RF*Hawk* & SA2600 Spectrum Analyzers

Programmer Manual

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Tektronix

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Preface

This programmer manual covers the RF*Hawk* (H600) and SA2600 Spectrum Analyzer instruments. It provides information on operating your instrument using an Ethernet network interface.

This manual is composed of the following sections

- *Getting Started* outlines how to configure and use the network interface.
- *Syntax and Commands* defines the syntax used in command descriptions, presents a list of all command subsystems, and presents detailed descriptions of all programming commands.
- *Status and Events* describes how the status and Events Reporting system operates and presents a list of all system errors.
- *Appendices* provides additional information.

Related Documentation

- *RFHawk Quick Start User Manual*
  (Tektronix part number 071-2464-XX) and *SA2600 Quick Start User Manual* (Tektronix part number 071-2465-XX)
  These manuals contain general information about how to put your instrument into service, guides to user interface controls, and application examples.
- *RFHawk and SA2600 instruments Online Help*
  The online help contains detailed information about application controls and parameter fields.

Getting Started

Getting Started

You can write computer programs that remotely set the instrument front panel controls or that take measurements and read those measurements for further analysis or storage. To help you get started with programming the instrument, this section includes the following subsections

- *Overview of the Manual*
  Summarizes each major section of this manual.
- *Configuring the Network Interface*
  Describes how to configure the RF*Hawk* or SA2600 network interface, and how to physically connect the instrument to a controller.
- *Using the Programmable Interface*
  Describes the communication protocol for using the programmable interface.

Overview of the Manual

The information contained in each major section of this manual is described below.

Syntax and Commands

Syntax and Commands, describes the structure and content of the messages your program sends to the instrument. The following figure shows command parts as described in the *Command Syntax* subsection.

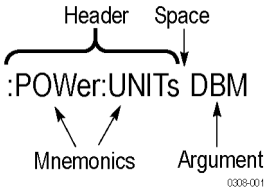


Figure 1-1: Command parts

Section 2 also describes the effect of each command and provides examples of how you might use it. The *Command Groups* subsection provides lists by functional areas. The commands are listed alphabetically in the *Command Descriptions* section.

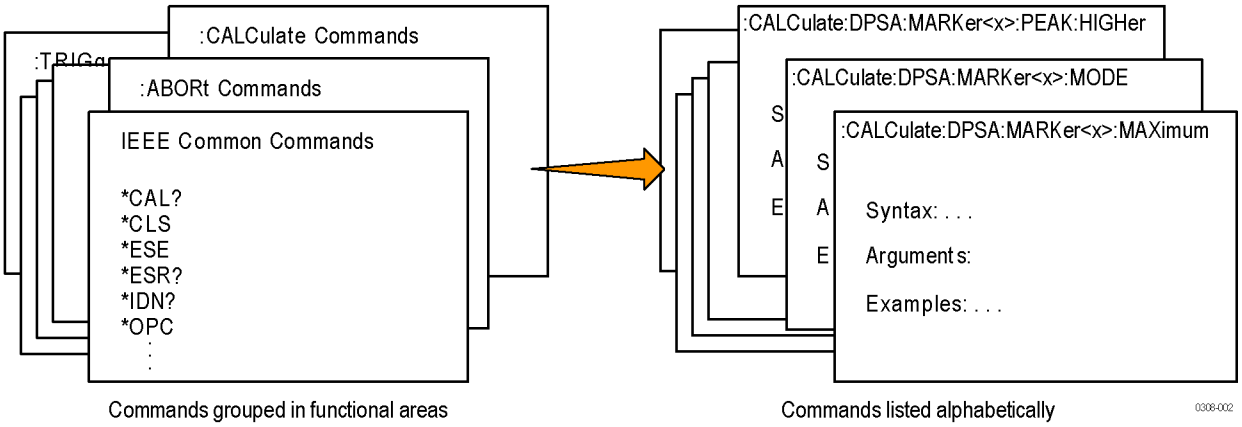


Figure 1-2: Functional groupings and an alphabetical list of commands

Status and Events

The program may request information from the instrument. The instrument provides information in the form of status and error messages. The following figure illustrates the basic operation of this system. Section 3, *Status and Events*, describes how to get status or event information from the program and details the event and error messages.

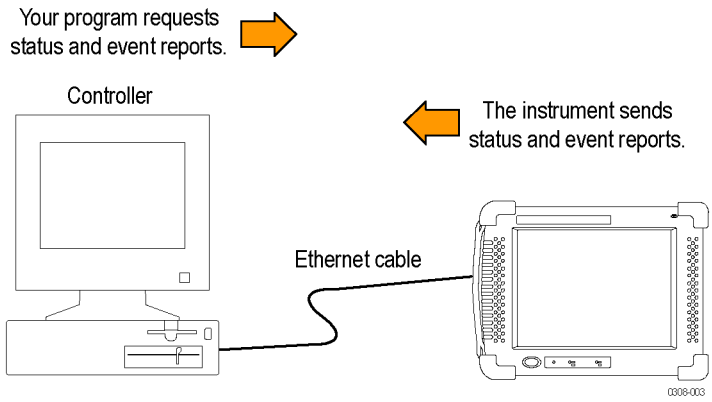


Figure 1-3: Event-driven program

Configuring the Network Interface

The RF*Hawk* or SA2600 programmable interface is accessible through the instruments network interface when the RFHawk or SA2600 application is running. You must configure instrument network settings before using the programmable interface. Use the following steps to configure the instrument network interface:

1. Work with your network administrator to determine the IP address of the RF*Hawk* instrument. If the network has DHCP enabled, the instrument will automatically obtain an IP address when powered on and connected to the network. If your network does not support DHCP, or you need a fixed IP address for your instrument, have your system administrator provide you with an address.
2. Connect a standard Ethernet cable from a network connector to the Ethernet port on the top of the instrument. You can do this before or after powering on the instrument.

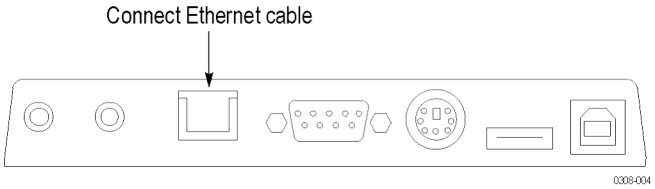


Figure 1-4: Instrument ethernet connection

3. Power on the instrument if it is not already powered on.
4. On the instrument, tap **Start > Settings > Network and Dial-up Connections** to open the **Network Connections** dialog box. The instrument network interface is listed as ENDS4ISA1.
5. Double-tap the **ENDS4ISA1** icon to open the **CSA8900 Settings** dialog box:
   - If your instrument is using DHCP to obtain an IP address, and the **Obtain an IP address via DHCP** button is set, you do not need any further network configuration. Close the dialog box and continue to the next numbered step.
   - If the instrument has already been assigned a fixed IP address, the address fields should show the address information.
   - If you are assigning or changing the instrument fixed IP address, tap the **Specify an IP address** button, enter the appropriate address settings, and tap **OK**.
6. Close the **Network Connections** dialog box. You can now use the network interface to control the RF*Hawk* or SA2600 application using the network-accessed programmable interface.

Using the Programmable Interface

The RF*Hawk* and SA2600 programmable interface consists of simple text commands. These are modeled after the Standard Commands for Programmable Instruments (SCPI) syntax. As an example of a typical command, :SENS:FREQ:CENT? requests the spectrum analyzer's center frequency. The instrument uses raw TCP sockets to receive commands and send replies. To send a command to the RFHawk or SA2600, make a connection on TCP port 34835 and send the text of the command, followed by a newline (ASCII 10). The instrument will reply on the same TCP port, and will add a newline to the end of its response.

Appendix C lists C++ source code that uses the Win32 Winsock library to interface to the RFHawk or SA2600. Included is a custom library module with routines for opening and closing the interface, writing commands, reading query responses, and determining details when error conditions occur. Also included is a test wrapper that uses the custom library module to perform basic instrument operations. Appendix C also lists MATLAB code that uses the MATLAB Instrument Control Toolbox plug-in to interface to the RFHawk or SA2600. The MATLAB example opens the interface, sends a simple query command, and then reads the response. The example files are provided as attachments to this PDF file.

Syntax and Commands

Command Syntax

This section contains information on the Standard Commands for Programmable Instruments (SCPI) and IEEE 488.2 Common Commands you can use to program your RF*Hawk* or SA2600 instrument. The information is organized in the following subsections

- Backus-Naur Form Definition
- SCPI Commands and Queries
- IEEE 488.2 Common Commands
- Constructed Mnemonics

Backus-Naur Form Definition

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

Table 2-1: BNF symbols and meanings

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

SCPI Commands and Queries

SCPI is a standard created by a consortium that provides guidelines for remote programming of instruments. These guidelines provide a consistent programming environment for instrument control and data transfer. This environment uses defined programming messages, instrument responses, and data format across all SCPI instruments, regardless of manufacturer. The instrument uses a command language based on the SCPI standard.

The SCPI language is based on a hierarchical or tree structure as shown in the following figure that represents a subsystem. The top level of the tree is the root node; it is followed by one or more lower-level nodes.

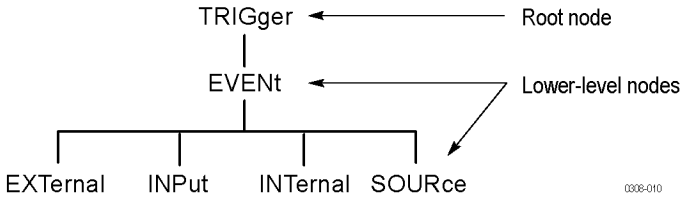


Figure 2-1: Example of SCPI subsystem hierarchy tree

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

Creating Commands

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

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

For example, :TRIGger:EVENt:INTernal BOTH is a valid SCPI command created from the hierarchy tree. (See Figure 2-1.)

Creating Queries

To create a query, start at the root node of a tree structure, move down to the end of a branch, and add a question mark. TRIGger:EVENt:SOURce? is an example of a valid SCPI query using the hierarchy tree in the figure. (See Figure 2-1.)

Query Responses

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

Table 2-2: Query response examples

Query	Response
CALCulate:SPECtrum:MARKer:X	7.50E+9
TRACe1:DPSA:DETection	AVER

A few queries also initiate an operation action before returning information. For example, the *CAL? query runs a calibration.

Parameter Types

Every parameter in the command and query descriptions is of a specified type. The parameters are enclosed in brackets, such as <value>. The parameter type is listed after the parameter and is enclosed in parentheses, for example, (boolean). Some parameter types are defined specifically for the RF*Hawk* and SA2600 instruments command set and some are defined by ANSI/IEEE 488.2-1987 as shown in the following table.

Table 2-3: Parameter types used in syntax descriptions

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

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

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

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

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

Special Characters

All characters in the range of ASCII 127-255 are defined as special characters. These characters are used in arbitrary block arguments only; using these characters in other parts of any command yields unpredictable results.

Abbreviating Commands, Queries, and Parameters

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

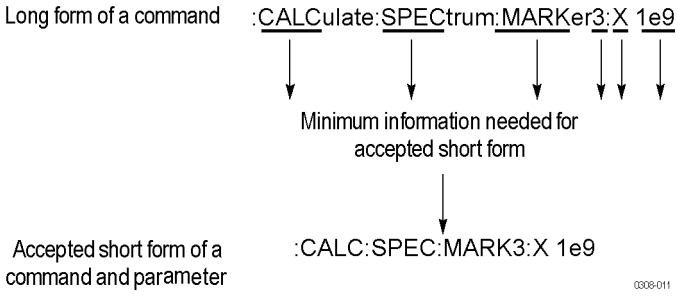


Figure 2-2: Example of abbreviating a command

Chaining Commands and Queries

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

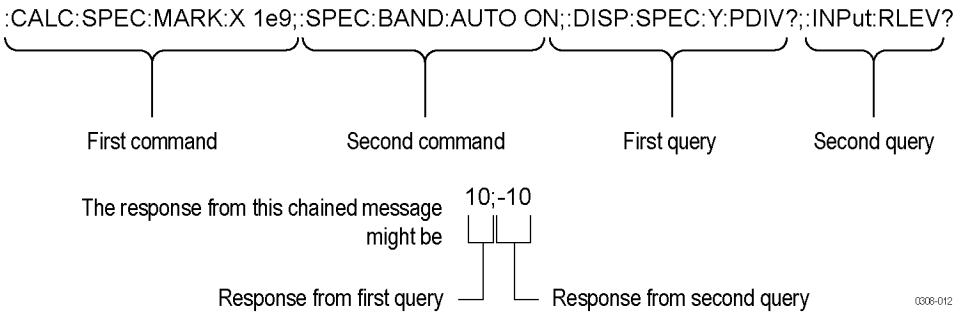


Figure 2-3: Example of chaining commands and queries

If a command or query has the same root and lower-level nodes as the previous command or query, you can omit these nodes. In the following figure, the second command has the same root node (TRIGger:EVENt) as the first command, so these nodes can be omitted.

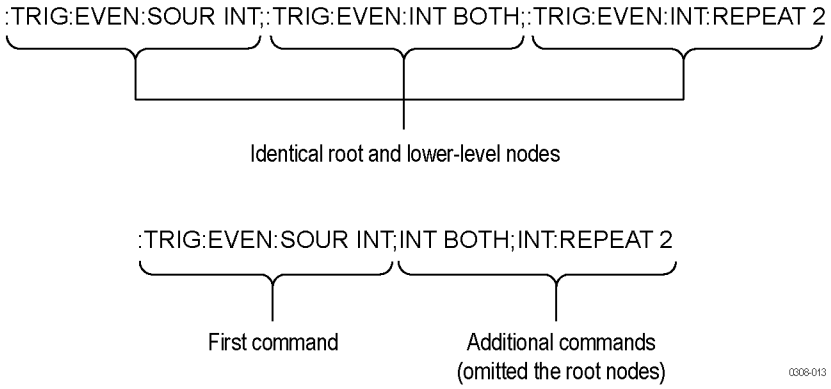


Figure 2-4: Example of omitting root and lower-level nodes in a chained message

General Rules

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

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

  correct "This string uses quotation marks correctly."

  correct ‘This string also uses quotation marks correctly.’

  incorrect "This string does not use quotation marks correctly.’

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

  ```
  :SENSE:DPSA:COLOR:MAXIMUM 50
  ```

  is the same as

  ```
  :sense:dpsa:color:maximum 50
  ```

  and

  ```
  :SENSE:dpsa:COLOR:maximum 50
  ```

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

- No embedded spaces are allowed between or within nodes.

  correct `:SENSE:DPSA:COLOR:MAXIMUM 50`

  incorrect `:SENSE: DPSA: COLOR:MAXI MUM 50`

IEEE 488.2 Common Commands

Description

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

Command and Query Structure

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

- *ESE 16
- *CLS

The following are examples of common queries

- *ESR
- *IDN

Constructed Mnemonics

Some header mnemonics specify one of a range of mnemonics. For example, a trace mnemonic can be either TRACe1, TRACe2, TRACe3, TRACe4, or TRACe5. You use these mnemonics in the command just as you do any other mnemonic. For example, there is a TRACe1:SPECtrum:FUNCtion command, and there is also a TRACe2:SPECtrum:FUNCtion command. In the command descriptions, this list of choices is abbreviated as TRACe<x>. The value of <x> is the upper range of valid suffixes. If the numeric suffix is omitted, the instrument uses the default value of "1".

Table 2-4: Constructed mnemonics

Symbol	Meaning
MARKer<x>	A marker specifier where <x> = 0, 1, 2, 3, 4, 5, or 6. Refer to *Marker Mnemonics*.
TRACe<x>	A trace specifier where <x> = 1, 2, 3, 4, or 5. Refer to *TRACe Commands* for details.

Command Groups

This section lists the RF*Hawk* and SA2600 instrument commands in two ways. It first presents them by functional groups. It then lists them alphabetically. The functional group list starts below. The alphabetical list provides more detail on each command.

The RF*Hawk* and SA2600 instruments conform to the Standard Commands for Programmable Instruments (SCPI) 1999.0 and IEEE Std 488.2-1987 except where noted.

Items followed by question marks are queries; items without question marks are commands. Some items in this section have a question mark in parentheses () in the command header section; this indicates that the item can be both a command and a query.

For the conventions of notation in this manual, refer to *Command Syntax* and following pages.

Functional Groups

All commands are divided into groups as shown in the following table.

Table 2-5: List of command group

Command group	Function
IEEE common	Conforms to the IEEE Std 488.2.
ABORt	Resets the trigger system and stops measurements.
CALCulate	Controls the markers and the search operations.
CALibration	Controls the external correction.
DISPlay	Controls the display of measurement results and waveforms.
INITiate	Controls data acquisition.
INPut	Controls the characteristics of the signal input.
MMEMory	Provides mass storage capabilities for the instrument.
OUTPut	Controls the characteristics of the signal output.
SENSe	Sets up detailed conditions for each measurement.
SYSTem	Sets or queries system parameters for operation.
TRACe	Controls trace activation and math operations.
TRIGger	Controls triggering.
UNIT	Specifies fundamental units for measurement.

Programming Hints

Here are some basic tips for using the RF*Hawk* and SA2600 commands:

- *Selecting a measurement mode*
  Use Display commands to select or display a measurement mode.
  [Example] `DISPlay:GENeral:MEASview:NEW SPECtrum`
  Selects the Spectrum measurement mode.

- *Setting measurement parameters*
  Use Sense commands to set conditions for the measurement session.
  [Example] `SENSe:SPECtrum:FREQuency:CENTer 1.5e9`
  Sets the center frequency to 1.5 GHz in the Spectrum measurement mode.

- *Acquiring an input signal*
  Use an Initiate or Abort command to start or stop data acquisition.
  [Example] `INITiate:CONTinuous ON;INITiate:IMMediate`
  Starts data acquisition in the continuous mode.

- *Processing waveforms arithmetically*
  Use Trace commands for math operation on waveforms.
  [Example] `TRACe1:SPECtrum:FUNCtion`
  AVERage Averages the spectrum waveform.

- *Measuring with the markers*
  Use Calculate commands to measure some quantity using the markers.
  [Example] `CALCulate:SPECtrum:MARKer1:MAXimum`
  Positions the marker at the highest peak signal on the spectrum.

- *Obtaining the measurement results*
  Use a Fetch command to get the results.
  [Example] `FETCh:SPECtrum:TRACe1`
  Returns the spectrum trace data.

- *Scaling the waveform*
  Use Display commands to change the waveform portion on screen.
  [Example] `DISPlay:SPECTtrum:Y:SCALE:PDIVISION 5`
  Sets the scale to 5 dB per division in the Spectrum measurement mode.

The following sections list the commands by group.

IEEE Common Commands

The IEEE 488.2 common commands have a "*" prefix.

Table 2-6: Status and error commands

Header	Description
*CAL?	Runs and returns the instrument normalization status.
*CLS	Clears status.
*ESE	Sets or queries the bits in the ESER register.
*ESR?	Returns the contents of the SESR register.
*IDN?	Returns the instrument identification code.
*OPC	Synchronizes commands.
*RST	Returns the instrument settings to the factory defaults.
*SRE	Sets or queries the bits in the SRER register.
*STB?	Returns the contents of the SBR register.
*TRG	Generates a trigger.
*WAI	Prevents the instrument from executing further commands.

Abort Commands

Use the Abort commands to reset the trigger system and to stop measurements.

Table 2-7: Abort commands

Header	Description
ABORt	Resets the trigger system and places the instrument in a paused state.

Calculate Commands

Use the Calculate commands to control the markers and the search operations.

Table 2-8: Calculate commands

Header	Description
CALCulate:DPSA subgroup	**DPX spectrum measurement**
CALCulate:DPSA:MARKer<x>:MAXimum	Moves the marker to the highest peak on the trace.
CALCulate:DPSA:MARKer<x>:MODE	Sets or queries the markers absolute/delta readout mode.
CALCulate:DPSA:MARKer<x>:PEAK:HIGHer	Moves the marker to the next peak higher in amplitude on the trace.
CALCulate:DPSA:MARKer<x>:PEAK:LEFT	Moves the marker to the next peak to the left on the trace.
CALCulate:DPSA:MARKer<x>:PEAK:LOWer	Moves the marker to the next peak lower in amplitude on the trace.
CALCulate:DPSA:MARKer<x>:PEAK:RIGHt	Moves the marker to the next peak to the right on the trace.
CALCulate:DPSA:MARKer<x>[:SET]:CENTer	Sets the center frequency to the marker frequency.
CALCulate:DPSA:MARKer<x>:STATe	Sets or queries the enable/disable state of the marker.
CALCulate:DPSA:MARKer<x>:X	Sets or queries the frequency position of the marker.
CALCulate:DPSA:MARKer<x>:Y?	Queries the vertical position of the marker.
CALCulate:MARKer subgroup	
CALCulate:MARKer:PEAK:THReshold	Sets or queries the threshold level to detect peaks.
CALCulate:SEARch subgroup	
CALCulate:SEARch:LIMit:FAIL?	Query whether or not the current acquisition has a mask violation.
CALCulate:SEARch:LIMit:MATCh:BEEP[:STATe]	Sets or queries whether to beep when a mask violation occurs.
CALCulate:SEARch:LIMit:MATCh:SACQuire[:STATe]	Sets or queries whether to stop acquiring data when a mask violation occurs.
CALCulate:SEARch:LIMit:MATCh:SPICture[:STATe]	Sets or queries whether to perform a screen save when a mask violation occurs.
CALCulate:SEARch:LIMit:MATCh:STRace[:STATe]	Sets or queries whether to save the waveform trace when a mask violation occurs.
CALCulate:SEARch:LIMit:OPERation:MASK:LOAD	Loads the spectrum mask from a specified file for the search operation.
CALCulate:SEARch:LIMit:STATe	Sets or queries whether to enable or disable the search function (spectrum mask mode).
CALCulate:SPECtrum subgroup	**Spectrum measurement**
CALCulate:SPECtrum:MARKer<x>:MAXimum	Moves the specified marker to the highest peak on the trace.
CALCulate:SPECtrum:MARKer<x>:MODE	Sets or queries the markers absolute/delta readout mode.
CALCulate:SPECtrum:MARKer<x>:PEAK:HIGHer	Moves the marker to the next peak higher in amplitude on the trace.
CALCulate:SPECtrum:MARKer<x>:PEAK:LEFT	Moves the marker to the next peak to the left on the trace.
CALCulate:SPECtrum:MARKer<x>:PEAK:LOWer	Moves the marker to the next peak lower in amplitude on the trace.
CALCulate:SPECtrum:MARKer<x>:PEAK:RIGHt	Moves the marker to the next peak to the right on the trace.
CALCulate:SPECtrum:MARKer<x>[:SET]:CENTer	Sets the center frequency to the marker frequency.
CALCulate:SPECtrum:MARKer<x>:STATe	Sets or queries the enable/disable state of the marker.

Table 2-8: Calculate commands (cont.)

Header	Description
CALCulate:SPECtrum:MARKer<x>:TRACe	Sets or queries the trace on which the marker is placed.
CALCulate:SPECtrum:MARKer<x>:X	Sets or queries the horizontal position of the marker.
CALCulate:SPECtrum:MARKer<x>:Y?	Queries the vertical position of the marker.

Marker Mnemonics

Up to seven markers can be used. In commands, these are named MARKer<x>, where <x> can be 0, 1, 2, 3, 4, 5, or 6 as shown in the following table.

Table 2-9: Marker mnemonics

Mnemonic	Description
MARKer0	Measurement frequency marker
MARKer1	Marker 1 (M1)
MARKer2	Marker 2 (M2)
MARKer3	Marker 3 (M3)
MARKer4	Marker 4 (M4)
MARKer5	Marker 5 (M5)
MARKer6	Marker 6 (M6)

NOTE. *If you omit the numeric suffix, the marker control defaults to Marker 1.*

Before operating the marker, you have to enable it using the CALCulate basic commands.

If you attempt to use a marker other than above in a CALCulate command, the suffix error (error code -130) will occur.

Calibration Commands

Use the CALibration commands to control signal corrections.

Table 2-10: Calibration commands

Header	Description
CALibration:AUTO	Sets or queries the whether or not automatic normalizations should occur.
CALibration:CORRection:EXTernal:GAIN[:MAGNitude]	Sets or queries the external gain/loss value.
CALibration:CORRection:EXTernal:GAIN:STATe	Sets or queries whether to enable or disable the external gain/loss value.

Display Commands

Use the DISPlay commands to control the display of measurement waveforms and results on the screen.

Table 2-11: Display commands

Header	Description
DISPlay:DPSA subgroup	**DPX spectrum measurement**
DISPlay:DPSA:MARKer:SHOW:STATe	Sets or queries the current DPSA marker display mode.
DISPlay:GENeral subgroup	**General signal viewing**
DISPlay:GENeral:MEASview:NEW	Sets the current measurement mode.
DISPlay:GENeral:MEASview:SELect	Sets or queries the current measurement mode.
DISPlay:SPECtrum subgroup	**Spectrum measurement**
DISPlay:SPECtrum:MARKer:SHOW:STATe	Sets or queries the current Spectrum marker display mode.
DISPlay:SPECtrum:Y[:SCALe]:OFFSet	Sets or queries the vertical position.
DISPlay:SPECtrum:Y[:SCALe]:PDIVision	Sets or queries the vertical scale (per division).

Fetch Commands

Use the FETCh commands to retrieve the measurements from the data taken by the latest INITiate command.

Table 2-12: Fetch commands

Header	Description
FETCh:DPSA:BITMap?	Query the DPX Spectrum hit count data.
FETCh:DPSA:TRACe1?	Query the DPX Spectrum waveform data.
FETCh:SPECtrum:TRACe<x>?	Query the spectrum waveform data for the specified trace.

Format Commands

Use the FORMat commands to control the format of ASCII and binary data.

Table 2-13: Format commands

Header	Description
FORMat:[DATA]	Set binary or ASCII format for certain parameters and/or query responses.
FORMat:[DATA]:LOGGing	Set binary or ASCII format for data logging mode.

Initiate Commands

Use the INITiate commands to control the acquisition of data.

Table 2-14: Initiate commands

Header	Description
INITiate:CONTinuous	Sets or queries whether to acquire data continuously.
INITiate[:IMMediate]	Starts data acquisition.

Input Commands

Use the INPut commands to control the characteristics of the signal input.

Table 2-15: Input commands

Header	Description
INPut:ALEVel	Perform an auto-level.
INPut:RLEVel	Sets or queries the reference level.
RF: subgroup	
INPut[:RF]:ATTenuation	Sets or queries the input attenuation.
INPut[:RF]:GAIN:STATe	Sets or queries whether to enable the internal preamplifier.

Mass Memory Commands

Use the MMEMory commands to manipulate files on the mass memory devices.

For the trace specifier TRACe<x>, refer to *Trace Mnemonics.* (See page 2-27.)

Table 2-16: Mass memory (MMEMory) commands

Header	Description
MMEMory basic command subgroup	**General file control**
MMEMory:LOAD:RESults	Loads the previously stored measurement result from a specified file.
MMEMory:LOAD:STATe	Loads the instrument setup from a specified file.
MMEMory:SPECtrum:LOAD:TRACe<x>	Loads the spectrum trace data from the specified file.
MMEMory:STORe:RESults	Stores the measurement results in a specified file.
MMEMory:STORe:SCReen	Stores the screen image in a specified file.
MMEMory:STORe:STATe	Stores the instrument setup in a specified file.

Output Commands

Use the OUTPut commands to control the characteristics of the signal output.

Table 2-17: Output commands

Header	Description
OUTPut:IF[:STATe]	Sets or queries whether to turn on or off IF output.

Sense Commands

Use the SENSe commands to set up detailed measurement conditions.

Table 2-18: Sense commands

Header	Description
[SENSe] basic command subgroup	**General analysis parameter control**
[SENSe]:POWer:UNITs	Sets or queries the measurement unit of power.
[SENSe]:ROSCillator:SOURce?	Queries the reference oscillator source.
[SENSe]:DPSA subgroup	**DPX spectrum measurement**
[SENSe]:DPSA:CLEar:RESults	Resets the max hold or average trace and the bitmap.
[SENSe]:DPSA:COLor	Sets or queries the bitmap color mode.
[SENSe]:DPSA:COLor:MAXimum	Sets or queries the maximum value of the color axis.
[SENSe]:DPSA:COLor:MINimum	Sets or queries the minimum value of the color axis.
[SENSe]:DPSA:FREQuency:CENTer	Sets or queries the center frequency.
[SENSe]:DPSA:FREQuency:MEASurement	Sets or queries the measurement frequency.
[SENSe]:DPSA:FREQuency:SPAN	Sets or queries the frequency span.
[SENSe]:DPSA:MAX:SPAN	Sets the frequency span to the maximum span.
[SENSe]:SPECtrum subgroup	**Spectrum measurement**
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]	Sets or queries the resolution bandwidth (RBW).
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO	Sets or queries whether to set the RBW automatically.
[SENSe]:SPECtrum:FREQuency:CENTer	Sets or queries the center frequency.
[SENSe]:SPECtrum:FREQuency:MEASurement	Sets or queries the measurement frequency.
[SENSe]:SPECtrum:FREQuency:SPAN	Sets or queries the frequency span.
[SENSe]:SPECtrum:FREQuency:SPAN:BANDwidth[:RESolution]:RATio	Sets or queries the ratio of span to RBW.
[SENSe]:SPECtrum:FREQuency:STARt	Sets or queries the measurement start frequency.
[SENSe]:SPECtrum:FREQuency:STOP	Sets or queries the measurement stop frequency.
[SENSe]:SPECtrum:MAX:SPAN	Sets the frequency span to the maximum span.

System Commands

Use the SYSTem commands to Sets or queries system parameters for operation.

Table 2-19: System commands

Header	Description
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess	Sets or queries the UDP address at which to store the GPS time/location logging files.
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT	Sets or queries the UDP port at which to store GPS time/location logging files.
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess	Sets or queries the UDP address at which to store the measurement result logging files.
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT	Sets or queries the UDP port at which to store GPS time/location logging files.
SYSTem:DATE?	Queries the current instrument date.
SYSTem:ERRor:COUNt?	Queries the number of unread errors or events.
SYSTem:ERRor[:NEXT]?	Queries the latest error or event information.
SYSTem:GPS	Sets or queries the GPS operational mode.
SYSTem:GPS:POSition?	Query the current GPS position.
SYSTem:GPS:STATus?	Query the current GPS status.
SYSTem:LOGGing:GPS	Sets or queries the GPS time/location logging mode.
SYSTem:LOGGing:GPS:FILE[:NAME]	Sets or queries the GPS time/location data logging file name.
SYSTem:LOGGing:RESults	Sets or queries the measurement result logging mode.
SYSTem:LOGGing:RESults:FILE[:NAME]	Sets or queries measurement results logging file name.
SYSTem:TIME?	Queries the current instrument time.

Trace Commands

Use the TRACe commands to select trace type and to control trace arithmetic.

Table 2-20: Trace commands

Header	Description
TRACe<x>:DPSA subgroup	**DPX spectrum measurement**
TRACe<x>:DPSA:AVERage:COUNt	Sets or queries the number of traces to combine for averaging.
TRACe<x>:DPSA:AVERage:PROGress?	Queries the number of times the average trace has been averaged.
TRACe<x>:DPSA:AVERage:RESet	Clears the average data and resets the average counter.
TRACe<x>:DPSA:COLor:INTensity	Sets or queries the color intensity.
TRACe<x>:DPSA:COUNt:RESet	Clears the Max Hold data and counter, and restarts the process.
TRACe<x>:DPSA:DETection	Sets or queries the detector mode.
TRACe<x>:DPSA:DOT:PERSistent	Sets or queries whether to enable or disable dot persistence mode.
TRACe<x>:DPSA:DOT:PERSistent:TYPE	Sets or queries the persistence type.
TRACe<x>:DPSA:DOT:PERSistent:VARiable	Sets or queries the length of time that data points are displayed.
TRACe<x>:DPSA:FUNCtion	Sets or queries the trace function.
TRACe<x>:SPECtrum subgroup	**Spectrum measurement**
TRACe<x>:SPECtrum	Sets or queries whether to show or hide the specified trace.
TRACe<x>:SPECtrum:AVERage:COUNt	Sets or queries the number of traces to combine for averaging.
TRACe<x>:SPECtrum:AVERage:PROGress?	Queries the number of times the average trace has been averaged.
TRACe<x>:SPECtrum:AVERage:RESet	Clears the average data and resets the average counter.
TRACe<x>:SPECtrum:COUNt:RESet	Clears the Max or Min Hold data and counter, and restarts the process.
TRACe<x>:SPECtrum:DETection	Sets or queries the detector mode.
TRACe<x>:SPECtrum:FOReground	Sets or queries the foreground trace.
TRACe<x>:SPECtrum:FUNCtion	Sets or queries the trace function.
TRACe<x>:SPECtrum:LEFToperand	Sets or queries the left operand for the math trace.
TRACe<x>:SPECtrum:LOAD:TRACe	Load a live trace into a reference trace.
TRACe<x>:SPECtrum:OPERation	Sets or queries the math trace operation.
TRACe<x>:SPECtrum:RIGHtoperand	Sets or queries the right operand for the math trace.

Trace Mnemonics

Multiple traces can be used in some measurement modes. The traces are specified by the trace specifier TRACe<x> (<x>=1 to 5) which is defined for each measurement display as follows.

Table 2-21: Trace mnemonics

Measurement mode	TRACe1	TRACe2	TRACe3	TRACe4	TRACe5
DPX Spectrum	Trace 1	NA	NA	NA	Bitmap trace
Spectrum	Trace 1	Trace 2	Ref A	Ref B	Math

NOTE. *Valid traces depend on commands. Refer to each command description.*

Trigger Commands

Use the TRIGger commands to set up the trigger system.

Table 2-22: Trigger commands

Header	Description
TRIGger[:SEQuence]:EVENt:EXTernal:SLOPe	Sets or queries the external trigger slope type.
TRIGger[:SEQuence]:EVENt:INPut:LEVel	Sets or queries the trigger level for the IF input level trigger.
TRIGger[:SEQuence]:EVENt:INPut:SLOPe	Sets or queries the trigger slope for the IF input level trigger.
TRIGger[:SEQuence]:EVENt:INTernal	Sets or queries the internal time base trigger mode.
TRIGger[:SEQuence]:EVENt:INTernal:REPeat	Sets or queries the internal time base trigger repeat interval time.
TRIGger[:SEQuence]:EVENt:INTernal:TIME	Sets or queries the internal time base trigger start time.
TRIGger[:SEQuence]:EVENt:SOURce	Sets or queries the trigger event source.
TRIGger[:SEQuence]:IMMediate	Causes a trigger immediately.
TRIGger[:SEQuence]:STATus	Sets or queries the trigger mode (Free Run or Triggered).
TRIGger[:SEQuence]:TIME:DELay	Sets or queries the trigger delay time.

Unit Commands

Specify fundamental units for measurement.

Table 2-23: Unit commands

Header	Description
UNIT:POWer	Sets or queries the measurement unit of power.

Command Descriptions

ABORt (No Query Form)

Resets the trigger system and places the instrument in a paused state. Any actions related to the trigger system that are in progress, such as acquiring a measurement, are also aborted.

To start data acquisition, use the INITiate commands.

Conditions Measurement modes: All

Group Abort commands

Syntax `ABORt`

Related Commands INITiate:CONTinuous
INITiate[:IMMediate]

Arguments None

Examples `ABORT` resets the trigger system and stops data acquisition.

*CAL? (Query Only)

Runs and returns the instrument normalization status.

Conditions Spectrum mode

Group IEEE common commands

Syntax `*CAL?`

Arguments None

Returns `<NR1>`, where:
`1` indicates the instrument has completed a measurement normalization process with no errors.

0 indicates the instrument has completed a measurement normalization process with errors, or normalization on the instrument is disabled, or the instrument is not in Spectrum mode.

Examples *CAL? might return 1 indicating that the instrument has completed a measurement normalization process with no errors.

CALCulate:DPSA:MARKer<x>:MAXimum (No Query Form)

Moves the specified DPX mode marker to the maximum peak on the DPX spectrum trace. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax CALCulate:DPSA:MARKer<x>:MAXimum

Arguments None

Examples CALCULATE:DPSA:MARKER3:MAXIMUM moves Marker 3 (M3) to the highest peak on the DPX Spectrum trace.

CALCulate:DPSA:MARKer<x>:MODE

Sets or queries the specified DPX marker to absolute or delta measurement mode (in relation to Marker 1). Valid marker <x> values are 1 through 6. Marker 1 is always absolute.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax

```
CALCulate:DPSA:MARKer<x>:MODE { ABSolute | DELTa }
CALCulate:DPSA:MARKer<x>:MODE?
```

Arguments

`ABSolute` sets the specified marker to absolute measurement mode.

`DELTa` sets the specified marker to delta measurement mode, in relation to marker 1.

Examples

`CALCULATE:DPSA:MARKER4:MODE ABSolute` sets Marker 4 (M4) to measure the absolute value at the specified marker position.

`CALCULATE:DPSA:MARKER3:MODE?` might return `DELT`, indicating that the specified marker is set to delta measurement mode.

CALCulate:DPSA:MARKer<x>:PEAK:HIGHer (No Query Form)

Moves the specified marker to the next peak on the DPX spectrum trace that is higher than the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions

Measurement modes: DPX Spectrum

Group

Calculate commands

Syntax

```
CALCulate:DPSA:MARKer<x>:PEAK:HIGHer
```

Related Commands

CALCulate:DPSA:MARKer<x>:PEAK:LOWer
CALCulate:MARKer:PEAK:THReshold

Arguments

None

Examples

`CALCULATE:DPSA:MARKER2:PEAK:HIGHER` moves Marker 2 (M2) to the next peak higher in amplitude on the trace.

CALCulate:DPSA:MARKer<x>:PEAK:LEFT (No Query Form)

Moves the specified marker to the next peak on the DPX spectrum trace that is to the left of the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax `CALCulate:DPSA:MARKer<x>:PEAK:LEFT`

Related Commands CALCulate:DPSA:MARKer<x>:PEAK:RIGHt
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:DPSA:MARKER5:PEAK:LEFT` moves Marker 5 (M5) to the next peak to the left on the trace.

CALCulate:DPSA:MARKer<x>:PEAK:LOWer (No Query Form)

Moves the specified marker to the next peak on the DPX spectrum trace that is lower than the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax `CALCulate:DPSA:MARKer<x>:PEAK:LOWer`

Related Commands CALCulate:DPSA:MARKer<x>:PEAK:HIGHer
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:DPSA:MARKER2:PEAK:LOWER` moves Marker 2 (M2) to the next peak lower in amplitude on the trace.

CALCulate:DPSA:MARKer<x>:PEAK:RIGHt (No Query Form)

Moves the specified marker to the next peak on the DPX spectrum trace that is to the right of the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax `CALCulate:DPSA:MARKer<x>:PEAK:RIGHt`

Related Commands CALCulate:DPSA:MARKer<x>:PEAK:LEFT
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:DPSA:MARKER2:PEAK:RIGHT` moves Marker 2 (M2) to the next peak to the right on the trace.

CALCulate:DPSA:MARKer<x>[:SET]:CENTer (No Query Form)

Sets the measurement center frequency to that of the specified DPX mode marker frequency. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax `CALCulate:DPSA:MARKer<x>[:SET]:CENTer`

Arguments None

Examples `CALCULATE:DPSA:MARKER1:SET:CENTER` sets the center frequency to the frequency of marker 1.

CALCulate:DPSA:MARKer<x>:STATe

Sets or queries the enable/disable state of the specified DPX mode marker. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax
```
CALCulate:DPSA:MARKer<x>:STATe { OFF | ON | 0 | 1 }
CALCulate:DPSA:MARKer<x>:STATe?
```

Arguments `ON` or `1` enables the specified marker.

`OFF` or `0` disables the specified marker.

Examples `CALCulate:DPSA:MARKer5:STATe ON` enables Marker 5 (M5).

`CALCulate:DPSA:MARKer2:STATe?` might return `0` to indicate that Marker 2 (M2) is not enabled.

CALCulate:DPSA:MARKer<x>:X

Sets or queries the frequency value at the position of the specified marker in the DPX spectrum view. Valid marker <x> values are 0 through 6.

When the specified maker is enabled and set to absolute marker mode, the return value of the query is a NRf type equal to the specified markers current frequency. When the specified maker is enabled and set to delta marker mode, the return value of the query is a NRf type equal to the difference between the specified markers frequency and the marker 1 frequency.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax

```
CALCulate:DPSA:MARKer<x>:X <value>
CALCulate:DPSA:MARKer<x>:X?
```

Related Commands CALCulate:DPSA:MARKer<x>:Y?

Arguments `<value>::=<NRf>` specifies the frequency position of the marker.
Range: allowable frequency range of the instrument.

Examples `CALCULATE:DPSA:MARKER3:X:FREQUENCY 800e6` places Marker 3 (M3) at 800 MHz.

CALCulate:DPSA:MARKer<x>:Y? (Query Only)

Queries the amplitude (vertical) value at the position of the specified marker in the DPX spectrum view. Valid marker <x> values are 0 through 6.

When the specified maker is enabled and set to absolute marker mode, the return value of the query is a NRf type equal to the specified markers current amplitude. When the specified maker is enabled and set to delta marker mode, the return value of the query is a NRf type equal to the difference between the specified markers amplitude and the marker 1 amplitude.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Calculate commands

Syntax `CALCulate:DPSA:MARKer<x>:Y?`

Arguments None

Returns `<NRf>` The specified markers absolute or delta amplitude, in current power units, as specified by the UNIT:POWER command.

NOTE. *When using log power units, the response units for the math trace is always in dB.*

Examples `CALCULATE:DPSA:MARKER1:Y?` might return `-34.28`, indicating that Marker 1 (M1) is at -34.28 dBm of the DPX waveform trace.

CALCulate:MARKer:PEAK:THReshold

Sets or queries the threshold value that determines the minimum peak amplitude for marker peak searches.

Conditions Measurement modes: All

Group Calculate commands

Syntax
```
CALCulate:MARKer:PEAK:THReshold <value>
CALCulate:MARKer:PEAK:THReshold?
```

Related Commands
CALCulate:DPSA:MARKer<x>:PEAK:HIGHer
CALCulate:DPSA:MARKer<x>:PEAK:LEFT
CALCulate:DPSA:MARKer<x>:PEAK:LOWer
CALCulate:DPSA:MARKer<x>:PEAK:RIGHt
CALCulate:SPECtrum:MARKer<x>:PEAK:HIGHer
CALCulate:SPECtrum:MARKer<x>:PEAK:LEFT
CALCulate:SPECtrum:MARKer<x>:PEAK:LOWer
CALCulate:SPECtrum:MARKer<x>:PEAK:RIGHt

Arguments `<value>::=<NRf>` specifies the minimum threshold level for detecting peaks. The threshold value uses the current power units.
Range: -170 to +20 dBm.

Examples `CALCULATE:MARKER:PEAK:THRESHOLD -50` sets the minimum threshold level to -50 dBm.

CALCulate:SEARch:LIMit:FAIL? (Query Only)

Queries whether or not the current acquisition has a Spectrum mask violation.

Conditions Measurement modes: Spectrum and DPX Spectrum

Group Calculate commands

Syntax `CALCulate:SEARch:LIMit:FAIL?`

Arguments None

Returns `<boolean>` where 0 represents a spectrum mask limit violation on trace 1, and 1 indicates no mask limit violations on trace 1.

Examples `CALCulate:SEARch:LIMit:FAIL?` might return `0` to indicate that trace 1 violates the current spectrum mask or if mask testing is not enabled.

CALCulate:SEARch:LIMit:MATCh:BEEP[:STATe]

Sets or queries whether or not to beep when a spectrum mask violation occurs.

Conditions Measurement modes: Spectrum and DPX Spectrum

Group Calculate commands

Syntax
```
CALCulate:SEARch:LIMit:MATCh:BEEP[:STATe] { OFF | ON | 0 | 1 }
CALCulate:SEARch:LIMit:MATCh:BEEP[:STATe]?
```

Arguments `ON` or `1` enables the instrument to sound a beep when a mask test violation occurs.

`OFF` or `0` disables the instrument from sounding a beep when a mask test violation occurs.

Examples

`CALCULATE:SEARCH:LIMIT:MATCH:BEEP:STATE 1` sets the instrument to sound a beep when a mask test violation occurs.

`CALCULATE:SEARCH:LIMIT:MATCH:BEEP?` might return a 0, indicating that the instrument sound beep on mask test violation parameter is disabled.

CALCulate:SEARch:LIMit:MATCh:SACQuire[:STATe]

Sets or queries whether or not to pause acquisitions when a spectrum mask violation occurs.

Conditions

Measurement modes: Spectrum and DPX Spectrum

Group

Calculate commands

Syntax

```
CALCulate:SEARch:LIMit:MATCh:SACQuire[:STATe] { OFF | ON | 0 | 1 }
CALCulate:SEARch:LIMit:MATCh:SACQuire[:STATe]?
```

Arguments

`ON` or `1` sets the instrument to pause acquisition when a mask test violation occurs.

`OFF` or `0` sets the instrument to continue measurement acquisition when a mask test violation occurs.

Examples

`CALCULATE:SEARCH:LIMIT:MATCH:SACQUIRE:STATE 1` sets the instrument to pause acquisition when a mask test violation occurs.

`CALCULATE:SEARCH:LIMIT:MATCH:SACQUIRE?` might return a 0, indicating that the instrument is set to continue measurement acquisition when a mask test violation occurs.

CALCulate:SEARch:LIMit:MATCh:SPICture[:STATe]

Sets or queries whether or not to export a screen image when a spectrum mask violation occurs.

Conditions

Measurement modes: Spectrum and DPX Spectrum

Group

Calculate commands

Syntax

```
CALCulate:SEARch:LIMit:MATCh:SPICture[:STATe] { OFF | ON | 0 | 1 }
CALCulate:SEARch:LIMit:MATCh:SPICture[:STATe]?
```

Arguments

ON or 1 sets the instrument to automatically save a screen shot of spectrum mask violations when a mask test violation occurs.

OFF or 0 sets the instrument to not automatically save a screen shot of the mask violations when a mask test violation occurs.

Examples

CALCULATE:SEARCH:LIMIT:MATCH:SPICTURE:STATE ON sets the instrument to automatically save a screen shot of spectrum mask violations when a mask test violation occurs.

CALCULATE:SEARCH:LIMIT:MATCH:SPICTURE? might return a 0, indicating that the instrument is set to continue measurement acquisition without saving a screen shot of the mask violations when a mask test violation occurs.

CALCulate:SEARch:LIMit:MATCh:STRace[:STATe]

Sets or queries whether or not to export the current measurement results when a spectrum mask violation occurs.

Conditions

Measurement modes: Spectrum and DPX Spectrum

Group

Calculate commands

Syntax

```
CALCulate:SEARch:LIMit:MATCh:STRace[:STATe] { OFF | ON | 0 | 1 }
CALCulate:SEARch:LIMit:MATCh:STRace[:STATe]?
```

Arguments

ON or 1 sets the instrument to automatically export measurement results of spectrum mask violations to a file when a mask test violation occurs.

OFF or 0 sets the instrument to not export measurement results of spectrum mask violations to a file when a mask test violation occurs.

Examples

CALCULATE:SEARCH:LIMIT:MATCH:STRACE:STATE ON sets the instrument to export measurement results of spectrum mask violations to a file when a mask test violation occurs.

CALCULATE:SEARCH:LIMIT:MATCH:STRACE? might return a 1, indicating that the instrument is set to export measurement results of spectrum mask violations to a file when a mask test violation occurs.

CALCulate:SEARch:LIMit:OPERation:MASK:LOAD

Loads a specified spectrum mask file.

Conditions Measurement modes: Spectrum and DPX Spectrum

Group Calculate commands

Syntax CALCulate:SEARch:LIMit:OPERation:MASK:LOAD <file_name>

Arguments <file_name>::=<string> specifies the path and file from which to load the spectrum mask file. You do not need to specify the mask test file extension.

When the specified spectrum mask file name does not include a path component, the file will be loaded from the current stored settings directory.

When the specified spectrum mask file name does include a path, the file will be loaded from the directory specified in the path.

The instrument ignores the command and generates an execution error if the specified spectrum mask file does not exist.

Examples CALCULATE:SEARCH:LIMIT:OPERATION:MASK:LOAD "Mask1" loads the mask data from the *Mask1.hdm* file.

CALCulate:SEARch:LIMit:STATe

Sets or queries the spectrum mask testing state.

This command is ignored and an error event generated if issued with a 1 or ON argument when no mask file is currently specified or the currently specified mask file does not exist.

Conditions Measurement modes: Spectrum and DPX Spectrum

Group Calculate commands

Syntax

```
CALCulate:SEARch:LIMit:STATe { OFF | ON | 0 | 1 }
CALCulate:SEARch:LIMit:STATe?
```

Arguments

`ON` or `1` enables Spectrum mask testing.

`OFF` or `0` disables Spectrum mask testing.

Examples

`CALCULATE:SEARCH:LIMIT:STATE 1` enables Spectrum mask testing.

`CALCULATE:SEARCH:LIMIT:STATE?` might return a 0, indicating that Spectrum mask testing is disabled.

CALCulate:SPECtrum:MARKer<x>:MAXimum (No Query Form)

Moves the specified marker to the maximum peak on the spectrum trace. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax

```
CALCulate:SPECtrum:MARKer<x>:MAXimum
```

Arguments None

Examples `CALCULATE:SPECtrum:MARKER3:MAXIMUM` moves Marker 3 (M3) to the highest peak on the spectrum trace.

CALCulate:SPECtrum:MARKer<x>:MODE (No Query Form)

Sets or queries the specified marker to absolute or delta measurement mode (in relation to Marker 1). Valid marker <x> values are 1 through 6. Marker 1 is always absolute.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax
```
CALCulate:SPECtrum:MARKer<x>:MODE { ABSolute | DELTa }
CALCulate:SPECtrum:MARKer<x>:MODE?
```

Arguments `ABSolute` sets the specified marker to absolute measurement mode.

`DELTa` sets the specified marker to delta measurement mode, in relation to Marker 1.

Examples `CALCULATE:SPECtrum:MARKER4:MODE ABSolute` sets Marker 4 (M4) to measure the absolute value at the specified marker position.

`CALCULATE:SPECtrum:MARKER3:MODE?` might return `DELT`, indicating that the specified marker is set to delta measurement mode.

CALCulate:SPECtrum:MARKer<x>:PEAK:HIGHer (No Query Form)

Moves the specified marker to the next peak on the Spectrum trace that is higher than the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax
```
CALCulate:SPECtrum:MARKer<x>:PEAK:HIGHer
```

Related Commands CALCulate:SPECtrum:MARKer<x>:PEAK:LOWer
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:SPECtrum:MARKER2:PEAK:HIGHER` moves Marker 2 (M2) to the next peak higher in amplitude on the Spectrum trace.

CALCulate:SPECtrum:MARKer<x>:PEAK:LEFT (No Query Form)

Moves the specified marker to the next peak on the Spectrum trace that is to the left of the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax `CALCulate:SPECtrum:MARKer<x>:PEAK:LEFT`

Related Commands CALCulate:SPECtrum:MARKer<x>:PEAK:RIGHt
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:SPECtrum:MARKER5:PEAK:LEFT` moves Marker 5 (M5) to the next peak to the left on the Spectrum trace.

CALCulate:SPECtrum:MARKer<x>:PEAK:LOWer (No Query Form)

Moves the specified marker to the next peak on the Spectrum trace that is lower than the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax `CALCulate:SPECtrum:MARKer<x>:PEAK:LOWer`

Related Commands CALCulate:SPECtrum:MARKer<x>:PEAK:HIGHer
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:SPECtrum:MARKER2:PEAK:LOWER` moves Marker 2 (M2) to the next peak lower in amplitude on the Spectrum trace.

CALCulate:SPECtrum:MARKer<x>:PEAK:RIGHt (No Query Form)

Moves the specified marker to the next peak on the Spectrum trace that is to the right of the current marker position and is above the current marker peak threshold. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax `CALCulate:SPECtrum:MARKer<x>:PEAK:RIGHt`

Related Commands CALCulate:SPECtrum:MARKer<x>:PEAK:LEFT
CALCulate:MARKer:PEAK:THReshold

Arguments None

Examples `CALCULATE:SPECtrum:MARKER2:PEAK:RIGHT` moves Marker 2 (M2) to the next peak to the right on the Spectrum trace.

CALCulate:SPECtrum:MARKer<x>[:SET]:CENTer (No Query Form)

Sets the measurement center frequency to the frequency of the specified Spectrum mode marker. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax `CALCulate:SPECtrum:MARKer<x>[:SET]:CENTer`

Arguments None

Examples `CALCULATE:SPECtrum:MARKER1:SET:CENTER` sets the center frequency to the frequency of Marker 1 (M1).

CALCulate:SPECtrum:MARKer<x>:STATe

Sets or queries the enable/disable state of the specified mode marker. Valid marker <x> values are 0 through 6.

This command is ignored and an error event generated when the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax
```
CALCulate:SPECtrum:MARKer<x>:STATe { OFF | ON | 0 | 1 }
CALCulate:SPECtrum:MARKer<x>:STATe?
```

Arguments `ON` or `1` enables the specified marker.

`OFF` or `0` disables the specified marker.

Examples `CALCulate:SPECtrum:MARKer5:STATe ON` enables Marker 5 (M5).

`CALCulate:SPECtrum:MARKer2:STATe?` might return `0` to indicate that Marker 2 (M2) is not enabled.

CALCulate:SPECtrum:MARKer<x>:TRACe

Sets or queries the trace on which the specified marker is placed in the Spectrum measurement. Valid marker <x> values are 1 through 6.

This command is ignored and an error event generated when the instrument is not in Spectrum measurement mode, the display or markers are currently disabled, the specified marker is not enabled, or the specified trace is not enabled.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax

```
CALCulate:SPECtrum:MARKer<x>:TRACe { TRACe1 | TRACe2 |
TRACe3 | TRACe4 | TRACe5 | FOReground }
CALCulate:SPECtrum:MARKer<x>:TRACe?
```

Arguments

`TRACe1` places the specified marker on Trace 1.

`TRACe2` places the specified marker on Trace 2.

`TRACe3` places the specified marker on Trace 3 (Ref A).

`TRACe4` places the specified marker on Trace 4 (Ref B).

`TRACe5` places the specified marker on Trace 5 (Math).

`FOReground` places the specified marker on the front-most (selected) trace.

Examples

`CALCULATE:SPECTRUM:MARKER1:TRACE TRACE1` places Marker 1 (M1) on Trace 1.

`CALCULATE:SPECTRUM:MARKER2:TRACE?` might return `TRAC3`, indicating that the marker is on the Ref A waveform.

CALCulate:SPECtrum:MARKer<x>:X

Sets or queries the current frequency of the specified Spectrum mode marker on the spectrum trace.

When the specified maker is enabled and set to absolute marker mode, the return value of the query is a NRf type equal to the specified markers current frequency. When the specified maker is enabled and set to delta marker mode, the return value of the query is a NRf type equal to the difference between the specified markers frequency and the marker 1 frequency.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax

```
CALCulate:SPECtrum:MARKer<x>:X <value>
CALCulate:SPECtrum:MARKer<x>:X?
```

Related Commands CALCulate:SPECtrum:MARKer<x>:Y?

Arguments `<value>::=<NRf>` specifies the horizontal (frequency) position of the marker. Range: allowable frequency range of the instrument.

Examples `CALCULATE:SPECTRUM:MARKER3:X 800e6` places Marker 3 (M3) at 800 MHz on the spectrum trace.

CALCulate:SPECtrum:MARKer<x>:Y? (Query Only)

Queries the vertical position (amplitude) of the selected marker on the spectrum trace.

When the specified marker is enabled and set to absolute marker mode, the return value of the query is a NRf value equal to the specified markers current amplitude. When the specified marker is enabled and set to delta marker mode, the return value of the query is a NRf value equal to the difference between the specified markers amplitude and the marker 1 amplitude.

This command is ignored and an error event generated when the specified marker is not enabled, marker display is disabled, or the instrument is not in Spectrum mode.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax

```
CALCulate:SPECtrum:MARKer<x>:Y?
```

Related Commands CALCulate:SPECtrum:MARKer<x>:X

Arguments None

Returns <NRf> specifies the markers absolute or delta amplitude, in current power units, as specified by the UNIT:POWER command.

NOTE. *When using log power units, the response units for the math trace is always in dB.*

Examples CALCULATE:SPECTRUM:MARKER1:Y? might return -34.28, indicating Marker 1 (M1) is at -34.28 dBm.

CALibration:AUTO

Sets or queries the whether or not automatic normalizations should occur.

Conditions Measurement modes: Spectrum

Group Calculate commands

Syntax
```
CALibration:AUTO { OFF | ON | 0 | 1 }
CALibration:AUTO?
```

Arguments ON or 1 enables automatic normalizations.

OFF or 0 disables automatic normalizations.

Examples CALibration:AUTO ON enables automatic normalizations.

CALibration:AUTO? might return 0 to indicate that automatic normalizations are disabled.

CALibration:CORRection:EXTernal:GAIN[:MAGNitude]

Sets or queries the external gain or loss value. It can be enabled or disabled using the CALibration:CORRection:EXTernal:GAIN:STATe command.

Conditions Measurement modes: All

Group Calibration commands

Syntax
```
CALibration:CORRection:EXTernal:GAIN[:MAGNitude] <value>
CALibration:CORRection:EXTernal:GAIN[:MAGNitude]?
```

Arguments <value>::=<NRf> specifies the external gain or loss value of the RF signal applied to the instrument. A positive value sets external gain; a negative value sets external loss. Range: -80 to +30 dB.

Examples CALIBRATION:CORRECTION:EXTERNAL:GAIN:MAGNITUDE -10 specifies an external loss of -10 dB.

CALIBRATION:CORRECTION:EXTERNAL:GAIN:MAGNITUDE? might return 20, indicating an external gain of 20 dB.

CALibration:CORRection:EXTernal:GAIN:STATe

Sets or queries the external signal gain/loss state mode. When enabled, the instrument applies the gain or loss setting as specified by the CALibration:CORRection:EXTernal:GAIN[:MAGNitude] command.

Conditions Measurement modes: All

Group Calibration commands

Syntax
```
CALibration:CORRection:EXTernal:GAIN:STATe { OFF | ON | 0 |
1 }
CALibration:CORRection:EXTernal:GAIN:STATe?
```

Related Commands CALibration:CORRection:EXTernal:GAIN[:MAGNitude]

Arguments OFF or 0 disables the external gain/loss correction.

ON or 1 enables the external gain/loss correction.

Examples CALIBRATION:CORRECTION:EXTERNAL:GAIN:STATE ON enables the external gain/loss corrections.

*CLS (No Query Form)

Clears the instrument status data structures. Refer to Section 3, *Status and Events*, for the register information.

The *CLS command clears the following

- the Event Queue
- the Standard Event Status Register (SESR)
- the Status Byte Register (except the MAV bit)

Conditions Measurement modes: All

Group IEEE common commands

Syntax

```
*CLS
```

Related Commands *ESE
*ESR?
*SRE
*STB?

Arguments None

Examples `*CLS` clears the instrument status data structures.

DISPlay:DPSA:MARKer:SHOW:STATe

Sets or queries the DPX mode enable/disable state for markers and marker readouts.

This command is ignored and an error event generated when the instrument is not in DPX Spectrum mode.

Conditions Measurement modes: DPX Spectrum

Group Display commands

Syntax

```
DISPlay:DPSA:MARKer:SHOW:STATe { OFF | ON | 0 | 1 }
DISPlay:DPSA:MARKer:SHOW:STATe?
```

Arguments `OFF` or `0` disables markers and marker readouts in the DPX Spectrum measurement mode.

`ON` or `1` enables markers and marker readouts in the DPX Spectrum measurement mode.

Examples `DISPLAY:DPSA:MARKER:SHOW:STATE ON` enables markers and marker readouts in the DPX Spectrum mode.

DISPlay:GENeral:MEASview:NEW (No Query Form)

Sets a new measurement mode.

Conditions Measurement modes: All

Group Display commands

Syntax
```
DISPlay:GENeral:MEASview:NEW { SPECtrum | DPSA }
```

Arguments `SPECtrum` sets the instrument to Spectrum measurement mode.

`DPSA` sets the instrument to DPX Spectrum measurement mode.

Examples `DISPLAY:GENERAL:MEASVIEW:NEW DPSA` sets the instrument to the DPX Spectrum measurement mode.

DISPlay:GENeral:MEASview:SELect

Sets or queries the measurement mode.

Conditions Measurement modes: All

Group Display commands

Syntax
```
DISPlay:GENeral:MEASview:SELect { SPECtrum | DPSA }
DISPlay:GENeral:MEASview:SELect?
```

Arguments `SPECtrum` sets the instrument to Spectrum measurement mode.

`DPSA` sets the instrument to DPX Spectrum measurement mode.

Examples `DISPLAY:GENERAL:MEASVIEW:SELECT DPSA` sets the instrument to the DPX Spectrum measurement mode.

`DISPLAY:GENERAL:MEASVIEW:SELECT`? might return `SPEC`, indicating that the instrument is in the Spectrum measurement mode.

DISPlay:SPECtrum:MARKer:SHOW:STATe

Sets or queries the Spectrum mode enable/disable state for markers and marker readouts.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Display commands

Syntax
```
DISPlay:SPECtrum:MARKer:SHOW:STATe { OFF | ON | 0 | 1 }
DISPlay:SPECtrum:MARKer:SHOW:STATe?
```

Arguments `OFF` or `0` disables markers and marker readouts in the Spectrum measurement mode.

`ON` or `1` enables markers and marker readouts in the Spectrum measurement mode.

Examples `DISPLAY:SPECTRUM:MARKER:SHOW:STATE ON` enables markers and marker readouts in the Spectrum mode.

DISPlay:SPECtrum:Y[:SCALe]:OFFSet

Sets or queries the vertical position (the value at the top edge of the vertical axis) of the Spectrum display. The vertical position value uses the current power units.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when using linear power units.

Conditions Measurement modes: Spectrum

Group Display commands

Syntax
```
DISPlay:SPECtrum:Y[:SCALe]:OFFSet <value>
DISPlay:SPECtrum:Y[:SCALe]:OFFSet?
```

Related Commands [SENSe]:POWer:UNITs

Arguments <value>::=<NRf> specifies the vertical position.
The vertical position value uses the current power units.

Examples `DISPLAY:SPECTRUM:Y:SCALE:OFFSET -12.5` sets the vertical position to -12.5 dBm.

DISPlay:SPECtrum:Y[:SCALe]:PDIVision

Sets or queries the vertical scale (per division) of the Spectrum measurement graph.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when using linear power units.

Conditions Measurement modes: Spectrum

Group Display commands

Syntax
```
DISPlay:SPECtrum:Y[:SCALe]:PDIVision <value>
DISPlay:SPECtrum:Y[:SCALe]:PDIVision?
```

Arguments <value>::=<NRf> specifies the vertical scale (per division).
Range: 1 to 20 dB/div.

Examples `DISPLAY:SPECTRUM:Y:SCALE:PDIVISION 5` sets the vertical scale to 5 dB/div.

*ESE

Sets or queries the bits in the Event Status Enable Register (ESER). The ESER prevents events from being reported to the Status Byte Register (STB). Refer to Section 3, *Status and Events*, for the register information.

Conditions Measurement modes: All

Group IEEE common commands

Syntax
```
*ESE <value>
*ESE?
```

Related Commands *CLS
*ESR?
*SRE
*STB?

Arguments <value>::=<NR1> is a value in the range from 0 through 255. The binary bits of the ESER are set according to this value.

Examples *ESE 145 sets the ESER to binary 10010001.

*ESE? might return the string *ESE 184, showing that the ESER contains the binary value 10111000.

*ESR? (Query Only)

Returns the contents of the Standard Event Status Register (SESR). *ESR? also clears the SESR (since reading the SESR clears it). Refer to Section 3, *Status and Events*, for the register information.

Conditions Measurement modes: All

Group IEEE common commands

Syntax
```
*ESR?
```

Related Commands *CLS
*ESE
*SRE
*STB?

Arguments None

Returns <NR1> representing the contents of the SESR by a 0 to 255 decimal number.

Examples *ESR? might return the value 213, showing that the SESR contains binary 11010101.

FETCh:DPSA:BITMap? (Query Only)

Query the current DPX Spectrum mode hit count information for each cell of the bitmap data.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX Spectrum

Group Fetch commands

Syntax FETCh:DPSA:BITMap?

Arguments None

Returns <arbitrary block> containing hit count information for each cell of the DPX bitmap data, based on the current DPX bitmap intensity and dot persistence settings. The format of the query response is a matrix of cells consisting of 151 rows by 365 columns, for a total of 55115 bytes, with the following characteristics:

- The first byte in the response is the upper left hand corner cell of the displayed DPX Spectrum bitmap. The first row of data (the first 365 bytes) in the response is the top row of cells of the displayed DPX Spectrum bitmap.
- The last byte in the response is the lower right hand corner cell of the displayed DPX Spectrum bitmap. The last row of data (the last 365 bytes) in the response is the bottom row of cells of the displayed DPX Spectrum bitmap.
- Each byte in the data block indicates what percentage of time that particular cell was "hit" by the input signal. The following list indicates the hit percentage values:

Cell value	Percent hit range
15	93.34 to 100.00
14	86.68 to 93.33
13	80.01 to 86.67
12	73.34 to 80.00

Cell value	Percent hit range
11	66.68 to 73.33
10	60.01 to 66.67
9	53.34 to 60.00
8	46.68 to 53.33
7	40.01 to 46.68
6	33.34 to 40.00
5	26.68 to 33.33
4	20.01 to 26.67
3	6.68 to 13.33
2	6.68 to 13.33
1	0.01 to 6.67
0	0.0 0(Never hit)

Examples `FETCH:DPSA:BITMap?` might return `#555115...` for the hit count information of each cell of the bitmap data.

FETCh:DPSA:TRACe1? (Query Only)

Query the current DPX Spectrum mode trace1 data.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX Spectrum

Group Fetch commands

Syntax `FETCh:DPSA:TRACe1?`

Related Commands FORMat:[DATA]

Arguments None

Returns When the results data format is set to ASCII, the 365 amplitude points are returned as 365 comma-separated NR2 values. When the results data format is set to binary, the 365 amplitude points are returned in an arbitrary block format as 4-byte little endian floating point values as follows:

#<num_digit><num_byte><data(1)<data(2)>...<data(365)>

Where:
<num_digit> is the number of digits in <num_byte>. This value is always 4.
<num_byte> is the number of bytes of data that follow. This value is always 1460.
<data(n)> is the amplitude (in current power units) of the trace for point #n, 4-byte little endian floating-point format as specified in IEEE 488.2.

Examples FETCH:DPSA:TRACe1? might return #41460xxxx... for the DPX Spectrum waveform data.

FETCh:SPECtrum:TRACe<x>? (Query Only)

Queries the current Spectrum mode trace data for the specified trace. The valid range of trace<x> values is 1 through 5.

This command is ignored and an error event generated when the specified trace is not currently enabled or the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Fetch commands

Syntax FETCh:SPECtrum:TRACe<x>?

Related Commands FORMat:[DATA]

Arguments None

Returns When the results data format is set to ASCII, the 501 amplitude points are returned as 501 comma-separated NR2 values. When the results data format is set to binary, the 501 amplitude points are returned in an arbitrary block format as 4-byte little endian floating point values as follows:

#<num_digit><num_byte><data(1)<data(2)>...<data(501)>

Where:

<num_digit> is the number of digits in <num_byte>. This value is always 4.

<num_byte> is the number of bytes of data that follow. This value is always 2004.

<data(n)> is the amplitude (in current power units) of the trace for point #n, 4-byte little endian floating-point format as specified in IEEE 488.2.

NOTE. *When the trace is in min/max hold mode, waveform points for both the min and max waveforms are returned, resulting in a total of 1002 amplitude points.*

Examples `FETCH:SPECtrum:TRACe3?` might return `#42004xxxx...` for the Spectrum waveform trace 3 data.

FORMat:[DATA]

Sets or queries whether the following commands/queries will use binary or ASCII formats for parameters and/or query responses:

FETCh:DPSA:TRACe1?, FETCh:SPECtrum:TRACe<x>?, MMEMory:STORe:RESults

Conditions Measurement modes: All

Group Format commands

Syntax

```
FORMat:[DATA] {ASCii | BINary }
FORMat:[DATA]?
```

Related Commands FETCh:DPSA:TRACe1?
FETCh:SPECtrum:TRACe<x>?
MMEMory:STORe:RESults

Arguments `ASCii` sets the format type to ASCII.

`BINary` sets the format type to binary.

Examples `FORMAT:DATA ASCII` sets the format type to ASCII.

`FORMAT:DATA?` might return `BIN`, indicating that the format type is binary.

FORMat:[DATA]:LOGGing

Sets or queries the format of the measurement result data logging file (ASCII or binary).

Conditions Measurement modes: All

Group Format commands

Syntax
```
FORMat:[DATA]:LOGGing {ASCii | BINary }
FORMat:[DATA]:LOGGing?
```

Related Commands SYSTem:LOGGing:GPS
SYSTem:LOGGing:GPS:FILE[:NAME]
SYSTem:LOGGing:RESults
SYSTem:LOGGing:RESults:FILE[:NAME]

Arguments `ASCii` sets the data logging file format to ASCII.

`BINary` sets the data logging file format to binary.

Examples `FORMAT:DATA:LOGGING ASCII` sets the measurement data logging output file format to ASCII.

`FORMAT:LOGGING?` might return `BIN`, indicating that the measurement data logging output file format is binary.

*IDN? (Query Only)

Returns the instrument identification code.

Conditions Measurement modes: All

Group IEEE common commands

Syntax
```
*IDN?
```

Arguments None

Returns The instrument identification code in the following format

```
TEKTRONIX,<instrument_name>,<serial_number>,<firmware_version>
```

Where:
`TEKTRONIX` indicates that the manufacturer is Tektronix.
`<instrument_name>` is the instrument name (SA2600 or RFHawk).
`<serial_number>` is the serial number.
`<firmware_version>` is the software version of the application.

Examples `*IDN?` might return the response `TEKTRONIX,SA2600,B0101533,FV2.063`.

INITiate:CONTinuous

Sets or queries the instrument measurement acquisition mode (single or continuous).

Conditions Measurement modes: All

Group Initiate commands

Syntax

```
INITiate:CONTinuous { OFF | ON | 0 | 1 }
INITiate:CONTinuous?
```

Related Commands INITiate[:IMMediate]

Arguments `OFF` or `0` places the instrument in the single acquisition mode.

`ON` or `1` places the instrument in the continuous acquisition mode.

Examples `INITIATE:CONTINUOUS ON` places the instrument in the continuous acquisition mode.

INITiate[:IMMediate] (No Query Form)

Starts an input signal acquisition.

NOTE. *This is an overlapped command that does not finish executing before the next command starts executing. Use the *OPC(?) and *WAI commands to synchronize all pending operations to the execution of this command.*

Conditions Measurement modes: All

Group Initiate commands

Syntax

```
INITiate[:IMMediate]
```

Related Commands *OPC
*TRG
*WAI
INITiate:CONTinuous

Arguments None

Examples `INITIATE:IMMEDIATE` starts an input signal acquisition.

INPut:ALEVel (No Query Form)

Performs an auto-level operation.

Conditions Measurement modes: All

Group Input commands

Syntax `INPut:ALEVel`

Arguments None

Examples `INPut:ALEVel` performs an auto-level operation.

INPut:RLEVel

Sets or queries the input reference level.

Conditions Measurement modes: All

Group Input commands

Syntax
```
INPut:RLEVel <value>
INPut:RLEVel?
```

Arguments `<value>::=<NRf>` specifies the reference level value. The reference level value uses the current power units.

Examples `INPUT:RFLEVel 10` sets the reference level to 10.

INPut[:RF]:ATTenuation

Sets or queries the input attenuation value.

Conditions Measurement modes: All

Group Input commands

Syntax
```
INPut[:RF]:ATTenuation <value>
INPut[:RF]:ATTenuation?
```

Arguments `<value>::=<NR1>` specifies the input attenuation.
Range: 0 to 50 dB in 5 dB steps.

Examples `INPUT:RF:ATTENUATION 20` sets the input attenuation to 20 dB.

INPut[:RF]:GAIN:STATe

Sets or queries the input preamp state.

The preamp can only be enabled when the input attenuation is 15 dB or less.

Conditions Measurement modes: All

Group Input commands

Syntax
```
INPut[:RF]:GAIN:STATe { OFF | ON | 0 | 1 }
INPut[:RF]:GAIN:STATe?
```

Arguments `OFF` or `0` disables the internal pre-amp.

`ON` or `1` enables the internal pre-amp.

Examples `INPUT:RF:GAIN:STATE ON` enables the internal pre-amp.

MMEMory:LOAD:RESults (No Query Form)

Loads a binary format stored measurement result file.

This command is ignored and an error event generated when the specified measurement result file does not exist or is not a valid binary format measurement result file.

NOTE. *Loading a binary stored measurement result file has a side effect of setting the current instrument measurement mode to that of the result being recalled.*

Conditions Measurement modes: All

Group Mass memory commands

Syntax `MMEMory:LOAD:RESults <file_name>`

Arguments `<file_name>::=<string>` specifies the path and file name from which to load binary format stored measurement results data. When the specified file does not include a path component, the file is loaded from the current measurement results directory. When a path is specified, the current measurement results directory is set to that path.

You must enter a file extension as part of the file name. The following table lists valid measurement results file extensions.

Measurement	File extension
Spectrum	.ssp
DPX Spectrum	.sdpx

Examples `MMEMORY:LOAD:RESULTS "meas1.ssp"` loads and displays the binary format measurement results data from the *meas1.ssp* file and sets the current measurement mode to Spectrum.

MMEMory:LOAD:STATe (No Query Form)

Loads instrument settings data from a specified file and configures the instrument with the new settings data.

This command is ignored and an error event generated when the specified settings file does not exist or is not a settings file.

Conditions Measurement modes: All

Group Mass memory commands

Syntax `MMEMory:LOAD:STATe <file_name>`

Arguments `<file_name>::=<string>` specifies the path and file name from which to load the instrument settings data. When the specified file does not include a path component, the file is loaded from the current saved settings directory. When a path is specified, the current saved settings directory is set to that path. The file extension is .sav. You can omit the extension.

Examples `MMEMORY:LOAD:STATE "Setup1"` loads and configures the instrument settings from the *Setup1.sav* file of the current saved settings directory.

MMEMory:SPECtrum:LOAD:TRACe<x> (No Query Form)

Load the specified waveform trace from the specified measurement result file into either the RefA (Trace 3) or RefB (Trace 4) trace. Valid trace<x> values are 3 and 4.

This command is ignored and an error event generated when the file does not exist, the instrument is not in the Spectrum measurement mode, the destination trace is not enabled, or the measurement result file does not contain the specified source trace.

Conditions Measurement modes: Spectrum

Group Mass memory commands

Syntax `MMEMory:SPECtrum:LOAD:TRACe<x> {TRACe1 | TRACe2 | TRACe3 | TRACe4 | TRACe5},<file_name>`

Arguments `TRACe1` specifies to load Trace 1 waveform data from the file.

`TRACe2` specifies to load Trace 2 waveform data from the file.

`TRACe3` specifies to load Trace 3 waveform data from the file.

`TRACe4` specifies to load Trace 4 waveform data from the file.

`TRACe5` specifies to load Trace 5 waveform data from the file.

`<file_name>::=<string>` specifies the measurement results file from which to load the trace data. When the string does not include a path component, the file is loaded from the current measurement results directory. When a path is specified, the current measurement results directory is set to that path.

You must enter a file extension as part of the file name. See MMEMory:LOAD:RESults for a table of valid measurement results file extensions.

Examples

`MMEMORY:SPECTRUM:LOAD:TRACE3 TRACE1,"Meas23.ssp"` loads trace 1 waveform data from the *meas23.ssp*. file into Trace 3 (RefA) and displays the waveform.

MMEMory:STORe:RESults (No Query Form)

Store the current measurement results to a specified file in either binary or ASCII format, as last set by the FORMat:[DATA] command.

When set to binary, the file stored is a binary measurement results file, which can later be loaded with the MMEMory:LOAD:RESults command. Any user-specified file extension is replaced by the default measurement results file extension for the current measurement mode.

When set to ASCII, results are stored in an ASCII-format exported results file. To create a tab-separated format file, use a .txt file extension. To create a comma-separated format file, use a .csv file extension.

This command is ignored and an error event generated when a specified file directory component does not exist or the specified measurement result file name already exists.

Conditions

Measurement modes: All

Group

Mass memory commands

Syntax

`MMEMory:STORe:RESults <file_name>`

Related Commands

FORMat:[DATA]
MMEMory:LOAD:RESults

Arguments

`<file_name>::=<string>` specifies the path and file name in which to store the measurement results. When the string does not include a path component, the file is saved to the current measurement results directory. When a path is specified, the current measurement results directory is set to that path.

Examples `MMEMORY:STORE:RESULTS "RESULT1.csv"` stores the measurement results to the *RESULT1.csv* file as an ASCII comma-separated format file in the current measurement results directory.

MMEMory:STORe:SCReen(No Query Form)

Stores the instrument screen image to a specified file and format.

This command is ignored and an error event generated when a specified file directory component does not exist or the specified screen image file name already exists.

Conditions Measurement modes: All

Group Mass memory commands

Syntax `MMEMory:STORe:SCReen <file_name>`

Arguments `<file_name>::=<string>` specifies the path and file name in which to store the screen image. When the string does not include a path component, the file is saved to the current measurement results directory. When a path is specified, the current measurement results directory is set to that path.

The file extension sets the file format type. Valid file extensions are .png, .bmp and .jpg. If the file name does not include a file extension then it will use the current default exported screen format.

Examples `MMEMORY:STORE:SCREEN "image1.jpg"` stores the *image1.jpg* file in the current stored measurement results directory.

MMEMory:STORe:STATe (No Query Form)

Stores the instrument settings to a specified file.

This command is ignored and an error event generated when a specified file directory component does not exist or the specified file name already exists.

Conditions Measurement modes: All

Group Mass memory commands

Syntax `MMEMory:STORe:STATe <file_name>`

Arguments `<file_name>::=<string>` specifies the path and file name in which to store the instrument settings file. When the string does not include a path component, the file is saved to the current stored settings directory. When a path is specified, the current saved settings directory is set to that path.

The file extension is .sav. You can omit the extension. Any specified filename extension is discarded and replaced with sav.

Examples `MMEMORY:STORE:STATE "STATE1"` stores the instrument settings in the *STATE1.sav* file in the current saved settings directory.

*OPC

The *OPC command generates the operation complete message in the Standard Event Status Register (SESR) when all pending operations finish. The *OPC? query places the ASCII character "1" into the output queue when all pending operations are finished. The *OPC? response is not available to read until all pending operations finish.

The *OPC command allows you to synchronize the operation of the instrument with your application program. Refer to *Synchronizing Execution* (See page 3-7.) for the details.

Conditions Measurement modes: All

Group IEEE common commands

Syntax
```
*OPC
*OPC?
```

Arguments None

Examples `*OPC?` returns a 1 when all pending operations are finished.

OUTPut:IF[:STATe]

Sets or queries the state of the IF output. The nominal IF out frequency is 140 MHz. The IF Output signal can only be enabled when in Spectrum mode.

The IF output signal is unavailable when taking Spectrum measurements that require multiple acquisitions. Multiple acquisitions occur when the span is greater than 20 MHz, and can occur for some combinations of manually set RBW. To ensure an IF output signal, set the measurement span to be ≤20 MHz and set the RBW to Auto.

Enabling the IF output signal results in the instrument measurements being uncalibrated.

This command is ignored and an error event generated when the current instrument settings or measurement mode prohibit the IF output from being enabled.

Conditions Measurement modes: Spectrum

Group Output commands

Syntax

```
OUTPut:IF[:STATe] { OFF | ON | 0 | 1 }
OUTPut:IF[:STATe]?
```

Arguments `OFF` or `0` turns off IF output.

`ON` or `1` turns on IF output.

Examples `OUTPUT:IF:STATE ON` turns on IF output.

*RST (No Query Form)

Returns the instrument settings to the factory defaults.

The *RST command does not alter the following

- Alignment data that affect device specifications.
- The Output Queue.
- The Service Request Enable Register setting.
- The Standard Event Status Enable Register setting.
- Stored settings.

NOTE. *Execution of the *RST command is not complete until all changes from resetting the instrument are completed. Following commands and queries will not be executed until these actions are completed.*

Conditions Measurement modes: All

Group IEEE common commands

Syntax `*RST`

Related Commands *CLS

Arguments None

Examples `*RST` returns the instrument settings to the factory defaults.

[SENSe]:DPSA:CLEar:RESults (No Query Form)

Resets the DPX Spectrum max hold or average trace and the DPX bitmap.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax `[SENSe]:DPSA:CLEar:RESults`

Arguments None

Examples `SENSE:DPSA:CLEAR:RESULTS` resets the DPX Spectrum max hold or average trace and the DPX bitmap.

[SENSe]:DPSA:COLor

Sets or queries the DPX bitmap color mode.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax
```
[SENSe]:DPSA:COLor { BCYan | TEMPerature | SPECtral }
[SENSe]:DPSA:COLor?
```

Arguments The following table lists the arguments:

Table 2-24: Color palette for DPX Spectrum

Argument	Palette
BCYan	Binary cyan
TEMPerature	Temperature
SPECtral	Spectral

Examples `SENSE:DPSA:COLOR TEMPerature` sets the temperature color palette to Temperature.

[SENSe]:DPSA:COLor:MAXimum

Sets or queries the maximum value of the color axis in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax
```
[SENSe]:DPSA:COLor:MAXimum <value>
[SENSe]:DPSA:COLor:MAXimum?
```

Arguments `<value>::=<NRf>` specifies the maximum value of the color axis.
Range: The minimum value to 100%.

The minimum value is set using the [SENSe]:DPSA:COLor:MINimum command.

Examples `SENSE:DPSA:COLOR:MAXIMUM 90` sets the maximum value of the color axis to 90%.

[SENSe]:DPSA:COLor:MINimum

Sets or queries the minimum value of the color axis in the DPX spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax

```
[SENSe]:DPSA:COLor:MINimum <value>
[SENSe]:DPSA:COLor:MINimum?
```

Arguments <value>::=<NRf> specifies the minimum value of the color axis.
Range: 0% to the maximum value.

The maximum value is set using the [SENSe]:DPSA:COLor:MAXimum command.

Examples SENSE:DPSA:COLOR:MINIMUM 10 sets the minimum value of the color axis to 10%.

[SENSe]:DPSA:FREQuency:CENTer

Sets or queries the center frequency in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax

```
[SENSe]:DPSA:FREQuency:CENTer <value>
[SENSe]:DPSA:FREQuency:CENTer?
```

Related Commands [SENSe]:DPSA:MAX:SPAN

Arguments `<value>::=<NRf>` specifies the center frequency.
Range: 0 Hz to 6.2 GHz.

Examples `SENSE:DPSA:FREQUENCY:CENTER 2.5e9` sets the DPX Spectrum measurement center frequency to 2.5 GHz.

[SENSe]:DPSA:FREQuency:MEASurement

Sets or queries the measurement frequency in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax
```
[SENSe]:DPSA:FREQuency:MEASurement <value>
[SENSe]:DPSA:FREQuency:MEASurement?
```

Arguments `<value>::=<NRf>` is the measurement frequency.

Examples `SENSE:DPSA:FREQUENCY:MEASUREMENT 833e6` sets the DPX Spectrum measurement frequency to 833 MHz.

[SENSe]:DPSA:FREQuency:SPAN

Sets or queries the frequency span in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax
```
[SENSe]:DPSA:FREQuency:SPAN <value>
[SENSe]:DPSA:FREQuency:SPAN?
```

Arguments <value>::=<NRf> is the frequency span.
Range: 5.0 kHz to 20 MHz

Examples SENSE:DPSA:FREQUENCY:SPAN 20e6 sets the span to 20 MHz.

[SENSe]:DPSA:MAX:SPAN (No Query Form)

Sets the measurement span for the DPX Spectrum measurement mode to the maximum allowable span.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

Conditions Measurement modes: DPX spectrum

Group Sense commands

Syntax
```
[SENSe]:DPSA:MAX:SPAN
```

Arguments None

Examples SENSE:DPSA:MAX:SPAN sets the DPX Spectrum measurement mode span to the maximum allowable span.

[SENSe]:POWer:UNITs

Sets or queries the Spectrum and DPX Spectrum measurement amplitude power units. This command is equivalent to the UNIT:POWER command.

Conditions Measurement modes: Spectrum and DPX Spectrum

Group Sense commands

Syntax
```
[SENSe]:POWer:UNITs { DBM | DBV | VOLTs | WATTs | DBW | DBUV
| DBMV }
[SENSe]:POWer:UNITs?
```

Related Commands UNIT:POWer

Arguments The following table lists the arguments:

Table 2-25: Power units

Argument	Power unit
DBM	dBm
DBV	dBV
VOLTs	Volts
WATTs	Watts
DBW	dBW
DBUV	dBµV
DBMV	dBmV

NOTE. *All arguments are supported in the Spectrum measurement mode. The VOLTs and WATTs arguments are not supported in the DPX Spectrum measurement mode, and will generate an execution error if issued while in DPX Spectrum measurement mode.*

Examples `SENSE:POWER:UNITS DBM` specifies the measurement unit of power as dBm.

[SENSe]:ROSCillator:SOURce? (Query Only)

Queries the current reference oscillator source.

Conditions Measurement modes: All

Group Sense commands

Syntax `[SENSe]:ROSCillator:SOURce?`

Arguments None

Returns `INT` when the internal oscillator is being used as the reference oscillator source.

`EXT` when an externally connected reference is being used as the reference oscillator source.

`GPS` when the internal GPS is being used as the reference oscillator source.

Examples `SENSE:ROSCILLATOR:SOURCE?` might return `EXT`, indicating that an externally connected reference is being used as the reference oscillator source for the instrument.

[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]

Sets or queries the Spectrum measurement mode resolution bandwidth (RBW). Manually programming a specified RBW sets [SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO to OFF.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution] <value>
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]?
```

Related Commands [SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO

Arguments `<value>::=<NRf>` specifies the RBW. Range: 10 Hz to 3 MHz.

Examples `SENSE:SPECTRUM:BANDWIDTH:RESOLUTION 200e3` sets the RBW to 200 kHz.

[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO

Determines whether to set the resolution bandwidth (RBW) automatically or manually in the spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO { OFF
| ON | 0 | 1 }
```

```
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO?
```

Related Commands [SENSe]:SPECtrum:FREQuency:SPAN:BANDwidth[:RESolution]:RATio
[SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]

Arguments `OFF` or `0` specifies that the resolution bandwidth is set manually using the [SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution] command.

`ON` or `1` specifies that the resolution bandwidth is set automatically. Automatic RBW range: 10 Hz to 1 MHz.

Examples `SENSE:SPECTRUM:BANDWIDTH:RESOLUTION:AUTO ON` sets the resolution bandwidth automatically.

[SENSe]:SPECtrum:FREQuency:CENTer

Sets or queries the center frequency in the spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

NOTE. *The center, start and stop frequencies are set interlocking each other with the following relationships: (start frequency) = (center frequency) - (span)/2 and (stop frequency) = (center frequency) + (span)/2.*

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:FREQuency:CENTer <value>
[SENSe]:SPECtrum:FREQuency:CENTer?
```

Related Commands [SENSe]:SPECtrum:FREQuency:STARt
[SENSe]:SPECtrum:FREQuency:STOP

Arguments `<value>::=<NRf>` specifies the center frequency.

Range: 10 kHz to 6.2 GHz.

Examples `SENSE:SPECTRUM:FREQUENCY:CENTER 1.5e9` sets the center frequency to 1.5 GHz.

[SENSe]:SPECtrum:FREQuency:MEASurement

Sets or queries the Spectrum mode measurement frequency.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:FREQuency:MEASurement <value>
[SENSe]:SPECtrum:FREQuency:MEASurement?
```

Related Commands [SENSe]:SPECtrum:FREQuency:STARt
[SENSe]:SPECtrum:FREQuency:STOP

Arguments `<value>::=<NRf>` specifies the center frequency.

Range: 10 kHz to 6.2 GHz.

Examples `SENSE:SPECTRUM:FREQUENCY:CENTER 2.5e9` sets the measurement frequency to 2.5 GHz.

[SENSe]:SPECtrum:FREQuency:SPAN

Sets or queries the frequency span in the Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:FREQuency:SPAN <value>
[SENSe]:SPECtrum:FREQuency:SPAN?
```

Arguments `<value>::=<NRf>` specifies the frequency span.

Range: 1 kHz to 6.2 GHz.

Examples `SENSE:SPECTRUM:FREQUENCY:SPAN 20e6` sets the span to 20 MHz.

[SENSe]:SPECtrum:FREQuency:SPAN:BANDwidth[:RESolution]:RATio

Sets or queries the ratio of span to RBW (Resolution Bandwidth) in the Spectrum measurement. This command is valid when [SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO is set to On.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax

```
[SENSe]:SPECtrum:FREQuency:SPAN:BANDwidth[:RESolution]:RATio
<value>
[SENSe]:SPECtrum:FREQuency:SPAN:BANDwidth[:RESolution]:
RATio?
```

Related Commands [SENSe]:SPECtrum:{BANDwidth|BWIDth}[:RESolution]:AUTO

Arguments `<value>::=<NRf>` specifies the ratio of span to RBW. Range: 10 to 1000.

Programming a specified ratio sets the RBW equal to the current span divided by the specified ratio, rounded down to the nearest valid value.

Examples `SENSE:SPECTRUM:FREQUENCY:SPAN:BANDWIDTH:RESOLUTION:RATIO 200` sets the ratio to 200, setting the RBW to 200 kHz for the span of 40 MHz.

[SENSe]:SPECtrum:FREQuency:STARt

Sets or queries the measurement start frequency (left edge on the graph) in the spectrum measurement.

The center, start and stop frequencies are set interlocking each other.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax
```
[SENSe]:SPECtrum:FREQuency:STARt <value>
[SENSe]:SPECtrum:FREQuency:STARt?
```

Related Commands [SENSe]:SPECtrum:FREQuency:STOP
[SENSe]:SPECtrum:FREQuency:CENTer

Arguments `<value>::=<NRf>` is the measurement start frequency.

Examples `SENSE:SPECTRUM:FREQUENCY:START 3.95e9` sets the start frequency to 3.95 GHz.

[SENSe]:SPECtrum:FREQuency:STOP

Sets or queries the measurement stop frequency (right edge on the graph) in the spectrum measurement.

The center, start and stop frequencies are set interlocking each other.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax
```
[SENSe]:SPECtrum:FREQuency:STOP <value>
[SENSe]:SPECtrum:FREQuency:STOP?
```

Related Commands [SENSe]:SPECtrum:FREQuency:STARt
[SENSe]:SPECtrum:FREQuency:CENTer

Arguments `<value>::=<NRf>` is the measurement stop frequency.

Examples `SENSE:SPECTRUM:FREQUENCY:STOP 4.15e9` sets the stop frequency to 4.15 GHz.

[SENSe]:SPECtrum:MAX:SPAN (No Query Form)

Sets the frequency span to the maximum allowable span.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

Conditions Measurement modes: Spectrum

Group Sense commands

Syntax
```
[SENSe]:SPECtrum:MAX:SPAN
```

Arguments None

Examples `SENSE:SPECTRUM:MAX:SPAN` sets the frequency span to the maximum span.

*SRE

Sets or queries the value of the Service Request Enable Register (SRER). Refer to Section 3, *Status and Events*, for the register information.

Conditions Measurement modes: All

Group IEEE common commands

Syntax
```
*SRE <value>
*SRE?
```

Related Commands *CLS
*ESE
*ESR?
*STB?

Arguments `<value>::=<NR1>` is a value in the range from 0 to 255. The binary bits of the SRER are set according to this value. Using an out-of-range value causes an execution error.

Examples

`*SRE 48` sets binary 00110000 in the SRER's bits.

`*SRE?` might return `32`, indicating that the SRER's bit settings are 00100000.

*STB? (Query Only)

Returns the contents of the Status Byte Register (SBR) in the status/event reporting structure using the Master Summary Status (MSS) bit. Refer to Section3, *Status and Events*, for the register information.

Conditions

Measurement modes: All

Group

IEEE common commands

Syntax

`*STB?`

Related Commands

*CLS
*ESE
*ESR?
*SRE

Arguments

None

Returns

`<NR1>` representing the contents of the SBR as a decimal number.

Examples

`*STB?` might return `96`, indicating that the SBR contains binary 0110 0000.

SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess

Sets or queries the UDP address to which to send GPS time/location logging data.

This command is ignored and an error event generated if the specified UDP address does not adhere to an N.N.N.N format.

Conditions

Measurement modes: All

Group

System commands

Syntax

```
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess <value>
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess?
```

Related Commands

SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT
SYSTem:LOGGing:GPS
SYSTem:LOGGing:GPS:FILE[:NAME]

Arguments

`<value>::=<string>` specifies the UDP address to which to send GPS time/location logging data.

Examples

`SYSTEM:COMMUNICATE:LOGGING:GPS:SOCKET:ADDRESS "128.181.23.45"` sets the instrument to send GPS time/location logging data to UDP address 128.181.23.45.

SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT

Sets or queries the UDP port to which to send GPS time/location logging data.

Conditions

Measurement modes: All

Group

System commands

Syntax

```
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT <value>
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT?
```

Related Commands

SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess
SYSTem:LOGGing:GPS
SYSTem:LOGGing:GPS:FILE[:NAME]

Arguments

`<value>::=<NR1>` specifies the UDP port number to which to send GPS time/location logging data.

Examples

`SYSTEM:COMMUNICATE:LOGGING:GPS:SOCKET:PORT 21010` sets the UDP port to 21010.

SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess

Sets or queries the UDP address to which to send the measurement result logging data.

This command is ignored and an error event generated if the specified UDP address does not adhere to an N.N.N.N format.

Conditions Measurement modes: All

Group System commands

Syntax

```
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess <value>
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess?
```

Related Commands SYSTem:LOGGing:RESults
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT
SYSTem:LOGGing:RESults:FILE[:NAME]

Arguments `<value>::=<string>` specifies the UDP address to which to send measurement logging data.

Examples `SYSTEM:COMMUNICATE:LOGGING:RESULTS:SOCKET:ADDRESS "181.123.45.67"` sets the instrument to send measurement result logging data to UDP address 181.123.45.67.

SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT

Sets or queries the UDP port to which to send measurement result logging data.

Conditions Measurement modes: All

Group System commands

Syntax

```
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT <value>
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT?
```

Related Commands SYSTem:LOGGing:RESults
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess
SYSTem:LOGGing:RESults:FILE[:NAME]

Arguments `<value>::=<NR1>` specifies the UDP port number to which to send measurement results logging data.

Examples `SYSTEM:COMMUNICATE:LOGGING:RESULTS:SOCKET:PORT 21010` sets the measurement results UDP port to 21010.

SYSTem:DATE? (Query Only)

Queries the current instrument date setting.

Conditions Measurement modes: All

Group System commands

Syntax `SYSTem:DATE?`

Related Commands SYSTem:TIME?

Arguments None.

Returns `<NR1>,<NR1>,<NR1>` represent the year, month, and day values of the current system date setting.

Examples `SYSTEM:DATE?` might return `2009,7,17`, indicating the current instrument date setting is July 17, 2009.

SYSTem:ERRor:COUNt? (Query Only)

Queries the error/event queue for the number of unread items. As errors and events may occur at any time, more items may be present in the queue at the time it is actually read.

Conditions Measurement modes: All

Group System commands

Syntax `SYSTem:ERRor:COUNt?`

Arguments None

Returns <NR1> is the number of errors/events.

If the queue is empty, the response is 0.

Examples SYSTEM:ERROR:COUNT? might return 2, indicating that the error/event queue contains two unread errors/events.

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

Queries the next item in the error/event queue (which is removed from queue after the query). The response returns the full queue item consisting of an integer and a string. (See Table 3-3.)

Conditions Measurement modes: All

Group System commands

Syntax SYSTem:ERRor[:NEXT]?

Arguments None

Returns <ecode>,"<edesc>[;<einfo>]"

Where:
<ecode>::=<NR1> is the error/event code, ranging from -32768 to 32767.
<edesc>::=<string> is the description on the error/event.
<einfo>::=<string> is the additional information on the error/event.

Examples SYSTEM:ERROR:NEXT? might return –113,"Undefined header; Command not found; FETCh:DPSA:TRACe2?", indicating that the command issued was invalid.

SYSTem:GPS

Sets or queries the GPS receiver operational mode.

Conditions Measurement modes: All

Group System commands

Syntax

```
SYSTem:GPS { NONE | EXTernal | INTernal }
SYSTem:GPS?
```

Arguments

`NONE` disables GPS operation.

`EXTernal` enables operation with an externally connected GPS.

`INTernal` enables operation with the internal GPS.

Examples

`SYSTEM:GPS INTERNAL` sets the instrument to use the internal GPS receiver.

SYSTem:GPS:POSition? (Query Only)

Queries the current GPS provided latitude and longitude in decimal degrees units.

In the case where GPS operation is disabled, or GPS is not currently locked, the query response values for both parameters is "NAN".

Conditions

Measurement modes: All

Group

System commands

Syntax

```
SYSTem:GPS:POSition?
```

Arguments

None

Returns

`<NRf>,<NRf>` contains the comma-separated latitude and longitude numbers. North latitudes are positive, south latitudes are negative. East longitudes are positive, west longitudes are negative.

Examples

`SYSTEM:GPS:POSITION?` might return `45.4991875,-122.823165833333`, indicating the current latitude and longitude of the instrument.

SYSTem:GPS:STATus? (Query Only)

Queries the current GPS signal lock status.

Conditions

Measurement modes: All

Group System commands

Syntax
```
SYSTem:GPS:STATus?
```

Arguments None

Returns `DIS` indicates that GPS is not currently enabled.

`GOOD` indicates that the GPS receiver is locked to four or more satellites.

`FAIR` indicates that the GPS receiver is locked to less than four satellites.

`BAD` indicates that the GPS receiver is disabled or is not locked to any satellites.

Examples `SYSTEM:GPS:STATUS?` might return `"FAIR`, indicating that the GPS receiver is locked to less than four satellites.

SYSTem:LOGGing:GPS

Sets or queries the GPS time/location logging mode.

Conditions Measurement modes: All

Group System commands

Syntax
```
SYSTem:LOGGing:GPS { NONE | FILE | UDP }
SYSTem:LOGGing:GPS?
```

Related Commands SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT
SYSTem:LOGGing:GPS:FILE[:NAME]

Arguments `NONE` disables GPS time/location logging.

`FILE` enables GPS time/location logging to a file on the instrument.

`UDP` enables GPS time/location logging to a UDP (network) address.

Examples `SYSTEM:LOGGING:GPS FILE` enables GPS time/location logging to a file on the instrument.

SYSTem:LOGGing:GPS:FILE[:NAME]

Set or queries the GPS time/location log file name.

This command is ignored and an error event generated if the directory component of the specified GPS time/location log file does not exist or the specified GPS time/location log file name already exists.

Conditions Measurement modes: All

Group System commands

Syntax

```
SYSTem:LOGGing:GPS:FILE[:NAME] <file>
SYSTem:LOGGing:GPS:FILE[:NAME]?
```

Related Commands SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:ADDRess
SYSTem:COMMunicate:LOGGing:GPS[:SOCKet]:PORT
SYSTem:LOGGing:RESults

Arguments `<file>::=<string>` specifies the path and file name at which to store GPS time/location logging files. If the specified name does not include a path component, the file is stored at the current measurement results directory.

Examples `SYSTEM:LOGGING:GPS:FILE:NAME "GpsLocFile1"` sets the instrument to save the GPS time/location logging file to the current measurement results directory with the specified file name.

SYSTem:LOGGing:RESults

Sets or queries the measurement result logging mode

Conditions Measurement modes: All

Group System commands

Syntax

```
SYSTem:LOGGing:RESults { NONE | FILE | UDP }
SYSTem:LOGGing:RESults?
```

Related Commands SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT

SYSTem:LOGGing:RESults:FILE[:NAME]

Arguments

`NONE` disables measurement results logging.

`FILE` enables saving measurement result logging files to a location on the instrument.

`UDP` enables saving measurement result logging data to a UDP (network) address.

Examples

`SYSTEM:LOGGING:RESULTS FILE` sets the instrument to save measurement result logging files to a location on the instrument.

SYSTem:LOGGing:RESults:FILE[:NAME]

Sets or queries measurement results logging file name.

This command is ignored and an error event generated if a directory component of the specified log file does not exist or the specified log file name already exists.

Conditions

Measurement modes: All

Group

System commands

Syntax

```
SYSTem:LOGGing:RESults:FILE[:NAME] <file>
SYSTem:LOGGing:RESults:FILE[:NAME]?
```

Related Commands

SYSTem:LOGGing:RESults
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:ADDRess
SYSTem:COMMunicate:LOGGing:RESults[:SOCKet]:PORT

Arguments

`<file>::=<string>` specifies the path and file name at which to store measurement results logging files. If the specified name does not include a path component, the file is stored at the current measurement results directory.

Examples

`SYSTEM:LOGGING:RESULTS:FILE:NAME "MeasLogFile"` sets the instrument to save the measurement results logging file to the current measurement results directory with the specified file name.

SYSTem:TIME? (Query Only)

Queries the current instrument time setting.

Conditions Measurement modes: All

Group System commands

Syntax `SYSTem:TIME?`

Related Commands SYSTem:DATE?

Arguments None.

Returns `<NR1>,<NR1>,<NR1>` representing the hour, minute, and second values of the current system time setting.

Examples `SYSTEM:TIME?` might return `14,45,12`, indicating the current instrument time setting (2:45:12 PM).

TRACe<x>:DPSA:AVERage:COUNt

Sets or queries the number of traces to average in the DPX Spectrum view.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

The Trace parameter <x> = 1; only Trace 1 is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax
```
TRACe<x>:DPSA:AVERage:COUNt <number>
TRACe<x>:DPSA:AVERage:COUNt?
```

Arguments `<number>::=<NR1>` specifies the number of traces to combine for averaging. Range: 1 to 200.

Examples `TRACE1:DPSA:AVERAGE:COUNT 32` sets the number of DPX traces to average to 32.

TRACe<x>:DPSA:AVERage:PROGress? (Query Only)

Queries the number of times the current DPX Spectrum mode average waveform has been averaged.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

The Trace parameter <x> = 1; only Trace 1 is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax `TRACe<x>:DPSA:AVERage:PROGress?`

Arguments None.

Examples `TRACE1:DPSA:AVERAGE:PROGRESS?` might return `32`, indicating that 32 DPX Spectrum waveforms have been averaged.

TRACe<x>:DPSA:AVERage:RESet (No Query Form)

Resets the waveform averaging in the DPX Spectrum mode.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode or the current DPX trace mode is not set to Average.

The Trace parameter <x> = 1; only Trace 1 is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax `TRACe<x>:DPSA:AVERage:RESet`

Arguments None.

Examples `TRACE1:DPSA:AVERAGE:RESET` resets the DPX Spectrum mode average trace.

TRACe<x>:DPSA:COLor:INTensity

Sets or queries the color intensity in the DPX spectrum view.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

The Trace parameter <x> = 5; only Trace 5 (the bitmap) is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:COLor:INTensity <value>
TRACe<x>:DPSA:COLor:INTensity?
```

Arguments `<value>::=<NRf>` specifies color intensity. Range: 1 to 100%.

Examples `TRACE1:DPSA:COLOR:INTENSITY 30` sets the color intensity to 30%.

TRACe<x>:DPSA:COUNt:RESet (No Query Form)

Resets the DPX Spectrum mode max hold trace.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode or the current DPX Spectrum trace mode is not set to max hold.

The Trace parameter <x> = 1; only Trace 1 is valid when the trace function has been set to max hold.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:COUNt:RESet
```

Arguments None.

Examples `TRACE1:DPSA:COUNT:RESET` resets the DPX Spectrum max hold trace.

TRACe<x>:DPSA:DETection

Sets or queries the DPX Spectrum mode detector.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode or if you attempt to set the detector to Positive when the DPX Spectrum trace mode is set to max hold.

The Trace parameter <x> = 1; only Trace 1 is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:DETection { AVERage | POSitive }
TRACe<x>:DPSA:DETection?
```

Arguments `AVERage` sets the DPX Spectrum detector mode to Average.

`POSitive` sets the DPX Spectrum detector mode to Positive.

Examples `TRACE1:DPSA:DETECTION AVERAGE` sets the DPX Spectrum detector mode to Average.

TRACe<x>:DPSA:DOT:PERSistent

Enables or disables the dot persistence for the bitmap trace in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

The Trace parameter <x> = 5; only Trace 5 (bitmap trace) is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:DOT:PERSistent { OFF | ON | 0 | 1 }
TRACe<x>:DPSA:DOT:PERSistent?
```

Related Commands

TRACe<x>:DPSA:DOT:PERSistent:TYPE
TRACe<x>:DPSA:DOT:PERSistent:VARiable

Arguments

`OFF` or `0` disables the dot persistence.

`ON` or `1` enables the dot persistence.

Examples

`TRACE5:DPSA:DOT:PERSISTENT ON` enables the dot persistence in the DPX Spectrum view.

TRACe<x>:DPSA:DOT:PERSistent:TYPE

Sets or queries the persistence type for the bitmap trace in the DPX Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode or when dot persistence is not currently enabled.

The Trace parameter <x> = 5; only Trace 5 (bitmap trace) is valid.

Conditions

Measurement modes: DPX spectrum

Group

Trace commands

Syntax

```
TRACe<x>:DPSA:DOT:PERSistent:TYPE { VARiable | INFinite }
TRACe<x>:DPSA:DOT:PERSistent:TYPE?
```

Related Commands

TRACe<x>:DPSA:DOT:PERSistent
TRACe<x>:DPSA:DOT:PERSistent:VARiable

Arguments

`VARiable` sets the variable persistence display to leave acquired data points on the display for a period of time specified by the TRACe<x>:DPSA:DOT:PERSistent:VARiable command.

`INFinite` sets the instrument to show accumulated data points on the DPX Spectrum measurement for an indefinite period.

Examples

`TRACE5:DPSA:DOT:PERSISTENT:TYPE VARiable` selects the variable persistence display mode.

TRACe<x>:DPSA:DOT:PERSistent:VARiable

Sets or queries the decay period for how long a bitmap point is displayed before fading. Note that this setting has no units associated with it. The greater the persistence and intensity setting, the longer each dot remains displayed on the screen before fading. This command is effective when TRACe<x>:DPSA:DOT:PERSistent:TYPE is set to VARiable.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode, when dot persistence is not currently enabled, or when the dot persistence type is not currently set to Variable.

The Trace parameter <x> = 5; only Trace 5 (bitmap trace) is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:DOT:PERSistent:VARiable <number>
TRACe<x>:DPSA:DOT:PERSistent:VARiable?
```

Related Commands TRACe<x>:DPSA:DOT:PERSistent
TRACe<x>:DPSA:DOT:PERSistent:TYPE

Arguments `<number>::=<NR1>` specifies the period that the bitmap data points are displayed on the screen. Range: 1 to 1000 (unitless; the default value is 10).

Examples `TRACE5:DPSA:DOT:PERSISTENT:VARIABLE 20` specifies that the bitmap data points are displayed on the screen for a period of 20 before fading.

TRACe<x>:DPSA:FUNCtion

Sets or queries the DPX Spectrum trace function.

This command is ignored and an error event generated when the instrument is not in the DPX Spectrum measurement mode.

The Trace parameter <x> = 1; only Trace 1 is valid.

Conditions Measurement modes: DPX spectrum

Group Trace commands

Syntax

```
TRACe<x>:DPSA:FUNCtion { NORMal | HOLD | AVERage }
TRACe<x>:DPSA:FUNCtion?
```

Arguments

`NORMal` sets the DPX Spectrum mode trace function to Normal.

`HOLD` sets the DPX Spectrum mode trace function to Max Hold.

`AVERage` sets the DPX Spectrum mode trace function to Average.

Examples

`TRACE1:DPSA:FUNCTION HOLD` sets the DPX Spectrum trace function to Max Hold.

TRACe<x>:SPECtrum

Sets or queries visibility of waveform traces in Spectrum measurement mode.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

The Trace parameter <x> = 2 to 5 for command executions; Trace 1 is always visible and cannot be disabled.

Conditions

Measurement modes: Spectrum

Group

Trace commands

Syntax

```
TRACe<x>:SPECtrum { OFF | ON | 0 | 1 }
TRACe<x>:SPECtrum?
```

Arguments

`OFF` or `0` hides the specified trace.

`ON` or `1` shows the specified trace.

Examples

`TRACE3:SPECTRUM ON` enables displaying Trace 3 in the Spectrum measurement view.

TRACe<x>:SPECtrum:AVERage:COUNt

Sets or queries the number of traces to average when the Spectrum measurement mode trace function is set to average.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or if waveform averaging is not enabled on the specified trace.

The Trace parameter <x> = 1 or 2.

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax
```
TRACe<x>:SPECtrum:AVERage:COUNt <number>
TRACe<x>:SPECtrum:AVERage:COUNt?
```

Arguments `<number>::=<NR1>` specifies the number of traces to combine for averaging. Range: 1 to 200.

NOTE. *The average count value applies to both Trace 1 and Trace 2. Therefore specifying a value for Trace 1 also applies that value to Trace 2.*

Examples `TRACE1:SPECTRUM:AVERAGE:COUNT 64` sets the average count to 64 for Trace 1 (and Trace 2 if enabled).

TRACe<x>:SPECtrum:AVERage:PROGress? (Query Only)

Queries the number of times the specified Spectrum measurement waveform trace has been averaged.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

The parameter <x> = 1 or 2.

NOTE. *The average count applies to both Trace 1 and Trace 2. Therefore querying a value for Trace 1 is equal to querying the value for Trace 2.*

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax
```
TRACe<x>:SPECtrum:AVERage:PROGress?
```

Arguments None

Examples `TRACE1:SPECTRUM:AVERAGE:PROGRESS?` might return `118`, indicating that Spectrum waveform Trace 1 (and Trace 2 if enabled) have been averaged 118 times.

TRACe<x>:SPECtrum:AVERage:RESet (No Query Form)

Resets the specified Spectrum mode waveform trace averaging and restarts the trace averaging process.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when the specified Spectrum mode trace is not set to average acquisition mode.

The Trace parameter <x> = 1 or 2.

NOTE. *The reset applies to both Trace 1 and Trace 2. Therefore resetting Trace 1 also resets Trace 2.*

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax `TRACe<x>:SPECtrum:AVERage:RESet`

Arguments None

Examples `TRACE1:SPECTRUM:AVERAGE:RESET` clears average data and counter, and restarts the average process for Trace 1 (and Trace 2 if enabled).

TRACe<x>:SPECtrum:COUNt:RESet (No Query Form)

Resets the Spectrum mode Min Hold, Max Hold, or Min/Max Hold trace waveforms for Trace 1 and Trace 2. This command is effective when TRACe<x>:SPECtrum:FUNCtion is set to MAXHold, MINHold, or BOTH.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when the specified Spectrum mode trace is not set to max hold, min hold, or min/max hold acquisition mode.

The Trace parameter <x> = 1 or 2.

NOTE. *The reset applies to both Trace 1 and Trace 2. Therefore resetting Trace 1 also resets Trace 2.*

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax `TRACe<x>:SPECtrum:COUNt:RESet`

Arguments None

Examples `TRACE1:SPECTRUM:COUNT:RESET` clears the Min Hold, Max Hold, or Min/Max Hold data and counter, and restarts the process for Trace 1 (and Trace 2 if enabled).

TRACe<x>:SPECtrum:DETection

Sets or queries the algorithm used to decimate (decrease) the raw acquisition data down to a reasonable number of measurement points. Each spectrum waveform point corresponds to a frequency range, or bin, within the measurement span. When the spectrum analysis results in multiple points per bin, the detector setting determines how the multiple points are condensed to the single output waveform point for that bin.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

The Trace parameter <x> = 1 or 2.

NOTE. *This command applies to both Trace 1 and Trace 2. Therefore setting the Trace 1 detector mode also sets the Trace 2 detector mode.*

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax
```
TRACe<x>:SPECtrum:DETection { AVERage | POSitive | NEGative }
TRACe<x>:SPECtrum:DETection?
```

Arguments

AVERage displays the average data value for each bin.

POSitive displays the maximum (positive peak) data value for each bin.

NEGative displays the minimum (negative peak) data value for each bin.

Examples

TRACE1:SPECTRUM:DETECTION POSitive displays the maximum data value for each bin of Trace 1 (and Trace 2 if enabled).

TRACe<x>:SPECtrum:FOReground

Sets or queries the foreground status of the specified Spectrum measurement trace.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or the specified trace is disabled.

The Trace parameter <x> = 1 to 5; All traces are valid.

Conditions

Measurement modes: Spectrum

Group

Trace commands

Syntax

```
TRACe<x>:SPECtrum:FOReground { OFF | ON | 0 | 1 }
TRACe<x>:SPECtrum:FOReground?
```

Arguments

ON or 1 sets the specified trace to be the front-most trace.

OFF or 0 sets the front-most trace to the next available enabled trace.

Examples

TRACE3:SPECTRUM:FOREGROUND ON sets Trace 3 as the front-most trace in the Spectrum measurement view.

TRACe<x>:SPECtrum:FUNCtion

Sets or queries the function for the specified trace in the Spectrum view.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when the specified trace is not enabled.

The Trace parameter <x> = 1 and 2.

Conditions

Measurement modes: Spectrum

Group Trace commands

Syntax
```
TRACe<x>:SPECtrum:FUNCtion { NORMal | AVERage | MAXHold |
MINHold | BOTH }
TRACe<x>:SPECtrum:FUNCtion?
```

Arguments `NORMal` selects the normal spectrum display.

`AVERage` selects the Average display to show the average signal level at each frequency point.

`MAXHold` selects the Max Hold display to show the maximum signal level at each frequency point.

`MINHold` selects the Min Hold display to show the minimum signal level at each frequency point.

`BOTH` selects the Min Hold display to show both the maximum and minimum signal levels at each frequency point.

Examples `TRACE2:SPECTRUM:FUNCTION MAXHold` selects the Trace 2 waveform to show the maximum signal level at each frequency point in the Spectrum measurement view.

TRACe<x>:SPECtrum:LEFToperand

Sets or queries the left operand for the math trace (Trace 5) in the Spectrum view.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when a specified trace is not enabled.

The Trace parameter <x> = 5.

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax
```
TRACe<x>:SPECtrum:LEFToperand { TRACe1 | TRACe2 | TRACe3 |
TRACe4 }
TRACe<x>:SPECtrum:LEFToperand?
```

Related Commands TRACe<x>:SPECtrum:OPERation
TRACe<x>:SPECtrum:RIGHtoperand

Arguments

TRACe1 selects Trace 1 as the left operand for the math trace.

TRACe2 selects Trace 2 as the left operand for the math trace.

TRACe3 selects Trace 3 as the left operand for the math trace.

TRACe4 selects Trace 4 as the left operand for the math trace.

Examples

TRACE5:SPECTRUM:LEFTOPERAND TRACE1 selects Trace 1 as the left operand for the math trace.

TRACe<x>:SPECtrum:LOAD:TRACe (No Query Form)

Loads the specified Spectrum measurement waveform trace into the Ref A or Ref B waveform traces.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode, when a specified trace (source or destination) is not enabled, or the specified source and destination traces are the same.

The Trace parameter <x> = 3 (Ref A) or 4 (Ref B).

Conditions

Measurement modes: Spectrum

Group

Trace commands

Syntax

```
TRACe<x>:SPECtrum:LOAD:TRACe { TRACe1 | TRACe2 | TRACe3 |
TRACe4 | TRACe5 }
```

Arguments

TRACe1 loads the specified Spectrum measurement reference trace with the contents of trace 1.

TRACe2 loads the specified Spectrum measurement reference trace with the contents of trace 2.

TRACe3 loads the specified Spectrum measurement reference trace with the contents of trace 3.

TRACe4 loads the specified Spectrum measurement reference trace with the contents of trace 4.

TRACe5 loads the specified Spectrum measurement reference trace with the contents of trace 5.

Examples

TRACE4:SPECTRUM:LOAD:TRACE TRACE1 loads Trace 1 waveform data into the Spectrum waveform Trace 4 (Ref B).

TRACe<x>:SPECtrum:OPERation

Sets or queries the math operation to perform on the Spectrum mode Math trace.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode.

The Trace parameter <x> = 5 (Math trace)

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax

```
TRACe<x>:SPECtrum:OPERation { MINus | PLUS }
TRACe<x>:SPECtrum:OPERation?
```

Related Commands TRACe<x>:SPECtrum:LEFToperand
TRACe<x>:SPECtrum:RIGHtoperand

Arguments `MINus` sets the math trace operation to subtract two traces.

`PLUS` sets the math trace operation to add two traces.

Examples `TRACE5:SPECTRUM:OPERATION MINUS` sets the math trace operation to subtract two traces.

TRACe<x>:SPECtrum:RIGHtoperand

Sets or queries the right operand for the math trace (Trace 5) in the Spectrum measurement.

This command is ignored and an error event generated when the instrument is not in the Spectrum measurement mode or when a specified trace is not enabled.

The Trace parameter <x> = 5.

Conditions Measurement modes: Spectrum

Group Trace commands

Syntax

```
TRACe<x>:SPECtrum:RIGHtoperand { TRACe1 | TRACe2 | TRACe3
| TRACe4 }
```

TRACe<x>:SPECtrum:RIGHtoperand?

Related Commands TRACe<x>:SPECtrum:LEFToperand
TRACe<x>:SPECtrum:OPERation

Arguments TRACe1 selects Trace 1 as the right operand for the math trace.

TRACe2 selects Trace 2 as the right operand for the math trace.

TRACe3 selects Trace 3 as the right operand for the math trace.

TRACe4 selects Trace 4 as the right operand for the math trace.

Examples TRACE5:SPECTRUM:RIGHTOPERAND TRACE2 selects Trace 2 as the right operand for the math trace.

*TRG (No Query Form)

Generates a trigger. It produces the same effect as tapping the UI trigger tab "Force Trigger" button. This command is valid when the trigger mode is Triggered. In cases where the acquisition has been started but is currently waiting for the trigger event, issuing this command immediately forces the trigger event to occur.

Conditions Measurement modes: All

Group IEEE common commands

Syntax *TRG

Related Commands TRIGger[:SEQuence]:STATus

Arguments None

Examples *TRG generates a trigger.

TRIGger[:SEQuence]:EVENt:EXTernal:SLOPe

Sets or queries the trigger slope of the external trigger input.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:EXTernal:SLOPe { RISE | FALL | HIGH | LOW }
TRIGger[:SEQuence]:EVENt:EXTernal:SLOPe?
```

Arguments `RISE` causes the trigger event on the rising edge.

`FALL` causes the trigger event on the falling edge.

`HIGH` causes the trigger event on a logic high.

`LOW` causes the trigger event on a logic low.

Examples `TRIGGER:SEQUENCE:EVENT:EXTERNAL:SLOPE RISE` causes a trigger event on the rising edge of the external trigger input.

TRIGger[:SEQuence]:EVENt:INPut:LEVel

Sets or queries the IF trigger level.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:INPut:LEVel <value>
TRIGger[:SEQuence]:EVENt:INPut:LEVel?
```

Arguments `<value>::=<NRf>` specifies the IF level trigger threshold. The threshold value uses the current power units.

Examples `TRIGGER:SEQUENCE:EVENT:INPUT:LEVEL -10` sets the IF trigger threshold level to -10.

TRIGger[:SEQuence]:EVENt:INPut:SLOPe

Sets or queries the IF trigger slope type.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:INPut:SLOPe { RISE | FALL | HIGH
| LOW }
TRIGger[:SEQuence]:EVENt:INPut:SLOPe?
```

Arguments `RISE` causes the IF trigger event on the rising edge.

`FALL` causes the IF trigger event on the falling edge.

`HIGH` causes the IF trigger event on a logic high.

`LOW` causes the IF trigger event on a logic low.

Examples `TRIGGER:SEQUENCE:EVENT:INPUT:SLOPE RISE` causes the IF trigger event on the rising edge of the signal.

TRIGger[:SEQuence]:EVENt:INTernal

Sets or queries the internal time base trigger mode.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:INTernal {TIME | INTerval | BOTH }
TRIGger[:SEQuence]:EVENt:INTernal?
```

Related Commands TRIGger[:SEQuence]:EVENt:INTernal:REPeat
TRIGger[:SEQuence]:EVENt:INTernal:TIME

Arguments `TIME` sets the internal time base trigger mode to trigger at a specific time.

`INTerval` sets the internal time base trigger mode to trigger at a specific interval.

`BOTH` sets the internal time base trigger mode to trigger at a specific time and interval.

Examples `TRIGGER:SEQUENCE:EVENT:INTERNAL TIME` sets the internal time base trigger mode to trigger at a specific time.

TRIGger[:SEQuence]:EVENt:INTernal:REPeat

Sets or queries the internal time base trigger repeat interval time.

This command is ignored and an error event generated when the seconds parameter is less than 10 ms or greater than 600 seconds.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:INTernal:REPeat <seconds>
TRIGger[:SEQuence]:EVENt:INTernal:REPeat?
```

Arguments `<seconds>::=<NRf>` sets the internal time base trigger repeat interval time, in seconds. This value is rounded to the nearest 1µs boundary.

Examples `TRIGGER:SEQUENCE:EVENT:INTERNAL:REPEAT 300` sets the internal time base trigger repeat interval time to 300 seconds.

TRIGger[:SEQuence]:EVENt:INTernal:TIME

Sets or queries the internal time base trigger start time.

This command is ignored and an error event generated when the time parameter values are not standard hour, minute, or second values.

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:EVENt:INTernal:TIME
<hour>,<minute>,<seconds>
TRIGger[:SEQuence]:EVENt:INTernal:TIME?
```

Arguments `<hour>::=<NRf>` sets the hour portion of the internal time base trigger start time. This value is rounded to the nearest hour boundary.

<minutes>::=<NRf> sets the minute portion of the internal timebase trigger start time. This value is rounded to the nearest minute boundary.

<seconds>::=<NRf> sets the seconds portion of the internal timebase trigger start time. This value is rounded to the nearest 1µs boundary.

Examples `TRIGGER:SEQUENCE:EVENT:INTERNAL:TIME 14,33,00` sets the internal time base trigger start time to 2:33 PM.

TRIGger[:SEQuence]:EVENt:SOURce

Sets or queries the trigger event source.

This command is ignored and an error event generated when the current instrument settings constrain triggering to just free-run mode.

Conditions Measurement modes: All

Group Trigger commands

Syntax

```
TRIGger[:SEQuence]:EVENt:SOURce { INPut | EXTernal |
INTernal }
TRIGger[:SEQuence]:EVENt:SOURce?
```

Related Commands TRIGger[:SEQuence]:STATus

Arguments The following table lists the arguments.

Table 2-26: Trigger event source

Argument	Source
INPut	IF level input
EXTernal	External input
INTernal	Internal time base input.

Examples `TRIGGER:SEQUENCE:EVENT:SOURCE INPUT` sets the trigger event source as the IF level input.

TRIGger[:SEQuence]:IMMediate (No Query Form)

Forces a trigger immediately, skipping the event detection. This command is valid when TRIGger[:SEQuence]:STATus is set to On (the trigger mode is Triggered).

In cases where the acquisition has been started but is currently waiting for the trigger event, issuing this command immediately forces the trigger event to occur. In cases where an acquisition is not currently waiting for the trigger event, this command effectively performs no operation.

This command is ignored and an error event generated when the current instrument settings constrain triggering to just free-run mode.

Conditions Measurement modes: All

Group Trigger commands

Syntax

```
TRIGger[:SEQuence]:IMMediate
```

Arguments None

Examples `TRIGGER:SEQUENCE:IMMEDIATE` causes a trigger immediately, skipping the event detection and delay.

TRIGger[:SEQuence]:STATus

Sets or queries the trigger mode (Free Run or Triggered).

This command is ignored and an error event generated when the current instrument settings constrain triggering to just free-run mode.

Conditions Measurement modes: All

Group Trigger commands

Syntax

```
TRIGger[:SEQuence]:STATus { OFF | ON | 0 | 1 }
TRIGger[:SEQuence]:STATus?
```

Related Commands TRIGger[:SEQuence]:EVENt:SOURce

Arguments `OFF` or `0` selects free-run mode.

`ON` or `1` selects triggered mode.

Examples `TRIGGER:SEQUENCE:STATUS ON` selects the triggered mode.

TRIGger[:SEQuence]:TIME:DELay

Sets or queries the trigger delay time (after recognizing the event but before actually declaring the trigger).

Conditions Measurement modes: All

Group Trigger commands

Syntax
```
TRIGger[:SEQuence]:TIME:DELay <value>
TRIGger[:SEQuence]:TIME:DELay?
```

Arguments `<value>::=<NRf>` specifies the trigger delay time in seconds. Range: 0 to 60 seconds. The value is rounded to the nearest 1 ns boundary.

Examples `TRIGGER:SEQUENCE:TIME:DELAY 1.5` sets the trigger delay time to 1.5 seconds.

UNIT:POWer

Sets or queries the amplitude power units. This command is equivalent to [SENSe]:POWer:UNITs.

This command is ignored and an error event generated if you issue a VOLTs or WATTs argument while in the DPX Spectrum measurement mode.

Conditions Measurement modes: All

Group Unit commands

Syntax
```
UNIT:POWer { DBM | DBV | VOLTs | WATTs | DBW| DBUV | DBMV }
UNIT:POWer?
```

Arguments The following table lists the arguments.

Table 2-27: Power units

Argument	Power unit
DBM	dBm
DBV	dBV
VOLTs	Volts
WATTs	Watts
DBW	dBW
DBUV	dBµV
DBMV	dBmV

NOTE. *The DPX Spectrum measurements do not support VOLTs or WATTs units.*

Examples `UNIT:POWER DBM` specifies the measurement unit of power as dBm.

*WAI (No Query Form)

Prevents the instrument from executing further commands or queries until all pending operations finish. This command allows you to synchronize the operation of the instrument with your application program. For the details, refer to *Synchronizing Execution* (See page 3-7.).

Conditions Measurement modes: All

Group IEEE common commands

Syntax `*WAI`

Related Commands *OPC

Arguments None

Status and Events

Status and Events

The SCPI interface in the instrument includes a status and event reporting system that enables the user to monitor crucial events that occur in the instrument. The instrument is equipped with four registers and one queue that conform to IEEE Std 488.2-1987. This section will discuss these registers and queues along with status and event processing.

Status and Event Reporting System

The following figure outlines the status and event reporting mechanism offered in the RF*Hawk* and SA2600 instruments.

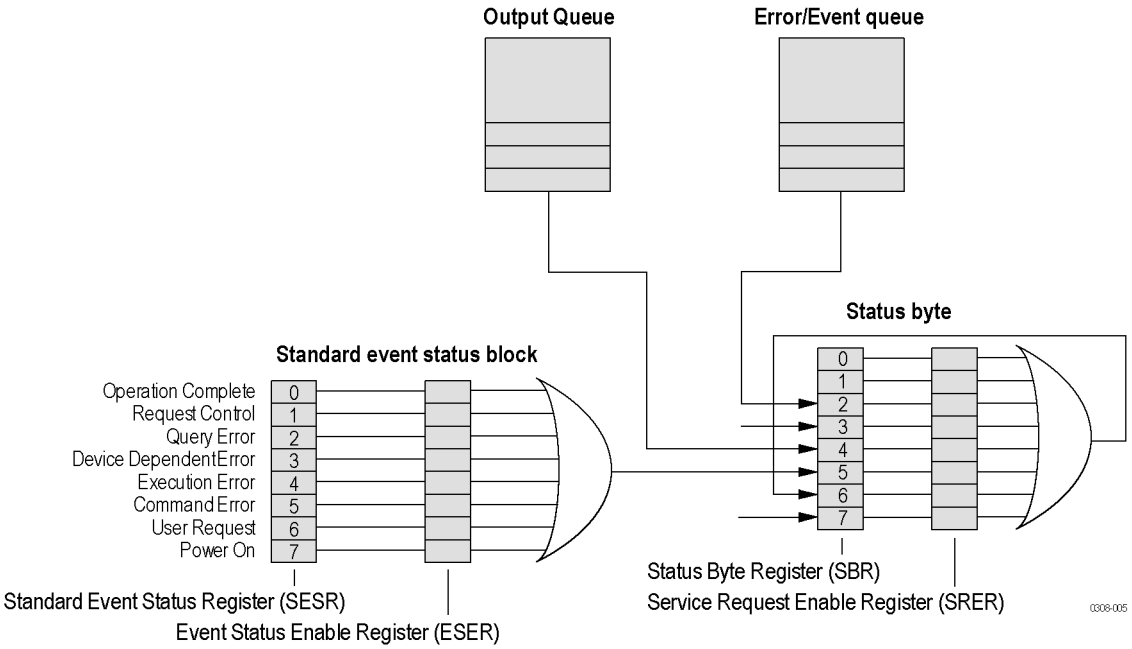


Figure 3-1: Status/Event reporting mechanism

Status Byte

The Status Byte contains the following two registers

- Status Byte Register (SBR)
- Service Request Enable Register (SRER)

Status Byte Register (SBR)

The SBR is made up of 8 bits. Bits 4, 5 and 6 are defined in accordance with IEEE Std 488.2-1987. These bits are used to monitor the output queue, SESR and

master status summary, respectively. The contents of this register are returned when the *STB? query is used.

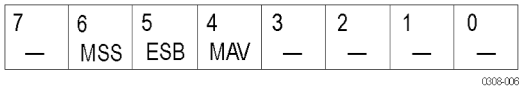


Figure 3-2: Status Byte Register (SBR)

Table 3-1: SBR bit functions

Bit	Description
7	Not used.
6	Master Status Summary (MSS) bit. Indicates that the instrument has issued a service request for one or more reasons. The MSS bit is never cleared to 0 by the *STB? query.
5	Event Status Bit (ESB). This bit indicates whether or not a new event has occurred after the previous Standard Event Status Register (SESR) has been cleared or after an event readout has been performed.
4	Message Available Bit (MAV). This bit indicates that a message has been placed in the output queue and can be retrieved.
3-0	Not used.

Service Request Enable Register (SRER)

The SRER is made up of bits defined exactly the same as bits 0 through 7 in the SBR as shown in the following figure. This register is used by the user to determine which events will set the MSS bit of the SBR.

The SRER bit 6 cannot be set.

Use the *SRE command to set the bits of the SRER. Use the *SRE? query to read the contents of the SRER. Bit 6 must be set to 0.

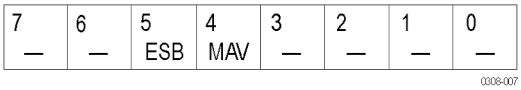


Figure 3-3: Service Request Enable Register (SRER)

Standard Event Status Block

Reports errors and operation complete status. It consists of the following registers

- Standard Event Status Register (SESR)
- Event Status Enable Register (ESER)

These registers are made up of the same bits defined in the following figure and table. Use the *ESR? query to read the contents of the SESR. Use the *ESE() command to access the ESER.

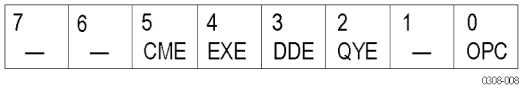


Figure 3-4: Standard event status register

Table 3-2: Standard event status register bit definition

Bit	Description
7	Not used.
6	Not used.
5	Command Error (CME). Indicates that a command error has occurred while parsing by the command parser was in progress.
4	Execution Error (EXE). Indicates that an error occurred during the execution of a command. Execution errors occur for one of the following reasons: ■ When a value designated in the argument is outside the allowable range of the instrument, or is in conflict with the capabilities of the instrument. ■ When the command could not be executed properly because the conditions for execution differed from those essentially required.
3	Device-Dependent Error (DDE). An instrument error has been detected.
2	Query Error (QYE). Indicates that a query error has been detected by the output queue controller. Query errors occur for one of the following reasons: ■ An attempt was made to retrieve messages from the output queue, despite the fact that the output queue is empty or in pending status. ■ The output queue messages have been cleared despite the fact that they have not been retrieved.
1	Not used.
0	Operation Complete (OPC). This bit is set with the results of the execution of the *OPC command. It indicates that all pending operations have been completed.

When an event occurs, the SESR bit corresponding to the event is set, resulting in the event being stacked in the Error/Event Queue. If the bit corresponding to the event has also been set in the ESER, the SBR ESB bit is also set. When a message is sent to the Output Queue, the SBR MAV bit is set.

Queues

There are two types of queues in the status reporting system used in the instrument: output queues and event queues.

Output Queue

The output queue is a FIFO (first in, first out) queue and holds response messages to queries, where they await retrieval. When there are messages in the queue, the SBR MAV bit is set.

The output queue will be emptied each time a command or query is received, so the controller must read the output queue before the next command or query is issued. If this is not done, an error will occur and the output queue will be emptied; however, the operation will proceed even if an error occurs.

Event Queue

The event queue is a FIFO queue and stores events as they occur in the instrument. If more than 32 events occur, event 32 will be replaced with event code -350 ("Queue Overflow"). The error code and text are retrieved using the SYSTem:ERRor queries.

Status and Event Processing Sequence

The following figure shows an outline of the sequence for status and event processing.

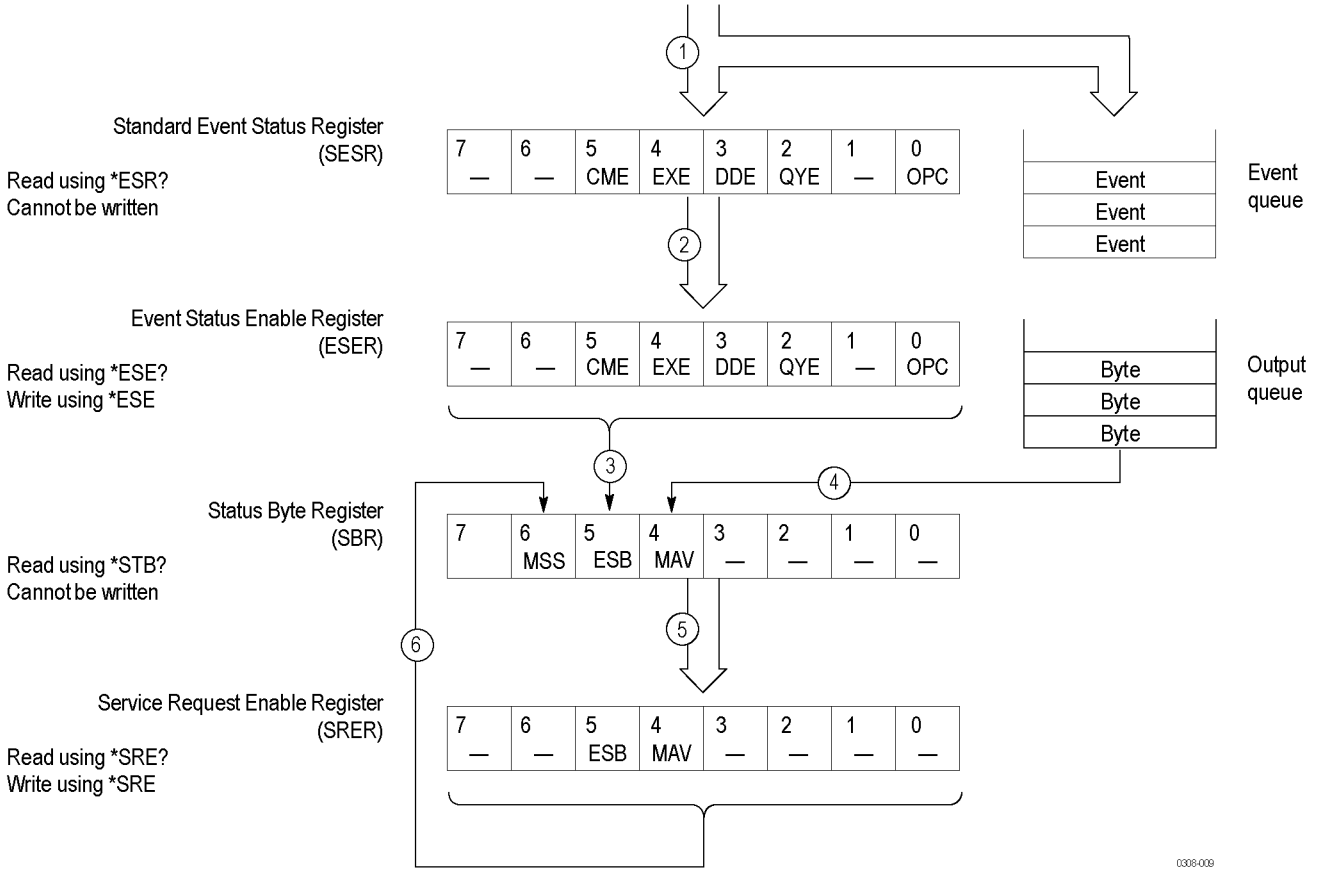


Figure 3-5: Status and event processing sequence

1. If an event has occurred, the SESR bit corresponding to that event is set and the event is placed in the event queue.
2. A bit corresponding to that event in the ESER has is set.
3. The SBR ESB bit is set to reflect the status of the ESER.
4. When a message is sent to the output queue, the SBR MAV bit is set.
5. Setting either the ESB or MAV bits in the SBR sets the respective bit in the SRER.
6. When the SRER bit is set, the SBR MSS bit is set.

Synchronizing Execution

Almost all commands are executed in the order in which they are sent from the controller, and the execution of each command is completed in a short period of time. However, the INITiate[:IMMediate] command performs data analysis in another thread, and another command can thus be executed concurrently.

This command is designed so that the next command to be sent is executed without waiting for the previous command to be completed. In some cases, a process executed by another command must first be completed before this commands can be executed; in other cases, this command must be completed before the next command is executed.

To achieve synchronization, the IEEE-488.2 common commands include the following commands:

- *OPC
- *OPC?
- *WAI

Using the *OPC command. The *OPC command sets the SESR OPC bit when all the operations for which it is waiting are completed. You can synchronize the execution by using this command together with the serial polling function.

The following is a command sequence example:

```
*ESE 1
    // Enable the ESER OPC bit
ABORt;INITiate:IMMediate;*OPC
    // Wait for the ESB bit of the SESR to be set to provide synchronization
```

Using the *OPC? query. The query *OPC? writes ASCII code "1" into the Output Queue when all operations for which it is waiting are completed. You can provide synchronization using the command string as the following example:

```
ABORt;INITiate:IMMediate;*OPC?
    // Wait for the *OPC? query response to provide synchronization
```

The command waits until "1" is written into the Output Queue. When the command goes to the Output Queue to read the data, a time-out may occur before the data is written into the queue.

Using the *WAI Command. After the process of the preceding command is completed, the *WAI command begins to execute the process of the next command as the following example:

```
ABORt;INITiate:IMMediate;*WAI
    // Wait for the *WAI process to provide synchronization
```

Error Messages and Codes

Error codes with a negative value are SCPI standard error codes; errors with a positive value are unique to the RF*Hawk* and SA2600 instruments.

Event codes and messages can be obtained by using the queries `SYSTem:ERRor?` and `SYSTem:ERRor:ALL?` These are returned in the following format:

```
<event_code>,"<event_message>"
```

Command Errors

Command errors are returned when there is a syntax error in the command.

Table 3-3: Command errors

Error code	Error message
-100	Command error
-101	Invalid character
-102	Syntax error
-103	Invalid separator
-104	Data type error
-105	GET not allowed
-108	Parameter not allowed
-109	Missing parameter
-110	Command header error
-111	Header separator error
-112	Program mnemonic too long
-113	Undefined header
-114	Header suffix out of range
-120	Numeric data error
-121	Character
-123	Exponent too large
-124	Too many digits
-128	Numeric data not allowed
-130	Suffix error
-131	Invalid suffix
-134	Suffix too long
-138	Suffix not allowed
-140	Character data error
-141	Invalid character data
-144	Character data too long

Table 3-3: Command errors (cont.)

Error code	Error message
-148	Character data not allowed
-150	String data error
-151	Invalid string data
-158	String data not allowed
-160	Block data error
-161	Invalid block data
-168	Block data not allowed
-170	Command expression error
-171	Invalid expression
-178	Expression data not allowed
-180	Macro error
-181	Invalid outside macro definition
-183	Invalid inside macro definition
-184	Macro parameter error

Execution Errors

These error codes are returned when an error is detected while a command is being executed.

Table 3-4: Execution errors

Error code	Error message
-200	Execution error
-201	Invalid while in local
-202	Settings lost due to RTL
-210	Trigger error
-211	Trigger ignored
-212	Arm ignored
-213	Init ignored
-214	Trigger deadlock
-215	Arm deadlock
-220	Parameter error
-221	Settings conflict
-222	Data out of range
-223	Too much data
-224	Illegal parameter value
-225	Out of memory

Table 3-4: Execution errors (cont.)

Error code	Error message
-226	Lists not same length
-230	Data corrupt or stale
-231	Data questionable
-240	Hardware error
-241	Hardware missing
-250	Mass storage error
-251	Missing mass storage
-252	Missing media
-253	Corrupt media
-254	Media full
-255	Directory full
-256	Filename not found
-257	Filename error
-258	Media protected
-260	Execution expression error
-261	Math error in expression
-270	Execution macro error
-271	Macro syntax error
-272	Macro execution error
-273	Illegal macro label
-274	Execution macro parameter error
-275	Macro definition too long
-276	Macro recursion error
-277	Macro redefinition not allowed
-278	Macro header not found
-280	Program error
-281	Cannot create program
-282	Illegal program name
-283	Illegal variable name
-284	Program currently running
-285	Program syntax error
-286	Program runtime error

Device Specific Errors

These error codes are returned when an internal instrument error is detected. This type of error may indicate a hardware problem.

Table 3-5: Device specific errors

Error code	Error message
-300	Device specific error
-310	System error
-311	Memory error
-312	PUD memory lost
-313	Calibration memory lost
-314	Save/Recall memory lost
-315	Configuration memory lost
-330	Self test failed
-350	Queue overflow

Query Errors

These error codes are returned in response to an unanswered query.

Table 3-6: Query errors

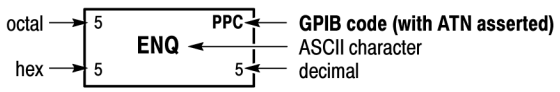
Error code	Error message
-400	Query error
-410	Query interrupted
-420	Query unterminated
-430	Query deadlocked
-440	Query unterminated after indefinite period

Appendices

Appendix A: Character Charts

B7 B6 B5 BITS B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 LA0 SP 20 32	60 LA16 0 30 48	100 TA0 @ 40 64	120 TA16 P 50 80	140 SA0 ` 60 96	160 SA16 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LL0 DC1 11 17	41 LA1 ! 21 33	61 LA17 1 31 49	101 TA1 A 41 65	121 TA17 Q 51 81	141 SA1 a 61 97	161 SA17 q 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 LA2 " 22 34	62 LA18 2 32 50	102 TA2 B 42 66	122 TA18 R 52 82	142 SA2 b 62 98	162 SA18 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 LA3 # 23 35	63 LA19 3 33 51	103 TA3 C 43 67	123 TA19 S 53 83	143 SA3 c 63 99	163 SA19 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 LA4 $ 24 36	64 LA20 4 34 52	104 TA4 D 44 68	124 TA20 T 54 84	144 SA4 d 64 100	164 SA20 t 74 116
0 1 0 1	5 PPC ENQ 5 5	25 PPU NAK 15 21	45 LA5 % 25 37	65 LA21 5 35 53	105 TA5 E 45 69	125 TA21 U 55 85	145 SA5 e 65 101	165 SA21 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 LA6 & 26 38	66 LA22 6 36 54	106 TA6 F 46 70	126 TA22 V 56 86	146 SA6 f 66 102	166 SA22 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 LA7 ' 27 39	67 LA23 7 37 55	107 TA7 G 47 71	127 TA23 W 57 87	147 SA7 g 67 103	167 SA23 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 LA8 (28 40	70 LA24 8 38 56	110 TA8 H 48 72	130 TA24 X 58 88	150 SA8 h 68 104	170 SA24 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51 LA9) 29 41	71 LA25 9 39 57	111 TA9 I 49 73	131 TA25 Y 59 89	151 SA9 i 69 105	171 SA25 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 LA10 * 2A 42	72 LA26 : 3A 58	112 TA10 J 4A 74	132 TA26 Z 5A 90	152 SA10 j 6A 106	172 SA26 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 LA11 + 2B 43	73 LA27 ; 3B 59	113 TA11 K 4B 75	133 TA27 [5B 91	153 SA11 k 6B 107	173 SA27 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 LA12 , 2C 44	74 LA28 < 3C 60	114 TA12 L 4C 76	134 TA28 \ 5C 92	154 SA12 l 6C 108	174 SA28 ¦ 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 LA13 – 2D 45	75 LA29 = 3D 61	115 TA13 M 4D 77	135 TA29] 5D 93	155 SA13 m 6D 109	175 SA29 } 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 LA14 . 2E 46	76 LA30 > 3E 62	116 TA14 N 4E 78	136 TA30 ^ 5E 94	156 SA14 n 6E 110	176 SA30 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 LA15 / 2F 47	77 UNL ? 3F 63	117 TA15 O 4F 79	137 UNT – 5F 95	157 SA15 o 6F 111	177 RUBOUT (DEL) 7F 127
	ADDRESSED COMMANDS	UNIVERSAL COMMANDS	LISTEN ADDRESSES		TALK ADDRESSES		SECONDARY ADDRESSES OR COMMANDS	

KEY



Tektronix
REF: ANSI STD X3.4-1977
IEEE STD 488.1-1987
ISO STD 646-2973

Appendix B: SCPI Conformance Information

All commands for the RF*Hawk* and SA2600 instruments are based on SCPI Version 1999.0. The following table lists the commands that are defined in the SCPI 1999.0 Standard. The other commands not listed in the table are not defined in the SCPI 1999.0 Standard.

Table B-1: SCPI 1999.0-defined commands

Command group	Command		
IEEE common	*CAL		
	*CLS		
	*ESE		
	*ESR		
	*IDN		
	*OPC		
	*RST		
	*SRE		
	*STB		
	*TRG		
	*WAI		
ABORt	:ABORt		
INITiate	:INITiate	:CONTinuous	
		[:IMMediate]	
SYSTem	:SYSTem	:DATE?	
		:ERRor	:COUNt?
			[:NEXT]?
		:TIME?	
UNIT	:UNIT	:POWer	

Appendix C: Sample Source Code

C++ Sample Code

The following source code uses the Win32 Winsock library to interface to the RF*Hawk* or SA2600. The following modules are included:

- **C_PILib.cpp** and **C_PILIb.h**: Library modules that encapsulates the TCP/IP interface to a minimal set of routines for communication with the RF*Hawk* or SA2600 programmable interface.
- **C_PILibTest.cpp**: A RF*Hawk* or SA2600 demo program that shows how to use the majority of the interface functions in the C_PILib library

These files are attached to this PDF document. Click the **Attachments** (paperclip) button in Adobe Reader to show the list of files. You can drag and drop these files onto your desktop.

MATLAB Sample Code

The following MATLAB code uses the MATLAB Instrument Control Toolbox plug-in to interface to the RF*Hawk* or SA2600. This code is also attached to the PDF document as file *RFHawkCommExample.m*.

```
%%
%% RFHawkCommExample -- Communication example for the
%% RFHawk/SA2600 V1.0
%%
%% This free software may not have gone through Tektronix
%% normal quality control or production processes,
%% but is provided to users as an accommodation to
%% respond to user requests.  The free software is provided
%% hereunder on an As-Is basis without any representation
%% or warranty.
%% TEKTRONIX DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS OR
%% IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY,
%% FITNESS FOR A PARTICULAR PURPOSE, AND NON-
%% INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.
%% IN NO EVENT SHALL TEKTRONIX BE LIABLE FOR ANY DIRECT,
```

```
%% INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL
%% DAMAGES IN ANY WAY ARISING OUT OF, OR CONNECTED WITH,
%% THE USE OF THIS FREE SOFTWARE.
%%
function RFHawkCommExample()
TCPIPControlHandle = tcpip('192.68.0.80', 34835);
set(TCPIPControlHandle, 'InputBufferSize', 4096);
set(TCPIPControlHandle, 'Terminator', 10);
fopen(TCPIPControlHandle);
fprintf(TCPIPControlHandle, '*IDN?');
strResponse = fgetl(TCPIPControlHandle);
disp(['Instrument ID: ' strResponse]);
fclose(TCPIPControlHandle);
end
```

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