Tektronix®

AFG1000 Series
Arbitrary Function Generator

Programmer Manual

077-1129-01

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Programmer Manual

Revision A

www.tek.com

077-1129-01

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For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tek.com to find contacts in your area.

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[W2 – 15AUG04]

Table of contents

Getting Started

Introduction

This programmer guide provides information to use commands for remotely controlling your instrument. With this information, write computer programs that will perform functions such as setting the front-panel controls, selecting clock source, setting sampling rate, and exporting data for use in other programs.

Connecting the Interface

The AFG1000 Series has a USB (type B) connector on the rear panel, as shown in the following figure. This connector conforms to USB-TMC. Attach a USB cable to this connector.

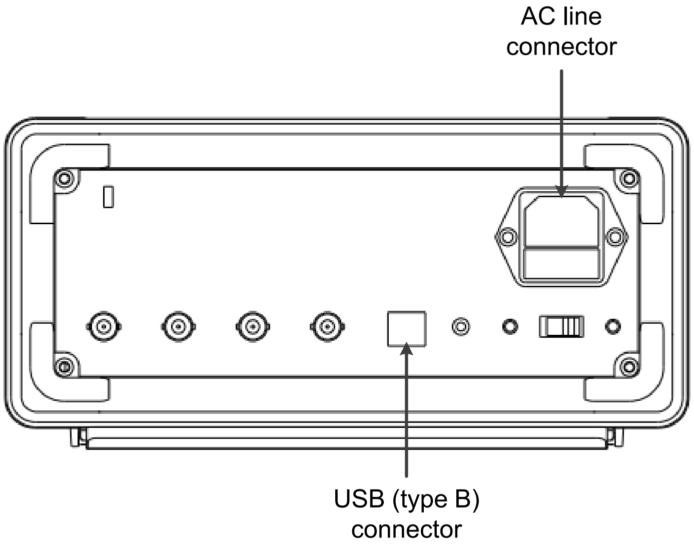


Figure 1: USB (type B) connector

Using TekVISA

TekVISA is Tektronix implementation of VISA (Virtual Instrument Software Architecture), an industry-standard communication protocol. VISA provides a common standard for software developers so that software from multiple vendors, such as instrument drivers, can run on the same platform. TekVISA is industry-compliant software, available with selected Tektronix instruments. Use this software to write (or draw) interoperable instrument drivers in a variety of Application Development Environments (ADEs). It implements a subset of Version 2.2 of the VISA specification for controlling USB instrument interface locally.

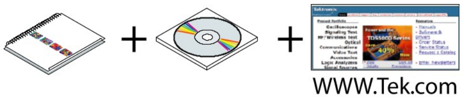
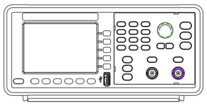
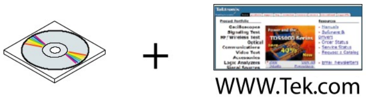
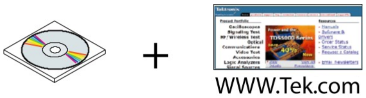
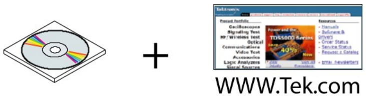
Installation

Use an internet browser to access the Tektronix Web site (www.tek.com/downloads) and download the current TekVISA to your PC. Unzip the downloaded file in a temporary directory of your choice and run *Setup.exe*.

NOTE: *The details on TekVISA concepts and operations are explained in the TekVISA Programmer Manual that can be also found on the Tektronix Web site.*

Where to find more information

The following table lists related documentation available for your instrument. The documentation is available on the Product Documentation CD and on the Tektronix Web site (www.tek.com/manuals).

Item	Purpose	Location
Important safety and compliance instructions	Compliance and safety instructions	
Built-in Help	UI Help and Operation	
Quick Start User Manual	Unpacking, Installation, Tutorials, Operation, and Overviews	
Programmer Manual	Menu Structures, User Interface, and Programming Information	
Technical Reference	Specifications and performance verification procedures	

Syntax and Commands

Command Syntax

Control the operations and functions of the instrument through the USB interface using commands and queries. The related topics listed below describe the syntax of these commands and queries. The topics also describe the conventions that the instrument uses to process them. See *Command Groups* (See page 10.) for a listing of the commands by command group, or use the index to locate a specific command.

Backus-Naur Form Definition

This manual describes commands and queries using the Backus-Naur Form (BNF) notation. The following table defines the standard BNF symbols.

Table 1: BNF symbols and meanings

Symbol	Meaning
< >	Defined element
:=	Is defined as
|	Exclusive OR
{ }	Group; one element is required
[ ]	Optional; can be omitted
. . .	Previous element(s) may be repeated
( )	Comment

Command and Query Structure

Overview Commands consist of set commands and query commands (usually simply called commands and queries). Commands change instrument settings or perform a specific action. Queries cause the instrument to return data and information about its status.

Most commands have both a set form and a query form. The query form of the command is the same as the set form except that it ends with a question mark. For example, the set command `MMEMory:CDIRectory` has a query form `MMEMory:CDIRectory?`. Not all commands have both a set and a query form; some commands are set only and some are query only.

Messages A command message is a command or query name, followed by any information the instrument needs to execute the command or query. Command messages consist of five element types.

Table 2: Command message elements

Symbol	Meaning
<Header>	The basic command name. If the header ends with a question mark, the command is a query. The header may begin with a colon (:) character; if the command is concatenated with other commands the beginning colon is required. The beginning colon can never be used with command headers beginning with a star (*).
<Mnemonic>	A header subfunction. Some command headers have only one mnemonic. If a command header has multiple mnemonics, they are always separated from each other by a colon (:) character.
<Argument>	A quantity, quality, restriction, or limit associated with the header. Not all commands have an argument, while other commands have multiple arguments. Arguments are separated from the header by a <Space>. Arguments are separated from each other by a <Comma>.
<Comma>	A single comma between arguments of multiple-argument commands. It may optionally have white space characters before and after the comma.
<Space>	A white space character between command header and argument. It may optionally consist of multiple white space characters.

Commands

Commands cause the instrument to perform a specific function or change one of its settings. Commands have the structure:

```
[:]<Header>[<Space><Argument>[<Comma><Argument>]...]
```

A command header is made up of one or more mnemonics arranged in a hierarchical or tree structure. The first mnemonic is the base or root of the tree and each subsequent mnemonic is a level or branch of the previous one. Commands at a higher level in the tree may affect those at a lower level. The leading colon (:) always returns you to the base of the command tree.

Queries

Queries cause the instrument to return information about its status or settings. Queries have the structure:

```
[:]<Header>?
```

```
[:]<Header>?[<Space><Argument>[<Comma><Argument>]...]
```

Specify a query at any level within the command tree unless otherwise noted. These branch queries return information about all the mnemonics below the specified branch or level.

Query Responses

When a query is sent to the instrument, only the values are returned. When the returned value is a mnemonic, it is noted in abbreviated format.

Command Entry

Follow these general rules when entering commands:

- Enter commands in upper or lower case.
- Precede any command with white space characters. White space characters include any combination of the ASCII control characters 00 through 09 and 0B through 20 hexadecimal (0 through 9 and 11 through 32 decimal).
- The instrument ignores commands that consists of just a combination of white space characters and line feeds.

SCPI Commands and Queries

The instrument uses a command language based on the SCPI standard. The SCPI (Standard Commands for Programmable Instruments) standard was created by a consortium to provide guidelines for remote programming of instruments. These guidelines provide a consistent programming environment for instrument control and data transfer. This environment uses defined programming messages, instrument responses and data formats that operate across all SCPI instruments, regardless of manufacturer.

The SCPI language is based on a hierarchical or tree structure. The top level of the tree is the root node; it is followed by one or more lower-level nodes.

Create commands and queries from these subsystem hierarchy trees. Commands specify actions for the instrument to perform. Queries return measurement data and information about parameter settings.

Creating Commands

SCPI commands are created by stringing together the nodes of a subsystem hierarchy and separating each node by a colon.

To create a SCPI command, start with the root node and move down the tree structure adding nodes until you reach the end of a branch. Most commands and some queries have parameters; you must include a value for these parameters. If you specify a parameter value that is out of range, the parameter will be set to a default value. The command descriptions, list the valid values for all parameters.

Creating Queries

To create a query, start at the root node of a tree structure, move down to the end of a branch, and add a question mark.

Query Responses

The query causes the instrument to return information about its status or settings. When a query is sent to the instrument, only the values are returned. When the returned value is a mnemonic, it is noted in abbreviated format.

Parameter Types

Every parameter in the command and query descriptions is of a specified type. (See Table 3.) The parameters are enclosed in brackets, such as <value>.

The parameter type is listed after the parameter and is enclosed in parentheses, for example, (boolean). Some parameter types are defined specifically for the instrument command set and some are defined by SCPI.

Table 3: Parameter types used in syntax descriptions

Parameter type	Description	Example
arbitrary block [1]	A specified length of arbitrary data	#512234xxxxx . . . where 5 indicates that the following 5 digits (12234) specify the length of the data in bytes; xxxxx ... indicates the data or #0xxxxx...<LF><&EOI>
boolean	Boolean numbers or values	ON or ≠ 0 OFF or 0
discrete	A list of specific values	MIN, MAX
binary	Binary numbers	#B0110
octal	Octal numbers	#Q57, #Q3
hexadecimal [2]	Hexadecimal numbers (0-9, A, B, C, D, E, F)	#H AA, #H1
NR1 [2] numeric	Integers	0, 1, 15, -1
NR2 [2] [3] numeric	Decimal numbers	1.2, 3.141516, -6.5
NR3 [2] numeric	Floating point numbers	3.1415E-9, -16.1E5
NRf [2] numeric	Flexible decimal number that may be type NR1, NR2 or NR3	See NR1, NR2, and NR3 examples
string [4]	Alphanumeric characters (must be within quotation marks)	"Testing 1, 2, 3"

[1] Defined in ANSI/IEEE 488.2 as "Definite Length Arbitrary Block Response Data."

[2] An ANSI/IEEE 488.2-1992-defined parameter type.

[3] Some commands and queries will accept an octal or hexadecimal value even though the parameter type is defined as NR1.

[4] Defined in ANSI/IEEE 488.2 as "String Response Data."

Special Characters

The Line Feed (LF) character or the New Line (NL) character (ASCII 10), and all characters in the range of ASCII 127-255 are defined as special characters. These characters are used in arbitrary block arguments only; using these characters in other parts of any command yields unpredictable results.

Abbreviating Commands, Queries, and Parameters

Abbreviate most SCPI commands, queries, and parameters to an accepted short form. This manual shows these short forms as a combination of upper and lower case letters. The upper case letters indicate the accepted short form of a command. As shown in the following figure, create a short form by using only the upper case letters. The accepted short form and the long form are equivalent and request the same action of the instrument.

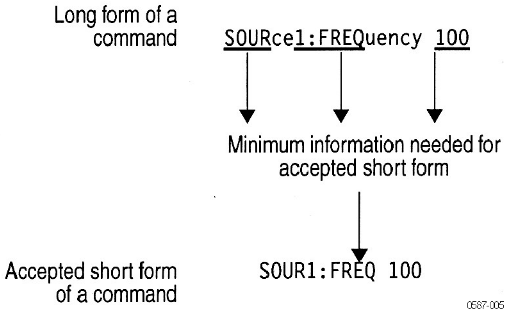

Long form of a command
SOURce1:FREQuency 100
Minimum information needed for accepted short form
Accepted short form of a command
SOUR1:FREQ 100
0587-005

Figure 2: Example of abbreviating a command

***NOTE:** The numeric suffix of a command or query may be included in either the long form or short form; the instrument will default to "1" if no suffix is used.*

Chaining Commands and Queries

Chain several commands or queries together into a single message. To create a chained message, first create a command or query, add a semicolon (;), and then add more commands or queries and semicolons until the message is complete. If the command following a semicolon is a root node, precede it with a colon (:).The single chained message should end in a command or query, not a semicolon. Responses to any queries in your message are separated by semicolons.

If a command or query has the same root and lower-level nodes as the previous command or query, you can omit these nodes.

Unit and SI Prefix

If the decimal numeric argument refers to amplitude, frequency, or time, express it using SI units instead of using the scaled explicit point input value format <NR3>. (SI units are units that conform to the Systeme International d'Unites standard.) For example, use the input format 200 mV or 1.0 MHz instead of 200.0E-3 or 1.0E+6, respectively, to specify voltage or frequency.

The following table lists the available units.

Table 4: Available units

Symbol	Meaning
DEG	degree (phase)
Hz	hertz (frequency)
PCT	percent (%)
s	second (time)
V	volt
Vpp	volt

You can omit a unit in a command, but you must include the unit when using a SI prefix. For example, frequency of 15 MHz can be described as follows

15.0E6, 1.5E7Hz, 15000000, 15000000Hz, 15MHz, etc.
("15M" is not allowed.)

General rules for using SCPI commands

Here are three general rules for using SCPI commands, queries, and parameters:

- Use single (‘ ’) or double (“ ”) quotation marks for quoted strings, but you cannot use both types of quotation marks for the same string.

correct	"This string uses quotation marks correctly."
correct	‘This string also uses quotation marks correctly.'
incorrect	"This string does not use quotation marks correctly.'

- Use upper case, lower case, or a mixture of both cases for all commands, queries, and parameters.

```
SOURCE1:FREQUENCY 10MHZ
```

is the same as

```
source1:frequency 100mhz
```

and

```
SOURCE1:frequency 10MHZ
```

NOTE: *Literal strings (quoted) are case sensitive, for example, file names.*

- No embedded spaces are allowed between or within nodes.

correct	`SOURCE1:FREQUENCY 10MHZ`
incorrect	`SOURCE1: FREQUENCY 10MHZ`

IEEE 488.2 Common Commands

Description

ANSI/IEEE Standard 488.2 defines the codes, formats, protocols, and usage of common commands and queries used on the interface between the controller and the instruments. The instrument complies with this standard.

Command and Query Structure

The syntax for an IEEE 488.2 common command is an asterisk (*) followed by a command and, optionally, a space and parameter value. The syntax for an IEEE 488.2 common query is an asterisk (*) followed by a query and a question mark. All of the common commands and queries are listed in the last part of the *Syntax and Commands* section. The following are examples of common commands:

- *CLS

The following are examples of common queries

- *IDN?

Command Groups

This section lists the commands organized by functional group. The Command Descriptions section lists all commands alphabetically. (See page 14.)

Memory Commands

Memory commands let you change setup memory attributes. The following table lists and describes Memory commands.

Table 5: Memory commands

Command	Description
*RCL	Recall instrument setting from setup memory
*SAV	Save instrument setting to setup memory

Mass Memory Commands

Mass Memory commands let you change mass memory attributes. The following table lists and describes the Mass Memory commands.

Table 6: Mass Memory commands

Command	Description
MMEMory:CATalog?	Query the status of mass memory
MMEMory:CDIRectory	Set/query current directory
MMEMory:DELete	Delete file or directory in mass memory

Output Commands

Output commands let you set output attributes. The following table lists and describes the Output commands.

Table 7: Output commands

Command	Description
OUTPut[1|2]:IMPedance	Set/query impedance
OUTPut[1|2][:STATe]	Set/query output on or off

Source Commands

Source commands let you set waveform output parameters. The following table lists and describes the Source commands.

Table 8: Source commands

Command	Description
[SOURce[1|2]]:AM[:DEPTh]	Set/query amplitude modulation depth
[SOURce[1|2]]:AM:INTernal:FREQuency	Set/query internal modulation frequency
[SOURce[1|2]]:AM:INTernal:FUNCtion	Set/query internal modulation waveform
[SOURce[1|2]]:AM:INTernal:FUNCtion:EFILe	Set/query EFILe setting
[SOURce[1|2]]:AM:SOURce	Set/query amplitude modulation source
[SOURce[1|2]]:AM:STATe	Set/query amplitude modulation status
[SOURce[1|2]]:ASKey[:AMPLitude]	Set/query ASK depth
[SOURce[1|2]]:ASKey:INTernal:RATE	Set/query ASK internal modulation rate
[SOURce[1|2]]:ASKey:SOURce	Set/query ASK source
[SOURce[1|2]]:ASKey:STATe	Set/query ASK status
[SOURce[1|2]]:BURSt:MODE	Set/query burst mode
[SOURce[1|2]]:BURSt:NCYCles	Set/query burst mode waveform output cycle
[SOURce[1|2]]:BURSt:SOURce	Set/query burst mode trigger source
[SOURce[1|2]]:BURSt:STATe	Set/query burst mode status
[SOURce[1|2]]:FM[:DEViation]	Set/query frequency deviation
[SOURce[1|2]]:FM:INTernal:FREQuency	Set/query internal modulation frequency
[SOURce[1|2]]:FM:INTernal:FUNCtion	Set/query internal modulation waveform
[SOURce[1|2]]:FM:INTernal:FUNCtion:EFILe	Set/query EFILe setting
[SOURce[1|2]]:FM:SOURce	Set/query frequency modulation source
[SOURce[1|2]]:FM:STATe	Set/query frequency modulation status
[SOURce[1|2]]:FREQuency:CENTer	Set/query center frequency
[SOURce[1|2]]:FREQuency:CONCurrent	Set/query concurrent change of frequency
[SOURce[1|2]]:FREQuency[:CW|:FIXed]	Set/query output waveform frequency
[SOURce[1|2]]:FREQuency:MODE	Set/query sweep status
[SOURce[1|2]]:FREQuency:SPAN	Set/query sweep frequency span
[SOURce[1|2]]:FREQuency:STARt	Set/query sweep start frequency
[SOURce[1|2]]:FREQuency:STOP	Set/query sweep stop frequency
[SOURce[1|2]]:FSKey[:FREQuency]	Set/query FSK hop frequency
[SOURce[1|2]]:FSKey:INTernal:RATE	Set/query FSK internal modulation rate
[SOURce[1|2]]:FSKey:SOURce	Set/query FSK source
[SOURce[1|2]]:FSKey:STATe	Set/query FSK status
[SOURce[1|2]]:FUNCtion:EFILe	Set/query EFILe name
[SOURce[1|2]]:FUNCtion[:SHAPe]	Set/query output waveform
[SOURce[1|2]]:PHASe[:ADJust]	Set/query output waveform phase
[SOURce[1|2]]:PHASe:INITiate	Initiate output waveform phase synchronization

Table 8: Source commands (cont.)

Command	Description
[SOURce[1|2]]:PM[:DEViation]	Set/query phase modulation deviation
[SOURce[1|2]]:PM:INTernal:FREQuency	Set/query internal modulation frequency
[SOURce[1|2]]:PM:INTernal:FUNCtion	Set/query internal modulation waveform
[SOURce[1|2]]:PM:INTernal:FUNCtion:EFILe	Set/query EFILe setting
[SOURce[1|2]]:PM:SOURce	Set/query phase modulation source
[SOURce[1|2]]:PM:STATe	Set/query phase modulation status
[SOURce[1|2]]:PSKey[:DEViation]	Set/query PSK deviation
[SOURce[1|2]]:PSKey:INTernal:RATE	Set/query PSK internal modulation rate
[SOURce[1|2]]:PSKey:SOURce	Set/query PSK source
[SOURce[1|2]]:PSKey:STATe	Set/query PSK status
[SOURce[1|2]]:PULSe:DCYCle	Set/query pulse waveform duty cycle
[SOURce[1|2]]:PWM:INTernal:FREQuency	Set/query pulse width modulation frequency
[SOURce[1|2]]:PWM:INTernal:FUNCtion	Set/query pulse width modulation waveform
[SOURce[1|2]]:PWM:INTernal:FUNCtion:EFILe	Set/query EFILe name
[SOURce[1|2]]:PWM:SOURce	Set/query pulse width modulation source
[SOURce[1|2]]:PWM:STATe	Set/query pulse width modulation status
[SOURce[1|2]]:PWM[:DEViation]:DCYCle	Set/query pulse width modulation deviation
[SOURce[1|2]]:SWEep:SOURce	Set/query sweep trigger source
[SOURce[1|2]]:SWEep:SPACing	Set/query sweep spacing
[SOURce[1|2]]:SWEep:TIME	Set/query sweep time
[SOURce[1|2]]:VOLTage[:LEVel] [:IMMediate]: OFFSet	Set/query output offset voltage
[SOURce[1|2]]:VOLTage[:LEVel] [:IMMediate][: AMPLitude]	Set/query output amplitude

Status Commands

Status commands let you determine the status of the instrument. The following table lists and describes the Status commands.

Table 9: Status commands

Command	Description
*CLS	Clear all event registers and queues

System Commands

System commands let you control miscellaneous instrument functions. The following table lists and describes the System commands.

Table 10: System commands

Command	Description
*IDN?	Return identification information
*OPT?	Return option information
*RST	Reset
SYSTem:ERRor[:NEXT]?	Return error event queue

Synchronization Commands

Synchronization commands let you synchronize the operation of the instrument. The following table lists and describes the Synchronization commands.

Table 11: Synchronization commands

Command	Description
*WAI	Wait to continue

Trace Commands

Trace commands let you set the edit memory and user waveform memory. The following table lists and describes the Trace commands.

Table 12: Trace commands

Command	Description
TRACe|DATA:CATalog?	Return user waveform memory status
TRACe|DATA:COPY	Copy edit memory (or user waveform memory) content to user waveform memory (or edit memory)
TRACe|DATA[:DATA]	Set/query waveform data to edit memory
TRACe|DATA[:DATA]:VALue	Set/query waveform data in edit memory
TRACe|DATA:POINts	Set/query number of points for waveform data in edit memory

Trigger Command

Trigger command lets you control the arbitrary function generator triggering.

Table 13: Trigger command

Command	Description
*TRG	Force trigger event

AFG Control

AFG Control command copies setups between two channels.

Table 14: AFG Control command

Command	Description
AFGControl:CSCopy	Copy CH1 (or CH2) setup parameters to CH2 (or CH1)

Command Descriptions

Commands either set or query instrument values. Some commands both set and query, some only set, and some only query.

Manual Conventions

This manual uses the following conventions:

- No Query Form indicates set-only commands
- A question mark (?) appended to the commands and Query Only indicates query-only commands
- Fully spells out headers, mnemonics, and arguments with the minimal spelling shown in upper case; for example, to use the abbreviated form of the DISPlay:BRIGhtness command, just type DISP:BRIG
- Syntax of some commands varies, depending on the model of instrument you are using; differences are noted

AFGControl:CSCopy (No Query Form)

This command copies setup parameters for one channel to another channel.

Group

AFG Control

Syntax

```
AFGControl:CSCopy {CH1|CH2},{CH1|CH2}
```

Arguments

CH1|CH2

Examples

```
AFGControl:CSCopy CH1,CH2
```

copies the CH1 setup parameters into CH2.

*CLS (No Query Form)

This command clears all the event registers and queues, which are used in the instrument status and event reporting system.

Group

Status

Syntax

```
*CLS
```

Arguments

None

Examples

```
*CLS
```

clears all the event registers and queues.

*IDN? (Query Only)

This query-only command returns identification information on the instrument.

Group

System

Syntax

```
*IDN?
```

Arguments

None

Returns

```
<Manufacturer>,<Model>,<Serial  Number>,<Firmware  Level>
```

where:

<Manufacturer>::= `TEKTRONIX`

<Model>::={AFG1022| AFG1062}

<Serial Number>

<Firmware Level>::=SCPI:99.0 FV:2.0.0

Examples

```
*IDN?
```

might return the following response:

```
TEKTRONIX,AFG1062,1331030,SCPI:99.0 FV:2.0.0
```

MMEMory:CATalog? (Query Only)

This query-only command returns the current state of the mass storage system (USB memory).

Group

Mass Memory

Syntax

```
MMEMory:CATalog?
```

Related Commands

MMEMory:CDIRectory

Arguments

None

Returns

```
<NR1>,<NR1>[,<file_name>,<file_type>,<file_size>]...
```

where:

The first <NR1> indicates that the total amount of storage currently used, in bytes. The second <NR1> indicates that the free space of mass storage, in bytes.

<file_name> is the name of directory or file. If the name exceeds 22 characters in length, it will be shortened to 8 characters (without suffix) in 8.3 name format.

<file_type> is DIR for directory, otherwise it is blank.

<file_size> is the size of the file, in bytes. This value will be 0 for directory.

Examples

The USB memory includes the Case and PWS4000-Main-CPU-Update folders, a SAMPLE1.tfw file, and a Test.zip file. The directory name PWS4000-Main-CPU-Update will be shortened to PWS400~1.

`MMEMory:CATalog?` might return the following response:

```
32751616,27970560,"Case,DIR,0","PWS400~1,DIR,0",”SAMPLE1.tfw,
,5412”,”Test.zip,,1735”
```

MMEMory:CDIRectory

This command changes the current working directory in the mass storage system.

Group

Mass Memory

Syntax

```
MMEMory:CDIRectory  [<directory_name>]
MMEMory:CDIRectory?
```

Arguments

<directory_name>::=<string> indicates the current working directory for the

mass storage system.

Returns <directory_name>::=<string>

Examples

```
MMEMory:CDIRectory  ”/AFG/WORK0”
```

changes the current directory to /AFG/WORK0.

MMEMory:DELete (No Query Form)

This command deletes a file or directory from the mass storage system. If a specified file in the mass storage is not allowed to overwrite or delete, this command causes an error. You can delete a directory if it is empty.

Group Mass Memory

Syntax

```
MMEMory:DELete  <file_name>
```

Arguments <file_name>::=<string> specifies a file to be deleted and should include full path.

Examples

```
MMEMory:DELete ”/AFG/WORK0/TEK001.tfw”
```

deletes the specified file from the /AFG/WORK directory.

*OPT? (Query Only)

This query-only command returns a list of the options installed in your instrument.

Group System

Syntax

```
*OPT?
```

Arguments None

Returns

<OPT>[,<OPT>[,<OPT>[,<OPT>]]]

Examples

```
*OPT?
```

might return 0, which indicates no option is installed in the instrument.

OUTPut[1|2]:IMPedance

This command sets the output load impedance for the specified channel. The specified value is used for amplitude, offset, and high/low level settings. You can set the impedance to any value from 1 Ω to 10 kΩ with a resolution of 1 Ω. The default value is 50 Ω.

The query returns the current load impedance setting in ohms. If the load impedance is set to INFinity, the query returns “9.9E+37”.

Group

Output

Syntax

```
OUTPut[1|2]:IMPedance   {<ohms>|INFinity|MINimum|MAXimum}
OUTPut[1|2]:IMPedance? {MINimum|MAXimum}
```

Arguments

<ohms>::=<NR3>[<units>]

where:

<units>::=OHM

INFinity sets the load impedance to >10 kΩ.

MINimum sets the load impedance to 1 Ω.

MAXimum sets the load impedance to 10 kΩ.

Returns

<ohms>::=<NR3>

Examples

```
OUTPut1:IMPedance  MAXimum
```

sets the CH 1 load impedance to 10 kΩ.

OUTPut[1|2][:STATe]

This command sets or query the instrument output state for the specified channel.

Group Output

Syntax

```
OUTPut[1|2][:STATe]  {ON|OFF|<NR1>}
OUTPut[1|2][:STATe]?
```

Arguments ON or <NR1>≠0 enables the instrument output.

OFF or <NR1>=0 disables the instrument output.

Returns <NR1>

Examples

```
OUTPut1:STATe ON
```

sets the instrument CH 1 output to ON.

*RCL (No Query Form)

This command restores the state of the instrument from a copy of the settings stored in the setup memory. The settings are stored using the *SAV command. If the specified setup memory is deleted, this command causes an error.

Group Memory

Syntax

```
*RCL  {0|1|2|…|30|31}
```

Related Commands *SAV

Arguments 0, 1, 2, … 30, or 31 specifies the location of setup memory.

Examples

```
*RCL 3
```

restores the instrument from a copy of the settings stored in memory location 3.

*RST (No Query Form)

This command resets the instrument to the factory default settings.

Group System

Syntax

```
*RST
```

Arguments None

Examples

```
*RST
```

resets the instrument settings to the factory defaults.

*SAV (No Query Form)

This command stores the current settings of the arbitrary function generator to a specified setup memory location.

Group Memory

Syntax

```
*SAV  {0|1|2|…|30|31}
```

Related Commands *RCL

Arguments 0, 1, 2, … 30, or 31 specifies the location of setup memory.

Examples

```
*SAV 2
```

saves the current instrument state in the memory location 2.

[SOURce[1|2]]:AM[:DEPTh]

This command sets or queries the modulation depth of AM modulation for the specified channel. Set the modulation depth from 0% to 100% with resolution of 1%.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:AM[:DEPTh]   {<depth>|MINimum|MAXimum}
[SOURce[1|2]]:AM[:DEPTh]? [MINimum|MAXimum]
```

Arguments

<depth>::=<NR2>[<units>]

where:

<NR2> is the depth of modulating frequency.

<units>::=PCT

MINimum sets the modulation depth to minimum value.

MAXimum sets the modulation depth to maximum value.

Returns

```
<depth>
```

Examples

```
SOURce1:AM:DEPth  MAXimum
```

sets the depth of modulating signal on CH 1 to the maximum value.

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

This command sets or queries the internal modulation frequency of AM modulation for the specified channel. Use this command when the internal modulation source is selected. Set the internal modulation frequency from 2 mHz to 20.00 kHz with resolution of 1 mHz.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:AM:INTernal:FREQuency  {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:AM:INTernal:FREQuency? [MINimum|MAXimum]
```

Arguments <frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz | kHz | MHz]

Returns <frequency>

Examples

```
SOURce1:AM:INTernal:FREQuency  10kHz
```

sets the CH 1 internal modulation frequency to 10 kHz.

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

This command sets or queries the modulating waveform of AM modulation for the specified channel. Use this command when the internal modulation source is selected.

If you specify EFILe when there is no EFILe or the EFILe is not yet defined, this command causes an error.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:AM:INTernal:FUNCtion  {SINusoid|SQUare|RAMP|PRNoise
|USER<NR1>|EMEMory|EFILe}
[SOURce[1|2]]:AM:INTernal:FUNCtion?
```

Related Commands SOURce[1|2]]:AM:SOURce

Arguments

`USER<NR1>|EMEMory`

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

A user defined waveform saved in the user waveform memory or the EMEMory can be selected as a modulating signal.

`EFILe`

EFILe is used as a modulating signal.

Returns

`SIN|SQU|RAMP|PRN|USER<NR1>|EMEMory|EFILe`

Examples

`SOURce1:AM:INTernal:FUNCtion  SQUare`

selects Square as the shape of modulating waveform for the CH 1 output.

[SOURce[1|2]]:AM:INTernal:FUNCtion:EFILe

This command sets or queries an EFILe name used as a modulating waveform for AM modulation. A file name must be specified in the mass storage system. This command returns " " if there is no file in the mass storage.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:AM:INTernal:FUNCtion:EFILe  <file_name>
[SOURce[1|2]]:AM:INTernal:FUNCtion:EFILe?
```

Arguments

<file_name>::=<string> specifies a file name in the mass storage system. The <file_name> includes path. Path separators are forward slashes (/).

Returns

`<file_name>`

Examples

`SOURce1:AM:INTernal:FUNCtion:EFILe  “SAMPLE1”`

sets a file named “SAMPLE1” in the mass storage.

[SOURce[1|2]]:AM:SOURce

This command sets or queries the source of modulating signal of AM modulation for the specified channel.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:AM:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:AM:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples

```
SOURce1:AM:SOURce  INTernal
```

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:AM:STATe

This command enables or disables AM modulation for the specified channel. The query returns the state of AM modulation.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:AM:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:AM:STATe?
```

Arguments

If `[SOURce[1|2]]` are omitted, CH 1 is specified automatically.

ON or <NR1>≠0 enables AM modulation.

OFF or <NR1>=0 disables AM modulation.

Returns

`<NR1>`

Examples

```
SOURce1:AM:STATe  ON
```

enables the CH 1 AM modulation.

[SOURce[1|2]]:ASKey[:AMPLitude]

This command is not supported for AFG1022.

This command sets or queries the modulation amplitude of ASK modulation for the specified channel. Set the modulation amplitude from 0 Vpp to the current amplitude of the carrier waveform.

Units	Amplitude resolution
Vpp	1 mVp-p or four digits

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:ASKey[:AMPLitude]   {<amplitude>|MINimum|MAXimum}
[SOURce[1|2]]:ASKey[:AMPLitude]?     [MINimum|MAXimum]
```

Arguments

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

where:

<NRf> is the modulation amplitude.

<units>::=[Vpp]

MINimum sets the modulation amplitude to minimum value.

MAXimum sets the modulation amplitude to maximum value.

Returns

```
<amplitude>
```

Examples

```
SOURce1:ASKey:AMPLitude  MAXimum
```

sets the amplitude of modulating signal on CH 1 to the maximum value.

[SOURce[1|2]]:ASKey:INTernal:RATE

This command sets or queries the internal modulation rate of ASK modulation for the specified channel. Use this command when the internal modulation source is selected.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:ASKey:INTernal:RATE   {<rate>|MINimum|MAXimum}
[SOURce[1|2]]:ASKey:INTernal:RATE?   {MINimum|MAXimum}
```

Arguments

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz | kHz | MHz]

Returns

<rate>

Examples

```
SOURce1:ASKey:INTernal:RATE  50Hz
```

sets the CH 1 internal modulation rate to 50 Hz.

[SOURce[1|2]]:ASKey:SOURce

This command sets or queries the source of modulation signal of ASK modulation for the specified channel.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:ASKey:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:ASKey:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples

```
SOURce1:ASKey:SOURce  INTernal
```

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:ASKey:STATe

This command enables or disables ASK modulation. The query returns the state of ASK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:ASKey:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:ASKey:STATe?
```

Arguments ON or <NR1>≠0 enables ASK modulation.

OFF or <NR1>=0 disables ASK modulation.

Returns
`<NR1>`

Examples
`SOURce1:ASKey:STATe ON`

enables the CH 1 ASK modulation.

[SOURce[1|2]]:BURSt:MODE

This command sets or queries the burst mode for the specified channel.

Conditions
For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group
Source

Syntax
```
[SOURce[1|2]]:BURSt:MODE  {TRIGgered|GATed}
[SOURce[1|2]]:BURSt:MODE?
```

Arguments
TRIGgered means that triggered mode is selected for burst mode.

GATed means that gated mode is selected for burst mode.

Returns
`TRIG|GAT`

Examples
`SOURce1:BURSt:MODE TRIGgered`

selects triggered mode.

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

This command sets or queries the number of cycles (burst count) to be output in burst mode for the specified channel. The query returns 9.9E+37 if the burst count is set to INFinity.

Conditions
For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do

not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:BURSt:NCYCles  {<cycles>|INFinity|MINimum|MAXimum}
[SOURce[1|2]]:BURSt:NCYCles? {MINimum|MAXimum}
```

Arguments

<cycles>::=<NRf>

where:

<NRf> is the burst count. The burst count ranges from 1 to 1,000,000.

INFinity sets the burst count to infinite count.

MINimum sets the burst count to minimum count.

MAXimum sets the burst count to maximum count.

Returns

`<cycles>`

Examples

```
SOURce1:BURSt:NCYCles  2
```

sets the CH 1 burst count to 2.

[SOURce[1|2]]:BURSt:SOURce

This command sets or queries the trigger source in the burst mode for the specified channel. This command is available only in the Triggered burst mode.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:BURSt:SOURce  [TIMer|MANual|EXTernal]
[SOURce[1|2]]:BURSt:SOURce?
```

Arguments

`TIMer` specifies an internal clock as the trigger source.

`MANual` specifies a manual trigger input as the trigger source.

`EXTernal` specifies an external trigger input as the trigger source.

Returns

```
TIM|MAN|EXT
```

Examples

```
SOURce1:BURSt:SOURce  EXTernal
```

sets an external trigger input as the trigger source in the burst mode.

[SOURce[1|2]]:BURSt:STATe

This command enables or disables the burst mode for the specified channel. The query returns the state of burst mode.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:BURSt:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:BURSt:STATe?
```

Arguments

ON or <NR1>≠0 enables the burst mode.

OFF or <NR1>=0 disables the burst mode.

Returns

```
<NR1>
```

Examples

```
SOURce1:BURSt:STATe  ON
```

enables the burst mode for the CH 1.

[SOURce[1|2]]:FM[:DEViation]

This command sets or queries the peak frequency deviation of FM modulation for the specified channel. The setting range of frequency deviation depends on the waveform selected as the carrier. For more information, refer to the *AFG1000 Series Specifications and Performance Verification Technical Reference*.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FM[:DEViation]   {<deviation>|MINimum|MAXimum}
[SOURce[1|2]]:FM[:DEViation]? [MINimum|MAXimum]
```

Arguments <deviation>::=<NRf>[<units>]

where:

<NRf> is the frequency deviation.

<units>::=[Hz | kHz | MHz]

Returns <deviation>

Examples

```
SOURce1:FM:DEViation  1.0MHz
```

sets the CH 1 frequency deviation to 1.0 MHz.

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

This command sets or queries the internal modulation frequency of FM modulation for the specified channel. Use this command when the internal modulation source is selected.

Set the internal modulation frequency from 2 mHz to 20.00 kHz with resolution of 1 mHz.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FM:INTernal:FREQuency   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FM:INTernal:FREQuency?  [MINimum|MAXimum]
```

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:FM:INTernal:FREQuency 10kHz
```
sets the CH 1 internal modulation frequency to 10 kHz.

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

This command sets or queries the modulating waveform of FM modulation for the specified channel. Use this command when the internal modulation source is selected.

If you specify EFILe when there is no EFILe or the EFILe is not yet defined, this command causes an error.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FM:INTernal:FUNCtion  {SINusoid|SQUare|RAMP|PRNoise
|USER<NR1>|EMEMory|EFILe}
```

```
[SOURce[1|2]]:FM:INTernal:FUNCtion?
```

Related Commands

SOURce[1|2]]:FM:SOURce

Arguments

```
USER<NR1>|EMEMory
```

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

A user defined waveform saved in the user waveform memory or the EMEMory can be selected as a modulating signal.

```
EFILe
```

EFILe is used as a modulating signal.

Returns

```
SIN|SQU|RAMP|PRN|USER<NR1>|EMEMory|EFILe
```

Examples

```
SOURce1:FM:INTernal:FUNCtion  SQUare
```

selects Square as the shape of modulating waveform for the CH 1 output.

[SOURce[1|2]]:FM:INTernal:FUNCtion:EFILe

This command sets or queries an EFILe name used as a modulating waveform for FM modulation. A file name must be specified in the mass storage system. This command returns " " if there is no file in the mass storage.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FM:INTernal:FUNCtion:EFILe  <file_name>
[SOURce[1|2]]:FM:INTernal:FUNCtion:EFILe?
```

Arguments

<file_name>::=<string> specifies a file name in the mass storage system. The <file_name> includes path. Path separators are forward slashes (/).

Returns

```
<file_name>
```

Examples

```
SOURce1:FM:INTernal:FUNCtion:EFILe  "SAMPLE1"
```

sets a file named "SAMPLE1" in the mass storage.

[SOURce[1|2]]:FM:SOURce

This command sets or queries the source of modulating signal of FM modulation for the specified channel.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FM:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:FM:SOURce?
```

Arguments

INTernal means that the carrier waveform is modulated with the internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns

`INT|EXT`

Examples

`SOURce1:FM:SOURce  INTernal`

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:FM:STATe

This command enables or disables FM modulation. The query returns the state of FM modulation.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FM:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:FM:STATe?
```

Arguments

ON or <NR1>≠0 enables FM modulation.

OFF or <NR1>=0 disables FM modulation.

Returns

`<NR1>`

Examples

`SOURce1:FM:STATe  ON`

enables the CH 1 FM modulation.

[SOURce[1|2]]:FREQuency:CENTer

This command sets or queries the center frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:SPAN command. The setting range of center frequency depends on the waveform selected for sweep.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FREQuency:CENTer   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FREQuency:CENTer? {MINimum|MAXimum}
```

Related Commands

[SOURce[1|2]]:FREQuency:SPAN, [SOURce[1|2]]:FREQuency:MODE

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the center frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:FREQuency:CENTer  550kHz
```

sets the CH 1 center frequency to 550 kHz.

[SOURce[1|2]]:FREQuency:CONCurrent

This command enables or disables the function to copy the frequency (or period) of one channel to another channel.

The `[SOURce[1|2]]:FREQuency:CONCurrent` command copies the frequency (or period) of the channel specified by the header suffix to another channel. If you specify CH 1 with the header, the CH 1 frequency will be copied to CH 2.

When the concurrent copy function is enabled, the FreqLock function is also enabled automaticlly. Use general knob to adjust frequency (or period) of the two channels sychronously.

The `[SOURce[1|2]]:FREQuency:CONCurrent?` command returns “0” (off) or “1” (on).

Group Source

Syntax

```
[SOURce[1|2]]:FREQuency:CONCurrent
{ON|OFF|<NR1>}
[SOURce[1|2]]:FREQuency:CONCurrent?
```

Arguments ON or <NR1>≠0 enables the concurrent copy function.

OFF or <NR1>=0 disables the concurrent copy function.

Returns <NR1>

Examples

```
SOURce1:FREQuency:CONCurrent ON
```

copies the frequency value of CH 1 to CH 2.

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

This command sets or queries the frequency of output waveform for the specified channel. This command is available when the Run Mode is set to other than Sweep.

The setting range of output frequency depends on the type of output waveform. If you change the type of output waveform, it might change the output frequency because changing waveform types impacts on the setting range of output frequency. The resolution is 1 μHz or 12 digits. For more information, refer to the *AFG1000 Series Specifications and Performance Verification Technical Reference*.

Group Source

Syntax

```
[SOURce[1|2]]:FREQuency[:CW|:FIXed]   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FREQuency[:CW|:FIXed]? {MINimum|MAXimum}
```

Arguments <frequency>::=<NRf>[<units>]

where:

<NRf> is the output frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:FREQuency:FIXed  500kHz
```

sets the CH 1 output frequency to 500 kHz when the Run Mode is set to other than Sweep.

[SOURce[1|2]]:FREQuency:MODE

This command sets or queries the frequency sweep state. Select sine, square or ramp waveform for sweep.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FREQuency:MODE  {CW|FIXed|SWEep}
[SOURce[1|2]]:FREQuency:MODE?
```

Related Commands

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

Arguments

CW|FIXed means that the frequency is controlled by the [SOURce[1|2]]:FREQuency[:CW|:FIXed] command. The sweep is invalid.

SWEep means that the output frequency is controlled by the sweep command set. The sweep is valid.

Returns

`CW|FIXed|SWEep`

Examples

`SOURce1:FREQuency:MODE SWEep` specifies the sweep command set for controlling the CH 1 output frequency.

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

This command sets or queries the span of frequency sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:CENTer command. The setting range of frequency span depends on the waveform selected for sweep.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FREQuency:SPAN   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FREQuency:SPAN?   {MINimum|MAXimum}
```

Related Commands

[SOURce[1|2]]:FREQuency:CENTer, [SOURce[1|2]]:FREQuency:MODE

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the frequency span.

<units>::=[Hz | kHz | MHz]

Returns

`<frequency>`

Examples

`SOURce1:FREQuency:SPAN 900 kHz`

sets the CH 1 frequency span to 900 kHz.

[SOURce[1|2]]:FREQuency:STARt

This command sets or queries the start frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:STOP command. The setting range of start frequency depends on the waveform selected for sweep. For more information, refer to the *AFG1000 Series Specifications and Performance Verification Technical Reference*.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FREQuency:STARt   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FREQuency:STARt? {MINimum|MAXimum}
```

Related Commands

[SOURce[1|2]]:FREQuency:STOP, [SOURce[1|2]]:FREQuency:MODE

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the start frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:FREQuency:STARt  10kHz
```

sets the sweep start frequency of CH 1 to 10 kHz.

[SOURce[1|2]]:FREQuency:STOP

This command sets or queries the stop frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:STARt command. The setting range of stop frequency depends on the waveform selected for sweep. For more information, refer to the *AFG1000 Series Specifications and Performance Verification*

Technical Reference.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FREQuency:STOP   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FREQuency:STOP?  {MINimum|MAXimum}
```

Related Commands [SOURce[1|2]]:FREQuency:STARt, [SOURce[1|2]]:FREQuency:MODE

Arguments <frequency>::=<NRf>[<units>]

where:

<NRf> is the stop frequency.

<units>::=[Hz | kHz | MHz]

Returns `<frequency>`

Examples

```
SOURce1:FREQuency:STOP  100KHz
```

sets the stop frequency of CH 1 to 100 kHz.

[SOURce[1|2]]:FSKey[:FREQuency]

This command sets or queries the hop frequency of FSK modulation for the specified channel.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FSKey[:FREQuency]   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:FSKey[:FREQuency]? {MINimum|MAXimum}
```

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the hop frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:FSKey:FREQuency  1.0MHz
```

sets the hop frequency of CH 1 FSK modulation to 1.0 MHz.

[SOURce[1|2]]:FSKey:INTernal:RATE

This command sets or queries the internal modulation rate of FSK modulation for the specified channel. Use this command when the internal modulation source is selected.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:FSKey:INTernal:RATE   {<rate>|MINimum|MAXimum}
[SOURce[1|2]]:FSKey:INTernal:RATE?   {MINimum|MAXimum}
```

Arguments

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz | kHz | MHz]

Returns

<rate>

Examples

```
SOURce1:FSKey:INTernal:RATE  50Hz
```

sets the CH 1 internal modulation rate to 50 Hz.

[SOURce[1|2]]:FSKey:SOURce

This command sets or queries the source of modulation signal of FSK modulation for the specified channel.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FSKey:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:FSKey:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples

```
SOURce1:FSKey:SOURce  INTernal
```

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:FSKey:STATe

This command enables or disables FSK modulation. The query returns the state of FSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:FSKey:STATe  {ON|OFF|<NR1>}
```

```
[SOURce[1|2]]:FSKey:STATe?
```

Arguments

ON or <NR1>≠0 enables FSK modulation.

OFF or <NR1>=0 disables FSK modulation.

Returns

```
<NR1>
```

Examples

```
SOURce1:FSKey:STATe  ON
```

enables the CH 1 FSK modulation.

[SOURce[1|2]]:FUNCtion:EFILe

This command sets or queries an EFILe name used as an output waveform. A file name must be specified in the mass storage system. This command returns “ ” if there is no file in the mass storage.

Group

Source

Syntax

```
[SOURce[1|2]]:FUNCtion:EFILe  <file_name>
[SOURce[1|2]]:FUNCtion:EFILe?
```

Arguments

<file_name>::=<string> specifies a file name in the mass storage system. The <file_name> includes path. Path separators are forward slashes (/).

NOTE: *The <file_name> argument is case sensitive.*

Returns

```
<file_name>
```

Examples

```
SOURce1:FUNCtion:EFILe  “SAMPLE1”
```

sets a file named “SAMPLE1” in the mass storage.

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

This command sets or queries the shape of the output waveform. When the specified user memory is deleted, this command causes an error if you select the user memory.

Group

Source

Syntax

```
[SOURce[1|2]]:FUNCtion[:SHAPe]   {SINusoid|SQUare|PULSe|RAMP
|PRNoise|<Built_in>|USER<NR1>|EMEMory|EFILe}
[SOURce[1|2]]:FUNCtion[:SHAPe]?
```

Arguments

<Built_in>::={StairDown|StairUp|Stair Up&Dwn|Trapezoid|RoundHalf|AbsSine|AbsHalfSine|ClippedSine|ChoppedSine|NegRamp|OscRise|OscDecay|CodedPulse|PosPulse|NegPulse|ExpRise|ExpDecay|Sinc|Tan|Cotan|SquareRoot|X^2|HaverSine|Lorentz|Ln(x)|X^3|CauchyDistr|BesselJ|BesselY|ErrorFunc|Airy|Rectangle|Gauss|Hamming|Hanning|Bartlett|Blackman|Laylight|Triangle|DC|Heart|Round|Chirp|Rhombus|Cardiac}

NOTE: *The arguments defined in <Built_in> can not be abbreviated, all the upper and lower case letters are needed.*

The following table shows the combination of modulation type and the shape of output waveform.

For AFG1022

	Sine, Square, Ramp	**Pulse**	**Noise**	**Arb**
AM	√			√
FM	√			√
PM	√			√
FSK	√			√
Sweep	√			√
Burst	√	√		√

For AFG1062

	Sine, Square, Ramp	**Pulse**	**Noise**	**Arb**
AM	√			√
FM	√			√
PM	√			√
PWM		√		
FSK	√			√
ASK	√			√
PSK	√			√

Sweep	√			√
Burst	√	√		√

If you specify EFILe when there is no EFILe or the EFILe is not yet defined, this command causes an error.

If you change the type of output waveform, it might change the output frequency because changing waveform types impacts the setting range of output frequency.

```
USER<NR1>|EMEMory
```

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

A user defined waveform saved in the user waveform memory or the EMEMory can be selected as an output waveform.

EFILe
EFILe is specified as an output waveform.

Returns

```
SIN|SQU|PULS|RAMP|PRN|<Built_in>|USER<NR1>|EMEMory|EFILe
```

Examples

```
SOURce1:FUNCtion:SHAPe  SQUare
```

selects the shape of CH 1 output waveform to square waveform.

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

This command sets or queries the phase of output waveform for the specified channel. Set the value in radians or degrees. If no units are specified, the default is RAD. The query returns the value in RAD.

This command is supported when you select a waveform other than DC and Noise.

Group

Source

Syntax

```
[SOURce[1|2]]:PHASe[:ADJust]   {<phase>|MINimum|MAXimum}
[SOURce[1|2]]:PHASe[:ADJust]? {MINimum|MAXimum}
```

Arguments

<phase>::=<NR3>[<units>]

where:

<NR3> is the phase of output waveform.

<units>::=[RAD | DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 to +2 PI, relative to phase value

DEG: 0 to +360, relative to phase value

Returns

```
<phase>
```

Examples

```
SOURce1:PHASe:ADJust MAXimum
```

sets the maximum value for the phase of CH 1 output waveform.

[SOURce[1|2]]:PHASe:INITiate (No Query Form)

This command synchronizes the phase of CH 1 and CH 2 output waveforms. The arbitrary/function generator performs the same operation if you specify either SOURce1 or SOURce2.

Group

Source

Syntax

```
[SOURce[1|2]]:PHASe:INITiate
```

Arguments

None

Examples

```
SOURce1:PHASe:INITiate
```

synchronizes the phase of CH 1 and CH 2 output signals.

[SOURce[1|2]]:PM[:DEViation]

This command sets or queries the peak frequency deviation of PM modulation for the specified channel.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:PM[:DEViation]   {<deviation>|MINimum|MAXimum}
[SOURce[1|2]]:PM[:DEViation]? [MINimum|MAXimum]
```

Arguments

<deviation>::=<NR3>[<units>]

where:

<NR3> is the phase deviation.

<units>::=[RAD | DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 PI to +1 PI, relative to phase value

DEG: 0 to +180, in 1 degree steps, relative to phase value

Returns

`<deviation>`

Examples

```
SOURce1:PM:DEViation  MAXimum
```

sets the maximum value for the CH 1 phase deviation.

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

This command sets or queries the internal modulation frequency of PM modulation for the specified channel. Use this command when the internal modulation source is selected.

Set the internal modulation frequency from 2 mHz to 20.00 kHz with resolution of 1 mHz.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:PM:INTernal:FREQuency   {<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:PM:INTernal:FREQuency?  [MINimum|MAXimum]
```

Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz | kHz | MHz]

Returns

`<frequency>`

Examples

```
SOURce1:PM:INTernal:FREQuency  10kHz
```

sets the CH 1 internal modulation frequency to 10 kHz.

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

This command sets or queries the modulating waveform of PM modulation for the specified channel. Use this command when the internal modulation source is selected.

If you specify EFILe when there is no EFILe or the EFILe is not yet defined, this command causes an error.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:PM:INTernal:FUNCtion   {SINusoid|SQuare|RAMP|PRNoise
|USER<NR1>|EMEMory|EFILe}
[SOURce[1|2]]:PM:INTernal:FUNCtion?
```

Related Commands

SOURce[1|2]]:PM:SOURce

Arguments

`USER<NR1>|EMEMory`

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

A user defined waveform saved in the user waveform memory or the EMEMory can be selected as a modulating signal.

`EFILe`

`EFILe` is used as a modulating signal.

Returns

```
SIN|SQU|RAMP|PRN|USER<NR1>|EMEMory|EFILe
```

Examples

```
SOURce1:PM:INTernal:FUNCtion  SQUare
```

selects Square as the shape of modulating waveform for the CH 1 output.

[SOURce[1|2]]:PM:INTernal:FUNCtion:EFILe

This command sets or queries an EFILe name used as a modulating waveform for PM modulation. A file name must be specified in the mass storage system. This command returns “ ” if there is no file in the mass storage.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:PM:INTernal:FUNCtion:EFILe  <file_name>
[SOURce[1|2]]:PM:INTernal:FUNCtion:EFILe?
```

Arguments

<file_name>::=<string> specifies a file name in the mass storage system. The <file_name> includes path. Path separators are forward slashes (/).

Returns

```
<file_name>
```

Examples

```
SOURce1:PM:INTernal:FUNCtion:EFILe  “SAMPLE1”
```

sets a file named “SAMPLE1” in the mass storage.

[SOURce[1|2]]:PM:SOURce

This command sets or queries the source of modulation signal of PM modulation for the specified channel.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:PM:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:PM:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples `SOURce1:PM:SOURce  INTernal`

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:PM:STATe

This command enables or disables PM modulation. The query returns the state of PM modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:PM:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:PM:STATe?
```

Arguments ON or <NR1>≠0 enables PM modulation.

OFF or <NR1>=0 disables PM modulation.

Returns `<NR1>`

Examples `SOURce1:PM:STATe  ON`

enables the CH 1 PM modulation.

[SOURce[1|2]]:PSKey[:DEViation]

This command sets or queries the peak frequency deviation of PSK modulation for the specified channel.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PSKey[:DEViation]   {<deviation>|MINimum|MAXimum}
[SOURce[1|2]]:PSKey[:DEViation]?    [MINimum|MAXimum]
```

Arguments

<deviation>::=<NR3>[<units>]

where:

<NR3> is the phase deviation.

<units>::=[RAD | DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 PI to +1 PI, relative to phase value

DEG: 0 to +180, in 1 degree steps, relative to phase value

Returns

`<deviation>`

Examples

```
SOURce1:PSKey:DEViation  MAXimum
```

sets the maximum value for the CH 1 phase deviation.

[SOURce[1|2]]:PSKey:INTernal:RATE

This command sets or queries the internal modulation rate of PSK modulation for the specified channel. Use this command when the internal modulation source is selected.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:PSKey:INTernal:RATE  {<rate>|MINimum|MAXimum}
[SOURce[1|2]]:PSKey:INTernal:RATE?  {MINimum|MAXimum}
```

Arguments <rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz | kHz | MHz]

Returns <rate>

Examples

```
SOURce1:PSKey:INTernal:RATE  50Hz
```

sets the CH 1 internal modulation rate to 50 Hz.

[SOURce[1|2]]:PSKey:SOURce

This command sets or queries the source of modulation signal of PSK modulation for the specified channel.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:PSKey:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:PSKey:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples

```
SOURce1:PSKey:SOURce  INTernal
```

sets the CH 1 source of modulating signal to internal.

[SOURce[1|2]]:PSKey:STATe

This command enables or disables PSK modulation. The query returns the state of PSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PSKey:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:PSKey:STATe?
```

Arguments

ON or <NR1>≠0 enables PSK modulation.

OFF or <NR1>=0 disables PSK modulation.

Returns

<NR1>

Examples

```
SOURce1:PSKey:STATe  ON
```

enables the CH 1 PSK modulation.

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

This command sets or queries the duty cycle of the pulse waveform for the specified channel.

For frequencies less than 1 MHz, the duty cycle is adjustable within the range of 0.1% to 99.9% in increments of 0.1. For frequencies greater than 1 MHz, the duty cycle is fixed at 50%.

The instrument will hold the settings of leading edge and trailing edge when the duty cycle is varied.

Group

Source

Syntax

```
[SOURce[1|2]]:PULSe:DCYCle  {<percent>|MINimum|MAXimum}
[SOURce[1|2]]:PULSe:DCYCle? [MINimum|MAXimum]
```

Arguments

<percent>::=<NR2>[<units>]

where:

<NR2> is the duty cycle.

<units>::=PCT

Returns

```
<percent>
```

Examples

```
SOURce1:PULSe:DCYCle  80.5
```

sets the duty cycle of the pulse waveform on CH 1 to 80.5%.

[SOURce[1|2]]:PWM:INTernal:FREQuency

This command sets or queries the internal modulation frequency of PWM modulation for the specified channel. Use this command when the internal modulation source is selected.

Set the internal modulation frequency from 2 mHz to 20.00 kHz with resolution of 1 mHz.

Select the source of modulating signal by using the [SOURce[1|2]]:PWM:SOURce [INTernal|EXTernal] command.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PWM:INTernal:FREQuency
{<frequency>|MINimum|MAXimum}
[SOURce[1|2]]:PWM:INTernal:FREQuency?
```

Related Commands

[SOURce[1|2]]:PWM:SOURce

Arguments

<frequency>::=<NRf>[<units>]

where <NRf> is the modulation frequency.

<units>::=[Hz | kHz | MHz]

Returns

```
<frequency>
```

Examples

```
SOURce1:PWM:INTernal:FREQuency  10kHz
```

sets the CH 1 internal frequency to 10 kHz.

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

This command sets or queries the modulating waveform of PWM modulation for the specified channel. Use this command when the internal modulation source is selected.

If you specify EFILe when there is no EFILe or the EFILe is not yet defined, this command causes an error.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PWM:INTernal:FUNCtion  {SINusoid|SQUare|RAMP|PRNoise
|USER<NR1>|EMEMory|EFILe}
```

```
[SOURce[1|2]]:PWM:INTernal:FUNCtion?
```

Related Commands

[SOURce[1|2]]:PWM:SOURce

Arguments

```
SINusoid|SQUare|RAMP|PRNoise
```

One of four types of function waveform can be selected as a modulating signal.

```
USER<NR1>|EMEMory
```

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

A user defined waveform saved in the user waveform memory or the EMEMory can be selected as a modulating signal.

```
EFILe
```

EFILe is used as a modulating signal.

Returns

```
SIN|SQU|RAMP|PRN|USER<NR1>|EMEMory|EFILe
```

Examples

```
SOURce1:PWM:INTernal:FUNCtion  SQUare
```

selects Square as the shape of modulating waveform for the CH 1 output.

[SOURce[1|2]]:PWM:INTernal:FUNCtion:EFILe

This command sets or queries an EFILe name used as a modulating waveform for PWM modulation. A file name must be specified in the mass storage system. This command returns “ ” if there is no file in the mass storage.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PWM:INTernal:FUNCtion:EFILe  <file_name>
[SOURce[1|2]]:PWM:INTernal:FUNCtion:EFILe?
```

Arguments

<file_name>::=<string> specifies a file name in the mass storage system. The <file_name> includes path. Path separators are forward slashes (/).

Returns

```
<file_name>
```

Examples

```
SOURce1:PWM:INTernal:FUNCtion:EFILe  “SAMPLE1”
```

creates a file named “SAMPLE1” in the mass storage.

[SOURce[1|2]]:PWM:SOURce

This command sets or queries the source of modulating signal of PWM modulation for the specified channel.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:PWM:SOURce  [INTernal|EXTernal]
[SOURce[1|2]]:PWM:SOURce?
```

Arguments INTernal means that the carrier waveform is modulated with the internal source.

EXTernal means that the carrier waveform is modulated with an external source.

Returns `INT|EXT`

Examples `SOURce1:PWM:SOURce  INTernal`

sets the source of modulating signal on CH 1 to internal.

[SOURce[1|2]]:PWM:STATe

This command enables or disables PWM modulation. The query returns the state of PWM modulation. Select only pulse waveform as a carrier waveform for PWM.

Conditions AFG1062 only

Group Source

Syntax

```
[SOURce[1|2]]:PWM:STATe  {ON|OFF|<NR1>}
[SOURce[1|2]]:PWM:STATe?
```

Arguments ON or <NR1>≠0 enables PWM modulation.

OFF or <NR1>=0 disables PWM modulation.

Returns `<NR1>`

Examples

```
SOURce1:PWM:STATe  ON
```

enables the CH 1 PWM modulation.

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

This command sets or queries the PWM deviation in percent for the specified channel.

The setting range must meet the following conditions:

Deviation ≤ Pulse Width - PWmin

Deviation ≤ Pulse Period - Pulse Width - PWmin

Deviation ≤ Pulse Width - 0.8 × (Leading Edge Time + Trailing Edge Time)

Deviation ≤ Pulse Period - Pulse Width - 0.8 × (Leading Edge Time + Trailing Edge Time)

where PWmin is the minimum pulse width.

Conditions

AFG1062 only

Group

Source

Syntax

```
[SOURce[1|2]]:PWM[:DEViation]:DCYCle
{<percent>|MINimum|MAXimum}
[SOURce[1|2]]:PWM[:DEViation]:DCYCle?
```

Arguments

<percent>::=<NR2>[<units>]

where:

<NR2> is the PWM deviation.

<units>::=PCT

Returns

```
<percent>
```

Examples

```
SOURce1:PWM[:DEViation]:DCYCle  5.0
```

sets the CH 1 PWM deviation to 5.0%.

[SOURce[1|2]]:SWEep:SOURce

This command sets or queries the trigger source in the sweep mode for the specified channel.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:SWEep:SOURce  [TIMer|MANual|EXTernal]
[SOURce[1|2]]:SWEep:SOURce?
```

Arguments `TIMer` specifies an internal clock as the trigger source.

`MANual` specifies a manual trigger input as the trigger source.

`EXTernal` specifies an external trigger input as the trigger source.

Returns `TIM|MAN|EXT`

Examples

```
SOURce1:SWEep:SOURce  EXTernal
```

sets an external trigger input as the trigger source in the sweep mode.

[SOURce[1|2]]:SWEep:SPACing

This command selects linear or logarithmic spacing for the sweep for the specified channel.

The query returns the type for the sweep spacing for the specified channel.

Conditions For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group Source

Syntax

```
[SOURce[1|2]]:SWEep:SPACing  {LINear|LOGarithmic}
[SOURce[1|2]]:SWEep:SPACing?
```

Arguments

LINear sets the sweep spacing to linear.

LOGarithmic sets the sweep spacing to logarithmic.

Returns

```
LIN|LOG
```

Examples

```
SOURce1:SWEep:SPACing  LINear
```

sets the CH1 sweep spacing to linear.

[SOURce[1|2]]:SWEep:TIME

This command sets or queries the sweep time for the sweep for the specified channel. The sweep time does not include hold time and return time. The setting range is 1 ms to 500 s.

Conditions

For the AFG1022, use `[SOURce1]`. Modulation, sweep, and burst conditions do not apply to CH2 for the AFG1022.

Group

Source

Syntax

```
[SOURce[1|2]]:SWEep:TIME   {<seconds>|MINimum|MAXimum}
[SOURce[1|2]]:SWEep:TIME?
```

Arguments

<seconds>::=<NRf>[<units>]

where:

<NRf> is the sweep time in seconds.

<units>::=[ns | µs | ms | s]

Returns

```
<seconds>
```

Examples

```
SOURce1:SWEep:TIME  100ms
```

sets the CH 1 sweep time to 100 ms.

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

This command sets or queries the offset level for the specified channel.

Group

Source

Syntax

```
[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet
{<voltage>|MINimum|MAXimum}
[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet?
{MINimum|MAXimum}
```

Arguments

<voltage>::=<NR3>[<units>]

where:

<NR3> is the offset voltage level.

<units>::=[mV | V]

Returns

```
<voltage>
```

Examples

```
SOURce1:VOLTage:LEVel:IMMediate:OFFSet  500mV
```

sets the CH 1 offset level to 500 mV.

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

This command sets or queries the output amplitude for the specified channel.

Units	Amplitude resolution
Vpp	1 mVp-p or four digits

Set the units of output amplitude by using the bezel menu selection.

Group

Source

Syntax

```
[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]
{<amplitude>|MINimum|MAXimum}
[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
```

```
{MINimum|MAXimum}
```

Arguments

<amplitude>::=<NR3>[<units>]

where:

<NR3> is the output amplitude.

<units>::=[Vpp]

Returns

```
<amplitude>
```

Examples

```
SOURce1:VOLTage:LEVel:IMMediate:AMPLitude  1Vpp
```

sets the CH 1 output amplitude to 1 Vpp.

SYSTem:ERRor[:NEXT]? (Query Only)

This query-only command returns the contents of the Error/Event queue.

Group

System

Syntax

```
SYSTem:ERRor[:NEXT]?
```

Arguments

None

Returns

```
<Error/event  number>::=<NR1>
<Error/event  description>::=<string>
```

Examples

```
SYSTEM:ERROR:NEXT?
```

might return the following response:

```
-201,"Invalid while in local"
```

If the instrument detects an error or an event occurs, the event number and event message will be returned.

TRACe|DATA:CATalog? (Query Only)

This query-only command returns the names of user waveform memory and edit memory.

Group

Trace

Syntax

```
TRACe|DATA:CATalog?
```

Arguments

None

Returns

```
<string>
```

A series of strings separated by commas is returned. Each string is enclosed within quotation marks.

Examples

```
TRACE|DATA:CATALOG?
```

might return “USER0”,”USER4”,”EMEM”

TRACe|DATA:COPY (No Query Form)

This command copies the contents of edit memory (or user waveform memory) to a specified user waveform memory (or edit memory).

Group

Trace

Syntax

```
TRACe|DATA:COPY  <trace_name>,EMEMory
TRACe|DATA:COPY EMEMory,{USER<NR1>}
```

Arguments

<trace_name>::={USER<NR1>}

<NR1> specifies the user waveform memory location.
For the AFG1022, <NR1> can be any number from 0 to 255.
For the AFG1062, <NR1> can be any number from 0 to 31.

Examples

```
DATA:COPY  USER0,EMEMory
```

copies the waveform data in the edit memory to the user waveform memory

USER0.

```
DATA:COPY EMEMory,USER0
```

copies the waveform data in the user waveform memory USER0 to the edit memory.

TRACe|DATA[:DATA]

This command transfers the waveform data from the external controller to the edit memory in the instrument. The query returns the binary block data.

Group

Trace

Syntax

```
TRACe|DATA[:DATA]   EMEMory,<binary_block_data>
TRACe|DATA[:DATA]?   EMEMory
```

Arguments

<binary_block_data>
where <binary_block_data> is the waveform data in binary format.

Returns

```
<binary_block_data>
```

Examples

```
DATA:DATA   EMEMory,#42000<DAB><DAB>...<DAB>
```

transmits a waveform to the edit memory in the instrument. The block data element #42000 indicates that 4 is the number of digits in 2000 (byte count) and the 2000 bytes of binary data are to be transmitted.

TRACe|DATA[:DATA]:VALue

This command sets or queries the data value at the specified point in the edit memory.

Group

Trace

Syntax

```
TRACe|DATA[:DATA]:VALue   EMEMory,<point>,<data>
TRACe|DATA[:DATA]:VALue?   EMEMory,<point>
```

Arguments

`<point>::=<NR1>`

where:

<NR1> is the specified point number in the edit memory.

`<data>::=<NRf>`

where:

<NRf> is the voltage value for the specified point number.

<units>::=[mV | V]

Returns

<NRf>

Examples

```
DATA:DATA:VALue  EMEMory,500,2.5V
```

sets the voltage value to 2.5V for the point number 500 in the edit memory.

```
DATA:DATA:VALue?  EMEMory,500
```

might return “2.5000000+e0”.

This example indicates that the voltage value of point number 500 is set to 2.5V.

TRACe|DATA:POINts

This command sets or queries the number of data points for the waveform created in the edit memory.

Group

Trace

Syntax

```
TRACe|DATA:POINts   EMEMory[,<points>|MINimum|MAXimum]
TRACe|DATA:POINts?   EMEMory{,MIN|MAX}
```

Arguments

`<points>::=<NR1>`

where

<NR1> sets the number of points for the waveform created in the edit memory.
For the AFG1022, <NR1> can be any number from 2 to 8192.
For the AFG1062, <NR1> can be any number from 2 to 1048576.

Returns

`<NR1>`

Examples

```
DATA:POINts EMEMory, 500
```

sets the waveform data points to 500 in the edit memory.

*TRG (No Query Form)

This command generates a trigger event.

Group

Trigger

Syntax

```
*TRG
```

Arguments

None

Examples

```
*TRG
```

generates a trigger event.

*WAI (No Query Form)

This command prevents the instrument from executing further commands or queries until all pending commands that generate an OPC message are complete.

Group

Synchronization

Syntax

```
*WAI
```

Arguments

None

Examples

```
*WAI
```

prevents the instrument from executing any further commands or queries until all pending commands that generate an OPC message are complete.

Command Errors

The following table shows the error messages generated by improper command syntax. Check that the command is properly formed and that it follows the rules in the Syntax and Commands.

Table 15: Command messages

Code	Message
0 (indicates no error)	
-101	Invalid character
-102	Syntax error
-108	Parameter not allowed
-201	Invalid while in local

Error/Event Queue

The event queue is an FIFO queue, which stores events as they occur in the instrument. The event queue can store up to 64 events.

The oldest error code and text are retrieved by using the following command:

```
SYSTem:ERRor[:NEXT]?
```

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