Keysight
AP5041A G3 and AP5042A G3
Vector Signal Generators

KEYSIGHT

PROGRAMMER'S MANUAL

Notices

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Warranty

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https://www.keysight.com/us/en/support/AP5041A

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Keysight also recommends that you secure your IT environments using appropriate third-party tools. For instruments that run the Microsoft Windows operating system, Keysight concurs with Microsoft's recommendations for ensuring that the instrument is protected:

- Get the latest critical Windows updates

- For network-connected instruments, use an Internet firewall (in Keysight instruments, Windows Firewall is enabled by default)

- For network-connected instruments, use up-to-date antivirus and anti-spyware software

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Contents

1 Programming the Instrument

This section describes the following features:

Introduction

This manual provides information for remote operation of the Keysight AP Vector Signal Generators using commands sent from an external controller via Ethernet, USB, or GPIB.This manual includes the following:

- A general description of the LAN and the bus data transfer and control functions.
- A general description of how to establish connection via LAN, USB, or GPIB.
- A listing of the IEEE-488 Interface Function Messages recognized by the AP signal generators with a description of its response.
- A complete listing and description of all the Standard Commands for Programmable Instruments (SCPI) commands that can be used to control signal generator operation with examples of command usage.

Programming the instrument

All instruments described in this manual can be accessed through LAN, USB or GIPB interface. All interfaces use standard SCPI command set to pass commands to the instrument.

While LAN is the preferred interface for Keysight instruments, GPIB is only optionally available for some models.

Ethernet LAN

All Keysight signal generators are preferably remote programmed via a 10/100/1000Base-T LAN interface and LAN-connected computer using one of several LAN interface protocols. The LAN allows instruments to be connected together and controlled by a LAN based computer. LAN and its associated interface operations are defined in the IEEE 802.2 standard.

All instruments support the following LAN interface protocols:

- **Socket based LAN:** The application programming interface (API) provided with the instrument supports general programming using the LAN interface under Windows operating system.
- **VXI-11**
- **Telephone Network (TELNET):** TELNET is used for interactive, one command at a time instrument control.
- **Internet protocol** optionally supported

For LAN operation, the AP Vector Signal Generator must be connected to the LAN, and an IP address must be assigned to the AP Vector Signal Generator either manually or by using DHCP client service. Your system administrator can tell you which method to use. Most current LAN networks use DHCP.

DHCP Configuration

If the DHCP server uses dynamic DNS to link the hostname with the assigned IP address, the hostname may be used in place of the IP address. Otherwise, the hostname is not usable.

Ethernet Interface Connection and Setup

The instrument fully supports the IEEE-802.3 standard. Most instrument functions (except power on/off) can be remotely controlled via a network server and an Ethernet connection. The instrument firmware supports the TCP/IP network protocol.

Ethernet uses a bus or star topologies where all of the interfacing instruments are connected to a central cable called the bus or are connected to a hub. Ethernet uses the CSMA/CD access method to handle simultaneous transmissions over the bus. CSMA/CD stands for Carrier Sense Multiple Access/Collision Detection. This standard enables network instruments to detect simultaneous data channel usage, called a collision, and provides for a contention protocol. When a network instrument detects a collision, the CSMA/CD standard dictates that the data will be retransmitted after waiting a random amount of time. If a second collision is detected, the data is again retransmitted after waiting twice as long. This is known as exponential back off.

The TCP/IP setup requires the following:

– IP Address: Every computer/electronic device in a TCP/IP network requires an IP address. An IP address has four numbers (each between 0 and 255) separated by periods.

  For example: 192.168.1.50 is a valid IP address.

– Subnet Mask: The subnet mask distinguishes the portion of the IP address that is the network ID from the portion that is the station ID. The subnet mask 255.255.0.0, when applied to the IP address given above, would identify the network ID as 192.168 and the station ID as 1.50. All stations in the same local area network should have the same network ID, but different station IDs.

– Default Gateway: A TCP/IP network can have a gateway to communicate beyond the LAN identified by the network ID. A gateway is a computer or electronic instrument that is connected to two different networks and can move TCP/IP data from one network to the other. A single LAN that is not connected to other LANs requires a default gateway setting of 0.0.0.0. If you have a gateway, then the default gateway would be set to the appropriate value of your gateway.

– MAC Address: A MAC address is a unique 48-bit value that identifies a network interface card to the rest of the network. Every network card has a unique MAC address permanently stored into its memory.

Interface between the instrument and other devices on the network is connected to a network via a category five (CAT-5) interface cable. This cable uses four twisted pairs of copper insulators terminated into an RJ45 connector. CAT-5 cabling is capable of supporting frequencies up to 100 MHz and data transfer speeds up to 1 Gbps, which accommodates 1000Base-T, 100Base-T, and 10Base-T networks.

Generally, a VISA I/O library (like NI-VISA™) is used on the server side to facilitate the communications. A VISA installation on the controller is a prerequisite for remote control over LAN interface. VISA is a standardized software interface library providing input and output functions to communicate with instruments. For more information about VISA refer to the VISA library supplier's documentation.

Only the IP address or the device name is required for link setup. The IP address/device name is part of the "visa resource string" used by the programs for identification and control of the instrument. The visa resource string has the form:

TCPIP::ipaddr::inst0::INSTR

ipaddr must be replaced by the IP address or the computer name of the instrument.

For instance, if the instrument has the IP address 192.168.1.50, TCPIP::192.168.1.50::inst0::INSTR is the valid resource name. Specification of **inst0** in the resource name is optional. In this example, also TCPIP::192.168.1.50::INSTR is therefore a valid resource name.

TCPIP designates the network protocol used and **INSTR** indicates that the VXI-11 protocol is used. If several instruments are connected to the network, each instrument has its own IP address and associated resource name. The controller identifies these instruments by means of the resource name.

Using Sockets LAN

Sockets LAN is a method used to communicate with the AP Vector Signal Generator over the LAN interface using the Transmission Control Protocol/Internet Protocol (TCP/IP). A socket is a fundamental technology used for computer networking and allows applications to communicate using standard mechanisms built into network hardware and operating systems. The method accesses a port on the signal generator/frequency synthesizer from which bidirectional communication with a network computer can be established.

Sockets LAN can be described as an Internet address that combines Internet Protocol (IP) with a device port number and represents a single connection between two pieces of software. The socket can be accessed using code libraries packaged with the computer operating system. Two common versions of socket libraries are the Berkeley Sockets Library for UNIX systems and Winsock for Microsoft operating systems.

Your AP Vector Signal Generator implements a socket Applications Programming Interface (API) that is compatible with Berkeley socket for UNIX systems and Winsock for Microsoft systems. The AP Vector Signal Generator is also compatible with other standard sockets APIs. The AP Vector Signal Generator can be controlled using predefined SCPI functions once the socket connection is established in your program. Socket connection is available on **port 18**.

Using and Configuring VXI-11 (VISA)

The AP Vector Signal Generator supports the LAN interface protocol described in the VXI-11 standard. VXI-11 is an instrument control protocol based on Open Network Computing/Remote Procedure Call (ONC/RPC) interfaces running over TCP/IP.

A range of standard software such as NI-VISA or Keysight IO Config is available to setup the computer-signal generator interface for the VXI- 11 protocol. Please refer to the applicable software user manual and documentation for information on running the program and configuring the VXI-11 interface. The program is used to configure the LAN client. Once the computer is configured for a LAN client, you can use the VXI- 11 protocol and the VISA library to send SCPI commands to the AP Vector Signal Generator over the LAN interface. Example programs are available on request under support@keysight.com.

VISA is an IO library used to develop IO applications and instrument drivers that comply with industry standards. It is recommended to use the VISA library for programming the signal generators/frequency synthesizers. The NI-VISA and Agilent VISA libraries are similar implementations of VISA and have the same commands, syntax, and functions.

Using Telnet LAN (Port 18)

Telnet provides a means of communicating with the AP Vector Signal Generator over the LAN. The Telnet client, run on a LAN connected computer, will create a session on the AP Vector Signal Generator. A connection, established between computer and AP Vector Signal Generator, generates a command line user interface.

Telnet service uses newline '\n' (0x0D hex) as line (and command) termination character.

Using the Telnet protocol to send commands to the AP Vector Signal Generator is similar to communicating with the AP Vector Signal Generator over LAN. You establish a connection with the AP Vector Signal Generator and then send or receive information using predefined commands. Communication is interactive: one command at a time. The telnet service is available on **port 18**.

USB (USBTMC)

All instruments support the following USB interface protocols:

- **USBTMC class device via VISA: USBTMC** stands for **USB Test & Measurement Class**. USBTMC is a protocol built on top of USB that allows GPIB-like communication with USB devices. From the user's point of view, the USB device behaves just like a GPIB device. USBTMC allows instrument manufacturers to upgrade the physical layer from GPIB to USB while maintaining software compatibility with existing software such as instrument drivers and any application that uses VISA. This is also what the VXI-11 protocol provides for TCP/IP.
- **USBTMC with IVI drivers:** the application programming interface (API) provided with the instrument supports general programming using the USB interface under Windows operating system using the IVI drivers.

USB-TMC Interface Connection and Setup using VISA

USBTMC stands for USB Test & Measurement Class. USBTMC is a protocol built on top of USB that allows GPIB-like communication with USB devices. From the user's point of view, the USB device behaves just like a GPIB device. For example, you can use VISA Write to send the *IDN? query and use VISA Read to get the response. The USBTMC protocol supports service request, triggers and other GPIB specific operations.

USBTMC upgrades the physical layer from GPIB to USB while maintaining software compatibility with existing software such as instrument drivers and any application that uses VISA. This is also what the VXI-11 protocol provides for TCP/IP.

NI-VISA 3.0 or later allows you to communicate as a controller to the instruments. NI-VISA is configured to detect USBTMC compliant instruments. To use such a device, plug it in and Windows should detect the new hardware and launch the New Hardware Wizard. Instruct the wizard to search for the driver, which in this case is NI-VISA. If NI-VISA is properly installed, the device will be installed as a USB Test & Measurement Class Device. Open Measurement & Automation Explorer (MAX). The new device will appear in MAX under Device and Interfaces » USB Devices. You can then use this resource name as you would use any GPIB resource.

USB-TMC Interface Connection and Setup using Keysight API

Keysight API programming interface supports direct communication to instruments using Keysight’s proprietary DLL driver libraries.

Please contact Keysight for more detailed documentation, programming samples, and updates on the DLL library.

GPIB Interface Connection and Setup

NOTE Applies to AP5041A and AP5042A - with Option GPB.

General GPIB information

GPIB (General Purpose Interface Bus) is an interface standard for connecting computers and peripherals, which supports the following international standards: IEEE 488.1, IEC-625, IEEE 488.2, and JIS-C1901. The GPIB interface allows you to control the instrument from an external computer. The computer sends commands and instructions to the instrument and receives data sent from the instrument via GPIB.

You can connect up to 15 instruments in a single GPIB system.

The length of cables to connect between instruments must be 4 m or less. The total length of connecting cables in a single GPIB system must be 2 m × the number of connected instruments (including the controller) or less. You cannot construct the system in which the total cable length exceeds 20 m.

The number of connectors connected to an individual instrument must be 4 or less. If you connect 5 or more connectors, excessive force is applied to the connector part, which may result in failure.

You can choose the instrument connection topology from star, linear, and combined. Loop connection is not allowed.

SCPI Commands

The Standard Commands for Programmable Instrumentation (SCPI) provides a uniform and consistent language to control programmable test and measurement instruments in instrumentation systems. The SCPI Standard is built on the foundation of IEEE-488.2, Standard Codes and Formats. It requires conformance to IEEE-488.2, but is pure software standard. SCPI syntax is ASCII text, and therefore can be attached to any computer test language such as BASIC, C, or C++. It can also be used with Test Application Environments such as LabWindows/CVI, LabVIEW™, or Matlab®. SCPI is hardware independent. SCPI strings can be sent over any instrument interface. It works equally well over USB-TMC, GPIB, RS-232, VXIbus or LAN networks.

Please see the Chapter 3, “SCPI Commands,” for detailed description of supported SCPI commands.

2 IEEE-488 Interface Commands

The following topics can be found in this chapter:

IEEE Command Parameter and Query Response Data Types

IEEE 488.2 defines different data formats for use in command parameters and query response messages.

IEEE 488.2 Definite Block Data

The definite block data format transfers arbitrary byte data. It is used to transfer files (text and binary).

A definite block is prefixed by a # character, indicating the beginning of block data.

A definite block has a #<ndigits><nbytes><data>{<data>} format, where:

- # marks the beginning of block data.
- <ndigits> specifies how many decimal digits are contained in <nbytes>. <ndigits> is a decimal integer.
- <nbytes> specifies how many <data> bytes follow. <nbytes> is a decimal integer.
- <data> are the data bytes transferred.

Example of definite block data:

#2141000000000;1.0

#214...: beginning of block data

#214...: byte count is two digits wide

#214...: 14 data bytes will follow

...1000000000;1.0: 14 bytes of data (file contents)

IEEE Mandated and Optional Command Commands

The required common commands are IEEE-488.2 mandated commands that are defined in the IEEE-488.2 standard and must be implemented by all SCPI compatible instruments. These commands are identified by an asterisk (*) at the beginning of the command keyword. These commands are used to control instrument status registers, status reporting, synchronization, and other common functions.

*CLS Clear Status Command

*ESE Standard Event Status Enable Command

*ESE? Standard Event Status Enable Query

*ESR? Standard Event Status Register Query

*IDN? Identification Query

*OPC Operation Complete Command

*OPC? Operation Complete Query

*OPT? Option Identification Query

*RCL Memory Register State Recall Command

*RST Reset Command

*SAV Memory Register State Save Command

*SRE Service Request Enable Command

*SRE? Service Request Enable Query

*STB? Read Status Byte Query

*TRG Trigger Command

*TST? Self-Test Query

*WAI Wait-to-Continue Command

*CLS

The Clear Status (CLS) command clears the status byte by emptying the error queue and clearing all the event registers including the Data Questionable Event Register, the Standard Event Status Register, the Standard Operation Status Register, and any other registers that are summarized in the status byte.

*ESE<data>

The Standard Event Status Enable (ESE) command sets the Standard Event Status Enable Register. The variable <data> represents the sum of the bits that will be enabled.

Range: 0–255

The setting enabled by this command is not affected by AP Vector Signal Generator preset or *RST. However, cycling the signal generator/frequency synthesizer power will reset this register to zero.

ESE?

The Standard Event Status Enable (ESE) returns the value of the Standard Event Status Enable Register.

Range: 0–255

ESR?

The Standard Event Status Register (ESR) returns the value of the Standard Event Status Register.

*IDN?

The Identification (IDN) query outputs an identifying string. The response will show the following information: <company name>, <model number>, <serial number>, <firmware revision>

*OPC

The Operation Complete (OPC) command sets bit 0 in the Standard Event Status Register when all pending operations have finished.

The Operation Complete command causes the instrument to set the operation complete bit (bit 0) in the Standard Event Status Register when all pending operations have been finished.

*OPC?

The Operation Complete (OPC) returns the ASCII character 1 in the Standard Event Status Register when all pending operations have finished.

This query stops any new commands from being processed until the current processing is complete. This command blocks the communication until all operations are complete (i.e. the timeout setting should be longer than the longest sweep).

*OPT?

The options (OPT) query returns a comma-separated list of all currently installed instrument options on the AP Vector Signal Generator.

Common returned option strings are:

520	Basic device
004	Number of channels of the device
UNZ	Fast Switching
GPB	GPIB (IEEE 488) programming interface

Further options are available for different AP Vector Signal Generator models. Refer to the Data Sheet for a complete list of options supported by a particular instrument.

*RCL<reg>

The Recall (RCL) command recalls the state from the specified memory register <reg>.

*RST

The Reset (RST) command resets most AP Vector Signal Generator functions to factory- defined conditions.

Remarks:

Each command shows the [*RST] default value if the setting is affected.

*SAV <reg>

The Save (SAV) command saves AP Vector Signal Generator settings to the specified memory register <reg>.

Remarks:

The save function does not save all AP Vector Signal Generator settings. Refer to the User's Guide for more information on the save function.

*SRE<data>

The Service Request Enable (SRE) command sets the value of the Service Request Enable Register. The variable <data> is the decimal sum of the bits that will be enabled. Bit 6 (value 64) is ignored and cannot be set by this command.

Range: 0–255

The setting enabled by this command is not affected by AP Vector Signal Generator preset or *RST. However, cycling the instrument's power will reset it to zero.

*SRE?

The Service Request Enable (SRE) returns the value of the Service Request Enable Register.

Range: 0–63 & 128-191

*STB?

The Read Status Byte (STB) returns the value of the status byte including the master summary status (MSS) bit.

Range: 0–255

*TRG

The Trigger (TRG) command triggers the instrument if bus trigger is the selected trigger source, otherwise, *TRG is ignored.

*TST?

The Self-Test (TST) query initiates the internal self-test and returns one of the following results:

0 - Indicates all tests passed.

1 - Indicates that one or more tests failed.

*WAI

The Wait-to-Continue (WAI) command causes the AP Vector Signal Generator4 to wait until all pending commands are completed, before executing any other commands.

3 SCPI Commands

This chapter introduces SCPI programming that includes descriptions of the command types, hierarchical command structure, data parameters, and notational conventions. Information on AP Vector Signal Generator status system and trigger system programming is also provided.

The following topics can be found in this chapter:

Introduction

Standard Commands for Programmable Instruments (SCPI) is an instrument command language for controlling instruments that goes beyond IEEE 488.2 to address a wide variety of instrument functions in a standard manner. SCPI promotes consistency, from the remote programming standpoint, between instruments of the same class and between instruments with the same functional capability. For a given measurement function, such as frequency or voltage, SCPI defines the specific command set that is available for that function. Thus, two oscilloscopes made by different manufacturers could be used to make frequency measurements in the same way. It is also possible for a SCPI counter to make a frequency measurement using the same commands as an oscilloscope. SCPI commands are easy to learn, self-explanatory and account for both novice and expert programmer's usage. Once familiar with the organization and structure of SCPI, considerable efficiency gains can be achieved during control program development, independent of the control program language selected.

A key to consistent programming is the reduction of multiple ways to control similar instrument functions. The philosophy of SCPI is for the same instrument functions to be controlled by the same SCPI commands. To simplify learning, SCPI uses industry-standard names and terms that are manufacturer and customer supported.

The advantage of SCPI for the ATE system programmer is reducing the time learning how to program new SCPI instruments after programming their first SCPI instrument.

Programmers who use programming languages such as BASIC, C, FORTRAN, etc., to send instrument commands to instruments will benefit from SCPI. Also, programmers who implement instrument device drivers for the ATE program AP Vector Signal Generator and/or software instrument front panels will benefit by SCPI's advantages. SCPI defines instrument commands, parameters, data, and status. It is not an application package, programming language or software intended for instrument front panel control.

SCPI is designed to be layered on top of the hardware-independent portion of IEEE 488.2.

SCPI Command Types

SCPI commands, which are also referred to as SCPI instructions, are messages to the instrument to perform specific tasks. The instrument command set includes:

- "Common" commands (IEE488.2 mandated commands)
- SCPI required commands
- SCPI optional commands (per SCPI 1999.0)
- SCPI compliant commands are unique to the instrument. Not all of the commands supported by the instrument are taken from the SCPI standard; however, their syntax follows SCPI rules.

SCPI Command Syntax

Typical SCPI commands consist of one or more keywords, parameters, and punctuation. SCPI command keywords can be a mixture of upper- and lower-case characters. Except for common commands, each keyword has a long and a short form. In this manual, the long form is presented with the short form in upper case and the remainder in lower case. Unrecognized versions of long form or short form commands, or improper syntax, will generate an error.

Structure of a Command Line

A command line may consist of one or several commands. It is terminated by an EOI together with the last data byte.

Several commands in a command line must be separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon. A colon ":" at the beginning of a command marks the root node of the command tree.

If the successive commands belong to the same system, having one or several levels in common, the command line can be abbreviated. To this end, the second command after the semicolon starts with the level that lies below the common levels. The colon following the semicolon must be omitted in this case.

Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

Parameters

Most commands require a parameter to be specified. The parameters must be separated from the header by a "white space". Permissible parameters are numerical values, Boolean parameters, text, character strings and block data. The type of parameter required for the respective command and the permissible range of values are specified in the command description.

Numerical values

Numerical values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa may comprise up to 255 characters, the values must be in the range of –9.9E37 to 9.9E37. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not allowed.

Units

In the case of physical quantities, the unit can be entered. Permissible unit prefixes are G (giga), MA (mega), MHZ are also permissible, K (kilo), M (milli), U (micro) and N (nano). If the unit is missing, the basic unit is used.

Boolean Parameters

Boolean parameters represent two states. The ON state (logically true) is represented by ON or a numerical value unequal to 0. The OFF state (logically false) is represented by OFF or the numerical value 0. ON or OFF is returned by a query.

Hierarchical Command Structure

All SCPI commands, except the common commands, are organized in a hierarchical structure similar to the inverted tree file structure used in most computers. The SCPI standard refers to this structure as “the Command Tree.” The command keywords that correspond to the major instrument control functions are located at the top of the command tree. The command keywords for the instrument command set are shown below.

:ABORt

:CALibration

:DISPlay

:INITiate

:MEMory

:OUTput

:SOURce

:STATus

:SYNChronous

:SYSTem

:TEST

:TRIGger

:UNIT

NOTE Not all command keywords are available on all instruments.

All instrument SCPI commands, except the “ABORt” command, have one or more subcommands (keywords) associated with them to further define the instrument function to be controlled. The subcommand keywords may also have one or more associated subcommands (keywords). Each subcommand level adds another layer to the command tree. The command keyword and its associated subcommand keywords form a portion of the command tree called a command subsystem.

Status System Programming

The AP Vector Signal Generator implements the Status Byte Register, the Service Request Enable Register, the Standard Event Status Register, and the Standard Event Status Enable Register.

The AP Vector Signal Generator status system consists of the following SCPI-defined status reporting structures:

- The Instrument Summary Status Byte
- The Standard Event Status Group
- The Operation Status Group
- The Questionable Status Group

The following paragraphs describe the registers that make up a status group and explain the status information that each status group provides.

Status Registers

In general, a status group consists of a condition register, a transition filter, an event register, and an enable register. Each component is briefly described in the following paragraphs.

Condition Register

The condition register is continuously updated to reflect the current status of the AP Vector Signal Generator. There is no latching or buffering for this register, it is updated in real time. Reading the contents of a condition register does not change its contents.

Transition Filter

The transition filter is a special register specifies which types of bit state changes in the condition register will set corresponding bits in the event register. Negative transition filters (NTR) are used to detect condition changes from True (1) to False (0); positive transition filters (PTR) are used to detect condition changes from False (0) to True (1). Setting both positive and negative filters True allows an event to be reported anytime the condition changes. Transition filters are read-write. Transition filters are unaffected by queries or *CLS (clear status) and *RST commands. The command "STATus:PRESet" sets all negative and positive transition filters to all 0's.

Event Register

The event register latches transition events from the condition register as specified by the transition filter. Bits in the event register are latched, and once set they remain set until cleared by a query or a *CLS command. Event registers are read only.

Enable Register

The enable register specifies the bits in the event register that can produce a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are recorded in the Summary Status Byte. Enable registers are read-write. Querying an enable register does not affect it. The command "STATus:PRESet" sets the Operation Status Enable register and the Questionable Status Enable register to all 0's.

Status Group Reporting

The state of certain AP Vector Signal Generator hardware and operational events and conditions can be determined by programming the status system. Three lower status groups provide status information to the Summary Status Byte group. The Summary Status Byte group is used to determine the general nature of an event or condition and the other status groups are used to determine the specific nature of the event or condition.

Summary Status Byte Group

The Summary Status Byte group, consisting of the Summary Status Byte Enable register and the Summary Status Byte, is used to determine the general nature of an AP Vector Signal Generator event or condition. The bits in the Summary Status Byte provide the following:

Operation Status Group

The Operation Status group, consisting of the Operation Condition register, the Operation Positive Transition register, the Operation Negative Transition register, the Operation Event register and the Operation Event Enable register.

Standard Event Status Group

The Standard Event Status group, consisting of the Standard Event Status register (an Event register) and the Standard Event Status Enable register, is used to determine the specific event that set bit 5 of the Summary Status Byte.

The bits in the Standard Event Status register provide the following:

Bit	Description
0	Set to indicate that all pending instrument operations were completed following execution of the "*OPC" command.
1	Request control
2	Set to indicate that a query error has occurred. Query errors have SCPI error codes from –499 to –400.
3	Set to indicate that a device-dependent error has occurred. Device-dependent errors have SCPI error codes from –399 to –300 and 1 to 32767.
4	Set to indicate that an execution error has occurred. Execution errors have SCPI error codes from –299 to –200.
5	Set to indicate that a command error has occurred. Command errors have SCPI error codes from –199 to –100.
6	User request
7	Power on

Operation Status Group

The Operation Status group, consisting of the Operation Condition register, the Operation Positive Transition register, the Operation Negative Transition register, the Operation Event register, and the Operation Event Enable register, is used to determine the specific condition that set bit 7 in the Summary Status Byte.

Related commands are covered by the section titled ":STATus Subsystem".

Bit	Description
0	NOT USED
1	NOT USED
2	NOT USED
3	(List) sweep state. This bit is set while a (list) sweep is running.
4	NOT USED
5	Waiting for trigger state. This bit is set while the device waits for a trigger event.
6	NOT USED
7	NOT USED
8	NOT USED
9	NOT USED
10	NOT USED
11	NOT USED
12	NOT USED
13	NOT USED
14	NOT USED
15	NOT USED

Questionable Status Group

The Questionable Status group, consisting of the Questionable Condition register, the Questionable Positive Transition register, the Questionable Negative Transition register, the Questionable Event register, and the Questionable Event Enable register, is used to determine the specific condition that set bit 3 in the Summary Status Byte.

Related commands are covered by the :STATus Subsystem chapter.

The bits in the Questionable Status register provide the following:

Bit	Description
0	NOT USED
1	NOT USED
2	NOT USED
3	Output power level inaccurate or out of range.
4	Device temperature out of operating range.
5	Output frequency inaccurate or out of range.
6	NOT USED
7	Modulation inaccurate or out of range.
8	NOT USED
9	Frequency/power change request dropped (illegal values or timing).
10	NOT USED
11	NOT USED
12	NOT USED
13	NOT USED
14	NOT USED
15	NOT USED

4 SCPI Command Descriptions

:ABORt Subsystem

The :ABORt command is a single command subsystem. There are no subcommands or associated data parameters, as shown below. The :ABORt command, along with the :TRIGger and :INITiate commands, comprise the Trigger group of commands.

Command	Parameters	Unit	Default
:ABORt			

ABORt

This command causes the List or Step sweep in progress to abort. Even if INIT:CONT[:ALL] is set to ON, the sweep will not immediately re-initiate.

:CALibration Subsystem

Command	Parameters	Unit	Default
:CALibration:SELF:APPLy	ON|ONFF|1|0		
:CALibration:SELF:GENerate	ON|ONFF|1|0		

CALibration:SELF:APPLy

`:CALibration:SELF:APPLy ON|OFF|1|0`

`:CALibration:SELF:APPLy?`

Applies either the factory calibration or the calibration from a self adjustment.

ON | 1	Applies the self adjusted calibration table if a self adjusted calibration is present from a previous self adjustment run. This command takes up to 1 minute.
OFF| 0	Applies the factory calibration run.

***RST** 1 if a self adjustment has been run previously, 0 otherwise.

CALibration:SELF:GENerate

`:CALibration:SELF:GENerate ON|OFF|1|0`

`:CALibration:SELF:GENerate?`

Creates or deletes a self adjustment calibration file.

When queried, it returns a 1 if a self adjustment is available from previously running CAL:SELF:GEN 1.

ON | 1	Performs a self adjustment if the hardware supports it. This will overwrite any existing self adjustment that has been created before. This procedure may take up to 5 minutes.
OFF| 0	Deletes any previously generated self adjustment calibration table from non volatile memory.

***RST** 1 if a self adjustment has been run previously, 0 otherwise.

:DISPlay Subsystem

NOTE

Applies to the AP5041A only.

The :DISPlay subsystem configures the front panel display.

Command	Parameters	Unit	Default
:DISPlay:ENABle	ON|OFF|1|0		ON

DISPlay:ENABle

:DISPlay:ENABle ON|OFF|1|0

:DISPlay:ENABle?

Enables or disables the front panel display. When disabled, the display does not show any instrument information. This mode cannot be left via front panel display control. Only re-enabling the display via remote control or power cycling brings the front panel display back to normal operation. Disabling the front panel display by this command can be used to hide confidential settings. Refer to “SYSTem:LOCK” for locking the front panel without hiding instrument settings.

***RST** ON

:INITiate Subsystem

The :INITiate subsystem controls the state of the trigger system. The subsystem commands and parameters are described below. The :INITiate commands, along with the :ABORt and :TRIGger commands, comprise the Trigger Group of commands.

Command	Parameters	Unit	Default
:INITiate:CONTinuous	ON|OFF|1|0		ON
:INITiate[:IMMediate]			

INITiate:CONTinuous ON|OFF|1|0

```
:INITiate:CONTinuous ON|OFF|1|0
```

```
:INITiate:CONTinuous?
```

When enabled, the trigger system continuously rearms after completion of a triggered sweep.

***RST** ON

INITiate[:IMMediate]

```
:INITiate[:IMMediate]
```

Sets the trigger to the armed state.

:MEMory Subsystem

This section covers common file memory commands. File memory commands related to other subsystems (e.g. MEMory:FILE:CORRection) are explained in the respective section.

Command	Parameters	Unit	Default
:MEMory:FILE:DELete:ALL			
:MEMory:FILE:FREE:ALL?			

MEMory:FILE:DELete:ALL

`:MEMory:FILE:DELete:ALL`

Deletes all user defined data files. This includes (but is not limited to) sweep list files, flatness and phase correction tables, IQ modulation data files etc.

MEMory:FILE:FREE:ALL

`:MEMory:FILE:FREE:ALL`

Returns two comma separated decimal values <free>, <used>.

<free>	Reports the free memory size in bytes available for user data.
<used>	Reports the number of memory bytes used by user data.

This query can be used to verify that no (possibly sensitive) user data is stored on the device. <used> will report zero bytes when no user data files are stored on the device.

:MMEMory Subsystem

This section covers common mass memory commands to support file management on the external SD card.

Command	Parameters	Unit	Default
:MMEMory:CATalog?			
:MMEMory:COPY	<src>,<dst>	string	
:MMEMory:DATA	<path>,<data>		
:MMEMory:DELete	<path>	string	
:MMEMory:INITialize			
:MMEMory:LOAD	<path>[,<id>]	string	
:MMEMory:MOVE	<src>,<dst>	string	

MMEMory:CATalog

`:MMEMory:CATalog?`

Query the number of used and total bytes and a list of file entries.

Return value:

<used_bytes>,<total_bytes>[,<file_etry_list>]

MMEMory:COPY

`:MMEMory:COPY "<src_file>","<dst file>"`

Copy a file to a different directory.

MMEMory:DATA

`:MMEMory:DATA "<file_f)ath>",<data>`

Transmit block data and store in a file which is either overwritten or created, depending on previous presence.

MMEMory:DELete

`:MMEMory:DELete "<file_path>"`

Deletes the specified file.

MMEMory:INITialize

`:MMEMory:INIT`

Initializes the storage directory which includes deleting all files (reformat SD card if larger than 32GB).

MMEMory:LOAD

```
:MMEMory:LOAD "<file_f)ath>"[,<segment_id>]
```

Upload waveform file to arbitrary subsystem (supported file formats: qid and .wfm)

MMEMory:MOVE

```
:MMEMory:MOVE "<src file>","<dst file>"
```

Move a file to a different directory.

:OUTPut Subsystem

Channel selection for multi-channel devices

Commands applying to a single channel use the <ch> field. Commands that are common to all channels have no <ch> field.

The target channel of such commands under the OUTPut subsystem can be defined by appending the channel index to the OUTPut node: <ch> is 1 to number of channels.

If <ch> is omitted, the command targets the currently selected default channel.

Default channel selection

Default output channel is coupled to default source channel. Refer to "SELect" for default channel selection.

Command	Parameters	Unit	Default
OUTPut<ch>:BLANking[:STATe]	ON|OFF|1|0		depends on device
OUTPut<ch>[:STATe]	ON|OFF|1|0		OFF

OUTPut<ch>:BLANking[:STATe] ON|OFF|1|0

`:OUTPut<ch>:BLANking[:STATe] ON|OFF|1|0`

`:OUTPut<ch>:BLANking[:STATe]?`

ON - The RF output to be turned off (blanked) during frequency changes.

OFF - Leaves RF output turned on (unblanked).

***RST** ON

OUTPut<ch>[:STATe] ON|OFF|1|0

`:OUTPut<ch>[:STATe] ON|OFF|1|0`

`:OUTPut<ch>[:STATe]?`

Turns RF output power on/off.

***RST** OFF

[:SOURce<ch>] Subsystem

Channel selection for multi-channel devices

Commands applying to a single channel use the <ch> field. Commands that are common to all channels have no <ch> field.

The target channel of such commands under the SOURce subsystem can be defined by appending the channel index to the SOURce node: <ch> is 1 to number of channels.

If <ch> is omitted, the command targets the currently selected default channel.

Command	Parameters	Unit	Default
[:SOURce]:SELect	<integer>		1

SELect

NOTE

Applies to the AP5042A only.

`[:SOURce]:SELect <channel>`

`[:SOURce]:SELect?`

For multi-channel devices, this command sets the default channel. Any command with channel index <ch> omitted applies to the default channel. This command sets the default channel of the following systems:

:MEMory

:OUTput

:SOURce

***RST** 1

Range 1 to the number of channels.

[:SOURce<ch>]:AIN Subsystem

The AIN subsystem controls the analog inputs.

Command	Parameters	Unit	Default
[:SOURce<ch>]:AIN<index>:CALibrate:ZERO			
[:SOURce<ch>]:AIN<index>:GAIN	<float>		
[:SOURce<ch>]:AIN<index>:OFFSet	<float>	V	0 V
[:SOURce<ch>]:AIN:OLOad:HOLD:RESet			
[:SOURce<ch>]:AIN<index>:OLOad:HOLD:STATe?			
[:SOURce<ch>]:AIN<index>:OLOad:STATe?			
[:SOURce<ch>]:AIN:OVRange:HOLD:RESet			
[:SOURce<ch>]:AIN<index>:OVRange:HOLD:STATe?			
[:SOURce<ch>]:AIN<index>:OVRange:STATe?			
[:SOURce<ch>]:AIN<index>:SOURce	QIN | IIN		QIN
[:SOURce<ch>]:AIN<index>:VOLTage?	MIN|MAX	V	
[:SOURce<ch>]:AIN[:STATe]	ON|OFF|1|0		OFF

AIN<index>:CALibrate:ZERO

`[:SOURce<ch>]:AIN<index>:CALibrate:ZERO`

Calibrates the zero offset for an analog input AIN channel. Expects an input of 0.0V DC at the AIN channel.

AIN<index>:GAIN

`[:SOURce<ch>]:AIN<index>:GAIN <float>`

`[:SOURce<ch>]:AIN<index>:GAIN?`

Sets a scalar gain on the selected AIN channel which is applied to the input before being used by any modulation subsystem.

<float> Value of the gain, maximum and minimum values depend on the zero-calibration.

***RST** 1.0

Range Refer to the Data Sheet.

AIN<index>:OFFSet

`[:SOURce<ch>]:AIN<index>:OFFSet <float>`

`[:SOURce<ch>]:AIN<index>:OFFSet?`

<float> Value of the total offset

***RST** 0 V

Range -0.56 V to 0.56 V

Unit V

AIN:OLOad:HOLD:RESet

`[:SOURce<ch>]:AIN:OLOad:HOLD:RESet`

Executes a reset of the overload hold state.

AIN<index>:OLOad:HOLD:STATe?

`[:SOURce<ch>]:AIN<index>:OLO:HOLD:STATe?`

Indicates if an overload has occurred since the last overload reset.

0	No overload has occurred since the last overload reset.
1	An overload has occurred since the last overload reset.

AIN<index>:OLOad:STATe?

`[:SOURce<ch>]:AIN<index>:OLOad:STATe?`

0	No overload
1	Overload

***RST** 0

AIN:OVRange:HOLD:RESet

`[:SOURce<ch>]:AIN:OVRange:HOLD:RESe`t

This command executes a reset of the overrange hold state.

AIN<index>:OVRange:HOLD:STATe?

`[:SOURce<ch>]:AIN<index>:OVRange:HOLD:STATe?`

Indicates if an overrange has occurred since the last overrange reset.

0	No overrange has occurred since the last overrange reset.
1	An overrange has occurred since the last overrange reset.

AIN<index>:OVRange:STATe?

`[:SOURce<ch>]:AIN<index>:OVRange:STATe?`

Returns the current overrange state of the AIN<index> input.

0	No overrange has occurred since the last overrange reset.
1	An overrange has occurred since the last overrange reset.

AIN<index>:SOURce

`[:SOURce<ch>]:AIN<index>:SOURce QIN|IIN`

`[:SOURce<ch>]:AIN<index>:SOURce?`

Set the port source for AIN1 or AIN2, using the corresponding AIN channel <index> numbers. Each source channel of the device has two analog input channels whose source can individually be set. Per default, AIN1 and AIN2 are connected to IIN and QIN respectively. The same single port (IIN/QIN) can technically feed both AIN channels if desired.

***RST** QIN

AIN[:STATe]

`[:SOURce<ch>]:AIN[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:AIN[:STATe]?`

Enables/disables all analog input (AIN) ports.

***RST** OFF

AIN<index>:VOLTage?

`[:SOURce<ch>]:AIN<index>:VOLTage? MIN|MAX`

Returns the current input voltage of an AIN channel. The returned value does not include the calibrated offset correction. The command can also optionally return the specified minimal and maximal voltage that are allowed at the AIN ports.

Range Please refer to the Data Sheet.

Unit V

[:SOURce<ch>]:AM Subsystem (Amplitude Modulation)

Command	Parameters	Unit	Default
[:SOURce<ch>]:AM:DEPTh	<float>	1|PCT	0.8
[:SOURce<ch>]:AM:EXTernal:SOURCe	AIN<ch>		AIN1
[:SOURce<ch>]:AM:INTernal:FREQuency	<float>	Hz	400 Hz
[:SOURce<ch>]:AM:INTernal:SHAPe	SINE|SQUare|TRiangle		SINE
[:SOURce<ch>]:AM:SENSitivity	<float>	V^{-1}	0.8 V^{-1}
[:SOURce<ch>]:AM:SOURce	INTernal|EXTernal		INTernal
[:SOURce<ch>]:AM:STATe	ON|OFF|1|0		OFF

AM:DEPTh

`[:SOURce<ch>]:AM:DEPTh <float>`

`[:SOURce<ch>]:AM:DEPTh?`

Sets the amplitude modulation depth. This setting will be used if [:SOURce<ch>]:AM:SOURce is set to INTernal.

***RST** 0.8

Range 0 to 0.99

Unit 1|PCT

AM:EXTernal:SOURce

`[:SOURce<ch>]:AM:EXTernal:SOURce AIN<ch>`

`[:SOURce<ch>]:AM:EXTernal:SOURce?`

Sets the AIN channel source for the amplitude modulation signal.

***RST** AIN1

AM:INTernal:FREQuency

`[:SOURce<ch>]:AM:INTernal:FREQuency <float>`

`[:SOURce<ch>]:AM:INTernal:FREQuency?`

Sets the internal amplitude modulation rate.

***RST** 400 Hz

Range Refer to the Data Sheet.

Unit Hz

AM:INTernal:SHAPe

`[:SOURce<ch>]:AM:INTernal:SHAPe SINE|SQUare|TRIangle`

`[:SOURce<ch>]:AM:INTernal:SHAPe?`

Specifies the AM modulation shape: Sine wave, square wave, or triangle wave.

***RST** SINE

AM:SENSitivity

`[:SOURce<ch>]:AM:INTernal:SENSitivity <float>`

`[:SOURce<ch>]:AM:INTernal:SENSitivity?`

Sets the external amplitude modulation sensitivity. This setting will be used if [:SOURce<ch>]:AM:SOURce is set to EXTernal.

***RST** 0.8 V^{-1}

Range 0 to 3 V^{-1}

Unit V^{-1}

AM:SOURce

`[:SOURce<ch>]:AM:SOURce INTernal|EXTernal`

`[:SOURce<ch>]:AM:SOURce?`

Selects the amplitude modulation signal source.

INTernal	An internal modulation source is applied.
EXTernal	The device's analog modulation input is activated.

***RST** INTernal

AM:STATe

`[:SOURce<ch>]:AM:STATe ON|OFF|1|0`

`[:SOURce<ch>]:AM:STATe?`

Turns the amplitude modulation on or off.

***RST** OFF

[:SOURce<ch>]:BB Subsystem

This subsystem configures the base band data path to the IQ modulator.

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:AVIO:DME			
[:SOURce<ch>]:BB:AVIO:ILS			
[:SOURce<ch>]:BB:AVIO:VOR			
[:SOURce<ch>]:BB:GENeral:AM			
[:SOURce<ch>]:BB:GENeral:FM			
[:SOURce<ch>]:BB:GENeral:PM			

Arbitrary Baseband

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:ARBitrary:CLOCk	<float>	Hz	500 MHz
[:SOURce<ch>]:BB:ARBitrary:CLOCk:ADJust	ON|OFF|1|0		OFF
[:SOURce<ch>]:BB:ARBitrary:DELay:MODE	BB|RF		RF
[:SOURce<ch>]:BB:ARBitrary:DELay:RELative	<float>	s	0 s
[:SOURce<ch>]:BB:ARBitrary:MODE	BLANk|CW|CIQ| NORMal|RETRace		BLANk

Arbitrary Waveform Modulation

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:ARBitrary:WAVeform:CLOCk	<float>	Hz	500 MHz
[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA	[<integer>,]<data>|<"filename">		
[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA:EXTended	<integer>,[<integer>],<data>		
[:SOURce<ch>):BB:ARBitrary:WAVeform:DATA:EXTended	l<data>		
[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA:FREE?			
[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA:DELete	ALL		
[:SOURce<ch>]:BB:ARBitrary:WAVeform:FILE:DELete	<"string">		
[:SOURce<ch>]:BB:ARBitrary:WAVeform:FILE:FREE?			
[:SOURce<ch>]:BB:ARBitrary:WAVeform:FILE:LIST?			
[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:COUNt?			
[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe	ON|OFF|1|0		OFF

Command	Parameters	Unit	Default
[:SOURce<ch>):BB:ARBitrary:WAVeform:META	#<integer><integer><data>		
[:SOURce<ch>]:BB:ARBitrary:WAVeform:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:BB:ARBitrary:WSEGment	<integer>|<"filename">		0
[:SOURce<ch>]:BB:ARBitrary:WSEGment:COUNt?	[MAX]		
[:SOURce<ch>]:BB:ARBitrary:WSEQuence:LOAD	<integer>,<integer>, <integer>		
[:SOURce<ch>]:BB:ARBitrary:WSEQuence:LOAD:ERRor?			
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:SLOPe	POSitive|NEGative		POSitive
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:WSEGment	<integer>		0
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MODE	SEAMless|IMMediate		SEAMless
[:SOURce<ch>]:BB:ARBitrary:WSEQuence:RUN	0|1		0
[:SOURce<ch>]:BB:ARBitrary:WSEGment:SOURce	INTernal|FCPort|SEQuence|MF		INTernal

Arbitrary Trigger Subsystem Commands

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:ABORt			
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:DELay	<float>	s	0 s
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:DELay	<float>	s	0 s
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SLOPe	POSitive|NEGative		POSitive
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SOURce	MF1|MF2		MF1
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence][IMMediate]			
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:INITiate:CONTinuous			
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:INITiate[:IMMediate]			
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:DELay	<float>	s	0 s
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:PWIDth	<float>	s	1 µs
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:SOURce	Immediate|BUS|EXTernal|SYNChronos		IMMediate
[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:TYPE	NORMal|NSEGment|NSEquence		NORMal

Arbitrary Modulations from External Ports

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:ARBitrary:AIQ:CLOCk?		Hz	
[:SOURce<ch>]:BB:ARBitrary:AIQ:SOURce:I	1 | 2		1
[:SOURce<ch>]:BB:ARBitrary:AIQ:SOURce:Q	1 | 2		2
[:SOURce<ch>]:BB:ARBitrary:AIQ[:STATe]	ON|OFF|1|0		OFF
[:SOURce<ch>]:BB:ARBitrary:FCPort:CLOCk	<float>	Hz	125 MHz
[:SOURce<ch>]:BB:ARBitrary:FCPort[:STATe]	ON|OFF|1|0		OFF

Additive White Gaussian Noise

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:AWGN:BANDwidth	<float>	Hz	400 MHz
[:SOURce<ch>]:BB:AWGN:CNR	<float>	dB	25 dB
[:SOURce<ch>):BB:AWGN:MODE	CARRierl NOISelSUM		CARRier
[:SOURce<ch>]:BB:AWGN:POWer:CARRier	<float>	dBm	
[:SOURce<ch>]:BB:AWGN:POWer:CONTrol	TOTal|CARRier|NOISe		TOTal
[:SOURce<ch>]:BB:AWGN:POWer:NOISe	<float>	dBm	
[:SOURce<ch>]:BB:AWGN[:STATe]	ON|OFF|1|0		OFF

Internal Vector Modulation

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:DM:CLOCk?		Hz	
[:SOURce<ch>]:BB:DM:FILTer:PARameter	<float>		0.5
[:SOURce<ch>]:BB:DM:FILTer:TAPS	<float>{,float}		
[:SOURce<ch>]:BB:DM:FILTer:TYPE	COSine|RCOSine| RECTangle| RASymmetric| DIRac|GAUSs		COSine

Command	Parameters	Unit	Default
[:SOURce<ch>]:BB:DM:FORMat	QAM8|QAM16| QAM32|QAM64| QAM128|QAM256| QAM512|QAM1024| QAM2048|QAM4096		QAM64
[:SOURce<ch>]:BB:DM:OSAMpling	<integer>		8
[:SOURce<ch>]:BB:DM:PATTern:LENGth	<integer>		4096
[:SOURce<ch>]:BB:DM:SRATe	<float>	S/s	200 MS/s
[:SOURce<ch>]:BB:DM:STATe	ON|OFF|1|0		OFF

BB:ARBitrary:AIQ:CLOCk?

`[:SOURce<ch>]:BB:ARBitrary:AIQ:CLOCk?`

Returns the sampling rate for the AIQ modulation.

Unit Hz

BB:ARBitrary:AIQ:SOURce:I

`[:SOURce<ch>]:BB:ARBitrary:AIQ:Source:I 1|2`

Sets the AIN channel source for the I (in-phase) part of the analog IQ modulation signal to either AIN1 or AIN2.

***RST** 1

BB:ARBitrary:AIQ:SOURce:Q

`[:SOURce<ch>]:BB:ARBitrary:AIQ:Source:Q 1|2`

Sets the AIN channel source for the Q (quadrature) part of the analog IQ modulation signal to either AIN1 or AIN2.

***RST** 2

BB:ARBitrary:AIQ[:STATe]

`[:SOURce<ch>]:BB:ARBitrary:AIQ[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:BB:ARBitrary:AIQ[:STATe]?`

Enables/disables the arbitrary baseband modulation, using the analog IQ modulation signals. The analog input ports have to be enabled with [:SOURce<ch>]"AIN[:STATe]".

***RST** OFF

BB:ARBitrary:CLOCk

`[:SOURce<ch>]:BB:ARBitrary:CLOCk <float>`

`[:SOURce<ch>]:BB:ARBitrary:CLOCk?`

Sets the base band path sample clock. The modulation bandwidth is +/- 40% of the sample clock, e.g. +/- 200 MHz at a 500 MHz sample clock.

***RST** 500 MHz

Range Please refer to the Data Sheet.

Unit Hz

BB:ARBitrary:CLOCk:ADJust

`[:SOURce<ch>]:BB:ARBitrary:CLOCk:ADJust ON|OFF|1|0`

`[:SOURce<ch>]:BB:ARBitrary:CLOCk:ADJust?`

Disables or enables sample rate conversion. This is relevant when working at the maximum sample rate (see "BB:ARBitrary:CLOCk").

OFF|0	Sample rate conversion is bypassed. This mode provides lowest latency but high resolution delay adjust is not available.
ON|1	Sample rate conversion is enabled, even at full sample rate (1:1 conversion). This mode allows for high resolution delay adjust but increases latency (see [SOURce<ch>]: BB:ARBitrary:DELay:RELative).

***RST** OFF

BB:ARBitrary:DELay:MODE

`[:SOURce<ch>]:BB:ARBitrary:DELay:MODE BB|RF`

`[:SOURce<ch>]:BB:ARBitrary:DELay:MODE?`

Configures if the [SOURce<ch>]"BB:ARBitrary:DELay:RELative" command delays IQ modulation only or both IQ modulation and carrier.

BB	Delay IQ modulation (base band) only.
RF	Delay IQ modulation (base band) and carrier. In this mode, adding delay behaves like adding electrical length (a cable) to the RF output port.

***RST** RF

BB:ARBitrary:DELay:RELative

`[:SOURce<ch>]:BB:ARBitrary:DELay:RELative <float>`

`[:SOURce<ch>]:BB:ARBitrary:DELay:RELative?`

Delays IQ modulation playback with high (femtoseconds) resolution. Available only when modulation clock is adjustable (see "BB:ARBitrary:CLOCk:ADJust" ON). Use [SOURce<ch>]:"BB:ARBitrary:DELay:MODE" to configure whether only IQ modulation or both IQ modulation and carrier shall be delayed.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

BB:ARBitrary:FCPort:CLOCk

`[:SOURce<ch>]:BB:ARBitrary:FCPort:CLOCk <float>`

`[:SOURce<ch>]:BB:ARBitrary:FCPort:CLOCk?`

Sets the sampling rate for FCP IQ modulation. The input is rounded to the nearest of 125 or 250 MHz.

***RST** 125 MHz

Range Please refer to the Data Sheet.

Unit Hz

BB:ARBitrary:FCPort:[STATe]

`[:SOURce<ch>]:BB:ARBitrary:FCPort[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:BB:ARBitrary:FCPort[:STATe]?`

Enables or disables streaming IQ modulation data from the FCP to the IQ modulator. FCP must be configured for IQ streaming by the [:SOURce<ch>]"FCPort:STReam:IQ" command.

***RST** OFF

BB:ARBitrary:MODE

`[:SOURce<ch>]:BB:ARBitrary:MODE BLANk|CW|CIQ|NORMal|RETRace`

`[:SOURce<ch>]:BB:ARBitrary:MODE?`

Defines the RF output mode.

BLANk	The output is suppressed to 0.
CW	The carrier signal is applied (I=1, Q=0) until trigger, then start with first sample.
CIQ	Defined according to the constant IQ data value until trigger, then start with first sample.
NORMal	First sample is applied until trigger, hold last sample at the end (segment transition).

RETRace	First sample applied until trigger, at the end switch again to the first sample.

***RST** CW

BB:ARBitrary:TRIG[:SEQuence]:ABORt

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:ABORt`

Inhibits the trigger signal.

BB:ARBitrary:TRIG[:SEQuence]:DELay

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:DELay <float>`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:DELay?`

Sets the amount of time to delay the response to the trigger.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

BB:ARBitrary:TRIG[:SEQuence]:EXTernal:DELay

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:DELay <float>`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:DELay?`

Sets the amount of time to delay the response to the external trigger.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SLOPe

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SLOPe POSitive|NEGative`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SLOPe?`

Sets the polarity for an external trigger signal.

***RST** POSitive

BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SOURce

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SOURce MF1|MF2`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:EXTernal:SOURce?`

Sets the arbitrary external trigger source.

***RST** MF1

BB:ARBitrary:TRIG[:SEQuence][IMMediate]

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence][IMMediate]`

Executes a specific arbitrary internal trigger event.

BB:ARBitrary:TRIG[:SEQuence]:INITiate:CONTinuous

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:INITiate:CONTinuous`

Inhibits the arbitrary trigger signal.

BB:ARBitrary:TRIG[:SEQuence]:INITiate[:IMMediate]

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:INITiate[:IMMediate]`

Initiates the system: Trigger signals will be accepted by the arbitrary trigger system until it is triggered once.

BB:ARBitrary:TRIG[:SEQuence]:OUTPut:DELay

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:DELay <float>`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:DELay?`

Sets the delay of the arbitrary trigger output signal.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

BB:ARBitrary:TRIG[:SEQuence]:OUTPut:POLarity

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:POLarity NORMal|INVerted`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:POLarity?`

Sets the arbitrary trigger output signal polarity.

***RST** NORMal

BB:ARBitrary:TRIG[:SEQuence]:OUTPut:PWIDth

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:PWIDth <float>`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:OUTPut:PWIDth?`

Sets the pulse width of the arbitrary trigger output signal.

***RST** 1 us

Range Please refer to the Data Sheet.

Unit s

BB:ARBitrary:TRIG[:SEQuence]:SOURce

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:SOURce IMMediate|BUS|EXTernal|SYNChronous`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:SOURce?`

Sets the arbitrary trigger source.

IMMediate	No waiting for a trigger event occurs.
BUS	Command BB:ARBitrary:TRIGger:[IMMediate].
EXTernal	Externally applied signal or command BB:ARBitrary:TRIGger:[IMMediate].
SYNChronous	Synchronized trigger over all channels.

***RST** IMMediate

BB:ARBitrary:TRIG[:SEQuence]:TYPE

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:TYPE NORMal|NSEGment|NSEQuence`

`[:SOURce<ch>]:BB:ARBitrary:TRIG[:SEQuence]:TYPE?`

Selects the waveform's response to a trigger signal.

NORMal	1st trigger = start waveform, subsequent trigger = ignored.
NSEGment	1st trigger = start waveform, subsequent trigger = load next segment (if available)
NSEQuence	1st trigger = start waveform, subsequent trigger = load next sequence (if available).

***RST** NORMal

BB:ARBitrary:WAVeform:CLOCk

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:CLOCk <float>`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:CLOCk?`

Sets the sampling rate for the waveform modulation.

***RST** 500 MHz

Range Please refer to the Data Sheet.

Unit Hz

BB:ARBitrary:WAVeform:DATA

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA <integer>,<data>`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA <data>`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA <integer>,<"filename">`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:DATA <"filename">`

Writes waveforms (IQ modulation data samples with optional marker bits) to the device for playback.

Writing waveforms does not overwrite waveforms existing on the device. Combined waveforms uploaded to a device cannot exceed the maximum sample count supported by a device. The remaining number of samples that may be written to the device can be queried using [:SOURce]"BB:ARBitrary:WAVeform:DATA:FREE?".

Writing the same segment multiple times does not append data to this segment, but redefines this segment. See Parameter 1 description below for details. Previous waveform data of this segment is lost. Due to waveform memory fragmentation, still consumes waveform memory.

To clear the waveforms memory use the [:SOURce]:BB:ARBitrary:WAVeform:DATA:DELete ALL command. Refer to the Data Sheet for the maximum sample count.

Waveforms shorter than the minimum number of samples required per waveform will be automatically extended by cyclically repeating the waveform (2).

The remaining number of samples that may be written to the device can be queried using BB:ARBitrary:WAVeform:DATA:FREE?

Before sending any waveform, the device must be configured to handle IQ data with or without markers. When enabled, each IQ sample features additional marker bits that can be set individually. Using markers increases the logical size of a sample and thus reduces the total number of samples that can be stored on the device.

The maximum number of bytes transmittable in one SCPI command is smalle? than the total device memory and must be smaller than $1 \cdot 10^9$ (0.931 GB). The extended data transmission command must be used to transfer larger files to the device, which splits the data into multiple SCPI commands.

Parameter 1, [<integer>]

This optional parameter specifies the segment index used for:

– programmable sequences of segmented waveforms or segment selection by command, see "BB:ARBitrary:WSEGment" commands,

– segment selection via FCP, see "BB:ARBitrary:WSEGment" and "[:SOURce<ch>]:FCPort Subsystem" commands.

Range 0 to maximum number of segments minus 1 (refer to the Data Sheet). If omitted and IQ data is loaded from non-volatile memory (Option 006), the segment index specified in the associated *.qim configuration file is used. If omitted and no segment index is specified in a configuration file, or if omitted and block data is being loaded, the segment index defaults to 0.

Parameter 2 - Option 1, <data>

Data sent or received has IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes follow in <data_bytes>

Example of definite block data:

#18xxxxxxxx

#18...: byte count is one digit wide

#18...: 8 data bytes will follow

...xxxxxxxx: 8 bytes of data

The data itself consists of IQ data samples and optional marker bits. An IQ data sample is 32 bits wide (without marker bits) or 40 bits wide (with marker bits) and contains two 16-bits two's complement values (I and Q component) representing fixed point numbers from -1 to +1.Little-endian format is used: data at a lower address (transmitted first) is least significant. This is the same format that is used on many PCs (x86, AMD64 and x86-64 architectures).

Before sending waveforms the device has to be configured to handle IQ data with or without marker bits with the command [:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe. It is not possible to mix 32 bits wide data format with 40 bits wide data format.

Data format without marker bits:

Byte	Sample	Content
0	1	Lower (least significant) 8 bits of Q (quadrature) component.
1	1	Higher (most significant) 8 bits of Q (quadrature) component.
2	1	Lower (least significant) 8 bits of I (in-phase) component.
3	1	Higher (most significant) 8 bits of I (in-phase) component.
4	2	Lower (least significant) 8 bits of Q (quadrature) component
5...	2...	...

Data format with marker bits:

Byte	Sample	Content
0	1	8 marker bits
1	1	Lower (least significant) 8 bits of Q (quadrature) component
2	1	Higher (most significant) 8 bits of Q (quadrature) component
3	1	Lower (least significant) 8 bits of I (in-phase) component.
4	1	Higher (most significant) 8 bits of I (in-phase) component.
5	2	8 marker bits
6	2	Lower (least significant) 8 bits of Q (quadrature) component.
7...	2...	...

On little-endian systems this format is equivalent to an array of the following C type:

```
struct {
     int16_t q;
     int16_t i;
} IQ_SAMPLE;
```

With marker bits the format is equivalent to an array of the following C type:

```
struct {
     int8_t marker
     int16_t q;
     int16_t i;
} IQ_SAMPLE;
```

Parameter 2-Option2, <"filename">

Data is loaded from non-volatile memory (Option 006) from the file named "<name>.qid" and associated settings are loaded from a file named "<name>.qim", if it exists. Settings such as samplingRate and markerBits become active as soon as the data is loaded. The segmentID setting is used as the segment index unless a segment index is explicitly specified in parameter 1 of this command. More details about the non-volatile memory of AP5041A/AP5042A devices can be found in Application Note AN6004.

BB:ARBitrary:WAVeform:DATA:EXTended

```
[:SOURce] :BB:ARBitrary:WAVeform:DATA:EXTended
<integer>, [<integer>],<data>
```

The following command should be used for the transmission of IQ modulation data that is equal to or larger than $1 \cdot 10^9$ bytes. The definition is similar to the normal data transmission command above, except that the first parameter defines the total number of bytes to be transmitted across all following SCPI commands. The first extended data command opens the extended block data transfer, which is only closed in three cases:

- the number of received bytes is larger than or equal to the total number of bytes
- the STOP parameter was passed with the SCPI command
- a new data transmission was initiated using the regular data transmission command

Already transmitted bytes are saved to the specified segment index upon closing. Information about the current extended transmission can be queried.

Parameter 1, <integer>

This parameter specifies the total number of bytes split across all subsequent extended data commands.

Parameter 2, [<integer>)

This optional parameter specifies the segment index used to store more than one waveform.

Parameter 2, <data>

Data sent or received has IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes follow in <data_bytes>

BB:ARBitrary:WAVeform:DATA:EXTended:STOP

```
[:SOURce] :BB:ARBitrary:WAVeform:DATA:EXTended:STOP
l<data>
```

Stop the current extended transmission. Already transmitted data is not deleted.

Parameter, <data>

Data sent or received has IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes follow in <data_bytes>

BB:ARBitrary:WAVeform:DATA:EXTended? TOTal I DONE I REMaining

```
[:SOURce] :BB:ARBitrary:WAVeform:DATA:EXTended:STOP
l<data>
```

```
[:SOURce] :BB:ARBitrary:WAVeform:DATA:EXTended? DONE
```

```
[:SOURce] :BB:ARBitrary:WAVeform:DATA:EXTended? REMaining
```

Query the number of bytes from the ongoing extended block data transfer.

BB:ARBitrary:WAVeform:DATA:DELete

```
[:SOURce]:BB:ARBitrary:WAVeform:DATA:DELete ALL
```

Clears the waveform memory (deletes all waveforms stored on the device).

BB:ARBitrary:WAVeform:DATA:FREE?

```
[:SOURce]:BB:ARBitrary:WAVeform:DATA:FREE?
```

Returns the remaining number of samples that may be written to the device.

BB:ARBitrary:WAVeform:FILE:DELete

```
[:SOURce]:BB:ARBitrary:WAVeform:FILE:DELete <"string">
```

Deletes the specified waveform file from non-volatile memory.

BB:ARBitrary:WAVeform:FILE:FREE?

```
[:SOURce]:BB:ARBitrary:WAVeform:FILE:FREE?
```

Returns the free space of the non-volatile memory in bytes.

BB:ARBitrary:WAVeform:FILE:LIST?

`[:SOURce]:BB:ARBitrary:WAVeform:FILE:LIST?`

Returns an unsorted list of stored waveform files.

BB:ARBitrary:WAVeform:MARKer:COUNt?

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:COUNt?`

Returns the number of individual marker bits available per sample.

BB:ARBitrary:WAVeform:MARKer:STATe

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe ON|OFF|1|0`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe?`

Enables or disables marker bits. Marker bits can be used to wait for trigger events or to generate trigger signals (on the MF output ports). When enabled, each IQ sample features additional marker bits that can be set individually. Using markers increases the logical size of a sample and thus reduces the total number of samples that can be stored on the device. Refer to the Data Sheet for the maximum sample count with or without marker bits enabled.

***RST** OFF

BB:ARBitrary:WAVeform:MARKer:STATe

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe ON|OFF|1|0`

`[:SOURce<ch>]:BB:ARBitrary:WAVeform:MARKer:STATe?`

Enables or disables marker bits. Marker bits can be used to wait for trigger events or to generate trigger signals (on the MF output ports). When enabled, each IQ sample features additional marker bits that can be set individually. Using markers increases the logical size of a sample and thus reduces the total number of samples that can be stored on the device. Refer to the Data Sheet for the maximum sample count with or without marker bits enabled.

***RST** OFF

BB:ARBitrary:WAVeform:META

`[:SOURce<ch>] :BB:ARBitrary:WAVeform:META #<num digits><byte_count><data byte`

`[:SOURce<ch>] :BB:ARBitrary:WAVeform:META? <integer> I <filename>`

This command transmits metadata information corresponding to a QID segment (IQ modulation data) to the device. Data sent or received has IEEE488.2 definite block data format (see BB:ARB:WAV:DATA). Metadata contains information like playback rate, ID, crest factor, etc.

Get a list of meta information regarding one segment, given its ID. Returns the segment name, creation date, description, sample count, playback rate, number of marker bits, crest factor, peak and RMS power.

Please note:

- If a QID segment with corresponding metadata is selected, then the playback rate and crest factor are set automatically.
- The presence of metadata is optional. A QIM metadata item can be present without a corresponding QID segment. Thereby the order of QIM or QID data transmission can be defined by the user.
- Single QIM parameters can't be changed after uploading as they represent mostly immutable information about the segment. Metadata items can be overwritten by uploading a different QIM file containing the same segment ID.
- Removing all IQ segments removes all metadata items.
- A QID segment can be selected for playback not only by its segment ID but also by its QID filename, if the corresponding metadata is present.

BB:ARBitrary:WSEGment:META:DELete?

`[:SOURce<ch>] :BB:ARBitrary:WAVeform:META:DELete <integer | <filename> | ALL`

Delete all or one specific metadata item.

BB:ARBitrary:WSEGment

`[:SOURce<ch>]:BB:ARBitrary:WSEGment <integer>`

`[:SOURce<ch>]:BB:ARBitrary:WSEGment <"filename">`

`[:SOURce<ch>]:BB:ARBitrary:WSEGment?`

Selects the active waveform segment when internal segment selection is enabled ([SOURce<ch>]:"BB:ARBitrary:WSEGment:SOURce").

***RST** 0

Range 0 to maximum number of segments minus 1 (refer to the Data Sheet)

BB:ARBitrary:WSEGment:COUNt?

`[:SOURce<ch>]:BB:ARBitrary:WSEGment:COUNt?[MAX]`

Returns the number of segments currently stored on the device.

MAX	Passing this optional parameter lets the query return the maximum number of segments supported by the device.

BB:ARBitrary:WSEQuence:LOAD

```
[:SOURce<ch>]:BB:ARBitrary:WSEQuence:LOAD <integer>
(num_digits),<integer> (byte_count),<integer> (databyte)
```

Loads the sequencers script.

BB:ARBitrary:WSEQuence:LOAD:ERRor?

```
[:SOURce<ch>]:BB:ARBitrary:WSEQuence:LOAD:Error?
```

Returns the sequencer script parser error.

BB:ARBitrary:WSEGment:MF<index>:INPut:SLOPe

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:SLOPe
POSitive|NEGative
```

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:SLOPe?
```

Sets the detecting slope of the MF input signal for WSEG selection.

***RST** POSitive

BB:ARBitrary:WSEGment:MF<index>:INPut:STATe

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:STATe
ON|OFF|1|0
```

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:STATe?
```

Enables or disables the MF input for waveform segment selection.

***RST** OFF

BB:ARBitrary:WSEGment:MF<index>:INPut:WSEGment

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:WSEGment
<integer>
```

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MF<index>:INPut:WSEGment
?
```

Sets the segment ID that is to be activated with a MF trigger event.

***RST** 0

BB:ARBitrary:WSEGment:MODE

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MODE SEAMless|IMMediate
```

```
[:SOURce<ch>]:BB:ARBitrary:WSEGment:MODE?
```

Controls the transition between different segments.

SEAMless	In seamless mode, he next active segment occurs is appended seamlessly after the last sample of the previously active segment. Every segment is played completely.
IMMediate	The active segment is selected via FCP, see [:SOURce<ch>]:FCPort Subsystem.

***RST** SEAMless

BB:ARBitrary:WSEQuence:RUN

`[:SOURce<ch>]:BB:ARBitrary:WSEQuence:RUN 0|1`

`[:SOURce]:BB:ARBitrary:WSEQuence:RUN?`

Sets or queries the sequencer run state.

***RST** 0

BB:ARBitrary:WSEGment:SOURce

`[:SOURce<ch>]:BB:ARBitrary:WSEGment:SOURce INTernal|FCPort|SEQuence|MF`

`[:SOURce<ch>]:BB:ARBitrary:WSEGment:SOURce?`

Sets the source that controls the active segment selection.

INTernal	The active segment is selected by the command [SOURce<ch>]:BB:ARBitrary:WSEGment.
FCPort	The active segment is selected via FCP, see [:SOURce<ch>]:FCPort Subsystem commands.
SEQuence	The active segment is selected according to a predefined sequence.
MF	The active segment is selected with the MF input ports, see BB:ARBitrary:WSEGment:MF<index>:INPut:WSEGment.

***RST** INTernal

BB:AVIO:DME

`[:SOURce<ch>]:BB:AVIO:DME:<… >`

These commands provide Option AVIO DME (distance measuring equipment) modulations. All commands under BB:AVIO:DME:<...> follow the syntax of the [:SOURce<ch>]:DME:<...> commands. For example, [SOURce<ch>]:BB:AVIO:DME:STAT ON works similar to [:SOURce<ch>]:DME:STAT ON.

Please refer to the "[:SOURce<ch>]:DME Subsystem" documentation for a detailed description of these commands.

BB:AVIO:ILS

`[:SOURce<ch>]:BB:AVIO:ILS:<… >`

These commands provide Option AVIO ILS (instrument landing system) modulations. All commands under BB:AVIO:ILS:<…> follow the syntax of the [:SOURce<ch>]:ILS:<…> commands. For example, [SOURce<ch>]:BB:AVIO:ILS:LOC ON works similar to [:SOURce<ch>]:ILS:LOC ON. Please refer to the "[:SOURce<ch>]:ILS Subsystem" documentation for a detailed description of these commands.

BB:AVIO:VOR

`[:SOURce<ch>]:BB:AVIO:VOR:<… >`

These commands provide option AVIO VOR (VHF omnirange navigation system) modulations. All commands under BB:AVIO:VOR:<…> follow the syntax of the [:SOURce<ch>]:VOR:<…> commands. For example, [SOURce<ch>]:BB:AVIO:VOR ON works similar to [:SOURce<ch>]:VOR ON. Please refer to the "[:SOURce<ch>]:VOR Subsystem" documentation for a detailed description of these commands.

BB:AWGN:BANDwidth

`[:SOURce<ch>]:BB:AWGN:BANDwidth <float>`

`[:SOURce<ch>]:BB:AWGN:BANDwidth?`

Sets the noise bandwidth if only the additive white Gaussian noise is enabled. Only available if all other modulations are disabled.

***RST** 400 MHz

Range Please refer to the Data Sheet.

Unit Hz

BB:AWGN:CNR

`[:SOURce<ch>]:BB:AWGN:CNR <float>`

`[:SOURce<ch>]:BB:AWGN:CNR?`

Sets the carrier to noise ratio (CNR) in dB

The range depends on the AWGN Control Mode (see BB:AWGN:POW:CONT) as well as the output power range of the device. (Please refer to the Data Sheet.)

***RST** 25 dB

Range Please refer to the Data Sheet.

Unit dB

BB:AWGN:MODE

`[:SOURce<ch>] :BB:AWGN:MODE CARRier|NOISe|SUM`

`[:SOURce<ch>] :BB:AWGN:MODE?`

Sets the output signal multiplexing mode of the AWGN. The power is automatically adjusted to keep the same channel power.

CARRier	Only the carrier signal is routed to the output while the AWGN is disconnected.
NOISe	Only the AWGN is routed to the output as a standalone noise generator.
SUM	The AWGN is in additive mode. Both the carrier and noise generator are routed to the output.

***RST** SUM

BB:AWGN:POWer:CARRier

`[:SOURce<ch>]:BB:AWGN:POWer:CARRier <float>`

`[:SOURce<ch>]:BB:AWGN:POWer:CARRier?`

Sets the carrier power. It cannot be set if Power Control Mode is TOTal.

Range depends on the output power range of the device. (Please refer to the Data Sheet.)

Unit dBm

BB:AWGN:POWer:CONTrol

`[:SOURce<ch>]:BB:AWGN:POWer:CONTrol TOTal|CARRier|NOISe`

`[:SOURce<ch>]:BB:AWGN:POWer:CONTrol?`

Sets the Power Control Mode for AWGN. The set power of the chosen mode will stay constant, while the CNR changes.

TOTal	Total output power set by [:SOURce<ch>]"POWer[:LEVel][:IMMediate][:AMPLitude]" is constant, both carrier and noise amplitude change to get CNR.
CARRier	Total carrier power is constant, total output and total noise power change, so that CNR is correct.
NOISe	Total noise power is constant, total output and total carrier power change, so that CNR is correct.

***RST** TOTal

BB:AWGN:POWer:NOISe

`[:SOURce<ch>]:BB:AWGN:POWer:NOISe <float>`

`[:SOURce<ch>]:BB:AWGN:POWer:NOISe?`

Sets the total noise power. Cannot be set if Power Control Mode is TOTal.

Range depends on the output power range of the device. (Please refer to the Data Sheet.)

Unit dBm

BB:AWGN[:STATe]

`[:SOURce<ch>]:BB:AWGN[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:BB:AWGN[:STATe]?`

Enables/disables the white Gaussian noise as an additional modulation.

***RST** OFF

BB:DM:CLOCk?

`[:SOURce<ch>]:BB:DM:CLOCk?`

This command queries the sampling rate of the DM modulation. It is directly related to the symbol rate, [SOURce<ch>]"BB:DM:SRATe".

Unit Hz

BB:DM:FILTer:PARameter

`[:SOURce<ch>]:BB:DM:FILTer:PARameter <float>`

`[:SOURce<ch>]:BB:DM:FILTer:PARameter?`

Sets the digital pulse shaping filter parameter. The filter parameter for all available pulse shape filters is described under [:SOURce<ch>]:BB:DM:FILTer:TYPE.

***RST** 0.5

Range 0.0 to 3.0

BB:DM:FILTer:TAPS

`[:SOURce<ch>]:BB:DM:FILTer:TAPS <float>{,float}`

`[:SOURce<ch>]:BB:DM:FILTer:TAPS?`

Sets the taps of the digital pulse shaping filter. The parameter to this command is a comma separated list of all filter taps. Each filter tap is a <float> value with range -1.0 to +1.0. Maximum filter length is 1023.

BB:DM:FILTer:TYPE

`[:SOURce<ch>]:BB:DM:FILTer:TYPE COSine|RCOSine|RECTangle|RASymmetric|DIRac|GAUSs`

`[:SOURce<ch>]:BB:DM:FILTer:TYPE?`

Selects the digital pulse shaping filter. Some pulse shape filters feature a settable filter parameter. Refer to the filter descriptions below and the [:SOURce<ch>]:"BB:DM:FILTer:PARameter" command.

COSine	Raised cosine pulse. Filter parameter is roll off factor "beta".
RCOSine	Root raised cosine pulse. Filter parameter is roll off factor "beta".
RECTangle	Symmetric rectangular pulse. A trapezoidal boundary shape avoids intersymbol interference peaks. No configurable filter parameter.
RASymmetric	Asymmetric rectangular pulse. Asymmetric boundaries avoid intersymbol interference peaks. No configurable filter parameter.
DIRac	Dirac pulse. No configurable filter parameter.
GAUSs	Gaussian pulse. Filter parameter is "bandwidth x bit time product".

***RST** COSine

BB:DM:FORMat

`[:SOURce<ch>]:BB:DM:FORMat QAM8|QAM16|QAM32|QAM64|QAM128|QAM256|QAM512|QAM1024|QAM2048|QAM4096`

`[:SOURce<ch>]:BB:DM:FORMat?`

Selects the digital modulation scheme.

***RST** QAM64

BB:DM:OSAMpling

`[:SOURce<ch>]:BB:DM:OSAMpling <integer>`

`[:SOURce<ch>]:BB:DM:OSAMpling?`

Sets the digital modulation oversampling factor. The oversampling factor is the number of samples used per digital modulation symbol. The sample clock is the symbol rate multiplied by the oversampling factor. Reaching the sample clock limit this command reduces the symbol rate.

Refer to the "BB:ARBitrary:CLOCk" and "BB:DM:SRATe"commands for details.

***RST** 8

Range 1 to 32

BB:DM:PATTern:LENGth

`[:SOURce<ch>]:BB:DM:PATTern:LENGth <integer>`

`[:SOURce<ch>]:BB:DM:PATTern:LENGth?`

Sets the length in bits of the digital modulation data pattern. The pattern itself is a pseudo random bit sequence.

***RST** 4096

Range 1 to 65535

BB:DM:SRATe

`[:SOURce<ch>]:BB:DM:SRATe <float>`

`[:SOURce<ch>]:BB:DM:SRATe?`

Sets the digital modulation symbol rate. The sample clock is the symbol rate multiplied by the oversampling factor. Reaching the sample clock limit this command reduces the oversampling factor.Refer to the "BB:ARBitrary:CLOCk" and "BB:DM:OSAMpling" commands for details.

***RST** 200 MS/s

Range Please refer to the Data Sheet.

Unit S/s

BB:DM:STATe

`[:SOURce<ch>]:BB:DM:STATe ON|OFF|1|0`

`[:SOURce<ch>]:BB:DM:STATe?`

Enables or disables digital modulation.

***RST** OFF

BB:GENeral:AM

`[:SOURce<ch>]:BB:GENeral:AM`: <...>

These commands provide amplitude modulation. All commands under BB:GENeral:AM:<...> follow the syntax of the [:SOURce<ch>]:AM:<...> commands. For example, [SOURce<ch>]:BB:GEN:AM:STAT ON works similar to [:SOURce<ch>]:AM:STAT ON. Please refer to the "[:SOURce<ch>]:AM Subsystem (Amplitude Modulation)" documentation for a detailed description of these commands.

BB:GENeral:FM

[:SOURce<ch>]:BB:GENeral:FM <...>

These commands provide frequency modulation. All commands under BB:GENeral:FM:<...> follow the syntax of the [:SOURce<ch>]:FM:<...> commands. For example, [SOURce<ch>]:BB:GEN:FM:STAT ON works similar to [:SOURce<ch>]:FM:STAT ON. Please refer to the "[:SOURce<ch>]:FM Subsystem (Frequency Modulation)" documentation for a detailed description of these commands.

BB:GENeral:PM

[:SOURce<ch>]:BB:GENeral:PM <...>

These commands provide phase modulation. All commands under BB:GENeral:PM:<...> follow the syntax of the [:SOURce<ch>]:PM:<...> commands. For example, [SOURce<ch>]:BB:GEN:PM:STAT ON works similar to [:SOURce<ch>]:PM:STAT ON. Please refer to the "[:SOURce<ch>]:PM Subsystem (Phase Modulation)" documentation for a detailed description of these commands.

[:SOURce]:CORRection Subsystem

The flatness correction system provides power correction over frequency. Gain or loss of external components can be compensated.

Flatness correction is global and common to all channels.

Command	Parameters	Unit	Default
[:SOURce]:CORRection:FLATness:MODE	LOWer|HIGHer| INTerpolation		INTerpolation
[:SOURce]:CORRection:FLATness:PAIR	<float>,<float>	Hz, dBm|...	0 Hz, 0 dBm
[:SOURce]:CORRection:FLATness:PAIR?	<integer>		
[:SOURce]:CORRection:FLATness:POINts?			
[:SOURce]:CORRection:FLATness:PRESet			
[:SOURce]:CORRection:FLATness[:STATe]	ON|OFF|1|0		OFF
[:SOURce]:CORRection:PHASe:COMMit			
[:SOURce]:CORRection:PHASe[:STATe]	ON|OFF|1|0		(unchanged)
:MEMory:FILE:CORRection:FLATness:DATA	<"file name">,<data>		
:MEMory:FILE:CORRection:FLATness:LOAD	<"file name">		
:MEMory:FILE:CORRection:FLATness:PEEK?	<"file name">		
:MEMory:FILE:CORRection:FLATness:STORe	<"file name">		
:MEMory:FILE:CORRection:PHASe:DATA	<"file name">,<data>		
:MEMory:FILE:CORRection:PHASe:DEL	<"file name">|ALL		
:MEMory:FILE:CORRection:PHASe:LOAD	<"file name">		

CORRection:FLATness:MODE

`[:SOURce]:CORRection:FLATness:MODE LOWer|HIGHer|INTerpolation`

`[:SOURce]:CORRection:FLATness:MODE?`

Defines how the flatness correction value will be determined at frequency settings below, between or above the store correction pairs.

LOW	Selects the pair at or below an output frequency setting.
HIGH	Selects the pair at or above the output frequency setting.
INTerpolation	Selects linear interpolation between the two pairs closest to the output frequency setting.

***RST** INTerpolation

CORRection:FLATness:PAIR

[:SOURce]:CORRection:FLATness:PAIR <float>,<float>

[:SOURce]:CORRection:FLATness:PAIR? <integer>

Adds or changes a frequency and amplitude correction pair. The maximum number of points that can be entered is 3201.

A frequency and amplitude pair is written in the format <frequency in Hz>, <power in dBm|...>.

The query form returns the frequency and amplitude correction pair at the given point index. The index ranges from 0 to the number of points minus 1.

Use the "CORREction:FLATness:PRESet" command to clear the flatness correction list.

***RST** empty 0 Hz, 0 dBm (empty)

Range Please refer to the Data Sheet.

Unit Hz, dBm|...

CORREction:FLATness:POINts?

[:SOURce]:CORRection:FLATness:POINts?

Returns the number of points in the active (loaded) flatness correction data table.

CORREction:FLATness:PRESet

[:SOURce]:CORRection:FLATness:PRESet

Presets the user-flatness correction to a factory-defined setting that consists of one point.

The current correction data will be overwritten once this command is executed. Save the current data if needed. Refer to the "MEMory:FILE:CORRection:FLATness:STORe" command for storing user flatness files.

CORREction:FLATness[:STATe]

[:SOURce]:CORRection:FLATness[:STATe] ON|OFF|1|0

[:SOURce]:CORRection:FLATness[:STATe]?

Enables or disables the user-flatness corrections.

***RST** OFF

CORREction:PHASe:COMMit

[:SOURce]:CORRection:PHASe:COMMit

Commits phase calibration mode (PCM) state. The phase correction table updates to the UFS (ultra fast switching) system. The command is an alias to [:SOURce]:PHASe:PCM:COMMit that does also commit changes to the UFS system.

Phase correction tables are also loaded on power up, so power cycling the unit after uploading a new phase correction table has the same effect.

Execution of this command may take about 60 seconds.

This command is available only to devices with option PCM (phase calibration mode).

CORREction:PHASe[:STATe]

`[:SOURce]:CORRection:PHASe[:STATe] ON|OFF|1|0`

`[:SOURce]:CORRection:PHASe[:STATe]?`

Enables or disables user defined phase correction.

With user defined phase correction enabled, a phase correction value is applied to the RF output phase. This is typically used in phase calibration mode (PCM), although phase correction does also work with PCM disabled.

As, once enabled, phase correction shall always remain active, this setting is not changed by power down/power up and reset commands.

This command is available only to devices with option PCM (phase calibration mode).

***RST** (unchanged)

MEMory:FILE:CORRection:FLATness:DATA

`:MEMory:FILE:CORRection:FLATness:DATA {<”filename”>},<data>`

`:MEMory:FILE:CORRection:FLATness:DATA? {<”filename”>}`

Writes data to a flatness correction file.

The query returns flatness correction file data.

Data sent or received has IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>.

<byte_count> specifies how many data bytes follow in <data_bytes>.

Example of definite block data:

#2141000000000;1.0

#214...: byte count is two digits wide

#214...: 14 data bytes will follow

...1000000000;1.0: 14 bytes of data

The flatness correction data itself consists of values separated by semicolon ";" and rows separated by carriage return "\r" and/or newline "\n". Two values (frequency in Hz, power correction in dBm) make a row. Each row defines one flatness correction point.

Example of two points flatness correction (first point 100 MHz, +1 dB; second point 200 MHz, -1 dB):

100000000;1.0\r\n

200000000;-1.0;\r\n

MEMory:FILE:CORRection:FLATness:LOAD

`:MEMory:FILE:CORRection:FLATness:LOAD`

Loads a user- flatness correction file. The "<file name>" variable is the name of the file located in the directory USERFLAT. The directory path is implied in the command and need not be specified in the variable name.

MEMory:FILE:CORRection:FLATness:PEEK?

`:MEMory:FILE:CORRection:FLATness:PEEK? "<file name>"`

Checks a flatness correction data file. If the file exists, the number of correction points is returned. If there is no such file, 0 is returned.

MEMory:FILE:CORRection:FLATness:STORe

`:MEMory:FILE:CORRection:FLATness:STORe "<file name>"`

Stores the current user- flatness correction data to a file named by the:FLATness:STORe command.:CORRection:FLATness:STORe command. The directory path is implied in the command and need not be specified in the "<file name>" variable.

MEMory:FILE:CORRection:PHASe:DATA

`:MEMory:FILE:CORRection:PHASe:DATA <"file name">, <data>`

`:MEMory:FILE:CORRection:PHASe:DATA? <"file name">`

Writes data to a phase correction file.

The query returns the phase correction file data.

The file name parameter is a string in quotation marks, for example:

MEM:FILE:CORR:PHAS:DATA "table_ch1.csv",<data>

All channels share the same memory. Individual phase correction tables per channel must use individual file names. Memory is non-volatile, so all tables are preserved during power down/power up and reset commands.

File data is transferred in IEEE488.2 definite block data format.

After writing a phase correction table, it can be loaded by :MEMory<ch>:FILE:CORRection:PHASe:LOAD.

MEMory:FILE:CORRection:PHASe:DELete

```
:MEMory:FILE:CORRection:PHASe:DELete "<file name>"|ALL
```

Deletes a phase correction table.

The file name parameter is a string in quotation marks, for example:

MEM:FILE:CORR:PHAS:DEL “table_ch1.csv”

To delete all phase corrections at one time, send ALL (without quotation marks) instead of a file name.

MEMory:FILE:CORRection:PHASe:LOAD

```
:MEMory:FILE:CORRection:PHASe:LOAD "<file name>"
```

Deletes a phase correction table.

The file name parameter is a string in quotation marks, for example:

MEM:FILE:CORR:PHAS:LOAD “table_ch1.csv”

User phase correction files can be uploaded by :MEMory<ch>:FILE:CORRection:PHASe:DATA

The phase correction table remains loaded during power down/power up and reset commands.

This command is available only to devices with Option PCM.

[:SOURce<ch>]:DME Subsystem

NOTE Applies to AP5041A and AP5042A with Option 302 only.

This subsystem provides DME signal generation. It is only available to instruments with Option 302.

Command	Parameters	Unit	Default
[:SOURce<ch>]:DME:APULse:ATTenuation	<float>		0
[:SOURce<ch>]:DME:APULse:DELay	<float>	s	50 µs
[:SOURce<ch>]:DME:APULse:PFALl	<float>	s	2 µs
[:SOURce<ch>]:DME:APULse:PRISe	<float>	s	2 µs
[:SOURce<ch>]:DME:APULse:PSELect	<integer>		0
[:SOURce<ch>]:DME:APULse:PSPacing	<float>	s	12 µs
[:SOURce<ch>]:DME:APULse:PTYPe	SINGle|DOUBle		DOUBle
[:SOURce<ch>]:DME:APULse:PWIDth	<float>	s	12 µs
[:SOURce<ch>]:DME:APULse:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:DEADtime:DELay	<float>	s	10 µs
[:SOURce<ch>]:DME:DEADtime:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:DEFault			
[:SOURce<ch>]:DME:ECHO:ATTenuation	<float>		0
[:SOURce<ch>]:DME:ECHO:DELay	<float>	s	8 µs
[:SOURce<ch>]:DME:ECHO:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:FILTer	LINear|GAUSs|RCOS|COS|COS2		LINear
[:SOURce<ch>]:DME:FREQ	<float>	Hz	1 kHz
[:SOURce<ch>]:DME:IDENt	<string>		
[:SOURce<ch>]:DME:IDENt:DOT	<float>	s	0.1 s
[:SOURce<ch>]:DME:IDENt:PERiod	<float>	s	30 s
[:SOURce<ch>]:DME:IDENt:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:INTerference:ATTenuation	<float>		0
[:SOURce<ch>]:DME:INTerference:DELay	<float>	s	8 µs
[:SOURce<ch>]:DME:INTerference:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:PFALl	<float>	s	2 µs

Command	Parameters	Unit	Default
[:SOURce<ch>]:DME:PRISe	<float>	s	2 µs
[:SOURce<ch>]:DME:PSPacing	<float>	s	12 µs
[:SOURce<ch>]:DME:PWIDth	<float>	s	3.5 µs
[:SOURce<ch>]:DME:SQTR:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:TRIGger:OUT:SPACing	<float>	s	2 us
[:SOURce<ch>]:DME:TRIGger:OUT:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:DME:VIDeo:OUT:STATe	ON|OFF|1|0		OFF

DME:APULse:ATTenuation

`[:SOURce<ch>]:DME:APULse:ATTenuation <float>`

`[:SOURce<ch>]:DME:APULse:ATTenuation?`

Sets the attenuation of an additional pulse pair, relative to the main pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 0

Range Please refer to the Data Sheet.

DME:APULse:DELay

`[:SOURce<ch>]:DME:APULse:DELay <float>`

`[:SOURce<ch>]:DME:APULse:DELay?`

Sets the delay of an additional pulse or pulse pair relative to the main pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 50 µs

Range Please refer to the Data Sheet.

Unit s

DME:APULse:PFALl

`[:SOURce<ch>]:DME:APULse:PFALl <float>`

`[:SOURce<ch>]:DME:APULse:PFALl?`

Sets the fall time of each pulse in an additional pulse or pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 2 µs

Range Please refer to the Data Sheet.

Unit s

DME:APULse:PRISe

`[:SOURce<ch>]:DME:APULse:PRISe <float>`

`[:SOURce<ch>]:DME:APULse:PRISe?`

Sets the rise time of each pulse in an additional pulse or pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 2 µs

Range Please refer to the Data Sheet.

Unit s

DME:APULse:PSELect

`[:SOURce<ch>]:DME:APULse:PSELect <integer>`

`[:SOURce<ch>]:DME:APULse:PSELect?`

Up to four additional pulses or pulse pairs can be added to the main pulse pair. This command selects one of those additional pulses or pulse pairs for configuration with [:SOURce<ch>]:DME:APULse:<...> commands. The first pulse is selected with index 0.

***RST** 0

Range 0 to maximal index

DME:APULse:PSPacing

`[:SOURce<ch>]:DME:APULse:PSPacing <float>`

`[:SOURce<ch>]:DME:APULse:PSPacing?`

Sets the spacing between the two pulses of an additional pulse pair. Spacing is defined as the time between the centers of the two pulses. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 12 µs

Range Please refer to the Data Sheet.

Unit s

DME:APULse:PTYPe

`[:SOURce<ch>]:DME:APULse:PTYPe SINGle|DOUBle`

`[:SOURce<ch>]:DME:APULse:PTYPe?`

Selects the type of an additional pulse or pulse pair.

SINGle	Plays an additional single pulse.
DOUBle	Plays an additional pulse pair.

The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** DOUBle

DME:APULse:PWIDth

`[:SOURce<ch>]:DME:APULse:PWIDth <float>`

`[:SOURce<ch>]:DME:APULse:PWIDth?`

Sets the width of each pulse in an additional pulse or pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** 12 µs

Range Please refer to the Data Sheet.

Unit s

DME:APULse:STATe

`[:SOURce<ch>]:DME:APULse:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:APULse:STATe?`

Enables or disables an additional pulse or pulse pair. The additional pulse or pulse pair configured with this command can be selected with the [:SOURce<ch>]:DME:APULse:PSELect command.

***RST** OFF

DME:DEADtime:DELay

`[:SOURce<ch>]:DME:DEADtime:DELay <float>`

`[:SOURce<ch>]:DME:DEADtime:DELay?`

Sets the receiver dead time test pulse pair delay. The dead time pulse is a copy of the main pulse pair with settable delay.

***RST** 10 µs

Range Please refer to the Data Sheet.

Unit s

DME:DEADtime:STATe

`[:SOURce<ch>]:DME:DEADtime:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:DEADtime:STATe?`

Enables or disables the receiver dead time test pulse pair. The dead time pulse is a copy of the main pulse pair with settable delay.

***RST** OFF

DME:DEFault

`[:SOURce<ch>]:DME:DEFault`

Sets the DME settings to its default values win other subsystems

DME:ECHO:ATTenuation

`[:SOURce<ch>]:DME:ECHO:ATTenuation <float>`

`[:SOURce<ch>]:DME:ECHO:ATTenuation?`

Sets the main pulse pair echo attenuation. The echo is a copy of the main pulse pair with settable delay and attenuation.

***RST** 0

Range Please refer to the Data Sheet.

DME:ECHO:DELay

`[:SOURce<ch>]:DME:ECHO:DELay <float>`

`[:SOURce<ch>]:DME:ECHO:DELay?`

Sets the main pulse pair echo delay. The echo is a copy of the main pulse pair with settable delay and attenuation.

***RST** 8 µs

Range Please refer to the Data Sheet.

Unit s

DME:ECHO:STATe

`[:SOURce<ch>]:DME:ECHO:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:ECHO:STATe?`

Enables or disables the main pulse pair echo. The echo is a copy of the main pulse pair with settable delay and attenuation.

***RST** OFF

DME:FILTer

`[:SOURce<ch>]:DME:FILTer LINear|GAUSs|RCOS|COS|COS2`

`[:SOURce<ch>]:DME:FILTer?`

This command selects the pulse shaping filter applied to the main DME pulse pair.

LINear	No filtering (trapezoidal pulse shape).
GAUSs	Gaussian pulse shape filtering.
RCOS	Root raised cosine pulse shape filtering.
COS	Raised cosine pulse shape filtering.
COS2	The pulse consists of a cosine during the rise time and a squared cosine during the fall time. Also known as COS/COS2.

***RST** LINear

DME:FREQuency

`[:SOURce<ch>]:DME:FREQuency <float>`

`[:SOURce<ch>]:DME:FREQuency?`

Sets the repetition rate of the DME pulse pattern.

***RST** 1 kHz

Range Please refer to the Data Sheet.

Unit Hz

DME:IDENt

`[:SOURce<ch>]:DME:IDENt <string>`

`[:SOURce<ch>]:DME:IDENt?`

Sets the ident of the DME modulation. Idents up to 4 letters with numbers are allowed.

DME:IDENt:DOT

`[:SOURce<ch>]:DME:IDENt:DOT <float>`

`[:SOURce<ch>]:DME:IDENt:DOT?`

Sets the dot duration of the Morse code for the AVIO DME modulation.

***RST** 0.1 s

Range Please refer to the Data Sheet.

Unit s

DME:IDENt:PERiod

`[:SOURce<ch>]:DME:IDENt:PERiod <float>`

`[:SOURce<ch>]:DME:IDENt:PERiod?`

Determines at what period the IDENT is repeated.

***RST** 30 s

Range Please refer to the Data Sheet.

Unit s

DME:IDENt:STATe

`[:SOURce<ch>]:DME:IDENt:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:IDENt:STATe?`

Enables or disables the IDENT for AVIO DME modulation.

***RST** OFF

DME:INTerference:ATTenuation

`[:SOURce<ch>]:DME:INTerference:ATTenuation <float>`

`[:SOURce<ch>]:DME:INTerference:ATTenuation?`

Sets the interference pulse attenuation relative to the main pulse pair. Interference is a copy of the first main pulse (a single pulse), sent before the main pulse pair. Attenuation and main pulse pair delay are settable.

***RST** 0

Range Please refer to the Data Sheet.

DME:INTerference:DELay

`[:SOURce<ch>]:DME:INTerference:DELay <float>`

`[:SOURce<ch>]:DME:INTerference:DELay?`

Sets the delay between interference and main pulse pair. Interference is a copy of the first main pulse (a single pulse), sent before the main pulse pair. Attenuation and main pulse pair delay are settable.

***RST** 8 µs

Range Please refer to the Data Sheet.

Unit s

DME:INTerference:STATe

`[:SOURce<ch>]:DME:INTerference:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:INTerference:STATe?`

Enables or disables interference. Interference is a copy of the first main pulse (a single pulse), sent before the main pulse pair. Attenuation and main pulse pair delay are settable.

***RST** OFF

DME:PFALl

`[:SOURce<ch>]:DME:PFALl <float>`

`[:SOURce<ch>]:DME:PFALl?`

Sets the fall time of each pulse in the main pulse pair.

***RST** 2 µs

Range Please refer to the Data Sheet.

Unit s

DME:PRISe

`[:SOURce<ch>]:DME:PRISe <float>`

`[:SOURce<ch>]:DME:PRISe?`

Sets the rise time of each pulse in the main pulse pair.

***RST** 2 µs

Range Please refer to the Data Sheet.

Unit s

DME:PSPacing

`[:SOURce<ch>]:DME:PSPacing <float>`

`[:SOURce<ch>]:DME:PSPacing?`

Sets the spacing between the two pulses of the main pulse pair. Spacing is defined as the time between the centers of the two pulses.

***RST** 12 µs

Range Please refer to the Data Sheet.

Unit s

DME:PWIDth

`[:SOURce<ch>]:DME:PWIDth <float>`

`[:SOURce<ch>]:DME:PWIDth?`

Sets the width of each pulse in the main pulse pair.

***RST** 3.5 µs

Range Please refer to the Data Sheet.

Unit s

DME:SQTR:STATe

`[:SOURce<ch>]:DME:SQTR:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:SQTR:STATe?`

Enables or disables sending 250 randomly spaced pulses with a minimum of 60 µs in between. Period is taken from [:SOURce<ch>]:DME:FREQ.

***RST** OFF

DME:STATe

`[:SOURce<ch>]:DME:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:STATe?`

Enables or disables the DME modulation.

***RST** OFF

DME:TRIGger:OUT:SPACing

`[:SOURce<ch>]:DME:TRIGger:OUT:SPACing <float>`

`[:SOURce<ch>]:DME:TRIGger:OUT:SPACing?`

Sets the trigger output pulse spacing for DME pulses.

***RST** 2 µs

Range Please refer to the Data Sheet.

Unit s

DME:TRIGger:OUT:STATe

`[:SOURce<ch>]:DME:TRIGger:OUT:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:TRIGger:OUT:STATe?`

Enables or disables the trigger output. When enabled, it sends out a single pulse through marker bits when the DME pulsepair is sent out. The trigger width is 1.5 µs and trigger spacing is 2 µs. This output can be combined with the DME video out.

***RST** OFF

DME:VIDeo:OUT:STATe

`[:SOURce<ch>]:DME:VIDeo:OUT:STATe ON|OFF|1|0`

`[:SOURce<ch>]:DME:VIDeo:OUT:STATe?`

Enables or disables sending out the video signal of the DME signal. High at 50% of the pulse height. Can be combined with the DME trigger out.

***RST** OFF

[:SOURce<ch>]:FCPort Subsystem

This subsystem provides configuration of the Fast Control Port.

Command	Parameters	Unit	Default
[:SOURce<ch>]:FCPort:DIAgnostic?			
[:SOURce<ch>]:FCPort:STReam:CALibrate			
[:SOURce<ch>]:FCPort:STReam:IQ	ON|OFF|1|0		OFF
[:SOURce<ch>]:FCPort:STReam:IQ:LOCKed?			
[:SOURce<ch>]:FCPort:STReam:SEGment	ON|OFF|1|0		OFF
[:SOURce<ch>]:FCPort:TEST[:STATe]	ON|OFF|1|0		OFF

FCPort:DIAGnostic?

`[:SOURce<ch>]:FCPort:DIAGnostic?`

Returns a text file containing information gathered in FCP test mode. FCP test mode is enabled by the "FCPort:TEST[:STATe]" command.

The file content is returned in IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>.

<byte_count> specifies how many data bytes follow in <data_bytes>.

Example of definite block data:

#18xxxxxxxx

#18...: byte count is one digit wide

#18...: 8 data bytes will follow

...xxxxxxxx: 8 bytes of data

The content of the text file (data portion of definite block data) is described in Application Note AN6002.

FCPort:STReam:CALibrate

`[:SOURce]:FCPort:STReam:CALibrate`

Runs a search to find the best input delay. Special input at the FCP is required by the user. Please refer to Application Note AN6002 for details.

FCPort:STReam:IQ

`[:SOURce]:FCPort:STReam:IQ ON|OFF|1|0`

`[:SOURce]:FCPort:STReam:IQ?`

Enables or disables FCP streaming IQ data to the IQ modulator.

In order to enable streaming the baseband subsystem must be configured for FCP IQ data streaming too. See [SOURce<ch>]:BB:ARBitrary:FCPort for details.

***RST** OFF

FCPort:STReam:IQ:LOCKed?

`[:SOURce]:FCPort:STReam:IQ:LOCKed?`

Returns the lock state of the IQ stream clock, determining if the clock provided by the user on the FCP interface has been locked to a PLL inside the device.

It returns 0 if the IQ stream mode is not active, see [SOURce<ch>]:FCPort:STReam:IQ.

FCPort:STReam:SEGment

[:SOURce]:FCPort:STReam:SEGment ON|OFF|1|0

[:SOURce]:FCPort:STReam:SEGment?

Enables or disables FCP streaming segment indices selecting the active waveform segment.

In order to enable streaming segment indices, the baseband subsystem must be configured accordingly:

- Waveform segments must be uploaded, see "BB:ARBitrary:WAVeform:DATA" and related commands.
- FCP must be selected as the source controlling the active segment, see "BB:ARBitrary:WSEGment:SOURce".
- Waveform playback must be enabled, see "BB:ARBitrary:WAVeform:META".

***RST** OFF

FCPort:TEST[:STATe]

`[:SOURce]:FCPort:TEST[:STATe] ON|OFF|1|0`

`[:SOURce]:FCPort:TEST[:STATe]?`

Enables or disables the FCP test mode. Test result information can be obtained by the [:SOURce<ch>]:FCPort:DIAgnostic? query. Refer to Application Note AN6002 for details.

***RST** OFF

[:SOURce<ch>]:FM Subsystem (Frequency Modulation)

Command	Parameters	Unit	Default
[:SOURce<ch>]:FM:COUPling	AC|DC		AC
[:SOURce<ch>]:FM:DEViation	<float>	Hz	1000 Hz
[:SOURce<ch>]:FM:EXTernal:SOURce	AIN<ch>		AIN1
[:SOURce<ch>]:FM:INTernal:FREQuency	<float>	Hz	400 Hz
[:SOURce<ch>]:FM:INTernal:SHAPe	RD|RU|SINE|SQUare|TRIangle		SINE
[:SOURce<ch>]:FM:SENSitivity	<float>	Hz/V	1000 Hz/V
[:SOURce<ch>]:FM:SOURce	INTernal|EXTernal		EXTernal
[:SOURce<ch>]:FM:STATe	ON|OFF|1|0		OFF

FM:COUPling

`[:SOURce<ch>]:FM:COUPling AC|DC`

`[:SOURce<ch>]:FM:COUPling?`

Selects AC or DC signal coupling for the external FM modulation.

***RST** AC

FM:DEViation

`[:SOURce<ch>]:FM:DEViation <float>`

`[:SOURce<ch>]:FM:DEViation?`

Sets the frequency modulation deviation. This setting will be used if [:SOURce<ch>]:FM:SOURce is set to INTernal.

***RST** 1000 Hz

Range Please refer to the Data Sheet.

Unit Hz

FM:EXTernal:SOURce

`[:SOURce<ch>]:FM:EXTernal:SOURce AIN<ch>`

`[:SOURce<ch>]:FM:EXTernal:SOURce?`

Sets the AIN channel source for the frequency modulation signal.

***RST** AIN1

FM:INTernal:FREQuency

`[:SOURce<ch>]:FM:INTernal:FREQuency <float>`

`[:SOURce<ch>]:FM:INTernal:FREQuency?`

Sets the frequency modulation rate in Hz. This setting will be used if [:SOURce<ch>]:FM:SOURce is set to INTernal.

***RST** 400 Hz

Range Please refer to the Data Sheet.

Unit Hz

FM:INTernal:SHAPe

`[:SOURce]:FM:INTernal:SHAPe RD|RU|SINE|SQUare|TRIangle`

`[:SOURce]:FM:INTernal:SHAPe?`

Specifies the FM modulation shape.

RD	Selects ramp down.
RU	Selects ramp up.
SINE	Selects sine wave.
SQUare	Selects square wave.
TRIangle	Selects triangle wave.

***RST** SINE

FM:SENSitivity

`[:SOURce<ch>]:FM:SENSitivity <float>`

`[:SOURce<ch>]:FM:SENSitivity?`

Sets the frequency modulation deviation per one volt peak amplitude signal input. This setting will be used if [:SOURce<ch>]:FM:SOURce is set to EXTernal.

***RST** 1000 Hz/V

Range Please refer to the Data Sheet.

Unit Hz/V

FM:SOURce

`[:SOURce<ch>]:FM:SOURce INTernal|EXTernal`

`[:SOURce<ch>]:FM:SOURce?`

Selects the FM modulation signal source.

INTernal	An internal modulation signal is applied.
EXTernal	The device's frequency modulation input is activated.

***RST** EXTernal

FM:STATe

[:SOURce<ch>]:FM:STATe ON|OFF|1|0

[:SOURce<ch>]:FM:STATe?

Turns the frequency modulation on or off.

***RST** OFF

[:SOURce<ch>]:FREQuency Subsystem

Command	Parameters	Unit	Default
[:SOURce<ch>]:FREQuency:CENTer	<float>	Hz	1.5 GHz
[:SOURce<ch>]:FREQuency[:FIXed|CW]	<float>	Hz	100 MHz/1 GHz
[:SOURce<ch>]:FREQuency:MODE	FIXed|CW|SWEep|LIST| CHIRp		FIXed
[:SOURce<ch>]:FREQuency:SPAN	<float>	Hz	1 GHz
[:SOURce<ch>]:FREQuency:STARt	<float>	Hz	1 GHz
[:SOURce<ch>]:FREQuency:STEP	<float>	Hz	1 GHz
[:SOURce<ch>]:FREQuency:STOP	<float>	Hz	2 GHz

FREQuency:CENTer

[:SOURce<ch>]:FREQuency:CENTer <float>

[:SOURce<ch>]:FREQuency:CENTer?

Sets the sweep center frequency.

***RST** 1.5 GHz

Range Please refer to the Data Sheet.

Unit Hz

FREQuency[:FIXed|CW]

[:SOURce<ch>]:FREQuency[:CW] <float>

[:SOURce<ch>]:FREQuency[:CW]?

Sets the AP Vector Signal Generator output frequency for the CW frequency mode.

***RST** 1 GHz

Range Please refer to the Data Sheet.

Unit Hz

FREQuency:MODE

[:SOURce<ch>]:FREQuency:MODE FIXed|CW|SWEep|LIST|CHIRp

[:SOURce<ch>]:FREQuency:MODE?

Sets the frequency mode of the AP Vector Signal Generator to CW, (list) sweep or chirp.

FIXed or CW	Selects fixed frequency operation and stops an active frequency sweep or chirp.
SWEep or LIST	Selects the swept frequency mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or SWEep frequency sweep. In SWEep mode, frequency will be determined by programmed values for the :STARt and :STOP :FREQuency subsystem commands.

***RST** FIXed

FREQuency:SPAN

[:SOURce<ch>]:FREQuency:SPAN <float>

[:SOURce<ch>]:FREQuency:SPAN?

Sets the frequency sweep span.

***RST** 1 GHz

Range Please refer to the Data Sheet.

Unit Hz

FREQuency:STARt

[:SOURce<ch>]:FREQuency:STARt <float>

[:SOURce<ch>]:FREQuency:STARt?

Sets the first frequency point in a chirp or step sweep.

***RST** 1 GHz

Range Please refer to the Data Sheet.

Unit Hz

FREQuency:STEP

[:SOURce<ch>]:FREQuency:STEP <float>

[:SOURce<ch>]:FREQuency:STEP?

Sets the frequency step size for sweeps and chirps.

***RST** 1 GHz

Range Please refer to the Data Sheet.

Unit Hz

FREQuency:STOP

[:SOURce<ch>]:FREQuency:STOP <float>

[:SOURce<ch>]:FREQuency:STOP?

Sets the last frequency point in a chirp or step sweep.

***RST** 2 GHz

Range Please refer to the Data Sheet.

Unit Hz

[:SOURce<ch>]:ILS Subsystem

NOTE Applies to the AP5041A and AP5042A with Option 302 only.

This subsystem provides ILS glide slope and localizer signal generation.

Command	Parameters	Unit	Default
[:SOURce<ch>]:ILS:GS:AM0[:DEPTh]	<float>	1|PCT	0.4
[:SOURce<ch>]:ILS:GS:AM0:FREQuency	<float>	Hz	90 Hz
[:SOURce<ch>]:ILS:GS:AM0:STATe	ON|OFF|1|0		ON
[:SOURce<ch>]:ILS:GS:AM1[:DEPTh]	<float>	1|PCT	0.4
[:SOURce<ch>]:ILS:GS:AM1:FREQuency	<float>	Hz	150 Hz
[:SOURce<ch>]:ILS:GS:AM1:STATe	ON|OFF|1|0		ON
[:SOURce<ch>]:ILS:GS:DDM	<float>	A	0 A
[:SOURce<ch>]:ILS:GS:DDM:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:ILS:GS:DEFault			
[:SOURce<ch>]:ILS:GS:SDM	<float>	1|PCT	0.8
[:SOURce<ch>]:ILS:GS[:STATe]	ON|OFF|1|0		OFF
[:SOURce<ch>]:ILS:GS:TEST	DDM0|UP|DOWN|FLAG		
[:SOURce<ch>]:ILS:LOCalizer:AM0[:DEPTh]	<float>	1|PCT	0.2
[:SOURce<ch>]:ILS:LOCalizer:AM0:FREQuency	<float>	Hz	90 Hz
[:SOURce<ch>]:ILS:LOCalizer:AM0:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:ILS:LOCalizer:AM1[:DEPTh]	<float>	1|PCT	0.2
[:SOURce<ch>]:ILS:LOCalizer:AM1:FREQuency	<float>	Hz	150 Hz
[:SOURce<ch>]:ILS:LOCalizer:AM1:PHASe	<float>	rad|deg	0 rad
[:SOURce<ch>]:ILS:LOCalizer:AM1:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:ILS:LOCalizer:DDM	<float>	A	0 A
[:SOURce<ch>]:ILS:LOCalizer:DDM:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:ILS:LOCalizer:DEFault			
[:SOURce<ch>]:ILS:LOCalizer:IDEN	<"string">		"ANAP"
[:SOURce<ch>]:ILS:LOCalizer:IDEN:DEPTh	<float>	1|PCT	0.1
[:SOURce<ch>]:ILS:LOCalizer:IDEN:FREQuency	<float>	Hz	1020 Hz

Command	Parameters	Unit	Default
[:SOURce<ch>]:ILS:LOCalizer:IDEN:MODE	PERiodic|CONTinuous		PERiodic
[:SOURce<ch>]:ILS:LOCalizer:IDEN:PERiod	<float>	s	20 s
[:SOURce<ch>]:ILS:LOCalizer:IDEN:STATE	ON|OFF|1|0		OFF
[:SOURce<ch>]:ILS:LOCalizer:SDM	<float>	1|PCT	0.4
[:SOURce<ch>]:ILS:LOCalizer[:STATe]	ON|OFF|1|0		OFF
[:SOURce<ch>]:ILS:LOCalizer:TEST	DDM0|LEFT|RIGHt| FLAG		

ILS:GS:AM0[:DEPTh]

`[:SOURce<ch>]:ILS:GS:AM0[:DEPTh] <float>`

`[:SOURce<ch>]:ILS:GS:AM0[:DEPTh]?`

Sets the AM0 (nominal 90 Hz upper beam) glide slope amplitude modulation depth.

***RST** 0.4

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:GS:AM0:FREQuency

`[:SOURce<ch>]:ILS:GS:AM0:FREQuency <float>`

`[:SOURce<ch>]:ILS:GS:AM0:FREQuency?`

Sets the frequency of the AM0 (nominal 90 Hz upper beam) ILS glide slope modulation.

***RST** 90 Hz

Range 88 to 92 Hz

Unit Hz

ILS:GS:AM0:STATe

`[:SOURce<ch>]:ILS:GS:AM0:STATe ON|OFF|1|0`

`[:SOURce<ch>]:ILS:GS:AM0:STATe?`

Turns the AM0 (nominal 90 Hz upper beam) ILS glide slope modulation signal on or off.

***RST** ON

ILS:GS:AM1[:DEPTh]

[:SOURce<ch>]:ILS:GS:AM1[:DEPTh] <float>

[:SOURce<ch>]:ILS:GS:AM1[:DEPTh]?

Sets the AM1 (nominal 150 Hz lower beam) glide slope amplitude modulation depth.

***RST** 0.4

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:GS:AM1:FREQuency

`[:SOURce<ch>]:ILS:GS:AM1:FREQuency <float>`

`[:SOURce<ch>]:ILS:GS:AM1:FREQuency?`

Sets the frequency of the AM1 (nominal 150 Hz lower beam) glide slope modulation depth.

***RST** 150 Hz

Range 147 to 153 Hz

Unit Hz

ILS:GS:AM1:STATe

`[:SOURce<ch>]:ILS:GS:AM1:STATe ON|OFF|1|0`

`[:SOURce<ch>]:ILS:GS:AM1:STATe?`

Turns the AM1 (nominal 150 Hz lower beam) ILS glide slope modulation signal on or off.

***RST** ON

ILS:GS:DDM

`[:SOURce<ch>]:ILS:GS:DDM <float>`

`[:SOURce<ch>]:ILS:GS:DDM?`

Sets the difference in modulation depth between the AM0 (90 Hz upper beam) and the AM1 (150 Hz lower beam) modulation signals. The DDM setting is in amperes (A) receiver electric current equivalent. The available range goes beyond the standard full-scale deflection of -150 to +150 µA.

***RST** 0 A

Range Please refer to the Data Sheet.

Unit A

ILS:GS:DDM:POLarity

`[:SOURce<ch>]:ILS:GS:DDM:POLarity NORMal|INVerted`

`[:SOURce<ch>]:ILS:GS:DDM:POLarity?`

Defines how the difference between the AM0 and AM1 is calculated.

NORMal: The difference in depth is calculated as AM1 (nominal 150 Hz lower beam) depth minus AM0 (nominal 90 Hz).

INVerted: The difference in depth is calculated as AM0 (nominal 90 Hz upper beam) depth minus AM1 (nominal 150 Hz).

***RST** NORMal

ILS:GS:DEFault

`[:SOURce<ch>]:ILS:GS:DEFault`

Sets all parameters of the ILS:GS subsystem to their default values without changes any other values.

ILS:GS:SDM

`[:SOURce<ch>]:ILS:GS:SDM <float>`

`[:SOURce<ch>]:ILS:GS:SDM?`

Sets the sum of modulation depths of the AM0 (nominal 90 Hz upper beam) and the AM1 (nominal 150 Hz lower beam) modulation signals.

***RST** 0.8

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:GS[:STATe]

`[:SOURce<ch>]:ILS:GS[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:ILS:GS[:STATe]?`

Enables or disables the ILS glide slope modulation.

***RST** OFF

ILS:GS:TEST

`[:SOURce<ch>]:ILS:GS:TEST DDM0|UP|DOWN|FLAG`

Selects a predefined ILS glide slope test setting. It overrides all ILS glideslope settings except state.

ILS:LOCalizer:AM0[:DEPTh]

`[:SOURce<ch>]:ILS:LOCalizer:AM0[:DEPTh] <float>`

`[:SOURce<ch>]:ILS:LOCalizer:AM0[:DEPTh]?`

Sets the AM0 (nominal 90 Hz left beam) localizer amplitude modulation depth.

***RST** 0.2

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:LOCalizer:AM0:FREQuency

`[:SOURce<ch>]:ILS:LOCalizer:AM0:FREQuency <float>`

`[:SOURce<ch>]:ILS:LOCalizer:AM0:FREQuency?`

Sets the AM0 (nominal 90 Hz left beam) ILS localizer modulation signal.

***RST** 90 Hz

Range 88 to 92 Hz

Unit Hz

ILS:LOCalizer:AM0:STATe

`[:SOURce<ch>]:ILS:LOCalizer:AM0:STATe ON|OFF|1|0`

`[:SOURce<ch>]:ILS:LOCalizer:AM0:STATe?`

Turns the AM0 (nominal 90 Hz left beam) ILS localizer modulation signal on or off.

***RST** OFF

ILS:LOCalizer:AM1[:DEPTh]

`[:SOURce<ch>]:ILS:LOCalizer:AM1[:DEPTh] <float>`

`[:SOURce<ch>]:ILS:LOCalizer:AM1[:DEPTh]?`

Sets the AM1 (nominal 150 Hz right beam) localizer amplitude modulation depth.

***RST** 0.2

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:LOCalizer:AM1:FREQuency

`[:SOURce<ch>]:ILS:LOCalizer:AM1:FREQuency <float>`

`[:SOURce<ch>]:ILS:LOCalizer:AM1:FREQuency?`

Sets the AM1 (nominal 150 Hz right beam) ILS localizer modulation signal.

***RST** 150 Hz

Range 147 to 153 Hz

Unit Hz

ILS:LOCalizer:AM1:PHASe

`[:SOURce<ch>]:ILS:LOCalizer:AM1:PHASe <float>`

`[:SOURce<ch>]:ILS:LOCalizer:AM1:PHASe?`

Sets the AM1 (nominal 150 Hz right beam) signal (relative to AM0).

***RST** 0 rad

Range Please refer to the Data Sheet.

Unit rad|deg

ILS:LOCalizer:AM1:STATe

`[:SOURce<ch>]:ILS:LOCalizer:AM1:STATe ON|OFF|1|0`

`[:SOURce<ch>]:ILS:LOCalizer:AM1:STATe?`

Turns the AM1 (nominal 150 Hz right beam) ILS localizer modulation signal on or off.

***RST** OFF

ILS:LOCalizer:DDM

`[:SOURce<ch>]:ILS:LOCalizer:DDM <float>`

`[:SOURce<ch>]:ILS:LOCalizer:DDM?`

Sets the difference in modulation depth between the AM0
(90 Hz left beam) and the AM1 (150 Hz right beam) modulation signals. The DDM setting is in amperes (A) receiver electric current equivalent. The available range goes beyond the standard full-scale deflection of -150 to +150 µA.

***RST** 0 A

Range Please refer to the Data Sheet.

Unit A

ILS:LOCalizer:DDM:POLarity

`[:SOURce<ch>]:ILS:LOCalizer:DDM:POLarity NORMal|INVerted`

`[:SOURce<ch>]:ILS:LOCalizer:DDM:POLarity?`

Defines how the difference between the AM0 and AM1 is calculated.

NORMal: The difference in depth is calculated as AM1 (nominal 150 Hz lower beam) depth minus AM0 (nominal 90 Hz) depth.

INVerted: The difference in depth is calculated as AM0 (nominal 90 Hz upper beam) depth minus AM1 (nominal 150 Hz) depth.

***RST** NORMal

ILS:LOCalizer:DEFault

`[:SOURce<ch>]:ILS:LOCalizer:DEFault`

Sets all parameters of the ILS:LOC subsystem to their default values without changing others default values.

ILS:LOCalizer:IDEN:DEPTh

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:DEPTh <float>`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:DEPTh?`

Sets the subcarrier amplitude modulation depth for the identification code transmission.

***RST** 0.1

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:LOCalizer:IDEN

`[:SOURce<ch>]:ILS:LOCalizer:IDEN <"string">`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN?`

Sets the Morse coded four characters long ILS localizer identification string. The string has SCPI string format (surrounded by quotation marks).

***RST** "ANAP"

ILS:LOCalizer:IDEN:FREQuency

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:FREQuency <float>`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:FREQuency?`

Sets the carrier frequency of the IDEN, that must be a multiple of 30 Hz.

***RST** 1020 Hz

Range Please refer to the Data Sheet.

Unit Hz

ILS:LOCalizer:IDEN:MODE

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:MODE PERiodic|CONTinuous`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:MODE?`

Selects the ILS localizer identification transmission repetition mode.

PERiodic	The identification is transmitted periodically every 20 seconds.
CONTinuous	The identification is transmitted continuously with 7 Morse dots pause between transmissions.

***RST** PERiodic

ILS:LOCalizer:IDEN:PERiod

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:PERiod <float>`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:PERiod?`

Sets the period where the ident is repeated. The period must be a multiple of 1/3 s.

***RST** 20 s

Range Please refer to the Data Sheet.

Unit s

ILS:LOCalizer:IDEN:STATe

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:MODE ON|OFF|1|0`

`[:SOURce<ch>]:ILS:LOCalizer:IDEN:MODE?`

Enables or disables transmission of the Morse coded ILS localizer identification string.

***RST** OFF

ILS: LOCalizer:SDM

`[:SOURce<ch>]:ILS:LOCializer:SDM <float>`

`[:SOURce<ch>]:ILS:LOCializer:SDM?`

Sets the sum of modulation depths of the AM0 (nominal 90 Hz left beam) and the AM1 (nominal 150 Hz right beam) modulation signals.

***RST** 0.4

Range Please refer to the Data Sheet.

Unit 1|PCT

ILS:LOCalizer[:STATe]

`[:SOURce<ch>]:ILS:LOC[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:ILS:LOC[:STATe]?`

Enables or disables the ILS localizer modulation.

***RST** OFF

ILS: LOCalizer:TEST

`[:SOURce<ch>]:ILS:LOC:TEST DDM0|LEFT|RIGHT|FLAG`

Selects a predefined ILS localizer test setting. It overrides all ILS localizer settings except state.

[:SOURce<ch>]:IQ Subsystem

The IQ subsystem controls the IQ modulator.

Command	Parameters	Unit	Default
[:SOURce<ch>]:IQ:CRESt:AUTOmatic?		dB	
[:SOURce<ch>]:IQ:CRESt:AWGN?		dB	
[:SOURce<ch>]:IQ:CRESt:MANual	<float>	dB	0 dB
[:SOURce<ch>]:IQ:CRESt:TOTal?		dB	
[:SOURce<ch>]:IQ:STATe	ON|OFF|1|0		ON

IQ:CRESt:AUTOmatic?

`[:SOURce<ch>]:IQ:CRESt:AUTOmatic?`

Queries the crest factor value of the last active automatic crest factor correction Not including AWGN crest Factor. Available for modulations: CIQ, IVM, ANLG, DME, ILS, VOR

Unit dB

IQ:CRESt:AWGN?

`[:SOURce<ch>]:IQ:CRESt:AWGN?`

Queries the crest factor value for AWGN (additive crest Factor of Noise).

Unit dB

IQ:CRESt:MANual

`[:SOURce<ch>]:IQ:CRESt:MANual <float>`

`[:SOURce<ch>]:IQ:CRESt:MANual?`

Sets the crest factor manually to compensate for the RMS value of an active IQ modulation. Only active while a modulation with manual crest factor is enabled. Returns the set value, regardless of which modulation is active.

***RST** 0 dB

Range Please refer to the Data Sheet.

Unit dB

IQ:CRESt:TOTal?

`[:SOURce<ch>]:IQ:CRESt:TOTal?`

Queries the current active total crest factor value.

Unit dB

IQ:STATe

`[:SOURce<ch>]:IQ:STATe ON|OFF|1|0`

`[:SOURce<ch>]:IQ:STATe?`

Enables or disables all IQ modulations.

***RST** ON

[:SOURce<ch>]:MF Subsystem

This command subsystem controls the multi-function inputs and outputs.

Command	Parameters	Unit	Default
[:SOURce<ch>]:MF:COUNt?			
[:SOURce<ch>]:MF<index>:INPut:STATe?			
[:SOURce<ch>]:MF<index>:OUTPut:ARBitrary:SOURce	MARKer|TRIGger		MARKer
[:SOURce<ch>]:MF<index>:OUTPut:MARKer:SOURce	<integer>		1
[:SOURce<ch>]:MF<index>:OUTPut:PULModulation:SOURce	VIDeo|TRIGger		VIDeo
[:SOURce<ch>]:MF<index>:OUTPut:SOURce	LOW|HIGH| PULModulation| ARBitrary		LOW
[:SOURce<ch>]:MF<index>:OUTPut:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:MF<index>:OUTPut:SWEep:SOURce	VALid|TRIGger		VALid

MF:COUNt?

`[:SOURce<ch>]:MF:COUNt?`

Returns the number of multi-function outputs of the device.

MF<index>:INPut:STATe?

`[:SOURce<ch>]:MF<index>:INPut:STATe?`

Returns the actual digital value of the multi-function input. 1: Logic high, 0: Logic low. The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

MF<index>:OUTPut:ARBitrary:SOURce

`[:SOURce<ch>]:MF<index>:OUTPut:ARBitrary:SOURce MARKer|TRIGger`

`[:SOURce<ch>]:MF<index>:OUTPut:ARBitrary:SOURce?`

Selects the source from the arbitrary modulation system that is assigned to the selected multi-function output.

The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

MARKer	The marker signal from the arbitrary modulation system is selected as the source for the multi-function output.

TRIGger	The trigger signal from the arbitrary modulation system is selected as the source for the multi-function output. (For future use.)

***RST** MARKer

MF<index>:OUTPut:MARKer:SOURce

`[:SOURce<ch>]:MF<index>:OUTPut:MARKer:SOURce <integer>`

`[:SOURce<ch>]:MF<index>:OUTPut:MARKer:SOURce?`

Selects the maker bit from the marker system that is assigned to the multi-function output. The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

***RST** 1

Range 1 to maximum marker bit (Refer to the Data Sheet.)

MF<index>:OUTPut:PULModulation:SOURce

`[:SOURce<ch>]:MF<index>:OUTPut:PULModulation:SOURce VIDeo|TRIGger`

`[:SOURce<ch>]:MF<index>:OUTPut:PULModulation:SOURce?`

Selects the source from the pulse modulation system that is assigned to the multi-function output. The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

VIDeo	The video signal from the pulse modulation system is selected as the source for the multi-function output.
TRIGger	The trigger signal from the pulse modulation system is selected as the source for the multi-function output. (For future use.)

***RST** VIDeo

MF<index>:OUTPut:SOURce

`[:SOURce<ch>]:MF<index>:OUTput:SOURce LOW|HIGH|PULModulation|ARBitrary`

`[:SOURce<ch>]:MF<index>:OUTput:SOURce?`

Selects the source signal of a multi-function output.

The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

LOW	The selected multi-function output's signal is a logic low (low voltage).
HIGH	The selected multi-function output's signal is a logic high (high voltage).
PULModulation	The selected multi-function output's signal is the pulse modulation system output signal. Use the [:SOURce<ch>]:MF<index>:OUTPut:PULModulation:SOURce command to configure the pulse modulation system output.
ARBitrary	The selected multi-function output's signal is the arbitrary modulation system output signal. Use the [:SOURce<ch>]:MF<index>:OUTPut:ARBitrary:SOURce command to configure the arbitrary modulation system output.

***RST** LOW

MF<index>:OUTPut:STATe

`[:SOURce<ch>]:MF<index>:OUTPut:STATe ON|OFF|1|0`

`[:SOURce<ch>]:MF<index>:OUTPut:STATe?`

Disables or enables a multi-function output.

The <index> suffix selects an individual output. The range is 1 to MF:COUNt?. If <index> is omitted it defaults to 1.

***RST** OFF

MF<index>:OUTPut:SWEep:SOURce

`[:SOURce<ch>]:MF<index>:OUTPut:SOURce VALid|TRIGger`

`[:SOURce<ch>]:MF<index>:OUTPut:SOURce?`

Sets the source from the sweep system that is assigned to the multi-function output. The <index> suffix selects an individual output. The range is 1 to [:SOURce<ch>]:MF:COUNt.

VALid	The valid signal from the sweep modulation system is selected as the source for the multi-function output. This represents the RF signal state (high = RF on).
TRIGger	The trigger signal from the sweep modulation system is selected as the source for the multi-function output.

***RST** VALid

[:SOURce<ch>]:PHASe Subsystem

Command	Parameters	Unit	Default
[:SOURce<ch>]:PHASe[:ADJust]	<float>	rad|deg	0 rad
[:SOURce<ch>]:PHASe:MEMory:RESTart			
[:SOURce<ch>]:PHASe:MEMory:STATe	ON|OFF|1|0		ON
[:SOURce<ch>]:PHASe:MODE	FIXed|CW|SWEep|LIST		FIXed
[:SOURce<ch>]:PHASe:PCM:COMMit			
[:SOURce<ch>]:PHASe:PCM:FREQuency:REFerence:LIST?			
[:SOURce<ch>]:PHASe:PCM:POWer:REFerence:LIST?			
[:SOURce<ch>]:PHASe:PCM[STATe]	ON|OFF|1|0		unchanged
[:SOURce<ch>]:PHASe:STARt	<float>	**rad**|deg	0 rad
[:SOURce<ch>]:PHASe:STEP?		rad	
[:SOURce<ch>]:PHASe:STOP	<float>	**rad**|deg	6.28 rad

PHASe[:ADJust]

`[:SOURce<ch>]:PHASe[:ADJust] <float>`

`[:SOURce<ch>]:PHASe[:ADJust]?`

Adjusts the phase of the signal.

***RST** 0 rad

Range Please refer to the Data Sheet.

Unit rad|deg

PHASe:MEMory:RESTart

`[:SOURce<ch>]:PHASe:MEMory:RESTart`

For devices with option PHS this command restarts phase memory. Phase memory aligns the output signal phase such that for any frequency a zero crossing occurs at the same reference point in time. Restart resets this reference point in time.

PHASe:MEMory:STATe

`[:SOURce<ch>]:PHASe:MEMory:STAT ON|OFF|1|0`

`[:SOURce<ch>]:PHASe:MEMory:STATe?`

Enables or disables phase memory and thus phase coherent switching.

Disabling phase memory (phase coherent switching) improves frequency switching speed for applications that do not require deterministic RF output phases. Please refer to the Data Sheet for details.

This command is available for devices featuring the PHS (phase coherent switching) only.

***RST** ON

PHASe:MODE

`[:SOURce<ch>]:PHASe:MODE FIXed|CW|SWEep|LIST`

`[:SOURce<ch>]:PHASe:MODE?`

Sets the phase mode of the AP Vector Signal Generator to CW or (list) sweep.

FIXed|CW	Selects fixed phase operation and stops an active phase sweep.
SWEep|LIST	Selects the swept phase mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or SWEep phase sweep. In SWEep mode, phase will be determined by programmed values for the :STARt and :STOP :PHASe subsystem commands. Use the [:SOURce<ch>]:SWEep Subsystem commands for sweep configuration. Use the [:SOURce<ch>]:ILS Subsystem commands for list sweep configuration.

***RST** FIXed

PHASe:PCM:COMMit

`[:SOURce<ch>]:PHASe:PCM:COMMit`

Commits phase calibration mode (PCM) state and the phase correction table updates to the UFS (ultra fast switching) system. The command is an alias to :MEMory:CORRection:PHASe:COMMit that also commits changes to the UFS system.

PCM state is also activated on power up, so power cycling the unit after enabling PCM has the same effect. Execution of this command may take up to 60 seconds. This command is available only to devices with option PCM.

PHASe:PCM:FREQuency:REFerence:LIST?

`[:SOURce<ch>]:PHASe:PCM:FREQency:REFerence:LIST?`

Queries the available phase calibration mode reference frequencies. The data is formatted as comma separated values.

Unit Hz

PHASe:PCM:POWer:REFerence:LIST?

`[:SOURce<ch>]:PHASe:PCM:POWer:REFerence:LIST?`

Queries the available phase calibration mode reference power levels. The data is formatted as comma separated values.

Unit dBm

PHASe:PCM[:STATe]

`[:SOURce<ch>]:PHASe:PCM[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:PHASe:PCM[:STATe]?`

Sets or queries phase calibration mode (PCM).

Once enabled, phase calibration mode always remains active, this setting is not changed by power down, power up, or reset commands.

***RST** Unchanged

PHASe:STARt

`[:SOURce<ch>]:PHASe:STARt <float>`

`[:SOURce<ch>]:PHASe:STARt?`

Sets the first phase point in the sweep.

***RST** 0 rad

Range Please refer to the Data Sheet.

Unit rad|deg

PHASe:STEP?

`[:SOURce<ch>]:PHASe:STEP?`

Returns the phase step size for a sweep.

Unit rad

PHASe:STOP

`[:SOURce<ch>]:PHASe:STOP <float>`

`[:SOURce<ch>]:PHASe:STOP?`

Sets the last phase point in a sweep.

***RST** 6.28 rad

Range Please refer to the Data Sheet.

Unit rad|deg

[:SOURce<ch>]:POWer Subsystem

Command	Parameters	Unit	Default
[:SOURce<ch>]:POWer:ALC:HOLD	ON|OFF|1|0		-
[:SOURce<ch>]:POWer:ALC:HOLD:AUTO	ON|OFF|1|0		ON
[:SOURce<ch>]:POWer:ALC:SEARch	ON|OFF|1|0|ONCE		ON
[:SOURce<ch>]:POWer:ALC[:STATe]	ON|OFF|1|0		ON
[:SOURce<ch>]:POWer:ATTenuation	<float>	dB	0 dB
[:SOURce<ch>]:POWer:ATTenuation:AUTO	ON|OFF|1|0		ON
[:SOURce<ch>]:POWer:ATTenuation:LIST?			
[:SOURce<ch>]:POWer[:LEVel][:IMMediate][:AMPLitude]	<float>	dBm|...	0 dBm
[:SOURce<ch>]:POWer:MODE	FIXed|CW|LIST|SWEep		FIXed
[:SOURce<ch>]:POWer:PEP	<float>	dBm|...	0 dBm
[:SOURce<ch>]:POWer:STARt	<float>	dBm|...	-20 dBm
[:SOURce<ch>]:POWer:STEP?		dB	
[:SOURce<ch>]:POWer:STOP	<float>	dBm|...	+10 dBm

POWer:ALC:HOLD

`[:SOURce<ch>]:POWer:ALC:HOLD ON|OFF|1|0`

`[:SOURce<ch>]:POWer:ALC:HOLD?`

Sets the automatic level control into hold mode. The amplitude level control loop is open. ALC hold can improve power stability when fast sweeps or modulations are active. When automatic ALC hold mode selection is active, the device chooses the appropriate ALC hold setting automatically.

Setting the ALC hold state manually disables automatic ALC hold mode selection. Refer to the "POWer:ALC:HOLD:AUTO" command. For information about how to use different ALC modes please refer to application note AN3005.

POWer:ALC:HOLD:AUTO

`[:SOURce<ch>]:POWer:ALC:HOLD:AUTO ON|OFF|1|0`

`[:SOURce<ch>]:POWer:ALC:HOLD:AUTO?`

Disables or enables automatic ALC hold mode selection. Enabling automatic ALC hold mode selection lets the device select the appropriate ALC hold mode setting. Refer to the "POWer:ALC:HOLD" command. For information about how to use different ALC modes please refer to application note AN3005.

***RST** ON

POWer:ALC:SEARch

`[:SOURce<ch>]:POWer:ALC:SEARch ON|OFF|1|0|ONCE`

`[:SOURce<ch>]:POWer:ALC:SEARch?`

Controls when the level correction occurs in ALC Hold On mode. See "POWer:ALC:HOLD" command.

ON | 1	The ALC search is performed immediately when the frequency or the power is changed.
OFF | 0	No ALC search is performed unless the ALC search is set to on (ON|1) or the ALC search is triggered manually (ONCE).
ONCE	Triggers an ALC search immediately.

***RST** ON

POWer:ALC[:STATe]

`[:SOURce<ch>]:POWer:ALC[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:POWer:ALC[:STATe]?`

Turns the ALC (automatic leveling control) on or off. Specified output power is guaranteed only with ALC on. For information about how to use different ALC modes please refer to application note AN3005.

***RST** ON

POWer:ATTenuation

`[:SOURce<ch>]:POWer:ATTenuation <float>`

`[:SOURce<ch>]:POWer:ATTenuation?`

(Devices with options 1E1, 2E1, 1E2, 2E2, 3E2 only)

Sets the power range extension attenuator. This command will also turn off the automatic attenuation setting. Refer to "POWer:ATTenuation:AUTO" for details. Attenuator input RF power will be in the power range with no external attention option as specified in the Data Sheet. Typical range is -20 to +10 dBm. For example, using a "POWer:ATTenuation" value of 50 dB, the output RF power range is -70 to -40 dBm.

***RST** 0 dB

Range Please refer to the Data Sheet.

Unit dB

POWer:ATTenuation:AUTO

`[:SOURce<ch>]:POWer:ATTenuation:AUTO ON|OFF|1|0`

`[:SOURce<ch>]:POWer:ATTenuation:AUTO?`

(Devices with options 1E1, 2E1, 1E2, 2E2, 3E2 only)

Turns the power range extension on or off. Turning it off allows fast power sweeps for devices featuring an extended output power range, but the programmable output power range is reduced. See "POWer:ATTenuation" for details. Turning it on will immediately restore the automatic power range extension setting for the currently active "POWer[:LEVel][:IMMediate][:AMPLitude]" output power setting.

***RST** ON

POW:ATTenuation:LIST?

`[:SOURce<ch>]:POWer:ATTenuation:LIST?`

(Devices with options 1E1, 2E1, 1E2, 2E2, 3E2 only)

Returns a comma-separated list of available attenuation settings. These can be selected using the [SOURce<ch>]:POWer:ATTenuation command. For devices with options 1E2, 2E2, 3E2, it returns 2 values:

– The step in dB at which the PE attenuation can be incremented.

– The maximum attenuation in dB that can be set.

Refer to the Data Sheet for a list of available settings.

POWer[:LEVel][:IMMediate][:AMPLitude]

`[:SOURce<ch>]:POWer[:LEVel][:IMMediate][:AMPLitude] <float>`

`[:SOURce<ch>]:POWer[:LEVel][:IMMediate][:AMPLitude]?`

Sets the RF output power.

***RST** 0 dBm

Range Please refer to the Data Sheet.

Unit dBm|dBu|dBW|W|dBuV|dBmV|dBV|V|dBuA|dBmA|dBA|A

POWer:MODE

`[:SOURce<ch>]:POWer:MODE FIXed|CW|LIST|SWEep`

`[:SOURce<ch>]:POWer:MODE?`

Sets the AP Vector Signal Generator power mode to CW or (list) sweep.

FIXed | CW	Selects fixed power operation and stops an active power sweep.

SWEep or LIST	Selects the swept power mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or SWEep power sweep. In SWEep mode, power will be determined by programmed values for the :STARt and :STOP :POWer subsystem commands.

***RST** FIXed

POWer:PEP

`[:SOURce<ch>]:POWer:PEP <float>`

`[:SOURce<ch>]:POWer:PEP?`

Sets the Peak Envelope Power (PEP).

***RST** 0 dBm

Range Please refer to the Data Sheet.

Unit dBm|dBu|dBW|W|dBuV|dBmV|dBV|V|dBuA|dBmA|dBA|A

POWer:STARt

[:SOURce<ch>]:POWer:STARt <float>

[:SOURce<ch>]:POWer:STARt?

Sets the first amplitude point in a sweep.

***RST** -20 dBm

Range Please refer to the Data Sheet.

Unit dBm|dBu|dBW|W|dBuV|dBmV|dBV|V|dBuA|dBmA|dBA|A

POWer:STEP?

`[:SOURce<ch>]:POWer:STEP[:LINear]?`

Queries the amplitude step size for a sweep.

Unit dB

POWer:STOP

`[:SOURce<ch>]:POWer:STOP` <float>

`[:SOURce<ch>]:POWer:STOP?`

Sets the last amplitude point in a sweep.

***RST** 10 dBm

Range Please refer to the Data Sheet.

Unit dBm|dBu|dBW|W|dBuV|dBmV|dBV|V|dBuA|dBmA|dBA|A

[:SOURce<ch>]:PM Subsystem (Phase Modulation)

Command	Parameters	Unit	Default
[:SOURce<ch>]:PM:DEViation	<float>	rad	2.4048 rad
[:SOURce<ch>]:PM:INTernal:FREQuency	<float>	Hz	400 Hz
[:SOURce<ch>]:PM:INTernal:SHAPe	RD|RU|SINE|SQUare|TRIangle		SINE
[:SOURce<ch>]:PM:SENSitivity	<float>	rad/V	2.4048 rad/V
[:SOURce<ch>]:PM:SOURce	EXTernal|INTernal		EXTernal
[:SOURce<ch>]:PM:STATe	ON|OFF|1|0		OFF

PM:DEViation

`[:SOURce<ch>]:PM:DEViation <float>`

`[:SOURce<ch>]:PM:DEViation?`

Sets the phase modulation deviation. This setting will be used if [:SOURce<ch>]:PM:SOURce is set to INTernal.

***RST** 2.4048 rad

Range Please refer to the Data Sheet.

Unit rad

PM:INTernal:FREQuency

`[:SOURce<ch>]:PM:INTernal:FREQuency <float>`

`[:SOURce<ch>]:PM:INTernal:FREQuency?`

Sets the phase modulation rate in Hz. This setting will be used if [:SOURce<ch>]:PM:SOURce is set to INTernal.

***RST** 400 Hz

Range Please refer to the Data Sheet.

Unit Hz

PM:INTernal:SHAPe

`[:SOURce<ch>]:PM:INTernal:SHAPe RD|RU|SINE|SQUare|TRIangle`

`[:SOURce<ch>]:PM:INTernal:SHAPe?`

Specifies the PM modulation shape.

RD Selects ramp down.

RU	Selects ramp up.
SINE	Selects sine wave.
SQUare	Selects square wave.
TRIangle	Selects triangle wave.

***RST** SINE

PM:SENSitivity

`[:SOURce<ch>]:PM:SENSitivity <float>`

`[:SOURce<ch>]:PM:SENSitivity?`

Sets the phase modulation deviation per one volt peak amplitude signal input. This setting will be used if [:SOURce<ch>]:PM:SOURce is set to EXTernal.

***RST** 2.4048 rad/V

Range Please refer to the Data Sheet.

Unit rad/V

PM:SOURce

`[:SOURce<ch>]:PM:SOURce EXTernal|INTernal`

`[:SOURce<ch>]:PM:SOURce?`

Selects the PM modulation signal source.

INTernal	An internal modulation signal is applied.
EXTernal	The device's phase modulation input is activated.

***RST** EXTernal

PM:STATe

`[:SOURce<ch>]:PM:STATe ON|OFF|1|0`

`[:SOURce<ch>]:PM:STATe?`

Turns the phase modulation on or off.

***RST** OFF

[:SOURce<ch>]:PULM Subsystem (Pulse Modulation)

This additional functionality provides pulse modulation of the RF output signal delivered to the load by an internal or external modulation signal. The INTernal selection accesses the internally generated modulation input while EXTernal selects the external pulse input.

Command	Parameters	Unit	Default
[:SOURce<ch>]:PULM:INTernal:FREQuency	<float>	Hz	10 Hz
[:SOURce<ch>]:PULM:INTernal:PERiod	<float>	s	100 ms
[:SOURce<ch>]:PULM:INTernal:PWIDth	<float>	s	50 ms
[:SOURce<ch>]:PULM:MODulator	RF|BB		RF
[:SOURce<ch>]:PULM:OUTPut:VIDeo:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:PULM:OUTPut:VIDeo:SOURce	<integer>		1
[:SOURce<ch>]:PULM:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:PULM:SOURce	INTernal|EXTernal|BITStream		Depends on the model
[:SOURce<ch>]:PULM:STATe	ON|OFF|1|0		OFF

PULM:INTernal:FREQuency

`[:SOURce<ch>]:PULM:INTernal:FREQuency <float>`

`[:SOURce<ch>]:PULM:INTernal:FREQuency?`

Sets the pulse rate for the internally generated square wave.

***RST** 10 Hz

Range Please refer to the Data Sheet.

Unit Hz

PULM:INTernal:PERiod

`[:SOURce<ch>]:PULM:INTernal:PERiod <float>`

`[:SOURce<ch>]:PULM:INTernal:PERiod?`

Sets the pulse period for the internally generated pulse modulation. If the entered value for the pulse period is equal to or less than the value for the pulse width, the pulse width changes to a value that is less than the pulse period.

***RST** 100 ms

Range Please refer to the Data Sheet.

Unit s

PULM:INTernal:PWIDth

`[:SOURce<ch>]:PULM:INTernal:PWIDth <float>`

`[:SOURce<ch>]:PULM:INTernal:PWIDth?`

Sets the pulse width for the internally generated pulse signal. If the entered value for the pulse width is equal to or greater than the value for the pulse period, the pulse width changes to a value that is less than the pulse period.

***RST** 50 ms

Range Please refer to the Data Sheet.

Unit s

PULM:MODulator

`[:SOURce<ch>]:PULM:MODulator RF|BB`

`[:SOURce<ch>]:PULM:MODulator?`

Selects the pulse modulator used.

RF	Selects the RF path modulator. The RF path modulator has best jitter performance but limited on/off ratio.
BB	Selects the base band modulator. The base band modulator has best on/off ratio but adds jitter if an external pulse modulation signal is used. This jitter is caused by sampling the external pulse modulation signal. Sampling occurs at the maximum base band sample clock, see BB:ARBitrary:CLOCk. For internal pulse modulation there is no additional jitter.

***RST** RF

PULM:OUTPut:VIDeo:POLarity

`[:SOURce<ch>]:PULM:OUTPut:VIDeo:POLarity NORMal|INVerted`

`[:SOURce<ch>]:PULM:OUTPut:VIDeo:POLarity?`

Selects the polarity of the pulse modulation video signal output.

NORMal	Pulse modulation video output is high during the pulse (RF on).
INVerted	Pulse modulation video output is low during the pulse (RF on).

***RST** NORMal

PULM:OUTPut:VIDeo:SOURce

`[:SOURce<ch>]:PULM:OUTPut:VIDeo:SOURce <integer>`

`[:SOURce<ch>]:PULM:OUTPut:VIDeo:SOURce?`

For multi channel devices this command selects the source channel for pulse modulation video output.

***RST** 1

Range 1 to number of channels

PULM:POLarity

`[:SOURce<ch>]:PULM:POLarity NORMal|INVerted`

`[:SOURce<ch>]:PULM:POLarity?`

Selects the polarity of the pulse modulation, regardless if the internal or external modulation source is used.

***RST** NORMal

PULM:SOURce

`[:SOURce<ch>]:PULM:SOURce INTernal|EXTernal`

`[:SOURce<ch>]:PULM:SOURce?`

Selects the source of the pulse modulation signal.

INTernal	Selects the internal modulation AP Vector Signal Generator with programmable pulse width and repetition period.
EXTernal	Selects the external pulse modulation signal.

***RST** INTernal

PULM:STATe

`[:SOURce<ch>]:PULM:STATe ON|OFF|1|0`

`[:SOURce<ch>]:PULM:STATe?`

Enables or disables pulse modulation for the selected path.

***RST** OFF

[:SOURce<ch>]:ROSCillator Subsystem

The ROSCillator subsystem configures internal or external frequency reference.

Reference configuration is global and common to all channels for standard multi-channel devices. For those devices channel index <ch> is ignored and shall be omitted.

Command	Parameters	Unit	Default
[:SOURce<ch>]:ROSCillator:EXTernal:FREQuency	<float>	Hz	device specific
[:SOURce<ch>]:ROSCillator:EXTernal:VARiable :FREQuency	<float>	Hz	device specific
[:SOURce<ch>]:ROSCillator:INTernal:TUNing	<float>		device specific
[:SOURce<ch>]:ROSCillator:OUTPut:FREQuency	<float>	Hz	device specific
[:SOURce<ch>]:ROSCillator:OUTPut[:STATe]	ON|OFF|1|0		OFF
[:SOURce<ch>]:ROSCillator:SOURce	INTernal|EXTernal| SLAVe|EXTVariable| CIN		INTernal

ROSCillator:EXTernal:FREQuency

`[:SOURce<ch>]:ROSCillator:EXTernal:FREQuency <float>`

`[:SOURce<ch>]:ROSCillator:EXTernal:FREQuency?`

Conveys the expected reference frequency value of an externally applied reference to the AP Vector Signal Generator.

***RST** device specific

Range Please refer to the Data Sheet.

Unit Hz

ROSCillator:EXTernal:VARiable:FREQuency

`[:SOURce<ch>]:ROSCillator:EXTernal:VARiable:FREQuency <float>`

`[:SOURce<ch>]:ROSCillator:EXTernal:VARiable:FREQuency?`

Conveys the expected reference frequency value of an externally applied reference to the signal generator using the variable external reference system of the device. This is opposite to the standard external reference system which allows just a few specific external frequencies, the variable external reference system allows any external frequency in a specified range.

The variable external reference system is enabled by selecting it as the reference source, see: “ROSCillator:SOURce” EXTVariable.

***RST** device specific

Range Please refer to the Data Sheet

Unit Hz

ROSCillator:INTernal:TUNing

[:SOURce<ch>]:ROSCillator:INTernal:TUNing <float>

[:SOURce<ch>]:ROSCillator:INTernal:TUNing?

Adjusts the internal frequency reference. An adjustment range of approx +/- 2.5 ppm can be used with when setting 0.5 +/- 0.5 increments.

***RST** device specific

Range 0 to 1 (0.5+/-0.5)

ROSCillator:LOCKed?

`[:SOURce<ch>]:ROSCillator:LOCKed?`

Queries if the instrument is locked to the externally applied reference. It is equivalent to checking the frequency bit in "STATus:QUEStionable:CONDition?" and returns a 1 if it is locked and 0 if not.

ROSCillator:OUTPut:FREQuency

[:SOURce<ch>]:ROSC:OUTPut:FREQuency <float>

[:SOURce<ch>]:ROSC:OUTPut:FREQuency?

Selects the reference output frequency.

***RST** device specific

Range Please refer to the Data Sheet.

Unit Hz

ROSCillator:OUTPut[:STATe]

[:SOURce<ch>]:ROSCillator:OUTPut[:STATe] ON|OFF|1|0

[:SOURce<ch>]:ROSCillator:OUTPut[:STATe]?

Enables or disables the frequency reference output.

***RST** OFF

ROSCillator:SOURce

`[:SOURce<ch>]:ROSCillator:SOURce INTernal|EXTernal|SLAVe|EXTVariable|CIN`

`[:SOURce<ch>]:ROSCillator:SOURce?`

Selects the reference clock source.

INTernal	Selects the internal reference oscillator.
EXTernal	Selects the reference input as the reference clock source using the standard external reference system. Option 1ER is disabled (if available) which improves relative phase stability between the reference and the RF output signal. See ROSCillator:EXTernal:FREQuency for the reference input clock setting.
SLAVe	Selects slave mode with fixed 100 MHz reference input clock. The master device must be configured for 100 MHz reference output: ROSCillator:OUTPut[:STATe] set to ON and ROSCillator:OUTPut:FREQuency set to 100 MHz.
EXTVariable	Instruments with Option 1ER support external reference signals to drive the instrument clock source. See ROSCillator:EXTernal:FREQuency for the reference input clock setting.

***RST** INTernal

[:SOURce<ch>]:SWEep Subsystem

Command	Parameters	Unit	Default
[:SOURce<ch>]:SWEep:BLANking	ON|OFF|1|0		ON
[:SOURce<ch>]:SWEep:COUNt	INFinite|<integer>		INFinite
[:SOURce<ch>]:SWEep:DELay	<float>	s	0 s
[:SOURce<ch>]:SWEep:DELay:AUTO	ON|OFF|1|0		OFF
[:SOURce<ch>]:SWEep:DIRection	UP|DOWN|RANDom		UP
[:SOURce<ch>]:SWEep:DWELl	<float>	s	400 µs
[:SOURce<ch>]:SWEep:POINts	<integer>		2
[:SOURce<ch>]:SWEep:SPACing	LINear|LOGarithmic		LINear
[:SOURce<ch>]:SWEep:TRIGger	<float>	s	0 s
[:SOURce<ch>]:SWEep:TRIGger:DELay		s	0 s
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:ABORt			
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:EXTernal:DELay	<float>	s	0 s
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:EXTernal:SLOPe	POSitive|NEGative		POSitive
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:EXTernal:SOURce	MF1|MF2		MF1
[:SOURce<ch>]:SWEep:TRIGger[:SEQuence][:IMMediate]			
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:INITiate			
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:INITiate:CONTinuous	ON|OFF|1|0		ON
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:OUTPut:DELay	<float>	s	0 s
[:SOURce<ch>]:SWEep:TRIGger [:SEQuence]:OUTPut:MODE	NORMal|POINt|GATE		NORMal
[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:POLarity	NORMal|INVerted		NORMal
[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:PWIDth	<float>	s	1 µs
[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:SOURce	IMMediate| BUS| EXTernal| SYNChronous		IMMEdiate
[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:TYPE	NORMal|POINt|GATE		NORMal

Related Commands
[:SOURce<ch>]:FREQuency:CENTer
[:SOURce<ch>]:FREQuency:MODE
[:SOURce<ch>]:FREQuency:SPAN

Related Commands
[:SOURce<ch>]:FREQuency:STARt
[:SOURce<ch>]:FREQuency:STOP
[:SOURce<ch>]:PHASe:MODE
[:SOURce<ch>]:PHASe:STARt
[:SOURce<ch>]:PHASe:STOP
[:SOURce<ch>]:POWer:MODE
[:SOURce<ch>]:POWer:STARt
[:SOURce<ch>]:POWer:STOP

SWEep:BLANking

`[:SOURce<ch>]:SWEep:BLANking ON|OFF|1|0`

`[:SOURce<ch>]:SWEep:BLANking?`

Enables or disables RF output blanking while waiting for the trigger signal. Blanking enabled means the RF output is off while waiting for the trigger event.

This setting is coupled with [:SOURce<ch>]:LIST:BLANking.

***RST** ON

SWEep:COUNt

`[:SOURce<ch>]:SWEep:COUNt InFinite|<integer>`

`[:SOURce<ch>]:SWEep:COUNt?`

Sets the number of sweep repetitions being played after triggering a sweep. If set to INFinite, the sweep will be repeated until a [SOURce<ch>]:FREQuency:MODE, [:SOURce<ch>]:PHASe:MODE or [SOURce<ch>]:POWer:MODE command is issued.

***RST** INFinite

Range INFinite or 2 to maximum count (Please refer to the Data Sheet.)

SWEep:DELay

`[:SOURce<ch>]:SWEep:DELay <float>`

`[:SOURce<ch>]:SWEep:DELay?`

Sets the delay time for the step sweep points. This is the amount of time the sweep pauses with RF off before playing the next point. The total amount of time spent per point equates to dwell time + delay time.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

SWEep:DELay:AUTO

`[:SOURce<ch>]:SWEep:DELay:AUTO ON|OFF|1|0`

`[:SOURce<ch>]:SWEep:DELay:AUTO?`

Enables or disables automatic off (delay) time selection. In automatic mode, delay time is selected such that the transients between sweep points are blanked and do not appear at the RF output. The automatically selected off time varies with device type. It can be queried by [:SOURce<ch>]:SWEep:DELay? while automatic mode is enabled.

***RST** OFF

SWEep:DIRection

`[:SOURce<ch>]:SWEep:DIRection UP|DOWN|RANDom`

`[:SOURce<ch>]:SWEep:DIRection?`

Sets the direction of a step sweep.

UP	The sweep moves from start to stop.
DOWN	The sweep moves from stop to start.
RANDom	The sweep plays random points within the start and stop interval.

***RST** UP

SWEep:DWELl

`[:SOURce<ch>]:SWEep:DWELl <float>`

`[:SOURce<ch>]:SWEep:DWELl?`

Sets the dwell time for the step sweep points. The dwell time is the on time. This is the amount of time the sweep plays the current point with RF on. The total amount of time spent per point equates to dwell time + delay time.

***RST** 50 µs

Range Please refer to the Data Sheet.

Unit s

SWEep:POINts

`[:SOURce<ch>]:SWEep:POINts <integer>`

`[:SOURce<ch>]:SWEep:POINts?`

Defines the number of step sweep points.

***RST** 2

Range 2 to maximum (Please refer to the Data Sheet.)

SWEep:SPACing

`[:SOURce<ch>]:SWEep:SPACing LINear|LOGarithmic`

`[:SOURce<ch>]:SWEep:SPACing?`

Enables the instrument linear or logarithmic sweep modes.

LINear	Selects linear steps adding the same step size to each point.
LOGarithmic	Selects logarithmic steps multiplying each point with the same factor. Only available on selected instruments.

Logarithmic step is supported for frequency sweeps only. Power and phase sweeps support linear mode only (linear in dB for power sweeps) and ignore this setting. The instrument uses the specified start frequency, stop frequency, and number of points for both linear and logarithmic sweeps.

***RST** LINear

SWEep:TRIGger

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence][:IMMediate]`

Executes a specific sweep internal trigger event.

SWEep:TRIGger:ABORt

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:ABORt`

Resets the sweep trigger system to the idle state. In [SOURce<ch>]:SWEep:TRIGger:INITiate:CONTinuous OFF mode the sweep trigger system is no longer armed and ignores trigger events. [SOURce<ch>]:SWEep:TRIGger:INITiate rearms the sweep trigger system.

SWEep:TRIGger:DELay

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence][:EXTernal]:DELay <float>`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence][:EXTernal]:DELay?`

Sets the amount of time to delay the response to the sweep trigger.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

SWEep:TRIGger:EXTernal:DELay

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:DELay <float>`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:DELay`

Sets the amount of time to delay the response to the sweep trigger.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

SWEep:TRIGger:EXTernal:SLOPe

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:SLOPe POSitive|NEGative`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:SLOPe?`

Sets the polarity for an external sweep trigger signal.

***RST** POSitive

SWEep:TRIGger:EXTernal:SOURce

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:SOURce MF1|MF2`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:EXTernal:SOURce?`

Selects the multi-function channel as external sweep trigger input.

***RST** MF1

SWEep:TRIGger:INITiate

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:INITiate`

In [SOURce<ch>]:SWEep:TRIGger:INITiate:CONTinuous OFF mode this command arms the trigger system.

SWEep:TRIGger:INITiate:CONTinuous

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:INITiate:CONTinuous ON|OFF|1|0`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:INITiate:CONTinuous?`

When enabled, continuously rearms the sweep trigger system after completion of a triggered sweep.

***RST** ON

SWEep:TRIGger:OUTPut:DELay

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:DELay <float>`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:DELay?`

Sets the delay of the sweep trigger output signal.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

SWEep:TRIGger:OUTPut:MODE

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:MODE NORMal|POINt|GATE`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:MODE?`

Sets the sweep trigger output signal mode.

NORMal	Signal is pulsed once when triggered.
POINt	Signal is pulsed once for each point.

***RST** NORMal

SWEep:TRIGger:OUTPut:POLarity

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:POLarity NORMal|INVerted`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:POLarity?`

Sets the sweep trigger output signal polarity.

***RST** NORMal

SWEep:TRIGger:OUTPut:PWIDth

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:PWIDth <float>`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:OUTPut:PWIDth?`

Sets the pulse width of the sweep trigger output signal.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

SWEep:TRIGger:SOURce

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:SOURce IMMediate|BUS|EXTernal|SYNChronous`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:SOURce?`

Sets the sweep trigger source.

IMMediate	Signal is pulsed once when triggered.
BUS	Command [:SOURce<ch>]:SWEep:TRIGger:[IMMediate].
EXTernal	Externally applied signal or command [:SOURce<ch>]:SWEep:TRIGger:[IMMediate].
SYNChronous	Trigger from synchronous trigger subsystem source, see TRIGger:SYNChronous:SOURce.

***RST** IMMediate

SWEep:TRIGger:TYPE

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:TYPE NORMal|POINt|GATE`

`[:SOURce<ch>]:SWEep:TRIGger[:SEQuence]:TYPE?`

Selects the waveform's response to a sweep trigger signal.

NORMal	The first trigger starts the sweep, subsequent triggers are ignored until the sweep is finished.
POINt	Each trigger jumps to the next sweep point.

***RST** NORMal

Related Commands:

FREQuency:CENter

Sets the center frequency of a step sweep.

Refer to "FREQuency:CENTer" for a detailed command description.

FREQuency:MODE

Sets the frequency mode of the instrument. A frequency sweep can be enabled by selecting sweep mode or disabled by selecting any other mode.

Refer to "FREQuency:MODE" for a detailed command description.

FREQuency:SPAN

Sets the frequency span of a step sweep.

Refer to "FREQuency:SPAN" for a detailed command description.

FREQuency:STARt

Sets the start frequency in a step sweep.

Refer to "FREQuency:STARt" for a detailed command description.

FREQuency:STOP

Sets the stop frequency in a step sweep.

Refer to "FREQuency:STOP" for a detailed command description.

PHASe:MODE

Sets the phase mode of the signal generator. A phase sweep can be enabled by selecting sweep mode or disabled by selecting any other mode.

Refer to "PHASe:MODE" for a detailed command description.

PHASe:STARt

Sets the start phase in a step sweep.

Refer to "PHASe:STARt" for a detailed command description.

PHASe:STOP

Sets the stop phase in a step sweep.

Refer to "PHASe:STOP" for a detailed command description.

POWer:MODE

Sets the amplitude mode of the instrument. An amplitude sweep can be enabled by selecting sweep mode or disabled by selecting any other mode.

Refer to "POWer:MODE" for a detailed command description

POWer:STARt

Sets the start amplitude in a step sweep.

Refer to "POWer:STARt" for a detailed command description.

POWer:STOP

Sets the stop amplitude in a step sweep.

Refer to "POWer:STOP" for a detailed command description.

[:SOURce<ch>]:VOR Subsystem

NOTE Applies to AP5041A and AP5042A with Option 302 only.

This subsystem provides VOR signal generation.

Command	Parameters	Unit	Default
[:SOURce<ch>]:VOR:AM0[:DEPTh]	<float>	1|PCT	0.3
[:SOURce<ch>]:VOR:AM0:STATe	ON|OFF|1|0		ON
[:SOURce<ch>]:VOR:AM1[:DEPTh]	<float>	1|PCT	0.3
[:SOURce<ch>]:VOR:AM1:STATe	ON|OFF|1|0		ON
[:SOURce<ch>]:VOR:BEARing	<float>	rad|deg	0 rad
[:SOURce<ch>]:VOR:BEARing:DIRection	FROM|TO		FROM
[:SOURce<ch>]:VOR:DEFault			
[:SOURce<ch>]:VOR:FM:INDex	<float>		16
[:SOURce<ch>]:VOR:IDENt:FREQuency	<float>	Hz	1020 Hz
[:SOURce<ch>]:VOR:IDENt:PERiod	<float>	s	8 s
[:SOURce<ch>]:VOR:IDENt:STATe	ON|OFF|1|0		OFF
[:SOURce<ch>]:VOR[:STATe]	ON|OFF|1|0		OFF
[:SOURce<ch>]:VOR:SUBCarrier[:FREQuency]	<float>	Hz	9960 Hz
[:SOURce<ch>]:VOR:TEST	NORTh|SOUTh|EAST|WEST|1|2		
[:SOURce<ch>]:VOR:VARiable[:FREQuency]	<float>	Hz	30 Hz

VOR:AM0[:DEPTh]

`[:SOURce<ch>]:VOR:AM0[:DEPTh] <float>`

`[:SOURce<ch>]:VOR:AM0[:DEPTh]?`

Sets the VOR AM0 component (nominal 30 Hz navigation variable) amplitude modulation depth.

***RST** 0.3

Range Please refer to the Data Sheet.

Unit 1|PCT

VOR:AM0:STATe

`[:SOURce<ch>]:VOR:AM0:STATe ON|OFF|1|0`

`[:SOURce<ch>]:VOR:AM0:STATe?`

Enables or disables the VOR AM0 component (nominal 30 Hz navigation variable).

***RST** ON

VOR:AM1[:DEPTh]

`[:SOURce<ch>]:VOR:AM1[:DEPTh] <float>`

`[:SOURce<ch>]:VOR:AM1[:DEPTh]?`

Sets the VOR AM1 component (nominal 9960 Hz navigation reference subcarrier) amplitude modulation depth.

***RST** 0.3

Range Please refer to the Data Sheet.

Unit 1|PCT

VOR:AM1:STATe

`[:SOURce<ch>]:VOR:AM1:STATe ON|OFF|1|0`

`[:SOURce<ch>]:VOR:AM1:STATe?`

Enables or disables the VOR AM1 component (nominal 9960 Hz navigation reference subcarrier).

***RST** ON

VOR:BEARing

`[:SOURce<ch>]:VOR:BEARing <float>`

`[:SOURce<ch>]:VOR:BEARing?`

Sets the VOR bearing in radians. Append DEG to set the bearing in degrees.

***RST** 0 rad

Range Please refer to the Data Sheet.

Unit rad|deg

VOR:BEARing:DIRection

`[:SOURce<ch>]:VOR:BEARing:DIRection FROM|TO`

`[:SOURce<ch>]:VOR:BEARing:DIRection?`

Sets the polarity (changing as flying from or to a VOR station) of the VOR bearing setting.

***RST** FROM

VOR:DEFault

`[:SOURce<ch>]:VOR:DEFault`

Resets all VOR subsystem settings to their default (*RST) values.

VOR:FM:INDex

`[:SOURce<ch>]:VOR:FM:INDex <float>`

`[:SOURce<ch>]:VOR:FM:INDex?`

Sets the VOR navigation reference component (nominal 30 Hz) frequency modulation index on the VOR navigation reference subcarrier (nominal 9960 Hz).

***RST** 16

Range Please refer to the Data Sheet.

VOR:IDENt:FREQuency

`[:SOURce<ch>]:VOR:IDENt:FREQuency <float>`

`[:SOURce<ch>]:VOR:IDENt:FREQuency?`

Sets the carrier Frequency of the IDENT. Must be multiple of 30 Hz.

***RST** 1020 Hz

Range Please refer to the Data Sheet.

Unit Hz

VOR:IDENt:PERiod

`[:SOURce<ch>]:VOR:IDENt:PERiod <float>`

`[:SOURce<ch>]:VOR:IDENt:PERiod?`

Sets the period at which the ident is repeated and must be a multiple of 1/3 s.

***RST** 8 s

Range Please refer to the Data Sheet.

Unit s

VOR:IDENt:STATe

`[:SOURce<ch>]:VOR:IDENt:STATe ON|OFF|1|0`

`[:SOURce<ch>]:VOR:IDENt:STATe?`

Enables or disables the VOR IDENT component (nominal 1020 Hz Morse coded identification subcarrier).

***RST** OFF

VOR[:STATe]

`[:SOURce<ch>]:VOR[:STATe] ON|OFF|1|0`

`[:SOURce<ch>]:VOR[:STATe]?`

Enables or disables the VOR modulation.

***RST** OFF

VOR:SUBCarrier[:FREQuency]

`[:SOURce<ch>]:VOR:SUBCarrier[:FREQuency] <float>`

`[:SOURce<ch>]:VOR:SUBCarrier[:FREQuency]?`

Sets the VOR navigation reference subcarrier (nominal 9960 Hz) frequency.

***RST** 9960 Hz

Range 5000 to 15000 Hz

Unit Hz

VOR:TEST

`[:SOURce<ch>]:VOR:TEST NORTh|SOUTh|EAST|WEST|1|2`

Selects a predefined VOR test setting. It overrides all VOR settings except state.

VOR:VARiable:FREQuency

`[:SOURce<ch>]:VOR:VARiable:FREQuency <float>`

`[:SOURce<ch>]:VOR:VARiable:FREQuency?`

Sets the VOR navigation variable and reference component (nominal 30 Hz) frequency.

VOR navigation variable and reference component frequencies are locked to each other. Therefore, this command sets the frequency of both components.

***RST** 30 Hz

Range 10 to 60 Hz

Unit Hz

:STATus Subsystem

This subsystem controls the status-reporting structures. Refer to "Operation Status Group" and "Questionable Status Group" for a description of the individual status bits.

Command	Parameters	Unit	Default
:STATus:OPERation:CONDition?			
:STATus:OPERation:ENABle	<integer>		0
:STATus:OPERation[:EVENt]?			
:STATus:OPERation:NTR	<integer>		0
:STATus:OPERation:PTR	<integer>		0
:STATus:PREset			
:STATus:QUEStionable:CONDition?			
:STATus:QUEStionable:ENABle	<integer>		0
:STATus:QUEStionable[:EVENt]?			
:STATus:QUEStionable:NTR	<integer>		0
:STATus:QUEStionable:PTR	<integer>		0

STATus:OPERation:CONDition?

`:STATus:OPERation:CONDition?`

Returns the contents of the operation status condition register.

STATus:OPERation:ENABle

`:STATus:OPERation:ENABle <integer>`

`:STATus:OPERation:ENABle?`

Sets the enable bit mask of the operation status event register. Enabled event bits add to the sum bit in the status byte.

***RST** 0

Range 0 to 65535

STATus:OPERation[:EVENt]?

`:STATus:OPERation[:EVENt]?`

Returns the contents of the operation status event register and clears it.

STATus:OPERation:NTR

`:STATus:OPERation:NTR <integer>`

`:STATus:OPERation:NTR?`

Sets the negative transition filter bit mask of the operation status event register.

***RST** 0

Range 0 to 65535

STATus:OPERation:PTR

`:STATus:OPERation:PTR <integer>`

`:STATus:OPERation:PTR?`

Sets the positive transition filter bit mask of the operation status event register.

***RST** 0

Range 0 to 65535

STATus:PRESet

`:STATus:PRESet`

Disables all status events and clears all negative and positive transition filters.

STATus:QUEStionable:CONDition?

`:STATus:QUEStionable:CONDition?`

Returns the contents of the questionable status condition register.

STATus:QUEStionable:ENABle

`:STATus:QUEStionable:ENABle <integer>`

`:STATus:QUEStionable:ENABle?`

Sets the enable mask of the questionable status event register. Enabled event bits add to the sum bit in the status byte.

***RST** 0

Range 0 to 65535

STATus:QUEStionable[:EVENt]?

`:STATus:QUEStionable [:EVENt]?`

Returns the contents of the questionable status event register and clears it.

STATus:QUEStionable:NTR

`:STATus:QUEStionable:NTR <integer>`

`:STATus:QUEStionable:NTR?`

Sets the negative transition filter bit mask of the questionable status event register.

***RST** 0

Range 0 to 65535

STATus:QUEStionable:PTR

`:STATus:QUEStionable:PTR <integer>`

`:STATus:QUEStionable:PTR?`

Sets the positive transition filter bit mask of the questionable status event register.

***RST** 0

Range 0 to 65535

:SYNChronous Subsystem

The synchronous subsystem provides device-to-device clock (frequency and phase) synchronization and synchronous triggering of multiple devices.

Command	Parameters	Unit	Default
:SYNChronous:INPut:MODE	OFF|INITialze|ALIgn|RUN		OFF
:SYNChronous:OUTPut:MODE	OFF|INITialze|ALIgn|RUN		OFF
:SYNChronous:READy?			
:SYNChronous:SUCCessful?			

SYNChronous:INPut:MODE

`:SYNChronous:INPut:MODE OFF|INITialize|ALIgn|RUN`

`:SYNChronous:INPut:MODE?`

Sets or queries the synchronization input operating mode.

Enabling the synchronization input (INITialize, ALIgn or RUN mode) also selects the high frequency reference input required for multi device synchronization. However, disabling the synchronization input (OFF mode) will leave the high frequency reference input selection unchanged, as it may also be used without full multi device synchronization. Refer to [:SOURce]:ROSCillator:SOURce CIN for details.

OFF	Synchronization input disabled.
INITialize	Synchronization input enabled in initialization (locking) mode.
ALIgn	Synchronization input enabled in align (delay calibration) mode. ALIgn mode shall not be selected unless INITialize mode has completed.
RUN	Synchronization input enabled in run (normal operation) mode. RUN mode shall not be selected unless ALIGn mode has completed.

***RST** OFF

SYNChronous:OUTPut:MODE

`:SYNChronous:OUTPut:MODE OFF|INITialize|ALIgn|RUN`

`:SYNChronous:OUTPut:MODE?`

Sets or queries the synchronization output operating mode.

Enabling the synchronization output (INITialize, ALIgn or RUN mode) also selects the high frequency reference output required for multi device synchronization. However, disabling the synchronization output (OFF mode)

will leave the high frequency reference output state unchanged, as it may also be used without full multi device synchronization. Refer to [:SOURce]:ROSCillator:SOURce COUT for details.

OFF	Synchronization output disabled.
INITialize	Synchronization output enabled in initialization (locking) mode.
ALIgn	Synchronization output enabled in align (delay calibration) mode. ALIgn mode shall not be selected unless INITialize mode has completed.
RUN	Synchronization output enabled in run (normal operation) mode. RUN mode shall not be selected unless ALIGn mode has completed.

***RST** OFF

SYNChronous:READy?

`SYNChronous:READy?`

Queries the synchronization readiness (warm up) status.

Devices are ready for synchronization after a typical warm up time of approximately 5 minutes.

It is possible to successfully synchronize units before they are ready, but relative latencies and phases are not guaranteed to stay stable.

0	Not yet ready for synchronization.
1	Ready for synchronization.

SYNChronous:SUCCessful?

`SYNChronous:SUCCessful?`

Queries the synchronization status.

0	Synchronization failed.
1	Synchronization completed successfully.

:SYSTem Subsystem

Command	Parameters	Unit	Default
:SYSTem:ERRor:ALL?			
:SYSTem:ERRor[:NEXT]?			
:SYSTem:FIRMware:DATA	<data>		
:SYSTem:FIRMware:UPDate?			
:SYSTem:LOCK			
:SYSTem:LOCK:RELease			
:SYSTem:PRESet			
:SYSTem:STABle?			
:SYSTem:TEMPerature?		°C	
:SYSTem:UPTime?			
:SYSTem:VERSion?			

SYSTem:ERRor:ALL?

`:SYSTem:ERRor:ALL?`

Queries all entries in the instrument's error queue. Error messages in the queue contain an integer in the range [–32768, 32768] denoting an error code and associated descriptive text. This query clears the instrument's error queue.

If the error queue is empty, 0 (no error) is returned.

SYSTem:ERRor[:NEXT]?

`:SYSTem:ERRor[:NEXT]?`

Queries the next entry in the instrument's error queue. Error messages in the queue contain an integer in the range [–32768, 32768] denoting an error code and associated descriptive text. This query clears the returned error from the instrument's error queue.

If the error queue is empty, 0 (no error) is returned.

SYSTem:FIRMware:DATA

`:SYSTem:FIRMware:DATA <data>`

Sends a firmware package to the device. The firmware package file content is sent in the IEEE488.2 definite block data format:

#<num_digits><byte_count><data byte>{<data_byte}

<num_digits> specifies how many digits are contained in <byte_count>

<byte_count> specifies how many data bytes follow in <data_bytes>

Example of definite block data:

#18xxxxxxxx

#18...: byte

#18...: 8 data bytes will follow ...xxxxxxxx: 8 bytes of data

The data itself are the binary contents of the firmware package file.

This command does not install the firmware package uploaded. To verify and install the package, issue a :SYSTem:FIRMware:UPDate? query.

SYSTem:FIRMware:UPDate?

:SYSTem:FIRMware:UPDate?

Checks and installs a firmware package uploaded with :SYSTem:FIRMware:DATA. Data integrity and device compatibility of the firmware package is checked. A success or failure code is returned and in case of success the update process starts:

0	The firmware package is not valid (it is not compatible to this device or data is corrupted). The device continues to operate normally. Please check if the firmware package uploaded is valid for this device and if the correct block data format outlined in :SYSTem:FIRMware:DATA is used.
1	The firmware package is valid and the update process starts. The connection can now be closed. The update process takes up to a few minutes. After it completes, the device restarts automatically.

SYSTem:LOCK

NOTE Applies to the AP5041A only.

:SYSTem:LOCK

Locks (disables) front panel control. Instrument settings are still shown on the front panel, so locking the device will not hide possible confidential information like the frequency setting. Refer to “DISPlay:ENABle” for full display disable mode hiding all settings. The Local button on the front panel will unlock (re-enable) front panel control.

SYSTem:LOCK:RELease

NOTE Applies to the AP5041A only.

`:SYSTem:LOCK:RELease`

Unlocks (re-enables) front panel control.

SYSTem:PRESet

`:SYSTem:PRESet`

Resets most instrument functions to their factory-defined conditions. This command is similar to the *RST command.

SYSTem:STABle?

`SYSTem:STABle?`

Queries if the instrument has reached a stable operating temperature.

0	The device has not yet reached a stable operating temperature.
1	The device has yet reached a stable operating temperature.

SYSTem:TEMPerature?

`:SYSTem:TEMPerature?`

Returns the instrument's internal temperature (average from all temperature sensors).

Unit °C

SYSTem:UPTime?

`:SYSTem:UPTime?`

Returns the amount of time that the instrument has been running since the last power-on.

For example: 10h:30m:45s

SYSTem:VERSion?

`:SYSTem:VERSion?`

Returns the SCPI version number that the instrument software complies with [1999.0].

:SYSTem:COMMunicate Subsystem

Command	Parameters	Unit	Default
:SYSTem:COMMunicate:GPIB:ADDRess	<"string">		"1"
:SYSTem:COMMunicate:LAN:CONFig	DHCP|MANual|AUTO		AUTO
:SYSTem:COMMunicate:LAN:DEFaults			
:SYSTem:COMMunicate:LAN:GATEway	<"ipv4string">		automatic
:SYSTem:COMMunicate:LAN:IP	<"ipv4string">		automatic
:SYSTem:COMMunicate:LAN:MSESsion	ON|OFF|1|0		OFF
:SYSTem:COMMunicate:LAN:PORT	<integer>		18
:SYSTem:COMMunicate:LAN:RESTart			
:SYSTem:COMMunicate:LAN:RTMO	INFinite|<float>		INFinite
:SYSTem:COMMunicate:LAN:SUBNet	<"ipv4string">		automatic
:SYSTem:COMMunicate:QUERy:ECHO	ON|OFF|1|0		OFF
:SYSTem:COMMunicate:VXI:RTMO	INFinite|<float>		INFinite

SYSTem:COMMunicate:GPIB:ADDRess

NOTE Applies to the AP5041A and AP5042A with Option GPIB.

`:SYSTem:COMMunicate:GPIB:ADDRess <"string">`

`:SYSTem:COMMunicate:GPIB:ADDRess?`

Sets the AP instrument's GPIB device address. The address has SCPI string format. Example command to set address 10.
:SYSTem:COMMunicate:GPIB:ADDRess "10".

***RST** unchanged, "1" on factory preset

Range 1 to 30

SYSTem:COMMunicate:LAN:CONFig

`:SYSTem:COMMunicate:LAN:CONFig DHCP|MANual|AUTO`

`:SYSTem:COMMunicate:LAN:CONFig?`

Sets the instruments internet protocol (IP) address.

DHCP	The user assigns an IP address to the AP Vector Signal Generator.

MANual	The network assigns an IP address to the AP Vector Signal Generator. Requests will be repeated continuously with infinite timeout until a valid address has been assigned.
AUTO	The network assigns an IP address to the AP Vector Signal Generator with a fallback to Auto-IP if DHCP request continue to fail for more than 10 seconds.

***RST** unchanged, AUTO on factory preset

SYSTem:COMMunicate:LAN:DEFaults

```
:SYSTem:COMMunicate:LAN:DEFaults
```

Restores the instrument's LAN settings to their factory default values.

The default mode is :SYSTem:COMMunicate:LAN:CONFig AUTO. In this mode the instrument uses DHCP to retrieve an IP address and falls back to auto IP if DHCP fails.

SYSTem:COMMunicate:LAN:GATEway

```
:SYSTem:COMMunicate:LAN:GATEway <"ipv4string">
```

```
:SYSTem:COMMunicate:LAN:GATEway?
```

Sets the gateway for local area network (LAN) access to the AP Vector Signal Generator from outside the current sub-network. The query returns the current setting, not the saved setting.

The expected format for <"ipv4string"> is four decimal octets separated by periods, surrounded by quotation marks. Example command: :SYST:COMM:LAN:GATE "192.168.1.1".

In :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode this setting is configured automatically.

***RST** unchanged, automatic in :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode

Range "0.0.0.0" to "255.255.255.255"

SYSTem:COMMunicate:LAN:IP

```
:SYSTem:COMMunicate:LAN:IP <"ipv4string">
```

```
:SYSTem:COMMunicate:LAN:IP?
```

Sets the instrument's local area network (LAN) internet protocol (IP) address for your IP network connection.

The expected format for <"ipv4string"> is four decimal octets separated by periods, surrounded by quotation marks. Example command: :SYST:COMM:LAN:IP "192.168.1.100".

In :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode this setting is configured automatically.

***RST** unchanged, automatic in :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode

Range “0.0.0.0” to “255.255.255.255”

SYSTem:COMMunicate:LAN:MSESsion

`:SYSTem:COMMunicate:LAN:MSESsion ON|OFF|1|0`

`:SYSTem:COMMunicate:LAN:MSESsion?`

Enables multi-session for LAN communications. If it is enabled, up to 20 communication sockets can be opened to the device. If it is disabled, only a single LAN connection is possible.

***RST** unchanged, OFF on factory preset

SYSTem:COMMunicate:LAN:PORT

:SYSTem:COMMunicate:LAN:PORT <integer>

:SYSTem:COMMunicate:LAN:PORT?

Allows you to change the port on which the device is listening to incoming LAN connections. The default port is 18.

***RST** unchanged, 18 on a factory preset

Range 1 to 65535

SYSTem:COMMunicate:LAN:RESTart

`:SYSTem:COMMunicate:LAN:RESTart`

Restarts the network to enable changes that have been made to the LAN setup.

SYSTem:COMMunicate:LAN:RTMO

`:SYSTem:COMMunicate:LAN:RTMO INFinite|<float>`

`:SYSTem:COMMunicate:LAN:RTMO?`

Sets the LAN reconnect timeout in seconds or INFinite timeout. After the LAN connection is inactive for the configured timeout, a new connection can be established (reconnect). INFinite timeout disables reconnect. Finite or zero timeout enables reconnect. Non-zero finite timeout protects against undesired connection attempts.

***RST** unchanged, INFinite on power up

Range INFinite|0 to 1e6 s

SYSTem:COMMunicate:LAN:SUBNet

`:SYSTem:COMMunicate:LAN:SUBNet <"ipv4string">`

`:SYSTem:COMMunicate:LAN:SUBNet?`

Sets the Instrument's local area network (LAN) subnet mask address for your internet protocol (IP) network connection.

The expected format for <"ipv4string"> is four decimal octets separated by periods, surrounded by quotation marks. Example command: :SYST:COMM:LAN:SUBN "255.255.255.0".

In :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode this setting is configured automatically.

***RST** unchanged, automatic in :SYSTem:COMMunicate:LAN:CONFig DHCP|AUTO mode

Range "0.0.0.0" to "255.255.255.255"

SYSTem:COMMunicate:QUERy:ECHO

`:SYSTem:COMMunicate:QUERy:ECHO ON|OFF|1|0`

`:SYSTem:COMMunicate:QUERy:ECHO?`

Enables or disables the query echo for unknown queries. When enabled, every query is always answered, eliminating the timeout that would otherwise occur waiting for a response to a malformed or unknown query.

The query echo for unknown queries is a newline "\n" termination character (empty string). Answers to known queries remain unchanged.

***RST** OFF

SYSTem:COMMunicate:VXI:RTMO

`:SYSTem:COMMunicate:VXI:RTMO INFinite|<float>`

`:SYSTem:COMMunicate:VXI:RTMO?`

Sets the VXI-11 reconnect timeout in seconds or INFinite timeout. After the VXI-11 connection is inactive for the configured timeout, a new connection can be established (reconnect). INFinite timeout disables reconnect. Finite or zero timeout enables reconnect. Non-zero finite timeout protects against undesired connection attempts.

***RST** unchanged, INFinite on power up

Range INFinite | 0 to 1e6 s

:TEST Subsystem

Command	Parameters	Unit	Default
:TEST:FAST?			
:TEST:FULL?			
:TEST:FULL:REPort?			

TEST:FAST?

:TEST:FAST?

Initiates the internal fast self-test and returns one of the following results:

The self-test is a slow operation. It may be necessary to increase the query timeout in the remote programming application

0	All tests passed.
1	One or more tests failed.

TEST:FULL?

:TEST:FULL?

Initiates the internal full self-test and returns the sum of one or more of the following result flags:

0	All tests passed.
-1	ALC (automatic level control) is out of range.
-2	Frequency synthesis section unlocked.
-4	FPGA subsystem failure.
-8	Vector modulator failure.
-16	Other failure.

The self-test is a slow operation. It may be necessary to increase the query timeout in the remote programming application

TEST:FULL:REPort?

:TEST:FULL:REPort?

Returns a text file containing information gathered by the internal full self-test.

The text file is transferred in IEEE 488.2 definite block data format.

:TRIGger Subsystem

Triggers control the playback by telling the AP Vector Signal Generator when to play the signal.

Depending on the trigger settings for the AP Vector Signal Generator, the waveform playback can occur once, continuously, or the device may start and stop playing the waveform repeatedly (GATE mode). A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the AP Vector Signal Generator to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the AP Vector Signal Generator requires only a single trigger. In this situation, the device recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal from the RF output until you trigger the waveform.

There are four parts to configuring the trigger:

1. Choosing the trigger type which controls the waveform's transmission.

   NORMal: trigger edge starts sweeps

   POINt: trigger edge plays the next point

   GATE: trigger level starts/stops sweep

2. Setting the waveform's response to triggers:

   CONTinuous: repeatedly accepts trigger events

   SINGle: uses only one trigger event

3. Selecting the trigger source which determines how the device receives its trigger signal, internally or externally. The GATE choice requires an external trigger.

4. Setting the trigger polarity when using an external source.

Command	Parameters	Unit	Default
:TRIGger:OUTPut:MODE	NORMal|GATE|POINt|VALid		NORMal
:TRIGger:OUTPut:POLarity	NORMal|INVerted		NORMal
:TRIGger:OUTPut[:VALid]:SOURce	ALL|<integer>		1
:TRIGger[:SEQuence]:DELay	<float>	s	0 s
:TRIGger[:SEQuence]:ECOunt	<integer>		1
:TRIGger[:SEQuence][:IMMediate]			
:TRIGger[:SEQuence]:SLOPe	POSitive|NEGative|NP|PN		POSitive
:TRIGger[:SEQuence]:SOURce	IMMediate|KEY|EXT|BUS		IMMediate

Command	Parameters	Unit	Default
:TRIGger[:SEQuence]:TYPE	NORMal|GATE|POINt		NORMal
:TRIGger:SYNChronous:EXTernal:SOURce[:PORT]	MF1|MF2		MF1
:TRIGger:SYNChronous[:IMMediate]			
:TRIGger:SYNChronous:SLOPe	POSitive|NEGative		POSitive
:TRIGger:SYNChronous:SOURce	BUS|EXTernal		BUS
:TRIGger:SYNChronous:SOURce:CHANnel	<integer>		1

TRIGger:OUTPut:MODE

`:TRIGGer:OUTPut:MODE NORMal|GATE|POINt|VALid`

`:TRIGGer:OUTPut:MODE?`

Sets the trigger output signal mode.

Note that the low frequency output must be configured for trigger output by sending the [:SOURce]:LFOutput:SOURce TRIGger and [:SOURce]:LFOutput:STATe ON commands.

NORMal	The trigger output signal is pulsed once whenever playing a waveform sequence is triggered.
GATE	The trigger output signal is set when playing a waveform sequence is triggered and reset when playing stops.
POINt	The trigger output signal is pulsed for each point of the sweep (list) playing.
VALid	The trigger output is set while the RF output signal at one or multiple channels is valid (settled).

***RST** NORMal

TRIGger:OUTPut:POLarity

`:TRIGGer:OUTPut:POLarity NORMal|INVerted`

`:TRIGGer:OUTPut:POLarity?`

Sets the trigger output signal polarity.

Note that the low frequency output must be configured for trigger output by sending the [:SOURce]:LFOutput:SOURce TRIGger and [:SOURce]:LFOutput:STATe ON commands.

NORMal	The idle state of the trigger output signal is low. A high pulse or high signal is played upon trigger events or when the RF output signal is valid.

INVerted	The idle state of the trigger output signal is high. A low pulse or low signal is played upon trigger events or when the RF output signal is valid.

***RST** NORMal

TRIGger:OUTPut[:VALid]:SOURce

`:TRIGGer:OUTPut[:VALid]:SOURce ALL|<integer>`

`:TRIGGer:OUTPut[:VALid]:SOURce?`

Selects the source channel for the trigger output and the RF output valid signal.

ALL	In :TRIGger:OUTPut:MODE VALid mode: the trigger output is set while RF output of all currently enabled channels is valid (settled) and reset while any of the outputs has no valid RF signal (transient). In all other :TRIGger:OUTPut:MODE modes: the trigger output is set while any of the individual channels trigger output signals is set (logical “or” over all channels).
<integer>	Depending on :TRIGger:OUTPut:MODE the trigger output is set while RF output of the selected channel is valid (settled) or while the selected channels trigger output signal is set.

***RST** 1

Range ALL|1 to number of channels

TRIGger[:SEQuence]:DELay

`:TRIGger[:SEQuence]:DELay <float>`

`:TRIGger[:SEQuence]:DELay?`

Sets the amount of time to delay the instrument response to a trigger event.

The delay is a path (time) delay between when the instrument receives the trigger and when it responds to the trigger. The delay does not occur until you turn it on. You can set the delay value either before or after turning it on.

***RST** 0 s

Range Please refer to the Data Sheet.

Unit s

TRIGger[:SEQuence]:ECOunt

`:TRIGGer[:SEQuence]:ECOunt <integer>`

`:TRIGGer[:SEQuence]:ECOunt?`

Sets a modulus counter on consecutive trigger events. Setting the value to N means that only every Nth trigger event will be considered. Setting it to 1 will use every trigger event that does not occur during a running sweep.

***RST** 1

Range 1 to 255

TRIGger:[SEQuence][:IMMediate]

`:TRIGger[:SEQuence][:IMMediate]`

Triggers the device immediately if it is configured to wait for trigger events.

Immediate triggering is forced regardless of the selected trigger source.

TRIGger[SEQuence]:SLOPe

`:TRIGger[:SEQuence]:SLOPe POSitive|NEGative|NP|PN`

`:TRIGger[:SEQuence]:SLOPe?`

Sets the polarity for an external trigger signal while using the continuous, single triggering mode.

POSitive|NEGative	In normal or point mode selected by :TRIGger[:SEQuence]:TYPE NORMal|POINT the trigger system reacts to the rising (positive) or falling (negative) edge of the external trigger signal. In gated mode selected by :TRIGger[:SEQuence]:TYPE GATE the trigger is active while the external signal is high (positive) or low (negative). For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal.
NP|PN	(Available on selected instruments only). In normal or point mode selected by :TRIGger[:SEQuence]:TYPE NORMal|POINT the trigger system reacts to both rising and falling edges of the trigger signal. NP selects falling, PN selects rising edge first.

When the Instrument receives multiple trigger occurrences when only one is required, the AP Vector Signal Generator uses the first trigger and ignores the rest.

***RST** POSitive

TRIGger[:SEQuence]:SOURce

`:TRIGger[:SEQuence]:SOURce IMMediate|KEY|EXTernal|BUS`

`:TRIGger[:SEQuence]:SOURce?`

Sets the trigger source.

IMMediate	No waiting for a trigger event occurs.

KEY	This choice enables manual triggering by pressing the front-panel RF on/off. Applies to the AP5041A only.
EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the MOD IN connector.
BUS	This choice enables triggering over the remote control interface using the :TRIGer[:SEQuence][:IMMediate], *TRG or GET (group execute trigger) commands.

***RST** IMMediate

TRIGger[:SEQuence]:TYPE

`:TRIGger[:SEQuence]:TYPE NORMal|GATE|POINt`

`:TRIGger[:SEQuence]:TYPE?`

Sets the trigger type that controls the waveform's playback.

The following list describes the trigger type command choices:

NORMal	Upon triggering, the waveform sequence plays according to settlings defined by :INITiate:CONTinuous (only once or repeatedly).
GATE	An external trigger signal repeatedly starts and stops the waveform's playback. The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection. The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.
POINt	Upon triggering, only a single point of the sweep (list) is played.

***RST** NORMal

TRIGger:SYNChronous:EXTernal:SOURce

`:TRIGger:SYNChronous:EXTernal:SOURce[:PORT] MF1|MF2`

`:TRIGger:SYNChronous:EXTernal:SOURce?`

Selects the source port of the external trigger signal.

***RST** MF1

TRIGger:SYNChronous[:IMMediate]

`:TRIGger:SYNChronous[:IMMediate]`

Triggers all subsystems listening to synchronous trigger sources. Immediate triggering is forced regardless of the selected trigger source.

TRIGger:SYNChronous:SLOPe

`:TRIGger:SYNChronous:SLOPe POSitive|NEGative`

`:TRIGger:SYNChronous:SLOPe?`

Sets the polarity for an external synchronous trigger signal.

***RST** POSitive

TRIGger:SYNChronous:SOURce

`:TRIGger:SYNChronous:SOURce BUS|EXTernal`

`:TRIGger:SYNChronous:SOURce?`

Sets the synchronous trigger source.

***RST** BUS

TRIGger:SYNChronous:SOURce:CHANnel

`:TRIGger:SYNChronous:SOURce:CHANnel <integer>`

`:TRIGger:SYNChronous:SOURce:CHANnel?`

Sets the master channel for the synchronous trigger system.

This command exists only for compatibility with other command subsystems supporting multiple channels. Only channel 1 can be the master channel, so the command form is ignored and the query form will always return 1.

***RST** 1

:UNIT Subsystem

Command	Parameters	Unit	Default
:UNIT:POWer	DBM|DBMW|DM|DBUW|DBW|DB|DBUA|DBMA|DBA|DBUV|DBMV|DBV|UW|MW|W|UV|MV|V|UA|MA|A		DBM/W

UNIT:POWer

`:UNIT:POWer`
DBM | DBMW | DM | DBUW | DBW | DB | DBUA | DBMA | DBA | DBUV | DBMV | DBV | UW | MW | W | UV | MV | V | UA | MA | A

`:UNIT:POWer?`

This command sets the default unit for power setting commands and queries. All units listed below can be appended to all power setting commands. Example: POW 100MV.

DBM|DBMW|DM	Sets dBm (decibels with reference to 1 mW) as the default unit.
DBUW	Sets dBuW (decibels with reference to 1 µW) as the default unit.
DBW|DB	Sets dBW (decibels with reference to 1 W) as the default unit.
DBUA	Sets dBµA (decibels with reference to 1 µA into 50 Ω load) as the default unit.
DBUA	Sets dBµA (decibels with reference to 1 µA into 50 Ω load) as the default unit.
DBMA	Sets dBmA (decibels with reference to 1 mA into 50 Ω load) as the default unit.
DBA	Sets dBA (decibels with reference to 1 A into 50 Ω load) as the default unit.
DBUA	Sets dBµA (decibels with reference to 1 µA into 50 Ω load) as the default unit.
DBUV	Sets dBµV (decibels with reference to 1 µV into 50 Ω load) as the default unit.
DBMV	Sets dBmV (decibels with reference to 1 mV into 50 Ω load) as the default unit.
DBV	Sets dBV (decibels with reference to 1 V into 50 Ω load) as the default unit.
UW	Sets µW as the default unit.
MW	Sets mW as the default unit
W	Sets W as the default unit.
UV	Sets µV into 50 Ω load as the default unit.
MV	Sets mV into 50 Ω load as the default unit.

V	Sets V into 50 Ω load as the default unit.
UA	Sets µA into 50 Ω load as the default unit
MA	Sets mA into 50 Ω load as the default unit.
A	Sets A into 50 Ω load as the default unit.

***RST** DBMW

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