
12		Always 0 (unused)
11		Always 0 (unused)
10		Always 0 (unused)
9		Always 0 (unused)
8		Always 0 (unused)
7		Always 0 (unused)
6		Always 0 (unused)
5		Always 0 (unused)
4		Always 0 (unused)
3		Always 0 (unused)
2		Always 0 (unused)
1	2	FCTN OUT overload
0	1	SYNC/SUB OUT overload

Table 4.7 Contents of the questionable condition register and event register (Summary)

Bit	Weight	Description
15		Always 0 (unused)
14		Always 0 (unused)
13		Always 0 (unused)
12		Always 0 (unused)
11		Always 0 (unused)
10	1024	CH2 questionable status register summary
9		Always 0 (unused)
8	256	The compensation value of this unit is incorrect. Repair is required.
7		Always 0 (unused)
6	64	No signal is being input to 10MHz REF IN
5		Always 0 (unused)
4	16	The temperature inside the unit is too high. If this bit is 1 when the ambient temperature is below 40°C, the unit is broken.
3		Always 0 (unused)
2		Always 0 (unused)
1		Always 0 (unused)
0	1	CH1 questionable status register summary

4.4.1.2 Questionable Tansition Register

The Questionable Transition Filter detects changes in the Questionable Condition register and determines the transition of the Questionable Event register.
Table 4.8 shows the relationship between the Questionable Transition Filter settings and the transition of the Questionable Event register.

Table 4.8 Questionable Transition Filter and Questionable Event Register Transitions

s	Each bit setting of negative transition filter	Transition of questionable condition register to make each bit of questionable 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 Questionable Transition Filter register is set to 0 when the :STATus:PRESet command is received or when the power is turned on with the register enabled (*PSC ON) by the Power-On Status Clear command.

4.4.1.3 Questionable Event Register

The Questionable Event register reflects changes in the Questionable Condition register according to the settings of the Questionable Transition Filter register.
The Questionable Event register becomes 0 when a query to the Questionable Event register or a *CLS command is received.

4.4.1.4 Questionable Event Enable Register

The Questionable Event Enable Register reflects the state of the selected bit in the higher-level register.

- Questionable Event Enable Register (each channel)
  When a bit in the Questionable Event Enable Register is set to 1, each bit in the corresponding Questionable Event Register is enabled.
  When any valid bit is set to 1, the result for each channel is that bit 1 (CH1) or bit 10 (CH2) in the Questionable Condition Register (Summary) is set to 1.

- Questionable Event Enable Register (Summary)
  When a bit in the Questionable Event Enable Register is set to 1, each bit in the corresponding Questionable Event Register is enabled.
  When any valid bit is set to 1, QUE (bit 3) in the Questionable Status Byte Register is set to 1.

The Questionable Event Enable register is set to 0 when the :STATus:PRESet command is received or when the power is turned on with the Questionable Event Enable register enabled (*PSC ON) by the Power-On Status Clear command.

4.5 Warning Event Register Group

The warning event register group is shown in Figure 4.14. This register group configures three register sets: one register set for each channel and one register set to summarize their sets.

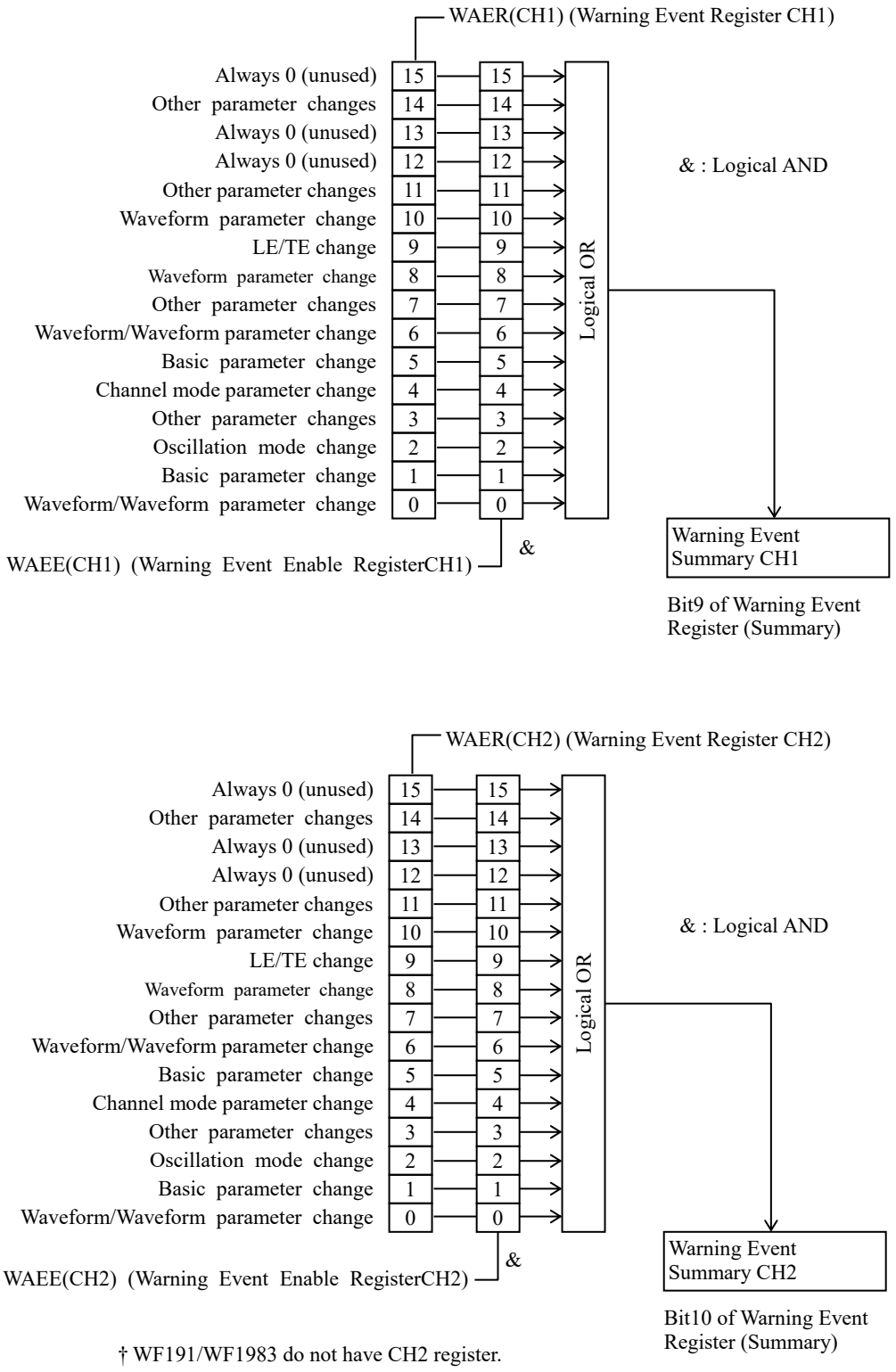


Figure 4.14 Warning Event Status Register Group Model

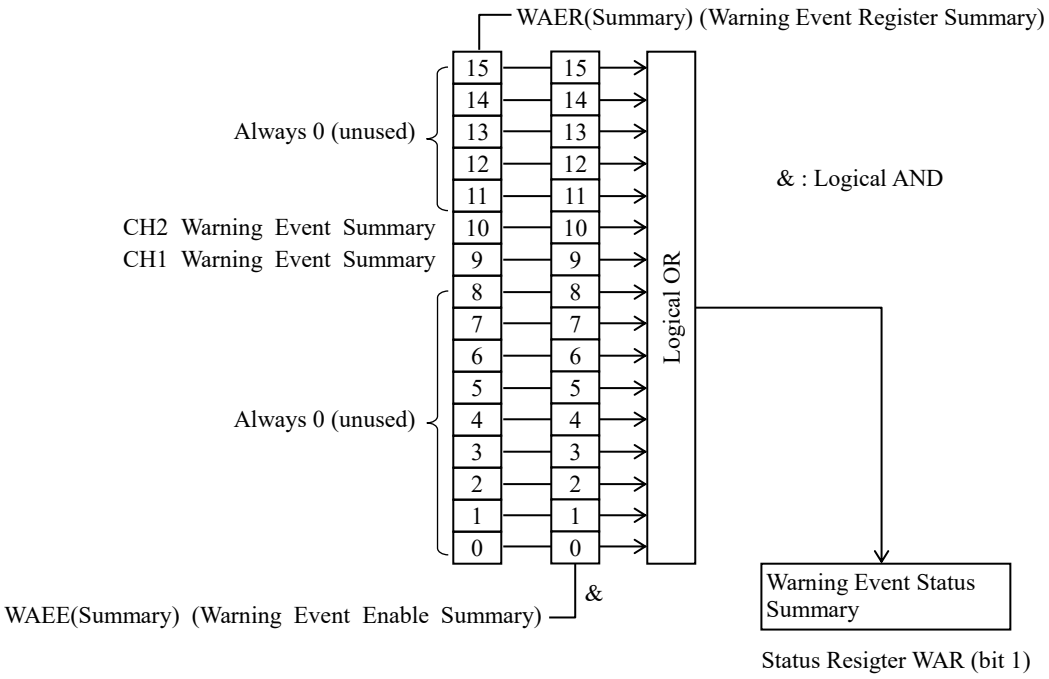


Figure 4.14 Warning Event Status Register Group Model (Continued)

4.5.1 Warning Event Register

Table 4.9 and Table 4.10 show the contents of each bit in the CH1 (CH2) warning event register and the warning event register.

The Event register is set to 0 when a query to the Event register or a *CLS command is received.

Table 4.9 CH1, CH2 Warning Event Register

Bit	Weight	Description
15		Always 0 (unused)
14	16384	Other parameters are changed.
13		Always 0 (unused)
12		Always 0 (unused)
11	2048	Other parameters are changed due to the change of basic parameters.
10		Always 0 (unused)
9	512	LE, TE parameters are changed due to the change of waveform parameters.
8	256	The waveform parameters were changed by changing the basic parameters (frequency, period, phase, amplitude, DC offset, high level, low level).
7	128	Other parameters are 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.
5	32	The basic parameter is changed due to the change of waveform or waveform parameter.
4	16	The channel mode parameter is changed due to the change of waveform or waveform parameter.
3	8	Other parameters are 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.
1	2	The basic parameter is changed due to the change of channel mode or channel mode parameter.
0	1	The waveform or waveform parameter is changed due to the change of channel mode or channel mode parameter.

Table 4.10 Warning Event Register (Summary)

Bit	Weight	Description
15		Always 0 (unused)
14		Always 0 (unused)
13		Always 0 (unused)
12		Always 0 (unused)
11		Always 0 (unused)
10	1024	CH2 warning event register summary
9	512	CH1 warning event register summary
8		Always 0 (unused)
7		Always 0 (unused)
6		Always 0 (unused)
5		Always 0 (unused)
4		Always 0 (unused)
3		Always 0 (unused)
2		Always 0 (unused)
1		Always 0 (unused)
0		Always 0 (unused)

The meaning of terms in Table 4.9 is as follows:

Channel mode change:
Represents switching between Indep/2Phase/2Tone/Ratio/Diff/Diff2.

Channel mode parameters:
Means the frequency difference and frequency ratio.

Waveform parameters:
This refers to the Transition Waveform of a Pulse Wave, Variable Duty Range, Pulse Width, Rise Time, Fall Time, Duty, Waveform Polarity, Amplitude Scale Range, Symmetry of a Ramp Wave, and other parameters specific to Parameter-Variable Waveforms.

Basic parameters:
This means frequency, period, phase, amplitude, DC offset, high level and low level.

Other parameters:
Represents parameters other than "Channel mode parameters, Basic parameters, and Waveform parameters"

4.5.2 Event Enable Register

The event enable register is used to select the bits in the event register to be summarized.

The warning event enable register reflects the state of the selected bit in the higher-level register.

- Warning Event Enable Register (each channel)
  When a bit in the Warning Event Enable Register is set to 1, each bit in the corresponding Warning Event Register is enabled.
  When any valid bit is set to 1, the result for each channel is that bit 9 (CH1) or bit 10 (CH2) in the Warning Condition Register (Summary) is set to 1.

- Warning Event Enable Register (Summary)
  When a bit in the Warning Event Enable Register is set to 1, each bit in the corresponding Warning Event Register is enabled.
  When any valid bit is set to 1, WAR (bit 1) in the Status Byte Register is set to 1.

The event enable register is set to 0 when the :STATus:PRESet command is received, or when the power is turned on with the event enable register enabled (*PSC ON) by the power-on status clear command.

4.6 Others

WF198x series provide the error queue and error message queue.
When there is an error message in the error queue, ERR (bit 2) in the status byte becomes 1, and when there is a response message, MAV (bit 4) in the status byte becomes 1.

5. 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 5.1. You can query the error number and message using ":SYSTem:ERRor?".

Table 5.1 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 suffix 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: ・ When "*CLS" cannot be executed due to the status of equipment ・ When "*RST" cannot be executed due to the status of equipment ・ When sequence cannot be changed to other oscillation mode due to the status of equipment ・ When other commands cannot be executed.
-211	Trigger ignored	GET (Group Execute Trigger), "*TRG", and other commands relating to the trigger are ignored. The relevant error occurs in the following cases: ・ When the compilation command is ignored because the equipment is not in the sequence Edit status ・ When the operation mode is sequence oscillation, the remote trigger is ignored because the device is not in the ready state ・ When the control command is ignored due to the status of equipment
-220	Parameter error	There is an error in the parameter. The relevant error occurs in the following cases: ・ When there is an error in the prefix/unit of the numerical parameter ・ When the specified unit cannot be used due to the status of equipment ・ When the name of arbitrary waveform exceeds 20 characters ・ When the name of arbitrary waveform contains a double quotation mark (") ・ When the number of data points for the arbitrary waveform is incorrect ・ When the compilation of sequence fails due to one of the following reasons: - When the total amount of waveform exceeds 32Mi words (WF1981/WF1982). - When the total amount of waveform exceeds 64Mi words (WF1983/WF1984). - When the sequence data 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: ・ When arbitrary waveform data cannot be saved due to insufficient memory
-290	Memory use error	Command cannot be executed because an error occurs relating to memory. The relevant error occurs in the following cases: ・ When empty memory is specified for the arbitrary waveform number ・ When the sequence data fails to compile because an empty memory is specified by the arbitrary waveform number ・ When the currently output or used arbitrary waveform is deleted
-291	Out of memory	Specified memory does not exist. The relevant error occurs in the following cases: ・ 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 message queue is full and processing cannot continue. The message queue has been cleared.
-440	Query UNTERMINATED after indefinite response	Query exists after "*IDN?" in the received string ("*IDN?" must be the last query in the received string).

6. Specifications

6.1 Interface Functions

Table 6.1 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 6.2 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

6.2 Response to Interface Message

Table 6.3 Response to Interface Message

IFC	・ Initialize the interface. ・ Release the specified listener or talker.
DCL and SDC	・ Clear the input buffer, message queue, or error queue. ・ Clear the error. ・ The SRQ transmission is cancelled and the bit that caused the SRQ transmission in the status byte is cleared to 0. ・ Disable the SRQ send.
LLO	・ Disable the LOCAL key (software key) operation of the panel.
GTL	・ Selects the local state.
GET	・ Execute trigger on CH1.

In LAN, you can not use these features.

6.3 Multi-Line Interface Message

*2 b7 / b6 / b5					0 0 0	*1 MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
b4	b3	b2	b1	Column / Low	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP	↑	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	*3 PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB		'		7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	10	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	11	VT		ESC		+		;		K		[		k		{	
1	1	0	0	12	FF		FS		,		<		L		\		l		|	
1	1	0	1	13	CR		GS		-		=		M		]		m		}	
1	1	1	0	14	SO		RS		.		>	↓	N		^	↓	n		~	
1	1	1	1	15	SI		US		/	↓	?	UNL	O	↓	_	UNT	o	↓	DEL	↓

Listener address assigned to the device

Listener address assigned to the device

Talker address assigned to the device

Listener address assigned to the device

Meaning is defined by the primary command

Meaning is defined by the primary command

Address command group (ACG)

Universal command group (UCG)

Listener address group (LAG)

Talker address group (TAG)

Primary command group (PCG)

Secondary command group (SCG)

Note: *1 MSG means an interface message.
*2 b1=DIO1・・・b7=DIO7. DIO8 is not used.
*3 Accompanied by the secondary command.

GTL : Go To Local
SDC : Selected Device Clear
PPC : Parallel Poll Configure
GET : Group Execute Trigger
TCT : Take Control
LLO : Local Lockout
DCL : Device Clear
PPU : Parallel Poll Unconfigure
SPE : Serial Poll Enable
SPD : Serial Poll Disable
UNL : Unlisten
UNT : Untalk

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
https://www.nfcorp.co.jp/english/