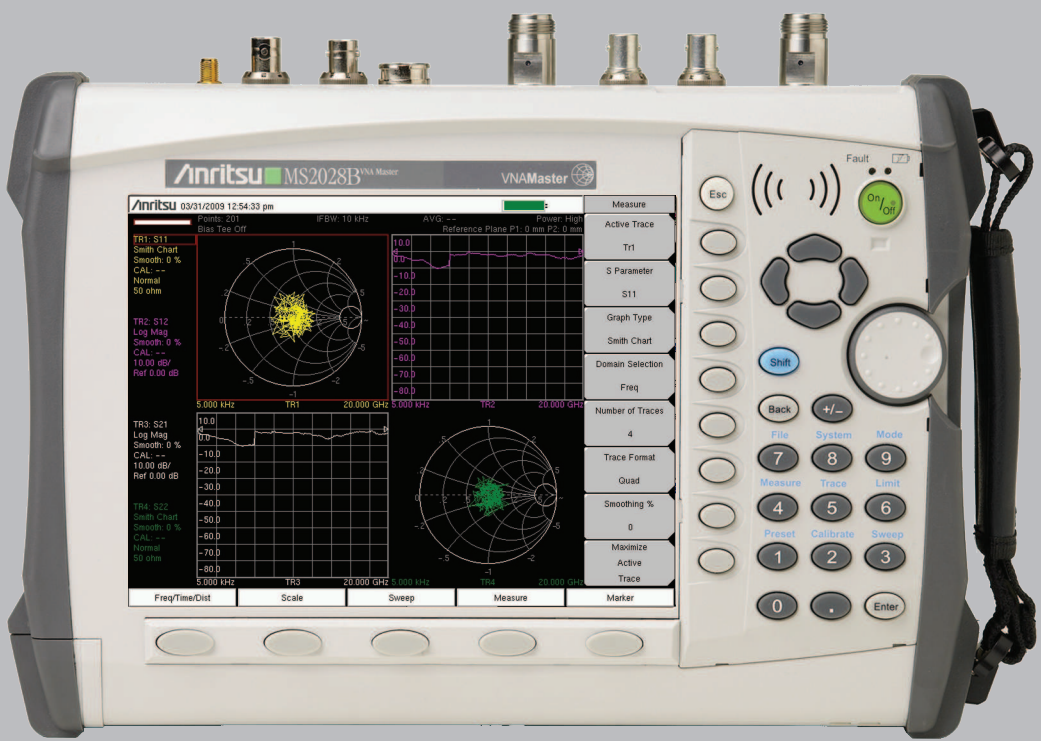
Programming Manual

Anritsu

VNA Master™

MS2026B Vector Network Analyzer 5 kHz to 6 GHz
MS2028B Vector Network Analyzer 5 kHz to 20 GHz



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Programming Manual

VNA Master™ MS202xB

MS2026B Vector Network Analyzer 5 kHz to 6 GHz

MS2028B Vector Network Analyzer 5 kHz to 20 GHz

Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

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DECLARATION OF CONFORMITY

Manufacturer's Name: ANRITSU COMPANY

Manufacturer's Address: Microwave Measurements Division
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

declares that the product specified below:

Product Name: Spectrum Analyzer

Model Number: MS2781A

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

Electromagnetic Interference:

Emissions: CISPR 11:1990/EN55011:1991 Group 1 Class A

Immunity:
EN 61000-4-2:1995/EN50082-1:1997 - 4kV CD, 8kV AD
EN 61000-4-3:1997/EN50082-1:1997 - 3V/m
ENV 50204/EN50082-1:1997 – 3V/m
EN 61000-4-4:1995/EN50082-1:1997 - 0.5kV SL, 1kV PL
EN 61000-4-5:1995/EN50082-1: 1997 - 1kV L-L, 2kV L-E
EN 61000-4-6:1994/EN61326: 1998 – 3V
EN 61000-4-11:1994/EN61326: 1998 – 1 cycle@100%

Electrical Safety Requirement:

Product Safety: EN 61010-1:2001

Corporate Quality Director

Morgan Hill, CA

29 Sept 2004
Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close, Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

Symbols Used in Manuals

Danger

This indicates a very dangerous procedure that could result in serious injury or death, or loss related to equipment malfunction, if not performed properly.

Warning

This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

Caution

This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.

This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

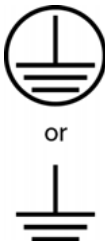
This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

Warning

Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

Warning



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Warning

This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Warning

Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

Caution

Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

Table of Contents

Table of Contents (Continued)

Chapter 4—Vector Voltmeter Commands

Chapter 5—Power Monitor Commands

Chapter 6—All Mode Commands

Appendix A—Example

Appendix B—List of Commands by Mode

Appendix C—Command Tables

Appendix D—Revision History

Chapter 1 — General Information

1-1 About this Manual

This SCPI Programming Manual provides information for remote operation of the MS202xB VNA Master Vector Network Analyzer (MS2026B and MS2028B) using commands sent from an external controller via Ethernet or USB connection. This Programming Manual includes the following:

- An overview of Ethernet and USB connection to the MS202xB
- An overview of Standard Commands for Programmable Instruments (SCPI) command structure and conventions
- The IEEE common commands that are supported by the MS202xB
- A complete listing and description of all the SCPI commands that can be used to remotely control functions of the VNA Master. These commands are organized by instrument mode and are listed in Chapter 6, "All Mode Commands".

This manual is intended to be used in conjunction with the MS202xB VNA Master Vector Network Analyzer User Guide, Anritsu Part Number 10580-00220. Refer to that manual for general information about the MS202xB, including equipment setup and operating instructions.

1-2 Introduction

This chapter provides a general description of remote programming setup, Ethernet and USB interface connections, and cable requirements.

1-3 Remote Programming Setup and Interface

Remote programming and operation of the VNA Master is accessed via the Ethernet or the USB interface. The following paragraphs provide information about the interface connections, cable requirements, and setup for remote operation.

Ethernet Interface Connection and Setup

The MS202xB fully supports the IEEE-802.3 standard. Most MS202xB functions (except power On/Off) can be controlled via an Ethernet connection to a PC that is connected directly (with an Ethernet cross-over cable) or through a network. The MS202xB software supports the TCP/IP network protocol.

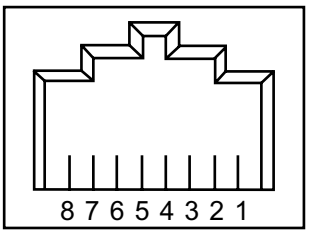
Ethernet networking uses a bus or star topology in which all of the interfacing devices are connected to a central cable called the bus, or are connected to a hub. Ethernet uses the CSMA/CD access method to handle simultaneous transmissions over the bus. CSMA/CD stands for *Carrier Sense Multiple Access/Collision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

The TCP/IP setup requires the following:

- IP Address: Every computer/electronic device in a TCP/IP network requires an IP address. An IP address has four numbers (each between 0 and 255) separated by periods. For example: 128.111.122.42 is a valid IP address.
- Subnet Mask: The subnet mask distinguishes the portion of the IP address that is the network ID from the portion that is the station ID. The subnet mask 255.255.0.0, when applied to the IP address given above, would identify the network ID as 128.111 and the station ID as 122.42. All stations in the same local area network should have the same network ID, but different station IDs.
- Default Gateway: A TCP/IP network can have a gateway to communicate beyond the LAN that is identified by the network ID. A gateway is a computer or electronic device that is connected to two different networks and can move TCP/IP data from one network to the other. A single LAN that is not connected to other LANs requires a default gateway setting of 0.0.0.0. If you have a gateway, then the default gateway would be set to the appropriate value of your gateway
- Ethernet Address: An Ethernet address (also known as MAC address) is a unique 48-bit value that identifies a network interface card to the rest of the network. Every network card has a unique ethernet address permanently stored into its memory.

Interface between the VNA Master and other devices on the network is via a category five (CAT-5) interface cable connected to a network. This cable uses 4 twisted pairs of insulated copper wires terminated into an RJ45 connector. CAT-5 cabling is capable of supporting frequencies up to 100 MHz and data transfer speeds up to 1 Gbps, which accommodates 1000Base-T, 100Base-T, and 10Base-T networks. CAT-5 cables are based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard developed by the Electronics Industries Association. A pinout diagram is shown in Table 1-1.

Table 1-1. 8-pin Ethernet RJ45 Connector Pinout Diagram



Pin	Name	Description	Wire Color
1	TX+	Transmit data (> +3 volts)	White/Orange
2	TX–	Transmit data (< –3 volts)	Orange
3	RX+	Receive data (> +3 volts)	White/Green
4	–	Not used (common mode termination)	Blue
5	–	Not used (common mode termination)	White/Blue
6	RX–	Receive data (< –3 volts)	Green
7	–	Not used (common mode termination)	White/Brown
8	–	Not used (common mode termination)	Brown

TCP/IP connectivity requires setting up the parameters that are described at the beginning of this section. The following is a brief overview of how to set up a general LAN connection on the MS202xB.

Note	You may need to consult your network documentation or network administrator for assistance in configuring your network setup.

VNA Master LAN Connections

The RJ-45 connector is used to connect the VNA Master to a local area network. Integrated into this connector are two LEDs. The amber LED indicates the speed of the LAN connection (ON for 10 Mb/s and OFF for 100 Mb/s), and the green LED flashes to show that LAN traffic is present. The instrument IP address is set by pressing the **Shift** key, then the **System** (8) key followed by the System Options soft key and the Ethernet Config soft key. The instrument IP address can be set automatically by using DHCP, or manually by entering the desired IP address, gateway address, and subnet mask.

Note	An active Ethernet cable must be connected to the MS202xB before it is turned ON in order to enable the Ethernet port for DHCP or for a static IP address. Depending upon local conditions, the port may remain enabled when changing from DHCP to static IP address, when changing from static IP address to DHCP, or when temporarily disconnecting the Ethernet cable. If the port becomes disabled, ensure that an active Ethernet cable is attached to the MS202xB, and then cycle the power OFF and back ON.

Dynamic Host Configuration Protocol (DHCP) is an Internet protocol that automates the process of setting IP addresses for devices that use TCP/IP, and is the most common method of configuring a device for network use. To determine if a network is set up for DHCP, connect the MS202xB to the network and select DHCP protocol in the Ethernet Config menu.

Power cycle the VNA Master. If the network is set up for DHCP, then the assigned IP address should be displayed briefly after the power-up sequence.

To display the IP address of the instrument, press the **Shift** key, then the **System** (8) key, then the System Options soft key, and then the Ethernet Config soft key.

USB Interface Connection and Setup

Note	For proper detection, Master Software Tools must be installed on the PC prior to connecting to the VNA Master using the USB port. Master Software Tools provides the installation tools to install the USB and VISA drivers.

The Universal Serial Bus (USB) architecture is a high-performance networking standard that is considered "plug and play" compatible. The USB driver software is automatically detected and configured by the operating system of the devices that are connected to the bus. The MS202xB conforms to the USB 2.0 standard and is a USB "full-speed" device that supports data rates of up to 10 Mbps with the following restrictions:

- One USB network can support up to 127 devices
- The maximum length of USB cables between active devices is 5 meters (for USB 2.0) and 3 meters (for USB 1.0)

To run the following example, you must have NI-VISA 2.5 or later installed on the controller PC, and you must select the VISA library (visa32.dll) as a reference in a Visual Basic project. For remote USB control, the controlling PC needs to have a version of VISA installed that supports USBTMC (USB Test and Measurement Class) devices.

1. Power On the MS202xB and controller PC and wait for the systems to power up completely.
2. Connect the USB cable mini-B connector to the MS202xB.
3. Connect the USB cable A connector to the controller PC USB host port. The controller PC should indicate "New Hardware Found" if the combination of USB VID/PID/Serial Number has never been connected to this controller PC.

Figure 1-1. USB Found New Hardware Wizard

4. Select to allow the Wizard to search for and install the USB software automatically.

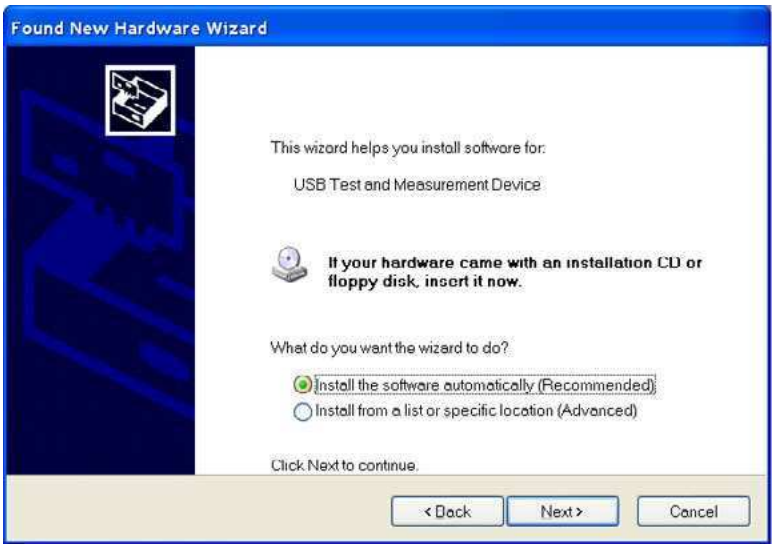


Figure 1-2. USB Found New Hardware Wizard

5. After the software is installed, close the Wizard by clicking Finish.

Figure 1-3. USB Found New Hardware Wizard

USB Interface, Type Mini-B

The USB 2.0 Mini-B device connector can be used to connect the MS202xB directly to a PC. The first time that the MS202xB is connected to a PC, the normal USB device detection is performed by the computer operating system. The CD-ROM that is shipped with the instrument contains a driver for Windows 2000, Windows XP, and Windows Vista. The driver is installed when Master Software Tools is installed. Drivers are not available for earlier versions of the Windows operating system. During the driver installation process, place the CD-ROM in the computer drive and specify that the installation wizard should search the CD-ROM for the driver.

1-4 Sending SCPI Commands

SCPI commands can be sent to the VNA Master though any Virtual Instrument Software Architecture (VISA) controller. VISA is a commonly-used API in the Test and Measurement industry for communicating with instruments from a PC. The physical connection between the PC and the VNA Master can be Ethernet or USB.

NI-VISA is the National Instruments implementation of the VISA I/O standard. Information and downloads are available at the following link:

http://www.ni.com/visa/

The following example describes the verification that a VISA controller can detect the VNA Master.

Note	The images shown and the instructions for your instrument and software may differ from the examples in this manual.

1. On the PC, run VISA Interactive Control and double click on the VNA Master.

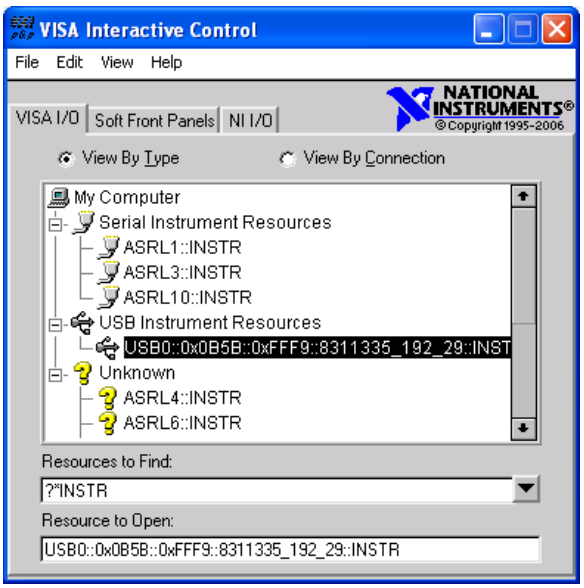


Figure 1-4. VISA Interactive Control

2. Select the viWrite tab and execute the default *IDN? write by clicking the Execute button.

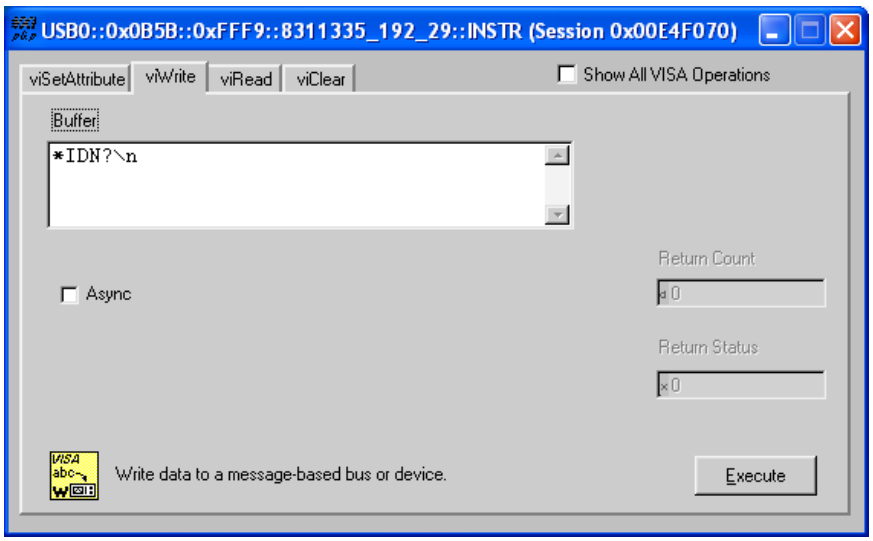


Figure 1-5. VISA Interactive Control viWrite Tab

3. Select the viRead tab and click the Execute button. If the PC is connected to the MS202xB, then the command returns the following information from the Buffer: manufacturer name (“Anritsu”), model number/options, serial number, and firmware package number.

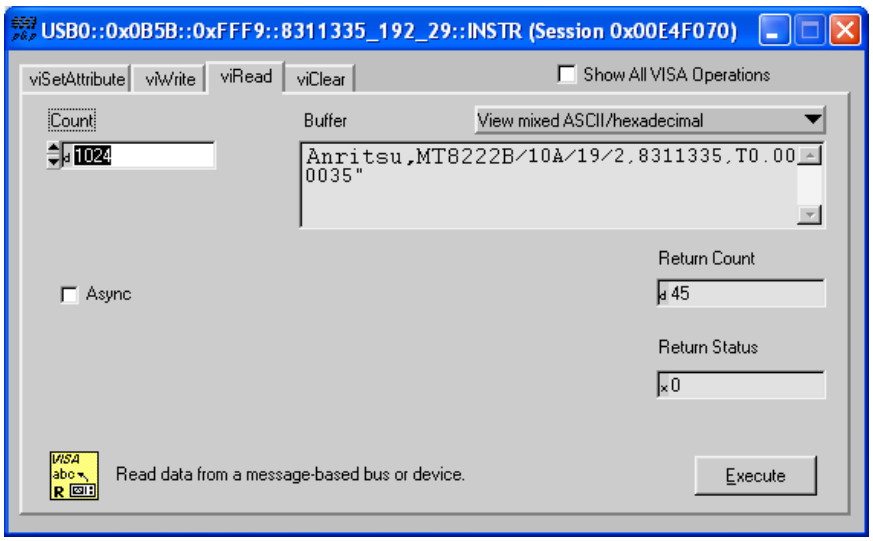


Figure 1-6. VISA Interactive Control viRead Tab

Chapter 2 — Programming with SCPI

2-1 Introduction

This chapter provides an introduction to SCPI programming that includes descriptions of the command types, hierarchical command structure, command subsystems, data parameters, and notational conventions.

2-2 Introduction to SCPI Programming

The Standard Commands for Programmable Instruments (SCPI) defines a set of standard programming commands for use by all SCPI-compatible instruments. SCPI is intended to give the user a consistent environment for program development. It does so by defining controller messages, instrument responses, and message formats for all SCPI-compatible instruments. SCPI commands are messages to the instrument to perform specific tasks. The MS202xB command set includes:

- "SCPI Common Commands" on page 2-2
- "SCPI Required Commands" on page 2-3
- "SCPI Optional Commands" on page 2-3

Caution	Programs that receive SCPI commands may require support for Extended ASCII character codes in order to display some of the returned characters, such as Greek letter mu (µ). Some commands, for example, return the units of time in microseconds (µs). In this Anritsu programming manual, the Greek letter mu is represented by the English letter "u" to avoid typographic problems during publication.

Note	The VNA Master follows the SCPI standard but is not fully compliant with that standard. The main reason that VNA Master is not fully compliant is because it does not support all of the required SCPI commands, and because it uses some exceptions in the use of short form and long form command syntax. SCRE for SCREen and TYP for TYPE are two examples of the command short forms that are used in VNA Master in order to be compatible with older products.

2-3 SCPI Common Commands

Some common commands are defined in the IEEE 488.2 standard and must be implemented by all SCPI compatible instruments. These commands are identified by the asterisk (*) at the beginning of the command keyword. These commands are defined to control instrument status registers, status reporting, synchronization, and other common functions. The common commands that are supported by the VNA Master are shown below.

***IDN?**

Title: Identification Query

Description: This command returns the following information in `<string>` format separated by commas: manufacturer name (“Anritsu”), model number/options, serial number, firmware package number. The model number and options are separated by a `"/"` and each option is separated by a `"/"`.

For example, the return string might appear as follows:

`"Anritsu,MS2028B/10/2,62011032,1.23"`

***RST**

Title: Reset

Description: This command restores parameters in the current application as well as system settings to their factory default values.

System settings that are affected by this command are Ethernet configuration, language, volume, and brightness. Note that the unit will power cycle after this command is executed.

Front Panel Access: Shift-8 (System), System Options, Reset, Factory Defaults

See Also: `:SYSTem:PRESet`

Note

The best practice when starting any remote program is to reset the instrument to a known state. This is especially important when the instrument is being used in both remote and front-panel operation. Use the ***RST** or the **:SYSTem:PRESet** command to restore the instrument to the factory default settings. If using Ethernet to connect to the instrument, then note that the use of ***RST** resets the Ethernet configuration and causes the instrument to reboot, which may reset the instrument IP address. If resetting the Ethernet configuration is not desired, then you may choose to use **:SYSTem:PRESet**.

Operating the instrument through the front panel and remotely at the same time could, under certain conditions, cause the instrument to hang up. To avoid conflicts, do not mix front-panel operation and remote operation.

2-4 SCPI Required Commands

The required SCPI commands that are supported by the MS202xB are listed in the Table 2-1. These commands work in all measurement modes and are described in Chapter 3 on page 3-1

Table 2-1. SCPI Required Commands

:STATus
:SYSTem

2-5 SCPI Optional Commands

Table 2-2 lists the optional SCPI commands that comprise the majority of the command set that is described in this document. These commands control most of the programmable functions of the MS202xB.

Table 2-2. SCPI Optional Commands

:ABORt	:FETCh	:INSTrument	:SOURce
:CALCulate	:FORMat	:MEASure	:TRACe
:CALibration	:INITiate	:MMEMory	:UNIT
:DISPlay	:INPut	:SENSe	:[SENSe]

The SCPI optional commands are sorted by measurement modes, and commands may be repeated in more than one mode.

- Chapter 3, “VNA Commands”
- Chapter 4, “Vector Voltmeter Commands”
- Chapter 5, “Power Monitor Commands”
- Chapter 6, “All Mode Commands”

2-6 Subsystem Commands

Subsystem commands control all instrument functions and some general purpose functions. All subsystem commands are identified by the colon that is used between keywords, as in `:INITiate:CONTinuous`.

The following information is provided for each subsystem command that is described in the following chapters:

- The command name ("Command Names" on page 2-4).
- The path from the subsystem root command ("Hierarchical Command Structure" on page 2-5).
- The query form of the command (if applicable) ("Query Commands" on page 2-6).
- The command title.
- A description of the purpose of the command.
- The data parameters that are used as arguments for the command (described in Section "Data Parameters" on page 2-8). This may include the parameter type and the available parameter choices.

Command Names

Typical SCPI commands consist of one or more keywords, parameters, and punctuation. SCPI command keywords can be a mixture of UPPERCASE and lowercase characters. Except for common commands, each keyword has a long form and a short form.

In this manual, the long form is presented with the short form portion in UPPERCASE and the remainder in lowercase. For example, the long form of the command keyword to control the instrument display is `:DISPlay`, and the short form is `:DISP`.

The short form keyword is usually the first four characters of the long form (example: `:CALC` for `:CALCulate`). The exception to this is when the long form is longer than four characters and the fourth character is a vowel. In such cases, the vowel is dropped and the short form becomes the first three characters of the long form. Example: the short form of the keyword `:POWer` is `:POW`.

Some command keywords may have a numeric suffix to differentiate between multiple instrument features such as multiple trace options. For example; keywords `:TRACe[:DATA]{1|2|3}`, `:TRACe1`, or `:TRACe3`.

Note	In the previous paragraph, `:TRACe` is identical to `:TRACe1`. If a numeric suffix is not included in a command, then the first option is implied. Braces (curly brackets) `{ }` designate optional keyword parameters. Square brackets `[ ]` designate optional command keywords.

As with any programming language, the exact command keywords and command syntax must be used. The syntax of the individual commands is described in detail in the programming command chapters. Unrecognized versions of long form or short form commands, or improper syntax, will generate an error.

Long Format versus Short Format

Each keyword has a long format and a short format. The start frequency can be specified by `:SENSe:FREQuency:STARt` or `:SENS:FREQ:STAR`. The capital letters in the command specification indicate the short form of the command. A mixture of the entire short form elements with entire long form elements of each command is acceptable. For example, `:SENS:FREQuency:STAR` is an acceptable form of the command. However, `:SENS:FREQuen:STAR` is not an acceptable form of the command because `:FREQuen` is neither the short form nor the entire long form of the command element.

Hierarchical Command Structure

All SCPI commands, except the common commands, are organized in a hierarchical structure similar to the inverted tree file structure that is used in most computers. The SCPI standard refers to this structure as "the Command Tree." The command keywords that correspond to the major instrument control functions are located at the top of the command tree. The root command keywords for the MS202xB SCPI command set are shown in Figure 2-1.

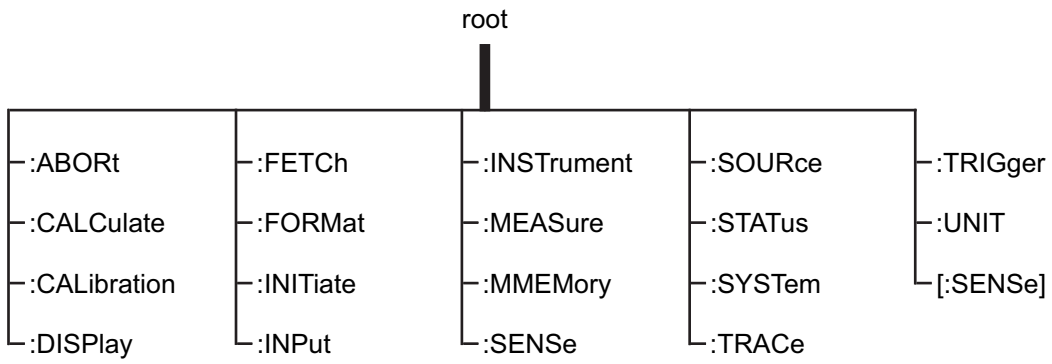


Figure 2-1. SCPI Command Tree

All MS202xB SCPI commands, except the `:ABORt` command, have one or more subcommands (keywords) associated with them to further define the instrument function to be controlled. The subcommand keywords may also have one or more associated subcommands (keywords). Each subcommand level adds another layer to the command tree. The command keyword and its associated subcommand keywords form a portion of the command tree called a command subsystem. The `:DISPlay` command subsystem is shown in Figure 2-2.

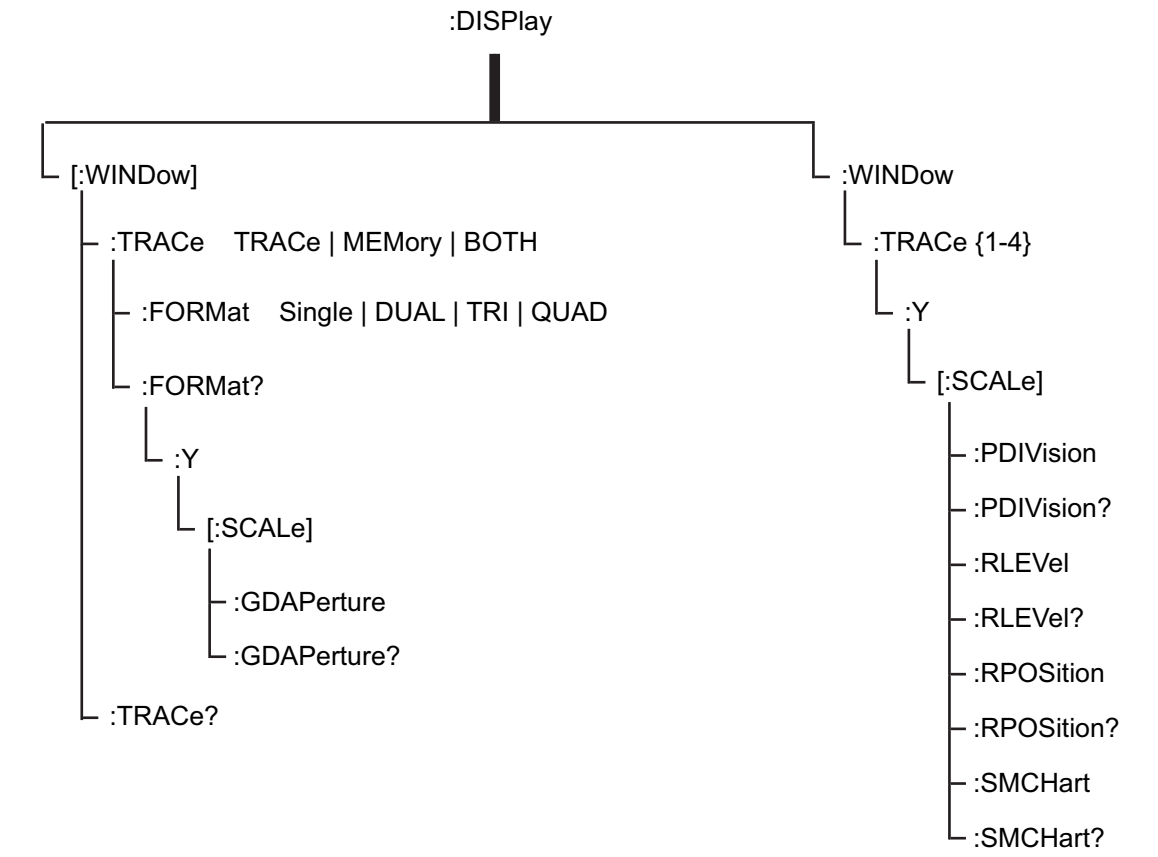


Figure 2-2. SCPI :DISPlay Subsystem

A colon (:) separates each subsystem. For example, the command `:DISPlay:WINDow:Trace MEMory` sets the window to display memory trace. Trace is part of the `:WINDow` subsystem, which is part of the `:DISPlay` subsystem. Y is also part of the `:DISPlay:WINDow:Trace{1-4}` subsystem.

Query Commands

All commands, unless specifically noted in the commands syntax descriptions, have a query form. As defined in IEEE-488.2, a query is a command with a question mark symbol appended (examples: `*IDN?` and `:TRACe[:DATA]? [1]|2|3|4)`. When a query form of a command is received, the current setting that is associated with the command is placed in the output buffer. Query commands usually return the short form of the parameter. Boolean values are returned as `1` or `0`, even when they can be set as `on` or `off`.

Identifiers

Some or all of the following identifiers have been used throughout the optional command definitions. Descriptions are provided here. In most cases, units are specified with the individual command.

Table 2-3. Description of Command Indentifiers

Identifier	Description
<amplitude>	Amplitude value. Units specified with the command.
<freq>	Frequency. Units specified with the command.
<integer>	Integer value, no units. Range specified with the command.
<number>	Numeric value, integer or real.
<percentage>	Percentage value from 0 to 100. Units are always %.
<rel ampl>	Relative amplitude. Units are always dB.
<x-parameter>	Parameter value in the units of the x-axis. Units are specified with the command.
<string>	The string should be enclosed in either single quotes (‘ ’) or double quotes (“ ”).
<file name>	The name should be enclosed in either single quotes (‘ ’) or double quotes (“ ”). The need for an extension is documented with applicable commands.
<voltage>	Voltage. Units specified with the command.
<current>	Current. Units specified with the command.

Data Parameters

Data parameters, referred to simply as “parameters,” are the quantitative values that are used as arguments for the command keywords. The parameter type that is associated with a particular SCPI command is determined by the type of information that is required to control the particular instrument function. For example, Boolean (`ON | OFF`) type parameters are used with commands that control switch functions.

Some command descriptions specify the type of data parameter that is to be used with each command. The most commonly used parameter types are numeric, extended numeric, discrete, and Boolean.

Numeric

Numeric parameters comprise integer numbers or any number in decimal or scientific notation, and may include polarity signs. This includes `<NR1>, <NR2>,` and `<NR3>` numeric data as defined in “Data Parameter Notations” on page 2-9. Parameters that accept all three `<NR>` formats are designated `<NRf>` throughout this document.

Extended Numeric

Extended numeric parameters include values such as `MAXimum` and `MINimum`.

Discrete

Discrete parameters, such as `INTernal` and `EXTernal`, are used to control program settings to a predetermined finite value or condition.

Boolean

Boolean parameters represent binary conditions and may be expressed as `ON, OFF` or `1, 0`.

Data Parameter Notations

The following syntax conventions are used for data parameter descriptions in this manual:

Table 2-4. Parameter Notations

<arg>	::=a generic command argument consisting of one or more of the other data types
<bNR1>	::=boolean values in <NR1> format; numeric 1 or 0
<boolean>	::=ON | OFF. Can also be represented as 1 or 0, where 1 means ON and 0 means OFF Boolean parameters are always returned as 1 or 0 in <NR1> format by query commands
<integer>	::=an unsigned integer without a decimal point (implied radix point)
<NR1>	::=a signed integer without a decimal point (implied radix point)
<NR2>	::=a signed number with an explicit radix point
<NR3>	::=a scaled explicit decimal point numeric value with an exponent (for example, floating point number)
<NRf>	::=<NR1>|<NR2>|<NR3>
<nv>	::=SCPI numeric value: <NRf>|MINimum|MAXimum|UP|DOWN|DEFault|NAN (Not A Number), |INFinity|NINFinity (Negative Infinity), or other types
<char>	::=<CHARACTER PROGRAM DATA> Examples: CW, FIXed, UP, and DOWN
<string>	::=<STRING PROGRAM DATA> ASCII characters surrounded by double quotes For example: “OFF”
<block>	::=IEEE-488.2 block data format
<NA>	::=Not Applicable

Unit Suffixes

Unit suffixes are not required for data parameters, provided the values are scaled for the global default units. The VNA Master SCPI default units are: Hz (Hertz) for frequency-related parameters, s (seconds) for time-related parameters, and m (meters) for distance-related parameters.

2-7 Notational Conventions

The SCPI interface standardizes command syntax and style to simplify the task of programming across a wide range of instrumentation. As with any programming language, the exact command keywords and command syntax must be used. Unrecognized commands or improper syntax will not function.

Table 2-5. Notational Conventions

:	A colon links command keywords together to form commands. The colon is not an actual part of the keyword, but is a signal to the SCPI interface parser. A colon must precede a root keyword immediately following a semicolon (see "Notational Examples" on page 2-11).
;	A semicolon separates commands if multiple commands are placed on a single program line.
[ ]	Square brackets enclose one or more optional keywords.
{ }	Braces enclose one or more keyword or command parameters that may be included one or more times.
|	A vertical bar indicates "or" and is used to separate alternative parameter options. Example: ON | OFF is the same as ON or OFF.
< >	Angle brackets enclose parameter descriptions.
::=	Means "is defined as" For example: <a>::=<b><c> indicates that <b><c> can replace <a>.
sp	Space, referred to as *white space*, must be used to separate keywords from their associated data parameters. It must not be used between keywords or inside keywords.
XXX	Indicates a root command name.

For further information about SCPI command syntax and style, refer to the Standard Commands for Programmable Instruments (SCPI) 1999.0 document.

2-8 Notational Examples

Table 2-6 provides examples of valid command syntax:

Table 2-6. Creating Valid Commands

Command Specification	Valid Forms

`[:SENSe]:FREQuency:STARt <freq>`	The following all produce the same result:
	`:SENSe:FREQuency:STARt 1 MHZ`
	`:SENS:FREQ:STAR 1 MHZ`
	`:sense:frequency:start 1000000`
	`:FREQ:STAR 1000 KHZ`

`:CALCulate:MARKer{1|2|3|4|5|6}:X <x-parameter>`	The first 2 commands set the location of marker 1. The third command sets the location of marker 2.
	`:CALC:MARK:X 1 GHZ`
	`:CALC:MARK1:X 1 GHZ`
	`:CALC:MARK2:X 2 GHZ`

`:UNIT:POWer DBM|DBV|DBMV|DBUV|V|W`	The following commands are identical:
	`:UNIT:POWer DBM`
	`:unit:pow dbm`

`:INITiate:CONTinuous OFF|ON|0|1`	The following commands are identical:
	`:INITiate:CONTinuous OFF`
	`:init:cont 0`

Command statements read from left to right and from top to bottom. In the command statement above, the `:FREQuency` keyword immediately follows the `:SENSe` keyword with no separating space. A space (*sp*) is used between the command string and its argument.

Note that the first keyword in the command string does not require a leading colon. It is good practice, however, to always use a leading colon for all keywords. Note also that the `[:SENSe]` keyword is optional. This is a SCPI convention (for all voltage or signal source type instruments) that allows shorter command statements to be used.

The following is an example of a multiple command statement that uses two separate commands in a single statement:

```
:FREQuency:STARt 10E6;:FREQuency:STOP 20E9
```

Note	A semicolon is used to join the commands, and a leading colon is used immediately after the semicolon to start the second command.

Command Terminators

The <new line> character (ASCII 10) in the last data byte of a command string is used as a command terminator. The use of a command terminator resets the command path to the root of the tree.

2-9 Formatting Conventions

This manual uses the following conventions in describing SCPI commands.

Table 2-7. Formatting Conventions

`:COMMands:LOOK:LIKE:THIS`	Commands are formatted to differentiate them from their description.
`:COMMand:QUERies:LOOK:LIKE:THIS?`	The query form of the command is followed by a “?”
Front panel key sequences use this formatting.	Front panel key presses are formatted to differentiate them from text descriptions. Key presses are separated by a comma (“,”).
`<identifier>`	Identifiers are enclosed in angular brackets, “< >”. They indicate that some type of data must be provided. Refer to Table 2-3 on page 2-7 for details on the types of identifiers.
|	The pipe (or vertical bar), “|” indicates that a choice must be made.
`[optional input]`	Optional input is enclosed in square brackets, “[ ]”. The “[ ]” are not part of the command.

2-10 Parameter Names

The parameters that are returned depend on the firmware version in the VNA Master, and this document does not cover all possible parameter values that can be returned by the command.

Parameter names are dependent upon individual applications and are different for each application. They can be extracted via a Trace Preamble command.

The following tables list the parameter options for the `:TRACe:PREamble?` command in each supported measurement mode:

Vector Network Analyzer: Refer to:

- Table 3-33, “Trace Header Parameters” on page 3-122.
- Table 3-34, “Trace Header Marker Parameters” on page 3-128
- Table 3-35, “Trace Header Limits Parameters” on page 3-129

Vector Voltmeter: Refer to Table 4-3, “Trace Header Parameters” on page 4-4.

Power Monitor: Refer to Table 5-3, “Trace Header Parameters” on page 5-3.

Chapter 3 — VNA Commands

3-1 Introduction

This chapter describes commands for Vector Network Analyzer mode. Only the commands that are listed in this chapter and in Chapter 6, "All Mode Commands" can be used in Vector Network Analyzer mode. Using commands from other modes may produce unexpected results.

Note	Front Panel Access in VNA mode via the function hard keys may be listed as **Freq**/**Time**/**Dist** or as **Freq**. The first function hard key is displayed with the label **Freq**/**Time**/**Dist** when Option 9 is installed in the VNA Master.

VNA Commands

Table 3-1. VNA Commands Subsystems

Keyword	Parameter Data or Units
:CALCulate{1-4}	Table 3-2, ":CALCulate Subsystem" on page 3-2
:DISPlay	Table 3-10, ":DISPlay Subsystem" on page 3-57
:FORMat	Table 3-11, ":FORMat Subsystem" on page 3-64
:INITiate	Table 3-12, ":INITiate Subsystem" on page 3-66
:INPut	Table 3-13, ":INPut Subsystem" on page 3-68
[:SENSe]	Table 3-14, "[:SENSe] Subsystem" on page 3-73
:SOURce	Table 3-28, ":SOURce Subsystem" on page 3-113
:STATus	Table 3-30, ":STATus Subsystem" on page 3-117
:SYSTem	Table 3-31, ":SYSTem Subsystem" on page 3-119
:TRACe	Table 3-32, ":TRACe Subsystem" on page 3-120

3-2 :CALCulate Subsystem

The commands in this subsystem process data that have been collected via the :CALCulate subsystem.

Table 3-2. :CALCulate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate{1-4}			
:DATA?	<char>	FDATa | SDATa | FMEM | SMEM Returns block data	Query Only
:FORMat		Refer to Table 3-3 on page 3-5	Refer to Subsystem
:LIMit		Refer to Table 3-4 on page 3-6	Refer to Subsystem
:MARKer		Refer to Table 3-5 on page 3-35	Refer to Subsystem
:MATH		Refer to Table 3-7 on page 3-48	Refer to Subsystem
:SMOothing		Refer to Table 3-8 on page 3-49	Refer to Subsystem
:TRANsform		Refer to Table 3-9 on page 3-50	Refer to Subsystem

Trace Data Transfer

:CALCulate<Tr>:DATA? FDATa|SDATa|FMEM|SMEM

Title: Trace Data Transfer

Description: Transfers the given trace data specified by <Tr> from the instrument to the controller. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

FDATa: Formatted (or Final) data. The returned data are based on the Graph Type that is associated with the trace. For graph types that use only one number per point (such as Log Mag, SWR, Phase, Real, Imaginary, Group Delay, Log Mag/2), the command returns one number per data point. For graph types that use two numbers per point (such as Smith Chart), the command returns two numbers per data point. Following is a list of the returned values for each Graph Type:

Graph Type	Returned Units
Log Magnitude	dB
Log Magnitude/2	dB
Phase	degree
SWR	unitless
Real	unitless
Imaginary	unitless
Group Delay	ns (nanosecond)
Smith Chart	R + jX ohm

SDATa: Complex measurement data. The returned numbers (which are independent of the Graph Type that is associated with the trace) are the complex measurement data (Real and Imaginary) for each point of the trace. A 551 point trace therefore has a total of 1102 points that get transferred.

FMEM: Formatted (or Final) Memory data. Similar to FDATa, but for memory data.

SMEM: Complex memory data. Similar to SDATa, but for memory data.

Note that in order to get valid data when querying for memory data, you must first store a trace into memory using the command `CALC:MATH:MEMorize`. The format of the block data that is returned can be specified by the command `:FORMat:DATA`. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header. Each data point is separated by a comma delimiter.

Query: Query Only

Syntax: `:CALCulate<Tr>:DATA? FDATa|SDATa|FMEM|SMEM`

Parameter: `FDATa|SDATa|FMEM|SMEM`

Related Command: `:FORMat:DATA`

Front Panel Access: **NA**

:CALCulate:FORMat Subsystem

Commands in this subsystem define the display format for a measurement.

Table 3-3. :CALCulate:FORMat Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate{1-4}			
:FORMat	<char>	LMAGnitude|SWR|PHASe|REAL|IMAGinary|GDELay|SMITh|LM/2	Query Exists
:FORMat?	<char>	LMAG|SWR|PHAS|REAL|IMAG|GDEL|SMIT|LM/2	Query Form

Graph Type

:CALCulate<Tr>:FORMat <Graph Type>

Title: Graph Type

Description: Defines the graph type for the given trace <Tr>. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. <Graph Type> is the graph type to which the specified trace is set, and it must be one of the following values:

LMAGnitude | SWR | PHASe | REAL | IMAGinary | GDELay | SMITh | LM/2

The query version of this command returns "LMAG" if the specified trace graph type is set to Log Mag, "SWR" if set to SWR, "PHAS" if set to Phase, "REAL" if set to Real, "IMAG" if set to Imaginary, "GDEL" if set to Group Delay, and "SMIT" is set to Smith chart, and "LM/2" if set to Log Mag/2 (cable loss).

Query: :CALCulate<Tr>:FORMat?

Syntax: :CALCulate<Tr>:FORMat <Graph Type>

Parameter: <Graph Type>

Default Value: Trace 1: SMIT

Trace 2: LMAG

Trace 3: LMAG

Trace 4: SMIT

Example: To set Trace 2 graph type to Log Magnitude

:CALC2:FORM LMAG

Front Panel Access: **Measurement**, Graph Type

:CALCulate:LIMit Subsystem

This subsystem defines the limit lines and controls the limit check.

Table 3-4. :CALCulate:LIMit Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:LIMit			
:ALARm	<boolean>	OFF|ON|0|1	Query Exists
:ALARm?	<boolean>	0|1	Query Form
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:TYPE	<char>	0|1	Query Exists
:TYPE?	<char>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
:CALCulate{1-4}			
:LIMit			
:LOWer			
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query

Table 3-4. :CALCulate:LIMit Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
:UPPer			
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form

Limit Alarm

:CALCulate:LIMit:ALARm OFF|ON|0|1

Title: Limit Alarm

Description: Enables/disables the active trace currently selected limit line alarm. Setting the value to `ON` or `1` turns on the active trace limit alarm. Setting the value to `OFF` or `0` turns off the active trace limit alarm. The query version of the command returns a `1` if the active trace currently selected limit line alarm is set to `ON` and returns `0` if set to `OFF`. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate:LIMit:ALARm?`

Syntax: `:CALCulate:LIMit:ALARm OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF or 0 (query returns 0 for OFF)

Example: To turn off limit alarm

```
:CALCulate:LIMit:ALARm OFF
```

OR

```
:CALCulate:LIMit:ALARm 0
```

To turn on limit alarm

```
:CALCulate:LIMit:ALARm ON
```

OR

```
:CALC:LIM:ALAR 1
```

Related Command: `:CALCulate:LIMit:TYPE`

Front Panel Access: **Shift 6** (Limit), Limit Alarm

Number of Lower Limit Points

:CALCulate<Tr>:LIMit:LOWer:POINt?

Title: Number of Lower Limit Points

Description: Returns the number of points currently in the lower limit line of the given trace `<Tr>`. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1.

Query: Query Form

Syntax: `:CALCulate<Tr>:LIMit:LOWer:POINt?`

Example: To query for the lower limit total point on trace #2:

```
:CALC2:LIM:LOW:POIN?
```

Front Panel Access: **NA**

Add Lower Limit Point

:CALCulate<Tr>:LIMit:LOWer:POINt:ADD

Title: Add Lower Limit Point

Description: Adds a new limit point to the lower limit line of the given trace `<Tr>`. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1.

Query: No Query

Syntax: `:CALCulate<Tr>:LIMit:LOWer:POINt:ADD`

Example: To add a point to the lower limit line on trace 2:

```
:CALC2:LIM:LOW:POIN:ADD
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Add Point

Delete Lower Limit Point

:CALCulate<Tr>:LIMit:LOWer:POINt:DELete

Title: Delete Lower Limit Point

Description: Deletes the lower limit point of the given trace <Tr>. After deletion, the point that is immediately to the left of the point that was deleted becomes the active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. Note that deletion is valid only if more than 2 limit points are present.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:LOWer:POINt:DELete

Example: To delete the trace 4 lower limit current active point:

```
:CALCulate4:LIMit:LOWer:POINt:DELete
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Delete Point

Lower Limit Next Point Left

:CALCulate<Tr>:LIMit:LOWer:POINt:LEFT

Title: Lower Limit Next Point Left

Description: Sets the limit point to the left of the lower limit active point of the given trace <Tr> as the new active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:LOWer:POINt:LEFT

Example: To make the lower limit point to the left of the current active point of trace 2 as the new active point:

```
:CALCulate2:LIMit:LOWer:POINt:LEFT
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Next Point Left

Lower Limit Next Point Right

:CALCulate<Tr>:LIMit:LOWer:POINt:RIGHt

Title: Lower Limit Next Point Right

Description: Sets the limit point to the right of the lower limit active point of the given trace <Tr> as the new active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:LOWer:POINt:RIGHt

Example: To make the lower limit point to the right of the current active point of trace 2 as the new active point:

```
:CALCulate2:LIMit:LOWer:POINt:RIGHt
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Next Point Right

Lower Limit Point X Value

:CALCulate<Tr>:LIMit:LOWer:POINt:X <x-parameter>

Title: Lower Limit Point X Value

Description: Sets the location of the lower limit point of the given trace <Tr> on the x-axis at the specified location. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. <x-parameter> is defined in the current x-axis. Sending the set command changes the Move Limit on the front panel to Point if it is currently set to Limit, and sets the given trace as the active trace. The <x-parameter> given unit must correspond to the given trace domain type. If no unit is specified with the <x-parameter>, then the default unit is used. The query version of the command returns the location of the given trace active lower limit point on the x-axis followed by the unit. If an error occurs, such as limit not ON, then the query version of the command returns −400 error codes. Limit line must be ON for the command to be valid. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: :CALCulate<Tr>:LIMit:LOWer:POINt:X?

Syntax: :CALCulate<Tr>:LIMit:LOWer:POINt:X <x-parameter>

Parameter: <x-parameter>

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Example: To set the trace 4 lower limit point to 5000 Hertz (trace 4 in frequency domain):

```
:CALCulate4:LIMit:LOWer:POINt:X 5000
```

OR to 500 MHz:

```
:CALCulate4:LIMit:LOWer:POINt:X 500 MHz
```

To set the trace 1 lower limit point to 5 Feet (trace 1 in distance domain with current distance unit in meter):

```
:CALCulate:LIMit:LOWer:POINt:X 5 FT
```

OR to 4 Meter

```
:CALCulate1:LIMit:LOWer:POINt:X 4 M
```

OR to 4 Meter

```
:CALCulate:LIMit:LOWer:POINt:X 4
```

To set the trace 2 lower limit point to 2.5 nanoseconds (trace 2 in time domain):

```
:CALCulate2:LIMit:LOWer:POINt:X 2.5 ns
```

To set the trace 3 lower limit point to 25 us (trace 3 in time domain):

```
:CALC3:LIM:LOW:POIN:X 25 us
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Lower Limit Point Y Value

:CALCulate<Tr>:LIMit:LOWer:POINt:Y <y-parameter>

Title: Lower Limit Point Y Value

Description: Sets the location of the lower limit point of the given trace `<Tr>` on the y-axis at the specified location. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified then default is trace number 1. Sending the set command changes the Move Limit on the front panel to Point if it is currently set to Limit, and sets the given trace as the active trace. The `<y-parameter>` is defined in the given trace current y-axis. If no unit is specified with the `<y-parameter>`, then the default unit is used. The query version of the command returns the location of the given trace lower limit point on the y-axis. If an error occurs, such as limit not `ON`, then the query version of the command returns −400 error codes. Limit line must be ON for the command to be valid. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate<Tr>:LIMit:LOWer:POINt:Y?`

Syntax: `:CALCulate<Tr>:LIMit:LOWer:POINt:Y <y-parameter>`

Parameter: `<y-parameter>`

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

Lower Limit State

:CALCulate<Tr>:LIMit:LOWer[:STATe] OFF|ON|0|1

Title: Lower Limit State

Description: Turns the lower limit line of the given trace <Tr> ON or OFF. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. The query version of the command returns a 1 if the lower limit line of the given trace is ON, and returns a 0 if it is OFF.

Query: :CALCulate<Tr>:LIMit:LOWer[:STATe]?

Syntax: :CALCulate<Tr>:LIMit:LOWer[:STATe] OFF|ON|0|1

Parameter: OFF|ON|0|1

Default Value: OFF or 0 (query returns 0 for OFF)

Example: To turn on lower limit of trace 1

```
:CALCulate:LIMit:LOWer ON
```

OR

```
:CALCulate1:LIMit:LOWer 1
```

OR

```
:CALCulate:LIMit:LOWer:STATe ON
```

To turn off upper limit of trace 4

```
:CALCulate4:LIMit:LOWer OFF
```

OR

```
:CALCulate4:LIMit:LOWer 0
```

OR

```
:CALC4:LIM:LOW:STAT 0
```

Related Command: :CALCulate:LIMit[:STATe]

Front Panel Access: **Shift 6** (Limit), Limit State

Lower Limit X Value

:CALCulate<Tr>:LIMit:LOWer:X <x-parameter>

Title: Lower Limit X Value

Description: Moves the lower limit of the given trace `<Tr>` on the x-axis to the given value. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1. `<x-parameter>` is defined in the given trace current x-axis. The unit given with the `<x-parameter>` must correspond to the given trace domain type. If no unit is specified with the `<x-parameter>`, then the default unit is used. The set version of the command changes the Move Limit on the front panel to Limit if it is currently set to Point, and sets the given trace as the active trace. The query version of the command returns the location of the given trace lower limit point on the x-axis followed by the unit. If an error occurs, such as limit not `ON`, then the query version of the command returns –400 error codes. Limit line must be ON for the command to be valid. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate<Tr>:LIMit:LOWer:X?`

Syntax: `:CALCulate<Tr>:LIMit:LOWer:X <x-parameter>`

Parameter: `<x-parameter>`

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Lower Limit X Value (continued)

Example: To move the trace 4 lower limit to 5000 Hertz (trace 4 in frequency domain)

```
:CALCulate4:LIMit:LOWer:X 5000
```

OR to 500 MHz:

```
:CALCulate4:LIMit:LOWer:X 500 MHz
```

To move the trace 1 lower limit to 5 Feet (trace 1 in distance domain with current distance unit in meter)

```
:CALCulate:LIMit:LOWer:X 5 FT
```

OR to 4 Meter

```
:CALCulate1:LIMit:LOWer:X 4 M
```

OR to 4 Meter

```
:CALCulate:LIMit:LOWer:X 4
```

To set the trace 2 lower limit point to 2.5 nanoseconds (trace 2 in time domain)

```
:CALCulate2:LIMit:LOWer:X 2.5 ns
```

To set the trace 3 lower limit point to 25 us (trace 3 in time domain)

```
:CALCulate3:LIMit:LOWer:X 25 us
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Lower Limit Y Value

:CALCulate<Tr>:LIMit:LOWer:Y <y-parameter>

Title: Lower Limit Y Value

Description: Sets the location of the lower limit line of the given trace <Tr> on the y-axis at the given value. This moves the entire lower limit and moves the current active limit point by the given value. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. The <y-parameter> is defined in the current y-axis. If no unit is specified with the <y-parameter>, then the default unit is used. The set version of the command changes the Move Limit on the front panel to Limit if it is currently set to Point, and sets the given trace as the active trace. The query version of the command returns the location of the active limit point on the y-axis. If an error occurs, such as limit not ON, then the query version of the command returns a −400 error codes. Limit line must be ON for the command to be valid.

Query: :CALCulate<Tr>:LIMit:LOWer:Y?

Syntax: :CALCulate<Tr>:LIMit:LOWer:Y <y-parameter>

Parameter: <y-parameter>

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

Number of Limit Points

:CALCulate:LIMit:POINt?

Title: Number of Limit Points

Description: Returns the number of points currently in the selected limit line. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: Query Form

Syntax: :CALCulate:LIMit:POINt?

Related Command: :CALCulate:LIMit:TYPE

Front Panel Access: **NA**

Add Limit Point

:CALCulate:LIMit:POINt:ADD

Title: Add Limit Point

Description: Adds a new limit point to the currently active limit line. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: No Query

Syntax: :CALCulate:LIMit:POINt:ADD

Related Command: :CALCulate:LIMit:TYPE

Front Panel Access: **Shift 6** (Limit), Limit Edit, Add Point

Delete Limit Point

:CALCulate:LIMit:POINt:DELete

Title: Delete Limit Point

Description: Deletes the active trace active limit point. After deletion, the point that is immediately to the left of the point that was deleted becomes the active point. Note that deletion is valid only if 2 or more limit points exist. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: No Query

Syntax: :CALCulate:LIMit:POINt:DELete

Example: To delete the currently active limit point

:CALCulate:LIMit:POINt:DELete

Front Panel Access: **Shift 6** (Limit), Limit Edit, Delete Point

Next Point Left

:CALCulate:LIMit:POINt:LEFT

Title: Next Point Left

Description: Sets the limit point immediately to the left of the active limit point as the active point. This makes it active for editing or deleting. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: No Query

Syntax: :CALCulate:LIMit:POINt:LEFT

Example: To select the point to the left of the active point

```
:CALCulate:LIMit:POINt:LEFT
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Next Point Left

Next Point Right

:CALCulate:LIMit:POINt:RIGHt

Title: Next Point Right

Description: Sets the limit point immediately to the right of the active limit point as the active point. This makes it active for editing or deleting. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: No Query

Syntax: :CALCulate:LIMit:POINt:RIGHt

Example: To select the point to the right of the active point:

```
:CALCulate:LIMit:POINt:RIGHt
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Next Point Right

Limit Point X Value

:CALCulate:LIMit:POINt:X <x-parameter>

Title: Limit Point X Value

Description: Sets the location of the active limit point on the x-axis at the specified location. Sending this command changes the Move Limit on the front panel to Point if it is currently set to Limit. The `<x-parameter>` must correspond to the current active trace domain type. If no unit is specified with the `<x-parameter>`, then the default unit is used. The query version of the command returns the location of the active limit point on the x-axis followed by the unit. If an error occurs, such as limit not `ON`, then the query version of the command returns –400 error codes. Limit line must be ON for the command to be valid. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate:LIMit:POINt:X?`

Syntax: `:CALCulate:LIMit:POINt:X <x-parameter>`

Parameter: `<x-parameter>`

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Example: To set the active limit point to 5000 Hertz (active trace in frequency domain):

```
:CALCulate:LIMit:POINt:X 5000
```

OR to 500 MHz:

```
:CALCulate:LIMit:POINt:X 500 MHz
```

To set the active limit point to 5 Feet (active trace in distance domain with current distance unit in meter):

```
:CALCulate:LIMit:POINt:X 5 FT
```

OR to 4 Meter

```
:CALCulate:LIMit:POINt:X 4 M
```

OR to 4 Meter

```
:CALCulate:LIMit:POINt:X 4
```

To set the active limit point to 2.5 nanoseconds (active trace in time domain):

```
:CALCulate:LIMit:POINt:X 2.5
```

OR

```
:CALCulate:LIMit:POINt:X  2.5 ns
```

To set the active limit point to 25 us (active trace in time domain):

```
:CALCulate:LIMit:POINt:X 25 us
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Limit Point Y Value

:CALCulate:LIMit:POINt:Y <y-parameter>

Title: Limit Point Y Value

Description: Sets the location of the active limit point on the y-axis at the specified location. Sending this command changes the Move Limit on the front panel to Point if it is currently set to Limit. The <y-parameter> is defined in the current y-axis. If no unit is specified with the <y-parameter>, then the default unit is used. The query version of the command returns the location of the active limit point on the y-axis. If an error occurs, such as limit not ON, the query version of the command returns an error code of –400. Limit line must be ON for the command to be valid. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: :CALCulate:LIMit:POINt:Y?

Syntax: :CALCulate:LIMit:POINt:Y <y-parameter>

Parameter: <y-parameter>

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

Limit State

`:CALCulate:LIMit[:STATe] OFF|ON|0|1`

Title: Limit State

Description: Turns the active trace currently selected limit line (upper or lower) ON or OFF. If the value is set to ON or 1, then the active trace selected limit line is turned ON. If the value is set to OFF or 0, then the active trace selected limit line is turned OFF. The query version of the command returns a 1 if the active trace selected limit line is ON and returns a 0 if it is OFF. Use `:CALCulate:LIMit:TYPe` to set the currently active limit line.

Query: `:CALCulate:LIMit[:STATe]?`

Syntax: `:CALCulate:LIMit[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF or 0 (query returns 0 for OFF)

Example: To turn on the currently selected limit line:

```
:CALCulate:LIMit ON
```

OR

```
:CALCulate:LIMit:STATe ON
```

OR

```
:CALCulate:LIMit:STATe 1
```

To turn off the currently selected limit line:

```
:CALCulate:LIMit OFF
```

OR

```
:CALCulate:LIMit:STATe 0
```

OR

```
:CALCulate:LIMit 0
```

Front Panel Access: **Shift 6** (Limit), Limit State

Limit Type

:CALCulate:LIMit:TYPE 0|1

Title: Limit Type

Description: Sets the limit line segment type (upper or lower) to be edited. Set the value to 1 for Lower limit segment and to 0 for Upper limit line segment. The query version of the command returns a 1 if the lower limit line is currently active for editing and returns a 0 if the upper limit line is currently active for editing.

Query: `:CALCulate:LIMit:TYPE?`

Syntax: `:CALCulate:LIMit:TYPE 0|1`

Parameter: `0|1`

Default Value: 0

Example: To set upper limit line active for editing:

```
:CALCulate:LIMit:TYPE 0
```

To set lower limit line active for editing:

```
:CALCulate:LIMit:TYPE 1
```

Front Panel Access: **Shift 6** (Limit), Limit

Number of Upper Limit Points

:CALCulate<Tr>:LIMit:UPPer:POINt?

Title: Number of Upper Limit Points

Description: Returns the number of points currently in the upper limit line of the given trace <Tr>. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: Query Form

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt?

Example: To query for the upper limit line total point on trace #2:

```
:CALC2:LIM:UPP:POIN?
```

Front Panel Access: **NA**

Add Upper Limit Point

:CALCulate<Tr>:LIMit:UPPer:POINt:ADD

Title: Add Upper Limit Point

Description: Adds a new limit point to the upper limit line of the given trace <Tr>. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt:ADD

Example: To add a point to the upper limit line on trace 2:

```
:CALC2:LIM:UPP:POIN:ADD
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Add Point

Delete Upper Limit Point

:CALCulate<Tr>:LIMit:UPPer:POINt:DELete

Title: Delete Upper Limit Point

Description: Deletes the upper limit point of the given trace <Tr>. After deletion, the point that is immediately to the left of the point that was deleted becomes the active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. Note that deletion is valid only if 2 or more limit points are active.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt:DELete

Example: To delete trace 3 upper limit current active point:

```
:CALCulate3:LIMit:UPPer:POINt:DELete
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Delete Point

Upper Limit Next Point Left

:CALCulate<Tr>:LIMit:UPPer:POINt:LEFT

Title: Upper Limit Next Point Left

Description: Sets the limit point to the left of the upper limit active point of the given trace <Tr> as the new active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt:LEFT

Example: To make the upper limit point to the left of the current active point of trace 2 as the new active point:

```
:CALCulate2:LIMit:UPPer:POINt:LEFT
```

OR

```
:CALC2:LIM:UPP:POIN:LEFT
```

Front Panel Access: **Shift 6** (Limit)), Limit Edit, Next Point Left

Upper Limit Next Point Right

:CALCulate<Tr>:LIMit:UPPer:POINt:RIGHt

Title: Upper Limit Next Point Right

Description: Sets the limit point to the right of the upper limit active point of the given trace <Tr> as the new active point. <Tr> is the trace number in the range 1 to 4. If no trace number is specified than defaults to trace number 1.

Query: No Query

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt:RIGHt

Example: To make the upper limit point to the right of the current active point of trace 2 as the new active point:

:CALCulate2:LIMit:UPPer:POINt:RIGHt

OR

:CALC2:LIM:UPP:POIN:RIGH

Front Panel Access: **Shift 6** (Limit), Limit Edit, Next Point Right

Upper Limit Point X Value

:CALCulate<Tr>:LIMit:UPPer:POINt:X <x-parameter>

Title: Upper Limit Point X Value

Description: Sets the location of the upper limit point of the given trace <Tr> on the x-axis at the specified location. <Tr> is the trace number in the range 1 to 4. If no trace number is specified than defaults to trace number 1. Sending the set command will change the Move Limit on the front panel to Point if it is currently set to Limit and set the given trace as the active trace. <x-parameter> is defined in the given trace current x-axis. The given unit must correspond to the given trace domain type. If no unit is specified with the <x-parameter> then the default unit will be used. The query version of the command returns the location of the given trace upper limit point on the x-axis followed by the unit. If an error occurs, such as limit not ON, the query version of the command returns an error code of –400. Limit line must be on for the command to be valid. Use :CALCulate:LIMit:TYPe to set the currently active limit line.

Query: :CALCulate<Tr>:LIMit:UPPer:POINt:X?

Syntax: :CALCulate<Tr>:LIMit:UPPer:POINt:X <x-parameter>

Parameter: <x-parameter>

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Example: To set the trace 4 upper limit point to 5000 Hertz (trace 4 in frequency domain):

```
:CALCulate4:LIMit:UPPer:POINt:X 5000
```

OR to 500 MHz:

```
:CALCulate4:LIMit:UPPer:POINt:X 500 MHz
```

To set the trace 1 upper limit point to 5 Feet (trace 1 in distance domain with current distance unit in meter):

```
:CALCulate:LIMit:UPPer:POINt:X 5 FT
```

OR to 4 Meter

```
:CALCulate1:LIMit:UPPer:POINt:X 4 M
```

OR to 4 Meter

```
:CALCulate:LIMit:UPPer:POINt:X 4
```

To set the trace 2 upper limit point to 2.5 nanoseconds (trace 2 in time domain):

```
:CALCulate2:LIMit:UPPer:POINt:X 2.5 ns
```

To set the trace 3 upper limit point to 25 us (trace 3 in time domain):

```
:CALCulate3:LIMit:UPPer:POINt:X 25 us
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Upper Limit Point Y Value

:CALCulate<Tr>:LIMit:UPPer:POINt:Y <y-parameter>

Title: Upper Limit Point Y Value

Description: Sets the location of the upper limit point of the given trace `<Tr>` on the y-axis at the specified location. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified than defaults to trace number 1. Sending the set command will change the Move Limit on the front panel to Point if it is currently set to Limit and set the given trace as the active trace. The <y-parameter> is defined in the given trace current y-axis. If no unit is specified with the <y-parameter> then the default unit will be used. The query version of the command returns the location of the given trace upper limit point on the y-axis. If an error occurs, such as limit not ON, the query version of the command returns an error code of –400. Limit line must be on for the command to be valid. Use `:CALCulate:LIMit:TYPe` to set the currently active limit line.

Query: `:CALCulate<Tr>:LIMit:UPPer:POINt:Y?`

Syntax: `:CALCulate<Tr>:LIMit:UPPer:POINt:Y <y-parameter>`

Parameter: `<y-parameter>`

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

Upper Limit State

:CALCulate<Tr>:LIMit:UPPer[:STATe] OFF|ON|0|1

Title: Upper Limit State

Description: Turns the upper limit line of the given trace `<Tr>` ON or OFF. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified than defaults to trace number 1. The query version of the command returns a 1 if the upper limit line of the given trace is ON and returns a 0 if OFF.

Query: `:CALCulate<Tr>:LIMit:UPPer[:STATe]?`

Syntax: `:CALCulate<Tr>:LIMit:UPPer[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF or 0 (query returns 0 for OFF)

Example: To turn on upper limit of trace 1:

```
:CALCulate:LIMit:UPPer ON
```

OR:

```
:CALCulate1:LIMit:UPPer 1
```

OR:

```
:CALCulate:LIMit:UPPer:STATe ON
```

To turn off upper limit of trace 4:

```
:CALCulate4:LIMit:UPPer OFF
```

OR:

```
:CALCulate4:LIMit:UPPer 0
```

OR:

```
:CALC4:LIM:UPP:STAT 0
```

Related Command: `:CALCulate:LIMit[:STATe]`

Front Panel Access: **Shift 6** (Limit), Limit State

Upper Limit X Value

:CALCulate<Tr>:LIMit:UPPer:X <x-parameter>

Title: Upper Limit X Value

Description: Moves the upper limit of the given trace `<Tr>` on the x-axis to the given value. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1. <x-parameter> is defined in the given trace current x-axis. The unit given with the <x-parameter> must correspond to the given trace domain type. If no unit is specified with the <x-parameter> then the default unit will be used. The set version of the command will change the Move Limit on the front panel to Limit if it is currently set to Point and set the given trace as the active trace. The query version of the command returns the location of the given trace upper limit point on the x-axis followed by the unit. If an error occurs, such as limit not ON, the query version of the command returns an error code of −400. Limit line must be on for the command to be valid. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate<Tr>:LIMit:UPPer:X?`

Syntax: `:CALCulate<Tr>:LIMit:UPPer:X <x-parameter>`

Parameter: `<x-parameter>`

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Example: To move the trace 4 upper limit to 5000 Hertz (trace 4 in frequency domain):

```
:CALCulate4:LIMit:UPPer:X 5000
```

OR to 500 MHz:

```
:CALCulate4:LIMit:UPPer:X 500 MHz
```

To move the trace 1 upper limit to 5 Feet (trace 1 in distance domain with current distance unit in meter):

```
:CALCulate:LIMit:UPPer:X 5 FT
```

OR to 4 Meter

```
:CALCulate1:LIMit:UPPer:X 4 M
```

OR to 4 Meter

```
:CALCulate:LIMit:UPPer:X 4
```

To set the trace 2 upper limit point to 2.5 nanoseconds (trace 2 in time domain):

```
:CALCulate2:LIMit:UPPer:X 2.5
```

OR

```
:CALCulate2:LIMit:UPPer:X 2.5 ns (nanoseconds)
```

To set the trace 3 upper limit point to 25 us (trace 3 in time domain):

```
:CALCulate3:LIMit:UPPer:X 25 us (microseconds)
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Upper Limit Y Value

:CALCulate<Tr>:LIMit:UPPer:Y <y-parameter>

Title: Upper Limit Y Value

Description: Sets the location of the upper limit line of the given trace <Tr> on the y-axis at the given value. This moves the entire upper limit and moves the current active limit point by the given value. <Tr> is the trace number in the range 1 to 4. If no trace number is specified than defaults to trace number 1. The <y-parameter> is defined in the current y-axis. If no unit is specified with the <y-parameter> then the default unit will be used. The set version of the command will change the Move Limit on the front panel to Limit if it is currently set to Point and set the given trace as the active trace. The query version of the command returns the location of the active limit point on the y-axis. If an error occurs, such as limit not ON, the query version of the command returns an error code of −400. Limit line must be on for the command to be valid. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: :CALCulate<Tr>:LIMit:UPPer:Y?

Syntax: :CALCulate<Tr>:LIMit:UPPer:Y <y-parameter>

Parameter: <y-parameter>

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

Limit X Value

:CALCulate:LIMit:X <x-parameter>

Title: Limit X Value

Description: Sets the location of the active limit point on the x-axis at the specified location. This moves the entire limit and moves the active limit point to the given value. The <x-parameter> given unit must correspond to the current active trace domain type. If no unit is specified with the <x-parameter> then the default unit will be used. Sending the set command will change the Move Limit on the front panel to Limit if it is currently set to Point. The query version of the command returns the location of the active limit point on the x-axis followed by the unit. If an error occurs, such as limit not ON, the query version of the command returns an error code of –400. Limit line must be on for the command to be valid. Use `:CALCulate:LIMit:TYPE` to set the currently active limit line.

Query: `:CALCulate:LIMit:X?`

Syntax: `:CALCulate:LIMit:X <x-parameter>`

Parameter: `<x-parameter>`

Default Units: Hz for Frequency domain,
Seconds for Time domain
Meters or Feet for distance domain.

Example: To move the active limit to 5000 Hertz (active trace in frequency domain):

```
:CALCulate:LIMit:X 5000
```

OR to 500 MHz:

```
:CALCulate:LIMit:X 500MHz
```

To move the active limit to 5 Feet (active trace in distance domain with current distance unit in feet):

```
:CALCulate:LIMit:X 5FT
```

OR to 4 Meter

```
:CALCulate:LIMit:X 4M
```

OR to 4 Meter

```
:CALCulate:LIMit:X 4
```

To move the active limit to 2.5 nanoseconds (active trace in time domain):

```
:CALCulate:LIMit:X 2.5
```

OR

```
:CALCulate:LIMit:X 2.5ns (nanoseconds)
```

To move the active limit point to 25 us (active trace in time domain):

```
:CALCulate:LIMit:X 25us (microseconds)
```

Front Panel Access: **Shift 6** (Limit), Limit Edit, Limit X

Limit Y Value

:CALCulate:LIMit:Y <y-parameter>

Title: Limit Y Value

Description: Sets the location of the active limit line on the y-axis at the given value. This moves the entire limit and moves the current active limit point by the given value. Sending this command will change the Move Limit on the front panel to Limit if it is currently set to Point. The <y-parameter> is defined in the current y-axis. If no unit is specified with the <y-parameter> then the default unit will be used. The query version of the command returns the location of the active limit point on the y-axis. If an error occurs, such as limit not ON, the query version of the command returns an error code of –400. Limit line must be on for the command to be valid. Use :CALCulate:LIMit:TYPE to set the currently active limit line.

Query: `:CALCulate:LIMit:Y?`

Syntax: `:CALCulate:LIMit:Y <y-parameter>`

Parameter: `<y-parameter>`

Default Units: Current active trace y-axis unit

Front Panel Access: **Shift 6** (Limit), Limit Edit, Amplitude

:CALCulate:MARKer Subsystem

This subsystem contains commands to manipulate data markers.

Table 3-5. :CALCulate:MARKer Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:MARKer			
:AOFF	NA	NA	No Query
:DATA?	<char>	comma separated data	Query Only
:DISPlay			
:FORMat	<char>	NONE|SCREen|TABLe|TRACe	Query Exists
:FORMat?	<char>	NONE|SCRE|TABL|TRAC	Query Form
:CALCulate			
:MARKer{1-8}			
:DELTa			
:REFerence	<char>	1|2|3|4|5|6|7|8|	Query Exists
:REFerence?	<char>	1|2|3|4|5|6|7|8|	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:DOMain?	<char>	FREQ|TIME|DIST	Query Only
:FORMat	<char>	GRAPh|LMAGnitude| LOGPhase|PHASe| RLIMaginary|SWR| IMPedance|ADMittance| NIMPedance|NADMittance| PIMPedance|GDELay|LM/2	Query Exists
:FORMat?	<char>	GRAP|LMAG|LOGP| PHAS|RLIM|SWR|IMP|ADM| NIMP|NADM|PIMP|GDEL|LM/2	Query Form
:MAXimum	NA	NA	No Query
:MINimum	NA	NA	No Query
:REFerence			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:SOURce	<char>	TR1|TR2|TR3|TR4|MEM1|MEM2|MEM3|MEM4|ALL	Query Exists
:SOURce?	<char>	TR1|TR2|TR3|TR4|MEM1|MEM2|MEM3|MEM4|ALL	Query Form

Table 3-5. :CALCulate:MARKer Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:TYPE	<char>	REFerence|DELTa|OFF	Query Exists
:TYPE?	<char>	REF|DELT|OFF	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y?	<NR3>	Depends on display type	Query Only

Turn All Markers Off

:CALCulate:MARKer:AOFF

Turns off all markers. This command will turn off all the markers and set it to off.

Marker Data

:CALCulate:MARKer:DATA?

Title: Marker Data

Description: Reports the marker information. Each marker data is separated by a comma and data are returned similar to that when Readout Format is set to Table.

Query: Query Only

Syntax: :CALCulate:MARKer:DATA?

Front Panel Access: **NA**

Delta Marker Reference To

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa:REFerence <Mk>

Title: Delta Marker Reference To

Description: Sets the specified delta marker reference to the given reference marker specified by <Mk>. <Mk> is the reference marker number in the range of 1 to 8. The query version of the command returns the reference marker number to which the specified delta marker should be referenced. If the selected marker is not a delta marker, then −230 is returned. Note that the set version of this command will set the specified delta marker as the active marker. The given reference marker number must be currently set as a reference marker and the specified delta marker number must currently be set as delta marker. Also both markers (delta and reference) must be in the same domain type.

Query: :CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa:REFerence?

Syntax: :CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa:REFerence <Mk>

Parameter: <Mk>

Default Value: −230 (The selected marker is a reference marker)

Example: Set Marker 1 as the reference marker of delta Marker 3:

```
:CALCulate:MARKer3:DELTa:REFerence 1
```

OR

```
:CALC:MARK3:DELT:REF 1
```

Related Command: :CALCulate:MARKer<Mk>:TYPE, :CALCulate:MARKer<Mk>:DOMain?

Front Panel Access: **Marker**, Avail Ref Mkr

Delta Marker State

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:STATe] OFF|ON|0|1

Title: Delta Marker State

Description: Sets the specified marker as the active marker and turn it on or off. If the value is set to ON or 1, then the specified marker is turn on and set as a delta marker. If the value is set to OFF or 0, then the specified marker is turn off. The query version of the command returns a 1 if the specified marker is a delta marker, and returns a 0 if it is not a delta marker.

Query: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:STATe]?`

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF

Example: To turn on marker #3 and set it as a delta marker:

```
:CALCulate:MARKer3:DELTa ON
```

OR

```
:CALCulate:MARKer3:DELTa 1
```

OR

```
:CALCulate:MARKer3:DELTa:STATe ON
```

OR

```
:CALCulate:MARKer3:DELTa:STATe 1
```

To turn off delta marker #6:

```
:CALCulate:MARKer6:DELTa OFF
```

OR

```
:CALCulate:MARKer6:DELTa:STATe OFF
```

OR

```
:CALCulate:MARKer6:DELTa:STATe 0
```

Related Command: `:CALCulate:MARKer:DELTa:REFerence`

Front Panel Access: **Marker**, Maker Type

Marker Readout Format

:CALCulate:MARKer:DISPlay:FORMat NONE|SCREen|TABLe|TRACe

Title: Marker Readout Format

Description: Sets the display readout format for markers. The query version of the command returns "NONE" if the display readout format is set to None, "SCRE" if Screen, "TABL" if Table, and "TRAC" if Trace.

Query: `:CALCulate:MARKer:DISPlay:FORMat?`

Syntax: `:CALCulate:MARKer:DISPlay:FORMat NONE|SCREen|TABLe|TRACe`

Parameter: `NONE|SCREen|TABLe|TRACe`

Default Value: NONE

Example: To set marker readout format to Table:

`:CALCulate:MARKer:DISPlay:FORMat TABLe`

OR

`:CALCulate:MARKer:DISPlay:FORMat TABL`

OR

`:CALC:MARK:DISP:FORM TABL`

Front Panel Access: **Marker**, Readout Format

Marker Domain Type

:CALCulate:MARKer<Mk>:DOMain?

Title: Marker Domain Type

Description: Query the specified marker `<Mk>` domain type. `<Mk>` is the marker number in the range of 1 to 8. If no marker number is specified, then the marker number (the `<Mk>` value) defaults to 1. This command returns "FREQ" if the specified marker domain is frequency, "TIME" if time, and "DIST" if distance.

Query: Query Only

Syntax: `:CALCulate:MARKer<Mk>:DOMain?`

Front Panel Access: **NA**

Marker Readout Style

:CALCulate:MARKer<Mk>:FORMat <Style>

Title: Marker Readout Style

Description: Sets the specified marker <Mk> readout style. <Mk> is the marker number in the range of 1 to 8. If no marker number is specified, then the marker number (the <Mk> value) defaults to 1. <Style> is the marker readout style and must be one of the following 12 values:

GRAPh|LMAGnitude|LOGPhase|PHASe|RLIMaginary|SWR|IMPedance||ADMittance|NIMPedance|NADMittance|PIMPedance|GDELay|LM/2

The query version of the command returns "GRAP" if the specified marker readout style is set to Graph Type, "LMAG" if the specified marker readout style is set to Log Magnitude, "LOGP" if Log Mag and Phase, "PHAS" if Phase, "RLIM" if Real and Imaginary, "SWR" if SWR, "IMP" for impedance, "ADM" for admittance, "NIMP" for normalized impedance, "NADM" for normalized admittance, "PIMP" for polar impedance, "GDEL" if group delay, "LM/2" for log mag/2 (cable loss). Note that the set version of this command will set the specified marker as the active marker.

Query: :CALCulate:MARKer<Mk>:FORMat?

Syntax: :CALCulate:MARKer<Mk>:FORMat <Style>

Parameter: <Style>

Default Value: GRAP

Example: To set marker #3 readout style to Log Mag:

```
:CALCulate:MARKer3:FORMat LMAG
```

OR

```
:CALCulate:MARKer3:FORMat LMAGnitude
```

OR

```
:CALC:MARK3:FORM LMAG
```

Related Command: :CALCulate:MARKer<Mk>:Y?, :CALCulate:MARKer:DATA?

Front Panel Access: **Marker**, Readout Style

Marker (Maximum) Peak Search

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum

Title: Marker (Maximum) Peak Search

Description: Puts the specified marker at the maximum value in the trace. Note that this turns on the selected marker (if it is not already on) and sets the selected marker as the active marker.

Query: No Query

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum`

Front Panel Access: **Marker**, Marker Search, Peak Search

Marker (Minimum) Valley Search

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum

Title: Marker (Minimum) Valley Search

Description: Puts the specified marker at the minimum value in the trace. Note that this turns on the selected marker (if it is not already on) and set the selected marker as the active marker.

Query: No Query

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum`

Front Panel Access: **Marker**, Marker Search, Peak Search

Reference Marker State

:CALCulate:MARKer<Mk>:REFerence[:STATe] OFF|ON|0|1

Title: Reference Marker State

Description: Sets the specified marker <Mk> as the active marker and turn it on or off. If the value is set to ON or 1, the specified marker is turn on and set as a reference marker. If the value is set to OFF or 0, the specified marker is turn off. The query version of the command returns a 1 if the specified marker is ON and is a reference marker, and returns a 0 if not. <Mk> is the marker number in the range of 1 to 8. If no marker number is specified, then the marker number (the <Mk> value) defaults to 1.

Query: `:CALCulate:MARKer<Mk>:REFerence[:STATe]?`

Syntax: `:CALCulate:MARKer<Mk>:REFerence[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF

Example: To turn on marker #3 and set it as reference marker:

```
:CALCulate:MARKer3:REFerence ON
```

OR

```
:CALCulate:MARKer3:REFerence 1
```

OR

```
:CALCulate:MARKer3:REFerence:STATe ON
```

OR

```
:CALCulate:MARKer3:REFerence:STATe 1
```

To turn off marker #6:

```
:CALCulate:MARKer6:REFerence OFF
```

OR

```
:CALCulate:MARKer6:REFerence:STATe OFF
```

OR

```
:CALCulate:MARKer6:REFerence:STATe 0
```

Front Panel Access: **Marker**, Marker Type

Marker On Trace

:CALCulate:MARKer<Mk>:SOURce <Tr>

Title: Marker On Trace

Description: Sets the specified marker `<Mk>` to the given trace <Tr>. `<Mk>` is the marker number in the range of 1 to 8. If no marker number is specified, then the marker number (the `<Mk>` value) defaults to 1. `<Tr>` is the trace and must be one of the following 9 values:

`TR1|TR2|TR3|TR4|MEM1|MEM2|MEM3|MEM4|ALL`

The query version of the command returns "TR1" if the specified marker is on trace 1, "TR2" if on trace 2, "TR3" if on trace 3, "TR4" if on trace 4, "MEM1" if on trace 1 memory, "MEM2" if on trace 2 memory, "MEM3" if on trace 3 memory, "MEM4" if on trace 4 memory, and "ALL" if the specified marker is on all 4 traces. Note that the set version of this command will set the specified marker as the active marker.

If an error occurs, such as "Marker not ON", the query version of the command returns an error code of `-400`.

Query: `:CALCulate:MARKer<Mk>:SOURce?`

Syntax: `:CALCulate:MARKer<Mk>:SOURce <Tr>`

Parameter: `<Tr>`

Front Panel Access: **Marker**, Marker on Trace

Marker Type

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TYPE REFerence|DELTa|OFF

Title: Marker Type

Description: Sets the specified marker to the given marker type and make it the active marker. If set to REF then the specified marker is turn on and is set as reference marker. If set to DELT then the specified marker is turn on and is set as a delta marker. If set to OFF then the specified marker is turn off. The query version of this command returns the string "REF" if the specified marker is set as reference marker, "DELT" if set as delta marker, or "OFF" if the specified marker is currently set to off.

Query: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TYPE?`

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TYPE REFerence|DELTa|OFF`

Parameter: `REFerence|DELTa|OFF`

Default Value: OFF

Example: To set marker #1 as the reference marker and turn it on:

```
:CALCulate:MARKer1:TYPE REFerence
```

OR

```
:CALCulate:MARKer:TYPE REF
```

Front Panel Access: **Marker**, Marker Type

Marker X Value

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X <x-parameter>

Title: Marker X Value

Description: Sets the location of the marker on the x-axis at the specified location. <x-parameter> is defined in the current x-axis units. The set command will set the specified marker as the active marker. The <x-parameter> given unit must correspond to the specified marker domain type. If no unit is specified with the <x-parameter> then the default unit will be used.

The query version of the command returns the location of the marker on the x-axis followed by the unit. If the Start and Stop values of the domain are the same, then the query returns the X value along with the marker point number within the brackets. The marker point number is determined with the following formula:

$$\text{MarkerPointNumber} = \frac{\text{NoOfPoints}}{2} + 1$$

For example, if 201 points are used in the measurement display, then the query returns: `<x-value> (101)`. When the results of division include a fraction, as in the current example, the result is rounded DOWN. `201/2 = 100.5` Rounding down to 100 before adding `1` yields the 101 that is returned by the query.

If an error occurs, such as marker not ON, the query version of the command returns an error code of –400. Note that the marker is snapped to the data point closest to the specified value. The selected marker must be ON for the command to be valid.

Query: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X?`

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X <x-parameter>`

Parameter: `<x-parameter>`

Default Units: Hz for frequency domain,
Seconds for Time domain,
Meters or Feet for distance domain.

Example: To set reference marker #2 (frequency domain) to 5000 hertz on the x-axis:

```
:CALCulate:MARKer2:X 5000
```

OR

```
:CALCulate:MARKer2:X 5000Hz
```

To set reference marker #1 to 1.5 GHz on the x-axis:

```
:CALCulate:MARKer1:X 1.5GHz
```

OR

```
:CALCulate:MARKer1:X 1.5GHz
```

To set reference marker #3 (time domain) to 1.5 nanoseconds on the x-axis:

```
:CALCulate:MARKer3:X 1.5ns
```

To set reference marker #1 (time domain) to 25 us:

```
:CALCulate:MARKer1:X 25us
```

Related Command: `:CALCulate:MARKer#:DOMain?`

Front Panel Access: **Marker**, [Marker 1/2/3/4/5/6/7/8]

Marker Read Y Value

:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?

Title: Marker Read Y Value

Description: Reads the current Y value for the specified marker. The units are in the y-axis unit. The command returns the marker readout style followed by the Y value and unit. If an error occurs, such as marker not ON, the command returns an error code of –400. The selected marker must be ON for the command to be valid.

Table 3-6. Returned Readout Style

Returned Value Symbols	Graph Type
R&I: (real,imaginary)	Real & Imaginary
SWR: magnitude	SWR
LM: magnitude dB	Log Mag
LMP: (magnitude dB, phase deg)	Log Mag & Phase
PH: phase deg	Phase
Z: (real impedance ohm, imaginary impedance ohm)	Impedance
PZ: (magnitude impedance ohm, phase impedance deg)	Polar Impedance
NZ: (real normalized impedance, imaginary normalized impedance)	Normalized Impedance
Y: (real admittance S, imaginary admittance S)	Admittance
NY: (real normalized admittance, imaginary normalized admittance)	Normalized Admittance
GD: groupDelay unit	Group Delay
LM/2: magnitude dB	LogMag/2

Query: Query Only

Syntax: `:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?`

Default Units: Current y-axis unit

Related Command: `:CALCulate:MARKer#:DOMain?`

`:CALCulate:MARKer<Mk>:FORMat <Style>`

Front Panel Access: **NA**

:CALCulate:MATH Subsystem

This subsystem contains functions for controlling math operations on the currently selected measurement and memory.

Table 3-7. :CALCulate:MATH Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:MATH			
:FUNCtion	<char>	NORMal|ADD|SUBTract|MULTiply|DIVide	Query Exists
:FUNCtion?	<char>	NORM|ADD|SUBT|MULT|DIV	Query Form
:MEMorize	NA	NA	No Query

Trace Math Function

:CALCulate:MATH:FUNCtion NORMal|ADD|SUBTract|MULTiply|DIVide

Title: Trace Math Function

Description: Sets the math operations on the currently active trace and the trace stored in memory. Note that a trace MUST be stored in Memory. Setting the FUNCtion to NORMal is equivalent of setting the Trace Math to “None” on the front panel. Setting the FUNCtion to ADD is equivalent of setting the Trace Math to “Trace Plus Memory” on the front panel. Setting the FUNCtion to SUBTract is equivalent to setting the Trace Math to “Trace Minus Memory” on the front panel. Setting the FUNCtion to MULTiply is equivalent to setting the Trace Math to “Trace Multiply Memory” on the front panel. Setting the FUNCtion to DIVide is equivalent to setting the Trace Math to “Trace Divide Memory” on the front panel. The query version of the command returns the string “NORM” for no trace math, “ADD” for trace plus memory, “SUBT” for trace minus memory, “MULT” for trace multiply memory, and “DIV” for trace divide memory.

Query: `:CALCulate:MATH:FUNCtion?`

Syntax: `:CALCulate:MATH:FUNCtion NORMal|ADD|SUBTract|MULTiply|DIVide`

Parameter: `NORMal|ADD|SUBTract|MULTiply|DIVide`

Default Value: NORM

Related Command: `:CALCulate:MATH:MEMorize`

Front Panel Access: **Shift 5** (Trace), Trace Math

Trace To Memory

:CALCulate:MATH:MEMorize

Title: Trace To Memory

Description: Copies the current measurement trace into memory.

Query: No Query

Syntax: :CALCulate:MATH:MEMorize

Front Panel Access: **Shift 5** (Trace), Save Trace to Memory

:CALCulate:SMOothing Subsystem

This subsystem contains functions for trace smoothing.

Table 3-8. :CALCulate:SMOothing Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SMOothing			
:APERture	<NR1>	Integer	Query Exists
:APERture?	<NR1>	Integer	Query Form

Smoothing

:CALCulate<Tr>:SMOothing:APERture <integer>

Title: Smoothing

Description: Sets the smoothing percentage for the given trace <Tr>. The query form of the command returns the current smoothing percentage. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: :CALCulate<Tr>:SMOothing:APERture?

Syntax: :CALCulate<Tr>:SMOothing:APERture <integer>

Parameter: <integer>

Default Value: 0

Range: 0 to 20

Front Panel Access: **Shift 4** (Measure), Smoothing %

:CALCulate:TRANsform Subsystem

Table 3-9. :CALCulate:TRANsform Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:TRANsform			
:DISTance			
:MAXimum?	<NR3>	MilliMeters or Feet	Query Only
:RESolution?	<NR3>	MilliMeters or Feet	Query Only
:STARt	<NRf>	Meters or Feet	Query Exists
:STARt?	<NR3>	MilliMeters or Feet	Query Form
:STOP	<NRf>	Meters or Feet	Query Exists
:STOP?	<NR3>	MilliMeters or Feet	Query Form
:UNIT	<char>	METers | FEET	Query Exists
:UNIT?	<char>	METER | FEET	Query Form
:TIME			
:MAXimum?	<NR3>	Nanoseconds	Query Only
:RESolution?	<NR3>	Nanoseconds	Query Only
:STARt	<NRf>	Seconds	Query Exists
:STARt?	<NR3>	Nanoseconds	Query Form
:STOP	<NRf>	Seconds	Query Exists
:STOP?	<NR3>	Nanoseconds	Query Form
:CALCulate{1-8}			
:TRANsform			
:DISTance			
:DATA?	<char>	Returns block data (meters)	Query Only
:TIME			
:DATA?	<char>	Returns block data (nanoseconds)	Query Only

Maximum Distance

:CALCulate:TRANsform:DISTance:MAXimum?

Title: Maximum Distance

Description: This command returns the maximum distance in millimeters if the current distance unit is set to meter, and otherwise returns the maximum distance in feet. This value is set based on the number of data points, propagation velocity, and start and stop frequency.

Query: Query Only

Syntax: `:CALCulate:TRANsform:DISTance:MAXimum?`

Default Value: 3000.00 mm (3 m) for MS2028B

10000.01 mm (10 m) for MS2026B

Default Unit: millimeters (mm)

Range: –3000.0 m to +3000.0 m

Front Panel Access: **Freq**/**Time**/**Dist**, Additional Dist Setup, Distance Info

Distance Resolution

:CALCulate:TRANsform:DISTance:RESolution?

Title: Distance Resolution

Description: This command returns the distance resolution in millimeters if the current distance unit is set to meter, and otherwise returns the resolution in feet. This value is set based on the propagation velocity, start and stop frequency.

Query: Query Only

Syntax: `:CALCulate:TRANsform:DISTance:RESolution?`

Default Value: 15.00 mm for MS2028B

50.00 mm for MS2026B

Default Unit: millimeters (mm)

Range: –3000.0 m to +3000.0 m

Front Panel Access: **Freq**/**Time**/**Dist**, Additional Dist Setup, Distance Info

Start Distance

:CALCulate:TRANsform:DISTance:STARt

Title: Start Distance

Description: Sets the start distance for DTF measurements. The query version of this command returns the start distance in millimeters if the current distance unit is set to meter, and otherwise returns the start distance in feet.

Query: `:CALCulate:TRANsform:DISTance:STARt?`

Syntax: `:CALCulate:TRANsform:DISTance:STARt`

Default Value: 0.0 mm

Default Unit: Meters (m) when setting, Millimeters (mm) for query

Range: –3000.0 m to +3000.0 m

Example: To set the start distance to 5 meters:

```
:CALC:TRAN:DIST:STAR 5
```

To set the start distance to 6 millimeters:

```
:CALCulate:TRANsform:DISTance:STARt 6mm
```

Front Panel Access: **Freq**/**Time**/**Dist**, Start Dist

Stop Distance

:CALCulate:TRANsform:DISTance:STOP

Title: Stop Distance

Description: Sets the stop distance for DTF measurements. The query version of this command returns the stop distance in millimeters if the current distance unit is set to meter, and otherwise returns the stop distance in feet.

Query: `:CALCulate:TRANsform:DISTance:STOP?`

Syntax: `:CALCulate:TRANsform:DISTance:STOP`

Default Value: 6850 mm

Default Unit: Meters (m) when setting, Millimeters (mm) for query

Range: –3000.0 m to +3000.0 m

Front Panel Access: **Freq**/**Time**/**Dist**, Stop Dist

Distance Units

:CALCulate:TRANsform:DISTance:UNIT METers|FEET

Title: Distance Units

Description: Sets the units to be used for DTF measurements. The query version of this command returns the string "METER" if the current distance unit is set to meter, and otherwise returns the string "FEET".

Query: `:CALCulate:TRANsform:DISTance:UNIT?`

Syntax: `:CALCulate:TRANsform:DISTance:UNIT METers|FEET`

Parameter: `METers|FEET`

Default Value: METers when setting, METER for query

Example: To set the distance unit to Meter:

`:CALCulate:TRANsform:DISTance:UNIT METers`

OR

`:CALC:TRAN:DIST:UNIT MET`

To set the distance unit to Feet:

`:CALC:TRAN:DIST:UNIT FEET`

OR

`:CALCulate:TRANsform:DISTance:UNIT FEET`

Front Panel Access: **Shift 8** (System), Application Options, Units

Maximum Time

:CALCulate:TRANsform:TIME:MAXimum?

Title: Maximum Time

Description: This command returns the maximum time in nanoseconds. This value is set based on the number of data points and the start and stop frequencies.

Query: Query Only

Syntax: `:CALCulate:TRANsform:TIME:MAXimum?`

Default Value: 10 nanoseconds for MS2028B

33.333 nanoseconds for MS2026B

Default Unit: nanoseconds (ns)

Range: −100 ms to +100 ms

Front Panel Access: **Freq**/**Time**/**Dist**, Time Info

Time Resolution

:CALCulate:TRANsform:TIME:RESolution?

Title: Time Resolution

Description: This command returns the time resolution in nanoseconds. This value is set based on the start and stop frequencies.

Query: Query Only

Syntax: `:CALCulate:TRANsform:TIME:RESolution?`

Default Value: 0.05 ns for MS2028B

0.166 ns for MS2026B

Default Unit: nanoseconds (ns)

Range: −100 ms to +100 ms

Front Panel Access: **Freq**/**Time**/**Dist**, Time Info

Start Time

:CALCulate:TRANsform:TIME:STARt

Title: Start Time

Description: Sets the start time. The query version returns the current start time in nanoseconds.

Query: `:CALCulate:TRANsform:TIME:STARt?`

Syntax: `:CALCulate:TRANsform:TIME:STARt`

Default Value: 0 ps

Default Unit: Seconds (s) when setting, nanoseconds (ns) for query

Range: −100 ms to +100 ms

Example: To set the start time to 10 microseconds:

```
:CALC:TRAN:TIME:STAR 10us
```

To set the start time to 20 nanoseconds:

```
:CALCulate:TRANsform:TIME:STARt 20ns
```

Front Panel Access: **Freq**/**Time**/**Dist**, Start Time

Stop Time

:CALCulate:TRANsform:TIME:STOP

Title: Stop Time

Description: Sets the stop time. The query version returns the current stop time in nanoseconds.

Query: `:CALCulate:TRANsform:TIME:STOP?`

Syntax: `:CALCulate:TRANsform:TIME:STOP`

Default Value: 20 ns

Default Unit: Seconds (s) when setting, nanoseconds (ns) for query

Range: –100 ms to +100 ms

Front Panel Access: **Freq**/**Time**/**Dist**, Stop Time

Get Distance List

:CALCulate<Tr>:TRANsform:DISTance:DATA?

Title: Get Distance List

Description: Produces the distance list in meters for the given trace. `<Tr>` is the trace number in the range 1 to 8 (1 to 4 for Traces TR1 to TR4 and 5 to 8 for Memory M1 to M4). If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header. Each distance value is returned in scientific notation and separated by a comma delimiter.

Query: Query only

Syntax: `:CALCulate<Tr>:TRANsform:DISTance:DATA?`

Default Unit: Meters

Related Command: `:CALCulate<Tr>:TRANsform:TIME:DATA?`

`:SENSe<Tr>:FREQuency:DATA?`

Front Panel Access: **NA**

Get Time List

:CALCulate<Tr>:TRANsform:TIME:DATA?

Title Get Time List

Description Produces the time list in nanoseconds for the given trace. <Tr> is the trace number in the range 1 to 8 (1 to 4 for Traces TR1 to TR4 and 5 to 8 for Memory M1 to M4). If no trace number is specified, then the <Tr> parameter defaults to trace number 1. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format #AX, where A is the number of digits in X, and X is the number of bytes that follow the header. Each time value is returned in scientific notation and separated by a comma delimiter.

Query Query only

Syntax :CALCulate<Tr>:TRANsform:TIME:DATA?

Default Unit Nanoseconds (ns)

Related Command :CALCulate<Tr>:TRANsform:DISTance:DATA?

:SENSe<Tr>:FREQuency:DATA?

Front Panel Access **NA**

3-3 :Display Subsystem

This subsystem provides commands that modify the display of data for the user. They do not modify the way in which data are returned to the controller.

Table 3-10. :DISPlay Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:DISPlay			
[:WINDow]			
:TRACe	<char>	TRACe|MEMory|BOTH	Query Exists
:FORMat	<char>	SINGle|DUAL|TRI|QUAD	Query Exists
:FORMat?	<char>	SING|DUAL|TRI|QUAD	Query Form
:Y			
[:SCALe]			
:GDAPerture	<NR1>	integer	Query Exists
:GDAPerture?	<NR1>	integer	Query Form
:TRACe?	<char>	TRAC|MEM|BOTH	Query Form
:WINDow			
:TRACe{1-4}			
:Y			
[:SCALe]			
:PDIVision	<NRf>	Depends on display type	Query Exists
:PDIVision?	<NR3>	Depends on display type	Query Form
:RLEVel	<NR3>	Depends on display type	Query Exists
:RLEVel?	<NR3>	Depends on display type	Query Form
:RPOSition	<NR1>	Integer	Query Exists
:RPOSition?	<NR1>	Integer	Query Form
:SMCHart	<char>	0|10|20|30|-3	Query Exists
:SMCHart?	<char>	0|10|20|30|-3	Query Form

Trace Display

:DISPlay[:WINDow]:TRACe TRACe|MEMory|BOTH

Title: Trace Display

Description: Sets the display type for the current active trace. Setting the display type to TRAC will display the trace only. Setting the display type to MEM will display the trace memory only. Setting the display type to BOTH will display both the trace and memory.

Query: `:DISPlay[:WINDow]:TRACe?`

Syntax: `:DISPlay[:WINDow]:TRACe TRACe|MEMory|BOTH`

Parameter: `TRACe|MEMory|BOTH`

Default Value: TRAC

Front Panel Access: **Shift 5** (Trace), Display

Trace Format

:DISPlay[:WINDow]:TRACe:FORMat SINGle|DUAL|TRI|QUAD

Title: Trace Format

Description: Defines the display trace format. The query version of this command returns "SING" if the trace format is set to Single, "DUAL" if set to dual, "TRI" if set to Tri, and "QUAD" if set to Quad.

Query: `:DISPlay[:WINDow]:TRACe:FORMat?`

Syntax: `:DISPlay[:WINDow]:TRACe:FORMat SINGle|DUAL|TRI|QUAD`

Parameter: `SINGle|DUAL|TRI|QUAD`

Default Value: QUAD

Example: To set the display trace format to Dual:

```
:DISPlay:TRACe:FORMat DUAL
```

Front Panel Access: **Measurement**, Trace Format

Group Delay Aperture

:DISPlay:WINDow:TRACe:Y[:SCALe]:GDAPerture <integer>

Title: Group Delay Aperture

Description: Sets the Group Delay aperture value (which is common to all traces). The query version of this command produces the Group Delay aperture as its output.

Query: `:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:GDAPerture?`

Syntax: `:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:GDAPerture <integer>`

Parameter: `<value>`

Default Value: 2

Range: 2 to 20

Front Panel Access: **Scale**, Aperture

Scale Resolution Per Division

:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:PDIVision <value>

Title: Scale Resolution Per Division

Description: Sets the scale per division for the y-axis. For Group Delay, sets the scale (time/division) for the y-axis. For Phase, sets the scale (degree/division) for the y-axis. For Log Magnitude and Log Mag/2, sets the scale (dB/division) for the y-axis. For all other measurements, the y-axis is unitless. `<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1.

Query: `:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:PDIVision?`

Syntax: `:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:PDIVision <value>`

Parameter: `<value>`

Default Value: Log Magnitude: 10 dB

Phase: 45°

SWR: 1

Group Delay: 1 ns

Real: 0.2

Imag: 0.2

Log Mag/2: 10 dB

Smith Chart: 10

Default Unit: Current active value unit (For time, the default for setting is seconds, but the query is always returned in nanoseconds (ns).)

Range: Log Magnitude: 0.05 dB to 40 dB

Phase: 0.1° to 90°

SWR: 0.001 to 10

Group Delay: 1 ps to 260 ns

Real: 0.01 to 260

Imag: 0.01 to 260

Log Mag/2: 0.05 dB to 40 dB

Smith Chart: 1 to 260

Note Although these values are not used for Smith Chart, when you query or set through SCPI, the instrument always returns a value. For Smith Chart, use `:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3`

Front Panel Access: **Scale**, Resolution Per Div

Scale Reference Level

:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RLEVel <value>

Title: Scale Reference Level

Description: Sets the reference level scale value for the y-axis. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1.

Query: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RLEVel?

Syntax: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RLEVel <value>

Parameter: <value>

Default Value: Log Magnitude: 0 dB

SWR: 1

Phase: 0°

Group Delay: 0 ps

Real: 0

Imag: 0

Log Mag/2: 0 dB

Smith Chart: 10

Default Unit: Current active value unit (For time, the default for setting is seconds, but the query is always returned in nanoseconds (ns).)

Range: Log Magnitude: −120 dB to +120 dB

SWR: 1 to 10

Phase: −180° to +180°

Group Delay: 0 ps to 260 ns

Real: −10000 to +10000

Imag: −10000 to +10000

Log Mag/2: −120 dB to +120 dB

Smith Chart: 1 to 260

Note	Although these values are not used for Smith Chart, when you query or set through SCPI, the instrument always returns a value. For Smith Chart, use :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3

Related Command: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RPOSition

Front Panel Access: **Scale**, Reference Value

Scale Reference Line

:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RPOSition <number>

Title: Scale Reference Line

Description: Sets the reference line scale value for the y-axis.

Query: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RPOSition?

Syntax: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RPOSition <number>

Parameter: <number>

Default Value: Log Magnitude: 9
SWR: 1
Phase: 5
Group Delay: 5
Real: 5
Imag: 5
Log Mag/2: 9
Smith Chart: 10

Range: Log Magnitude: 0 to 10
SWR: 0 to 10
Phase: 0 to 8
Group Delay: 0 to 10
Real: 0 to 10
Imag: 0 to 10
Log Mag/2: 0 to 10
Smith Chart: 0 to 10

Note	Although these values are not used for Smith Chart, when you query or set through SCPI, the instrument always returns a value. For Smith Chart, use :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3

Related Command: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RLEVel

Front Panel Access: **Scale**, Reference Line

Smith Chart Scalable Type

:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3

Title: Smith Chart Scalable Type

Description: Sets the Smith chart display scale type of the given trace number specified by <Tr>. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. Setting the value to 0 is equivalent of setting the Smith Chart scale to "Normal" on the front panel. Setting the value to 10 is equivalent of setting the Smith Chart scale to "Expand 10 dB" on the front panel. Setting the value to 20 is equivalent of setting the Smith Chart scale to "Expand 20 dB" on the front panel. Setting the value to 30 is equivalent of setting the Smith Chart scale to "Expand 30 dB" on the front panel. Setting the value to −3 is equivalent of setting the Smith Chart scale to "Compress 3 dB" on the front panel.

Query: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart?

Syntax: :DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3

Parameter: 0|10|20|30|-3

Default Value: 0 (Normal)

Front Panel Access: **Scale**

3-4 :Format Subsystem

This subsystem contains commands that determine the formatting of numeric data when it is transferred.

The format setting affects data in specific commands only. If a command is affected, it will be noted in the command description.

Table 3-11. :FORMat Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FORMat			
[:READings]			
[:DATA]	<char>	ASCii|INTeger,32|REAL,32	Query Exists
[:DATA]?	<char>	ASC|INT,32|REAL,32	Query Form

Numeric Data Format

`:FORMat[:READings][:DATA] ASCii|INTeger,32|REAL,32`

Title: Numeric Data Format

Description: This command specifies the format in which data is returned in certain commands. ASCii format returns the data in comma-separated ASCII format. The units are the current instrument units. This format requires many more bytes, so it will be the slowest format.

INTeger,32 values are signed 32-bit integers in little-endian byte order. This format returns the data in 4-byte blocks.

REAL,32 values are 32-bit floating point numbers conforming to the IEEE 754 standard in little-endian byte order. This format returns the data in 4-byte binary format. The units are the current instrument units.

Both INTeger and REAL formats return a definite block length. Each transfer begins with an ASCII header, such as #42204 for INTeger,32 and REAL,32. The first digit represents the number of following digits in the header (in this example, 4).

The remainder of the header indicates the number of bytes that follow the header (in this example, 2204 for INT,32 and REAL,32). You then divide the number of following bytes by the number of bytes in the data format that you have chosen (4 for both INTeger,32 and REAL,32…so 2204/4) to get the number of data points (in this example, 551).

Query: `:FORMat[:READings][:DATA]?`

Syntax: `:FORMat[:READings][:DATA] ASCii|INTeger,32|REAL,32`

Parameter: `ASCii|INTeger,32|REAL,32`

Default Value: ASC

Related Command: `:TRACe[:DATA]`

Front Panel Access: **NA**

3-5 :INITiate Subsystem

This subsystem controls the triggering of measurements.

Table 3-12. :INITiate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:INITiate			
:CONTinuous	<boolean>	OFF|ON|0|1	Query Exists
:CONTinuous?	<boolean>	0|1	Query Form
:HOLD	<boolean>	OFF|ON|0|1	Query Exists
:HOLD?	<boolean>	0|1	Query Form
[:IMMediate]	NA	NA	No Query

Continuous/Single Sweep

:INITiate:CONTinuous OFF|ON|0|1

Title: Continuous/Single Sweep

Description: Sets the sweep to continuous. If the instrument is currently on hold, and if sweep type is set to continuous, then setting to ON restarts the sweep. If the instrument is currently on hold, and if sweep type is set to single, then setting to ON will set the Sweep Type to Continuous and restart the sweep. If the instrument is currently sweeping, then setting a value of OFF or 0 sets the Sweep Type to Single and holds the sweep. The default value is ON. That is, sending `:INIT:CONT` is equivalent to sending `:INIT:CONT ON`. The query version of this command returns a `1` if the instrument is set to Continuous and Run, and it returns a `0` if set to Hold.

Query: `:INITiate:CONTinuous?`

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

Parameter: `OFF|ON|0|1`

Default Value: ON or 1 (query returns 1 for ON)

Related Command: `:INITiate:HOLD`

Front Panel Access: **Shift 3** (Sweep), Run/Hold

Hold Sweep

:INITiate:HOLD OFF|ON|0|1

Title: Hold Sweep

Description: Sets the sweep to hold. If the instrument is currently sweeping, then setting a value of ON or 1 pauses the sweep. If the instrument is currently not sweeping, and if sweep type is set to continuous, then setting a value of OFF or 0, restarts the sweep. If the instrument is currently not sweeping, and if sweep type is set to single, then setting a value of OFF or 0, triggers a sweep. The query version of the command returns a 1 if the hold command is set, and it returns a 0 if a Run is set.

Query: `:INITiate:HOLD?`

Syntax: `:INITiate:HOLD OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: OFF or 0 (query returns 0 for OFF)

Related Command: `:INITiate:CONTinuous`

Front Panel Access: **Shift-3** (Sweep), Run/Hold

Trigger Sweep/Measurement

:INITiate[:IMMediate]

Title: Trigger Sweep/Measurement

Description: Initiates a sweep/measurement. Use this command in combination with :STATus:OPERation? to synchronize the capture of one complete set of data. When this command is sent, the "sweep complete" bit of :STATus:OPERation? is set to 0, indicating that the measurement is not completed. The data collection is then triggered. The controlling program can poll :STATus:OPERation? to determine the status. When the "sweep complete" bit is set to 1, data is ready to be retrieved.

If sweep is set to Run, and sweep type is set to Continuous, then sending the :INIT:IMM command restarts the sweep.

If sweep is set to Hold, and sweep type is set to Single, then sending the :INIT:IMM command starts a sweep (instrument is temporarily in Run). After a single sweep is completed, the instrument returns to Hold.

Query: No Query

Syntax: `:INITiate[:IMMediate]`

Front Panel Access: **NA**

3-6 :INPut Subsystem

This subsystem controls characteristics of the input port.

Table 3-13. :INPut Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:INPut{1-2}			
:BIAS			
:CURRent	<NRf>	milliampere	Query Exists
:CURRent?	<char>	0|1 ; returns value in milliampere	Query Form
:EXTernal			
:CURRent?	<NR3>	milliampere	Query Only
:VOLTage?	<char>	0|1 ; returns value in Volts	Query Only
:VOLTage	<NRf>	12 to 32 Volts	Query Exists
:VOLTage?	<NR3>	Volts	Query Form
:INPut			
:BIAS			
:EXTernal			
:TRIPped			
[:STATe]?	<boolean>	1|0	Query Only
:INTernal			
:TRIPped			
[:STATe]	<boolean>	1|0	Query Only
:PORT			
:SELect	<char>	1|2	Query Exists
:SELect?	<char>	1|2	Query Form
:STATe	<char>	OFF|EXTernal|INTernal	Query Exists
:STATe?	<char>	OFF|EXT|INT	Query Form

Internal Bias Tee Current

:INPut<port_no>:BIAS:CURRent <current>

Title: Internal Bias Tee Current

Description: Sets the internal bias tee current limit for the specified port. When this limit is exceeded, the Bias Tee trips (turns OFF). <port_no> is the specified internal bias tee port number, 1 to 2. The query version of this command returns either the measured internal current or the set internal current limit (both are returned in milliampere units). To return the measured internal current for the specified port number, send the query command either with no value specified after the "?" (default condition) or with a value of 0 specified after the "?". Note that the query result for the measured internal current is valid only if the Bias Tee state is set to internal. If a value of 1 is specified after the "?", then the query version of this command returns the internal current limit that is set for the given port number.

Query: :INPut<port_no>:BIAS:CURRent? [0|1]

Syntax: :INPut<port_no>:BIAS:CURRent <current>

Parameter: <current>

Default Value: 450 mA when querying the internal current limit (:INPut<port_no>:BIAS:CURRent? 1). The default value for querying the measured current depends upon what is connected to the port.

Default Unit: milliampere (mA)

Range: 0 mA to 450 mA

Front Panel Access: **Shift-3** (Sweep), Configure Ports, Bias Tee Setup, Int Current Limit P1/P2

External Bias Tee Current

:INPut<port_no>:BIAS:EXTernal:CURRent?

Title: External Bias Tee Current

Description: Returns the external bias tee current. <port_no> is the specified external bias tee port number, 1 to 2.

Query: Query Only

Syntax: :INPut<port_no>:BIAS:EXTernal:CURRent?

Default Unit: mA

Front Panel Access: **NA**

External Bias Tee Tripped State

:INPut:BIAS:EXTernal:TRIPped[:STATe]?

Title: External Bias Tee Tripped State

Description: Returns whether the external bias tee is tripped. Returns 1 for tripped, otherwise returns 0.

Query: Query Only

Syntax: `:INPut:BIAS:EXTernal:TRIPped[:STATe]?`

Front Panel Access: **NA**

External Bias Tee Voltage

:INPut<port_no>:BIAS:EXTernal:VOLTage?

Title: External Bias Tee Voltage

Description: Returns the voltage of the external bias tee for the specified port number. <port_no> is the specified internal bias tee port number, 1 to 2.

Query: Query Only

Syntax: `:INPut<port_no>:BIAS:EXTernal:VOLTage?`

Default Units: Volts

Front Panel Access: **NA**

Internal Bias Tee Tripped State

:INPut:BIAS:INTernal:TRIPped[:STATe]?

Title: Internal Bias Tee Tripped State

Description: Returns whether the internal bias tee is tripped. Returns 1 for tripped, otherwise returns 0.

Query: Query Only

Syntax: `:INPut:BIAS:INTernal:TRIPped[:STATe]?`

Front Panel Access: **NA**

Internal Bias Tee Port Selection

`:INPut:BIAS:PORT:SELect 1|2`

Title: Internal Bias Tee Port Selection

Description: Specifies the internal bias tee port.

Query: `:INPut:BIAS:PORT:SELect?`

Syntax: `:INPut:BIAS:PORT:SELect 1|2`

Parameter: `1|2`

Default Value: 2

Front Panel Access: **Shift-3** (Sweep), Configure Ports, Bias Tee Setup, Int Port Selection

Bias Tee State

`:INPut:BIAS:STATe OFF|EXTernal|INTernal`

Title: Bias Tee State

Description: Enables/disables the bias tee. Query returns OFF|EXT|INT. For OFF state, query returns OFF (not 0).

Query: `:INPut:BIAS:STATe?`

Syntax: `:INPut:BIAS:STATe OFF|EXTernal|INTernal`

Parameter: `OFF|EXTernal|INTernal`

Default Value: OFF

Front Panel Access: **Shift-3** (Sweep), Configure Ports, Bias Tee Setup, Bias Tee

Internal Bias Tee Voltage

:INPut<port_no>:BIAS:VOLTage <voltage>

Title: Internal Bias Tee Voltage

Description: Sets the voltage of the internal bias tee for the specified port number. <port_no> is the specified internal bias tee port number, 1 or 2. The query version of this command returns either the measured internal bias tee voltage or the set internal bias tee voltage (both are returned in Volts). Note that the measured voltage can be slightly different than the set voltage depending on the load conditions. To return the last measured internal bias tee voltage for the specified port number, send the query command either with no value specified after the "?" (default condition) or with a value of 0 specified after the "?". Note that the query result for the measured internal bias tee voltage is valid only if the Bias Tee state is set to internal. If a value of 1 is specified after the "?", then the query version of this command returns the internal bias tee voltage that was set for the given port number.

Query: :INPut<port_no>:BIAS:VOLTage? [0|1]

Syntax: :INPut<port_no>:BIAS:VOLTage <voltage>

Parameter: <voltage>

Default Value: +12 V when querying the internal bias tee voltage that was set (:INPut<port_no>:BIAS:VOLTage? 1). The default value for querying the last measured bias tee voltage may be slightly different depending upon what is connected to the port.

Default Units: Volts

Range: 12 V to 32 V

Front Panel Access: **Shift-3** (Sweep), Configure Ports, Bias Tee Setup, Int Voltage P1/P2

3-7 [:SENSe] Subsystem

The commands in this subsystem relate to device-specific parameters, not to signal-oriented parameters.

Table 3-14. [:SENSe] Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:APPLication		Refer to Table 3-15 for Subsystem	
:AVERage		Refer to Table 3-16 for Subsystem	
:CALibration		Refer to Table 3-17 for Subsystem	
:CORRection		Refer to Table 3-18 for Subsystem	
:FREQuency		Refer to Table 3-25 for Subsystem	
:SWEep		Refer to Table 3-26 for Subsystem	
:TRACe		Refer to Table 3-27 for Subsystem	

3-8 [:SENSe]:APPLication Subsystem

This subsystem contains application specific commands.

Table 3-15. [:SENSe]:APPLication Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:APPLication			
:TST?	<char>	NORMal|PWRon	Query Only
:TST			
:RESult?	<block>	NA	Query Only

Application Self Test

[:SENSe]:APPLication:TST? NORMal|PWRon

Title: Application Self Test

Description: Executes an application self test and reports whether any errors were detected. A return value of "0" indicates that the test was completed without detecting any error.

Two self test types can be specified. If no test type is specified, then the test defaults to NORMal. The PWRon self test is a scaled-down version of the normal self test that runs during the instrument power-on cycle.

Query: Query Only

Syntax: [:SENSe]:APPLication:TST? NORMal|PWRon

Parameter: NORMal|PWRon

Front Panel Access: NA

Application Self Test Result

[:SENSe]:APPLication:TST:RESult?

Title: Application Self Test Result

Description: Returns the application self test result of the previous call to the application self test. The response begins with an ASCII header. The header specifies the number of following bytes. It appears in the format #AX<block data>, where A is the number of digits in X, and X is the number of bytes that follow the header. The first information of the <block data> contains the overall self test string ("PASSED" or "FAILED") followed by a comma, and each self test result separated by a comma. Each subset of the result is included in angle brackets, < >.

Note that an application self test command must be called prior to calling this command in order for the result to be valid.

Query: Query Only

Syntax: [:SENSe]:APPLication:TST:RESult?

Front Panel Access: **NA**

3-9 [:SENSe]:AVERage Subsystem

This subsystem contains commands that are related to the combination of the data from consecutive sweeps. Use commands in this subsystem to control sweep-to-sweep averaging and max hold functionality.

Table 3-16. [:SENSe]:AVERage Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:AVERage			
:CLEar	<char>		No Query
:COUNt	<NR1>	integer	Query Exists
:COUNt?	<NR1>	integer	Query Form

Restart Averaging

[:SENSe]:AVERage:CLEar

Title: Restart Averaging

Description: Clears and restarts averaging of the measurement data. Note that sweep averaging count must be set to greater than 1 for averaging to restart.

Query: No Query

Syntax: [:SENSe]:AVERage:CLEar

Front Panel Access **NA**

Number of Traces to Average

[:SENSe]:AVERage:COUNt <integer>

Title: Number of Traces to Average

Description: Sets the number of traces to be averaged. Note that when averaging count is set to be greater than 1, sweep averaging is turned on. To stop averaging, set the averaging count to 1.

Query: [:SENSe]:AVERage:COUNt?

Syntax: [:SENSe]:AVERage:COUNt <integer>

Parameter: <integer>

Default Value: 1

Range: 1 to 65535

Front Panel Access: **Shift-3** (Sweep), Sweep Averaging

3-10 [:SENSe]:CALibration Subsystem

This subsystem controls the system calibration.

Table 3-17. [:SENSe]:CALibration Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CALibration			
:STATe?	<NR1>	0-15	Query Only

Calibration State

[:SENSe]:CALibration:STATe?

Title: Calibration State

Description: Reports the calibrated state. This command returns a 0 if there is no valid calibration, otherwise it returns the bit of the S params that has a valid calibration. The bits are as follows:

S11 bit	0x01
S12 bit	0x02
S21 bit	0x04
S22 bit	0x08

For example, if a value of 15 is returned, then all the S params bit is valid (since decimal 15 is equivalent to binary 1111).

Query: Query Only

Syntax: [:SENSe]:CALibration:STATe?

Front Panel Access: **NA**

3-11 [:SENSe]:CORRection Subsystem

This subsystem provides commands for losses or gains external to the instrument.

Table 3-18. [:SENSe]:CORRection Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT		Refer to Table 3-19 on page 3-81	
:COLLect		Refer to Table 3-21 on page 3-88	
:DATA?	<char>	ERF|EDF|ESF|ETF|ELF|EXF|ETFS|ELFS|EXFS|ERR|EDR|ESR|ETR|ELR|EXR|ETRS|ELRS|EXRS Returns block data	Query Only
:IMPedance			
[:INPut]			
[:MAGNitude]			
:SMCHart	<char>	50|75	Query Exists
:SMCHart?	<char>	50|75	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

Error Correction Data

[:SENSe]:CORRection:DATA? <error terms parameters>

Title: Error Correction Data

Description: Transfers the system error correction data from the instrument to the controller. `<error term parameter>` are string parameters that describe the different error terms.

<error term parameter>	Descriptions
ERF	(Forward) Reflection tracking
EDF	(Forward) Directivity
ESF	(Forward) Source match
ETF	(Forward) Transmission tracking
ELF	(Forward) Load match
EXF	(Forward) Isolation
ETFS	(Forward Sensitivity) Transmission tracking
ELFS	(Forward Sensitivity) Load match
EXFS	(Forward Sensitivity) Isolation
ERR	(Reverse) Reflection tracking
EDR	(Reverse) Directivity
ESR	(Reverse) Source match
ETR	(Reverse) Transmission tracking
ELR	(Reverse) Load match
EXR	(Reverse) Isolation
ETRS	(Reverse Sensitivity) Transmission tracking
ELRS	(Reverse Sensitivity) Load match
EXRS	(Reverse Sensitivity) Isolation

The format of the block data that is returned can be specified by the command `:FORMat:DATA`. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header. Each data point is separated by a comma delimiter. Each term contains one complex value (real and imaginary) for each sweep point.

Query: Query Form

Syntax: `[:SENSe]:CORRection:DATA? <error terms parameters>`

Parameter: `<error terms parameters>`

Related Command: `:FORMat:DATA`

Front Panel Access: **NA**

Smith Chart Reference Impedance

[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]:SMCHart 50|75

Title: Smith Chart Reference Impedance

Description: Sets the Smith Chart reference impedance. Sets 50 for 50 ohm. Sets 75 for 75 ohm. The query form of the command returns the current Smith Chart reference impedance in ohms.

Query: `[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]:SMCHart?`

Syntax: `[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]:SMCHart 50|75`

Parameter: `50|75`

Default Value: 50

Range: 50, 75

Front Panel Access: **Scale**, Reference Impedance

Calibration Correction State

[:SENSe]:CORRection[:STATe] OFF|ON

Title: Calibration Correction State

Description: Turns the calibration error correction ON or OFF. Note that error correction can be turned ON only if valid calibration is available.

Query: `[:SENSe]:CORRection[:STATe]?`

Syntax: `[:SENSe]:CORRection[:STATe] OFF|ON`

Parameter: `OFF|ON`

Default Value: 0

Front Panel Access: **Shift-2** (Calibrate), Cal Correction

3-12 [:SENSe]:CORRection:CKIT Subsystem

This subsystem provides commands that modify and configure the device under test (DUT).

Table 3-19. [:SENSe]:CORRection:CKIT Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT			
:INFormation?	<char>	NMALe|NFEMale|KMALe| KFEMale|716Male| 716Female|TNCMale| TNCFemale|SMAMale| SMAFemale|USR1|USR2| USR3|USR4|WG11|WG12| WG13|WG14|WG15|WG16| WG17|WG18|WG20|USR1| USR2|USR3|USR4 Returns comma-delimited ASCII format	Query Only
:USER{1-4}		Refer to Table 3-20 on page 3-83	

Calibration Connector Information

[:SENSe]:CORRection:CKIT:INFormation? <connector>

Title: Calibration Connector Information

Description: Returns a string of information of the given calibration connector. `<connector>` defines the connector family. Valid connectors for calibration line type COAX are as follows:

NMALe | NFEMale | KMALe | KFEMale | 716Male | 716Female | TNCMale | TNCFemale |
SMAMale | SMAFemale | USR1 | USR2 | USR3 | USR4

Valid connectors for calibration line type WAVEguide are as follows:

WG11 | WG12 | WG13 | WG14 | WG15 | WG16 | WG17 | WG18 | WG20 | USR1 | USR2 |
USR3 | USR4

Note that the connector must be for valid for the current calibration line type.

Note that user 1, 2, 3, or 4 is based on the current calibration method.

The response begins with an ASCII header. The header specifies the number of following bytes. It appears in the format `#AX,` where `A` is the number of digits in `X,` and `X` is the number of bytes that follow the header. Parameters are returned in comma-delimited ASCII format. Each parameter is returned as `"NAME=VALUE[UNITS]."`

Query: Query Only

Syntax: `[:SENSe]:CORRection:CKIT:INFormation? <connector>`

Parameter: `<connector>`

Front Panel Access: **NA**

[:SENSe]:CORRection:CKIT:USER Subsystem

This subsystem contains commands to configure the user device under test (DUT).

Table 3-20. [:SENSe]:CORRection:CKIT:USER Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT			
:USER{1-4}			
:COAX|WGUide			
:SOLT			
:C{0-3}	<NRf>	e-15, e-27, e-36, e-45	Query Exists
:C{0-3}?	<NR3>	e-15, e-27, e-36, e-45	Query Form
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:OPEN	<NRf>	millimeters	Query Exists
:OPEN?	<NR3>	millimeters	Query Form
:SHORt	<NRf>	millimeters	Query Exists
:SHORt?	<NR3>	millimeters	Query Form
:SSLT			
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:SHORt{1-2}	<NRf>	millimeters	Query Exists
:SHORt{1-2}?	<NR3>	millimeters	Query Form
:SSST			
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:SHORt{1-3}	<NRf>	millimeters	Query Exists
:SHORt{1-3}?	<NR3>	millimeters	Query Form
:WGUide			
:SSLT			
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form
:SSST			
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form

DUT User Capacitance Coefficient value

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SOLT:C[0]|1|2|3 <capacitance>

Title: DUT User Capacitance Coefficient value

Description: Sets the DUT capacitance value for the specified user.

Query:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:C[0]|1|2|3?
```

Syntax:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:C[0]|1|2|3 <capacitance>
```

Parameter: `<capacitance>`

Example: To set the DUT capacitance #1 for User 1 with line type coax to 5:

```
:SENS:CORR:CKIT:USER:COAX:SOLT:C1 5
```

Front Panel Access: **NA**

DUT User Cutoff Frequency

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:WGUide:SSLT|SSST :FCUToff <freq>

Title: DUT User Cutoff Frequency

Description: Sets the DUT cutoff frequency for the specified user.

Query:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:WGUide:SSLT|SSST
:FCUToff?
```

Syntax:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:WGUide:SSLT|SSST
:FCUToff <freq>
```

Parameter: `<freq>`

Default Unit: Hz

Range: 5 kHz to 20 GHz for MS2028B

5 kHz to 6 GHz for MS2026B

Example: To set the DUT cutoff frequency for User 1 with calibration method SSLT to 1 GHz:

```
:SENS:CORR:CKIT:USER:WGU:SSLT:FCUT 1GHz
```

Front Panel Access: **NA**

DUT User Name

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SOLT|SSLT|SSST:NAME <string>

Title: DUT User Name

Description: Sets the DUT name for the specified user.

Query: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SOLT|SSLT|SSST:NAME?`

Syntax: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SOLT|SSLT|SSST:NAME <string>`

Parameter: `<string>`

Example: To set the DUT name for User 1 with line type coax and calibration method SOLT:

```
:SENS:CORR:CKIT:USER:COAX:SOLT:NAME "SOLT1"
```

Front Panel Access: **NA**

DUT User Open Offset

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT :OPEN <length>

Title: DUT User Open Offset

Description: Sets the DUT capacitance value for the specified user.

Query: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT :OPEN?`

Syntax: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT :OPEN <length>`

Parameter: `<length>`

Example: To set the DUT open offset for User 1 with line type coax to 3 mm:

```
:SENS:CORR:CKIT:USER:COAX:SOLT:OPEN 3
```

Front Panel Access: **NA**

DUT User Short Offset (SSLT)

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSLT:SHORt[1]|2 <length>

Title: DUT User Short Offset (SSLT)

Description: Sets the DUT Short offset for the specified user.

Query: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSLT:SHORt[1]|2?`

Syntax: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSLT:SHORt[1]|2 <length>`

Parameter: `<length>`

Example: To set the DUT short offset 2 for User 1 with line type coax and calibration method SSLT to 3 mm:

```
:SENSe:CORRection:CKIT:USER:COAX:SSLT:SHORt2 3
```

Front Panel Access: **NA**

DUT User Short Offset (SSST)

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSST:SHORt[1]|2|3 <length>

Title: DUT User Short Offset (SSST)

Description: Sets the DUT Short offset for the specified user.

Query: `[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSST:SHORt[1]|2|3?`

Syntax: [:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide :SSST:SHORt[1]|2|3 <length>

Parameter: <length>

Example: To set the DUT short offset 2 for User 1 with line type coax and calibration method SSST to 3 mm:

```
:SENSe:CORRection:CKIT:USER:COAX:SSST:SHORt2 3
```

Front Panel Access: **NA**

DUT User Short Offset for calibration method SOLT

[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT :SHORt <length>

Title: DUT User Short Offset for calibration method SOLT

Description: Sets the DUT capacitance value for the specified user.

Query:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:SHORt?
```

Syntax:

```
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:SHORt <length>
```

Parameter: `<length>`

Example: To set the DUT short offset for User 1 with line type coax to 3 mm:

```
:SENSe:CORRection:CKIT:USER:COAX:SOLT:SHORt 3
```

Front Panel Access: **NA**

[:SENSe]:CORRection:COLLect Subsystem

This subsystem controls the system calibration. To properly perform a calibration, several parameters must be set. The table below lists all of the required commands. First, use the :MEDium and :CONNector subcommands to specify the calibration line type and the DUT port setup. Then use the :METHod and :TYPE subcommands to specify the calibration method and the calibration type. Then use the :ACQUire subcommand to specify the calibration components to be measured. Finally, use the :SAVe subcommand to calculate, save, and finish the calibration. Note that the calibration components do not need to be measured in any specific order.

Table 3-21. [:SENSe]:CORRection:COLLect Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:COLLect			
:ABORt			
:ALL	NA	NA	No Query
[:ACQUire]	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOLation, 1|2|3	Query Exists
[:ACQUire]?	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOL, 1|2|3	Query Form
:ACQUire			
:STATus?	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOLation, 1|2|3	Query Only
:CONNector{1-2}	<char>	NMALe|NFEMale| KMALe|KFEMale| 716Male|716Female| TNCMale|TNCFemale| SMAMale|SMAFemale| USR1|USR2|USR3|USR4 WG11|WG12|WG13| WG14|WG15|WG16| WG17|WG18|WG20| USR1|USR2|USR3|USR4	Query Exists

Table 3-21. [:SENSe]:CORRection:COLLect Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:CONNector{1-2}?	<char>	NMAL|NFEM|KMAL| KFEM|716M|716F| TNCM|TNCF|SMAM| SMAF|USR1|USR2| USR3|USR4 WG11|WG12|WG13| WG14|WG15|WG16| WG17|WG18|WG20| USR1|USR2|USR3|USR4	Query Form
:MEDium	<char>	COAX|WGUide	Query Exists
:MEDium?	<char>	COAX|WGU	Query Form
:METHod	<char>	SOLT|SSLT|SSST	Query Exists
:METHod?	<char>	SOLT|SSLT|SSST	Query Form
:SAVe	NA	NA	No Query
:STATus?	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOLation, 1|2|3	Query Only
:TYPE	<char>	RF2P|RFP1|RFP2| RFBP|TRFP|TRRP| TRBP|RRP1|RRP2| RRBP|2PFP|2PRP	Query Exists
:TYPE?	<char>	RF2P|RFP1|RFP2| RFBP|TRFP|TRRP| TRBP|RRP1|RRP2| RRBP|2PFP|2PRP	Query Form

Calibration Abort

[:SENSe]:CORRection:COLLect:ABORt:ALL

Title: Calibration Abort

Description: Aborts the calibration measurement and restarts the current sweep or measurement, or both.

Query: No Query

Syntax: [:SENSe]:CORRection:COLLect:ABORt:ALL

Front Panel Access: **NA**

Calibration Steps

[:SENSe]:CORRection:COLLect[:ACQUire] <cal steps>,<port_no>

Title: Calibration Steps

Description: Performs a measurement of the given steps. `<cal steps>` is the calibration step to be performed and must be one of the following values:

`OPEN|SHORT|SHORT1|SHORT2|SHORT3|LOAD|THRU|ISOLation`

`<port_no>` is the port number, 1, 2, or 3. For calibration step `OPEN, SHORT, SHORT1, SHORT2, SHORT3, and LOAD,` valid port number is 1 or 2. For calibration step `THRU` and `ISOLation,` valid port number is 1 for Fwd, 2 for Rev, and 3 for Fwd and Rev.

Note that the calibration step must be valid for the given calibration type and calibration method. Refer to Table 3-22, Table 3-23, and Table 3-24 for a list of valid calibration steps for each type and method.

The query version of this command returns a string that consists of the last calibration step measurement that was performed followed by the port number. The calibration step and port number are delimited by a comma. Note that if no calibration step has been processed, then this command returns the string `"NONE, 0"`.

Query: `[:SENSe]:CORRection:COLLect[:ACQUire]?`

Syntax: `[:SENSe]:CORRection:COLLect[:ACQUire] <cal steps>,<port_no>`

Parameter: `<cal steps>,<port_no>`

Front Panel Access: **Shift-2** (Calibrate), Start Cal

Calibration Steps and Calibration Types:

For each calibration Type, the following tables (Table 3-22, Table 3-23, and Table 3-24) list the allowable calibration steps and port_no to be used in command [:SENSe]:CORRection:COLLect[:ACQUire] <cal steps>,<port_no>. The calibration steps are different for each calibration Method, and the port_no is different for each calibration Type. For example, for calibration Type RFP1 and calibration Method SOLT, the allowable <cal steps>,<port_no> settings are **"OPEN,1"**, **"SHORT,1"**, and "**LOAD,1**". The steps that are not allowed are indicated by "—".

Table 3-22. SOLT Calibration Method

Calibration Type	OPEN	SHORT	LOAD	THRU	ISOL
RF2P (Full 2 Port – S_{11}, S_{21}, S_{12}, S_{22})	1,2	1,2	1,2	3	3
RFP1 (Full S_{11} - Port 1)	1	1	1	—	—
RFP2 (Full S_{22} - Port 2)	2	2	2	—	—
RFBP (Full S_{11} & S_{22} - Both Ports)	1,2	1,2	1,2	—	—
TRFP (Response S_{21} - Trans Response Fwd Path)	—	—	—	1	1
TRRP (Response S_{12} - Trans Response Rev Path)	—	—	—	2	2
TRBP (Response S_{21} & S_{12} - Trans Resp Both Paths)	—	—	—	3	3
RRP1 (Response S_{11} - Reflection Response Port 1)	1	1	1	—	—
RRP2 (Response S_{22} - Reflection Response Port 2)	2	2	2	—	—
RRBP (Response S_{11} & S_{22} - Reflection Response Both Ports)	1,2	1,2	1,2	—	—
2PFP (1P2P S_{11}, S_{21} - 1 Path 2 Port Fwd Path)	1	1	1	1	1
2PRP (1P2P S_{22}, S_{12} - 1 Path 2 Port Rev Path)	2	2	2	2	2

Calibration Steps and Calibration Types (continued):

Table 3-23. SSLT Calibration Method

Calibration Type	SHORT1	SHORT2	LOAD	THRU	ISOL
RF2P (Full 2 Port – S_{11}, S_{21}, S_{12}, S_{22})	1,2	1,2	1,2	3	3
RFP1 (Full S_{11} - Port 1)	1	1	1	—	—
RFP2 (Full S_{22} - Port 2)	2	2	2	—	—
RFBP (Full S_{11} & S_{22} - Both Ports)	1,2	1,2	1,2	—	—
TRFP (Response S_{21} - Trans Response Fwd Path)	—	—	—	1	1
TRRP (Response S_{12} - Trans Response Rev Path)	—	—	—	2	2
TRBP (Response S_{21} & S_{12} - Trans Resp Both Paths)	—	—	—	3	3
RRP1 (Response S_{11} - Reflection Response Port 1)	1	—	1	—	—
RRP2 (Response S_{22} - Reflection Response Port 2)	2	—	2	—	—
RRBP (Response S_{11} & S_{22} - Reflection Response Both Ports)	1,2	—	1,2	—	—
2PFP (1P2P S_{11}, S_{21} - 1 Path 2 Port Fwd Path)	1	1	1	1	1
2PRP (1P2P S_{22}, S_{12} - 1 Path 2 Port Rev Path)	2	2	2	2	2

Calibration Steps and Calibration Types (continued):

Table 3-24. SSST Calibration Method

Calibration Type	SHORT1	SHORT2	SHORT3	THRU	ISOL
RF2P (Full 2 Port – S_{11}, S_{21}, S_{12}, S_{22})	1,2	1,2	1,2	3	3
RFP1 (Full S_{11} - Port 1)	1	1	1	—	—
RFP2 (Full S_{22} - Port 2)	2	2	2	—	—
RFBP (Full S_{11} & S_{22} - Both Ports)	1,2	1,2	1,2	—	—
TRFP (Response S_{21} - Trans Response Fwd Path)	—	—	—	1	1
TRRP (Response S_{12} - Trans Response Rev Path)	—	—	—	2	2
TRBP (Response S_{21} & S_{12} - Trans Resp Both Paths)	—	—	—	3	3
RRP1 (Response S_{11} - Reflection Response Port 1)	1	—	—	—	—
RRP2 (Response S_{22} - Reflection Response Port 2)	2	—	—	—	—
RRBP (Response S_{11} & S_{22} - Reflection Response Both Ports)	1,2	—	—	—	—
2PFP (1P2P S_{11}, S_{21} - 1 Path 2 Port Fwd Path)	1	1	1	1	1
2PRP (1P2P S_{22}, S_{12} - 1 Path 2 Port Rev Path)	2	2	2	2	2

Calibration Step Status

[:SENSe]:CORRection:COLLect:ACQUire:STATus? [<cal steps>,<port_no>]

Title: Calibration Step Status

Description: This command requests information about the current calibration step or the specified calibration step. If no calibration step is specified, then it returns a 1 if the current calibration step has completed, otherwise it returns a 0. `<cal steps>` is the calibration step to be performed and must be one of the following values:

`OPEN|SHORT|SHORT1|SHORT2|SHORT3|LOAD|THRU|ISOLation`

`<port_no>` is the port number, 1, 2, or 3. For step `OPEN, SHORT, SHORT1, SHORT2, SHORT3,` and `LOAD,` valid port number is 1 or 2. For calibration step `THRU` and `ISOLation,` valid port number is 1 for Fwd, 2 for Rev, and 3 for Fwd and Rev.

Query: Query Only

Syntax: `[:SENSe]:CORRection:COLLect:ACQUire:STATus? [<cal steps>,<port_no>]`

Parameter: `[<cal steps>,<port_no>]`

Front Panel Access: **NA**

DUT Port Setup

[:SENSe]:CORRection:COLLect:CONNector<port_no> <connector>

Title: DUT Port Setup

Description: Sets the connector family for the given port number. <port_no> is the port number, 1 or 2. <connector> defines the connector family. Valid connector for calibration line type COAX is the following:

NMALe|NFEMale|KMALe|KFEMale|716Male|716Female|TNCMale|TNCFemale|SMAMale|SMAFemale|USR1|USR2|USR3|USR4

Valid connector for the calibration line type WAVEguide is the following:

WG11|WG12|WG13|WG14|WG15|WG16|WG17|WG18|WG20|USR1|USR2|USR3|USR4

Note that the connector must be valid for the current calibration line type.

Query: [:SENSe]:CORRection:COLLect:CONNector<port_no>?

Syntax: [:SENSe]:CORRection:COLLect:CONNector<port_no> <connector>

Parameter: <connector>

Default Value: KMAL

Front Panel Access: **Shift-2** (Calibrate), DUT Port Setup, DUT Port 1/2

Calibration Line Type

[:SENSe]:CORRection:COLLect:MEDium COAX|WGUide

Title: Calibration Line Type

Description: Sets the calibration line type.

Query: [:SENSe]:CORRection:COLLect:MEDium?

Syntax: [:SENSe]:CORRection:COLLect:MEDium COAX|WGUide

Parameter: COAX|WGUide

Default Value: COAX

Front Panel Access: **Shift-2** (Calibrate), Line Type

Calibration Method

[:SENSe]:CORRection:COLLect:METHod SOLT|SSLT|SSST

Title: Calibration Method

Description: Sets the calibration method.

Query: [:SENSe]:CORRection:COLLect:METHod?

Syntax: [:SENSe]:CORRection:COLLect:METHod SOLT|SSLT|SSST

Parameter: SOLT|SSLT|SSST

Default Value: SOLT

Front Panel Access: **Shift-2** (Calibrate), Cal Method

Calculate Calibration Data

[:SENSe]:CORRection:COLLect:SAVe

Title: Calculate Calibration Data

Description: Calculates the calibration data according to the calibration method that is selected and the steps that are performed and then stores the result. This command is similar to the "calculate and finish" on the front panel of the list of calibration steps.

Query: No Query

Syntax: `[:SENSe]:CORRection:COLLect:SAVe`

Front Panel Access: **NA**

Calibration Status

[:SENSe]:CORRection:COLLect:STATus?

Title: Calibration Status

Description: This command requests information about the calibration status. The command returns 0 if none, 1 if calibration has already started, 2 if calibration has been aborted, 3 if a calibration is currently calculating, and 4 if a calibration has been completed.

Query: Query Only

Syntax: `[:SENSe]:CORRection:COLLect:STATus?`

Front Panel Access: **NA**

Calibration Type

[:SENSe]:CORRection:COLLect:TYPE <cal type>

Title: Calibration Type

Description: Configures the calibrate type. `<cal type>` is the calibration type and must be one of the following values:

`RF2P|RFP1|RFP2|RFBP|TRFP|TRRP|TRBP|RRP1|RRP2|RRBP|2PFP|2PRP`

CAL TYPE	DESCRIPTION
RF2P	Full 2 Port
RFP1	Full Port 1
RFP2	Full Port 2
RFBP	Full Both Ports
TRFP	Trans Response Fwd Path
TRRP	Trans Response Rev Path
TRBP	Trans Response Both Paths
RRP1	Reflection Response Port 1
RRP2	Reflection Response Port 2
RRBP	Reflection Response Both Ports
2PFP	1 Path 2 Port Fwd Path
2PRP	1 Path 2 Port Rev Path

Query: `[:SENSe]:CORRection:COLLect:TYPE?`

Syntax: `[:SENSe]:CORRection:COLLect:TYPE <cal type>`

Parameter: `<cal type>`

Default Value: RF2P

Front Panel Access: **Shift-2** (Calibrate), Cal Type

3-13 [:SENSe]:FREQuency Subsystem

Commands in this subsystem pertain to the frequency settings of the instrument.

Table 3-25. [:SENSe]:FREQuency Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:FREQuency			
:CENTer	<NRf>	Hertz	Query Exists
:CENTer?	<NR3>	Hertz	Query Form
:DSPAn?	<NR3>	Hertz	Query Only
:SPAN	<NRf>	Hertz	Query Exists
:SPAN?	<NR3>	Hertz	Query Form
:STARt	<NRf>	Hertz	Query Exists
:STARt?	<NR3>	Hertz	Query Form
:STOP	<NRf>	Hertz	Query Exists
:STOP?	<NR3>	Hertz	Query Form
:TSPAn?	<NR3>	Hertz	Query Only
[:SENSe]{1-8}			
:FREQuency			
:DATA?	<char>	Hertz (Returns block data)	Query Only

Center Frequency

[:SENSe]:FREQuency:CENTer <freq>

Title: Center Frequency

Description: Sets the center frequency. Note that changing the value of the center frequency will change the value of the coupled parameters: `Start Frequency` and `Stop Frequency`. It may also change the value of the span.

Query: `[:SENSe]:FREQuency:CENTer?`

Syntax: `[:SENSe]:FREQuency:CENTer <freq>`

Parameter: `<freq>`

Default Value: 10000002500 Hz for MS2028B

3000002500 Hz for MS2026B

Default Units: Hz

Range: 5 kHz to 20 GHz for MS2028B

5 kHz to 6 GHz for MS2026B

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Center Freq

Frequency Span

[:SENSe]:FREQuency:SPAN <freq>

Title: Frequency Span

Description: Sets the frequency span. Setting the value of <freq> to 0 Hz is the equivalent of setting the span mode to zero span. Note that changing the value of the frequency span will change the value of coupled parameters: Start Frequency and Stop Frequency, and may change the Center Frequency.

Query: `[:SENSe]:FREQuency:SPAN?`

Syntax: `[:SENSe]:FREQuency:SPAN <freq>`

Parameter: `<freq>`

Default Value: 19999995000 Hz for MS2028B

5999995000 Hz for MS2026B

Default Units: Hz

Range: 0 Hz to 19999995000 GHz for MS2028B

0 Hz to 5999995000 GHz for MS2026B

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Span

Distance Suggested Frequency Span

[:SENSe]:FREQuency:DSPAn?

Title: Distance Suggested Frequency Span

Description: This command returns the suggested frequency span based on the start and stop distance.

Query: Query Only

Syntax: `[:SENSe]:FREQuency:DSPAn?`

Default Value: At preset, DSpan is 8759123902 Hz for MS2028B

At preset, DSpan is 5999995000 Hz for MS2026B

Default Units: Hz

Range: 0 Hz to 19999995000 GHz for MS2028B

0 Hz to 5999995000 GHz for MS2026B

Front Panel Access: **Freq**/**Time**/**Dist**, Additional Dist Setup, Distance Info

Time Suggested Frequency Span

[:SENSe]:FREQuency:TSPAn?

Title: Time Suggested Frequency Span

Description: This command returns the suggested frequency span based on the start and stop time.

Query: Query Only

Syntax: `[:SENSe]:FREQuency:TSPAn?`

Default Value: At preset, 9999999827 Hz for MS2028B

At preset, 5999995000 Hz for MS2026B

Default Units: Hz

Range: 0 Hz to 19999995000 GHz for MS2028B

0 Hz to 5999995000 GHz for MS2026B

Front Panel Access: **Freq**/**Time**/**Dist**, Time Info

Start Frequency

[:SENSe]:FREQuency:STARt <freq>

Title: Start Frequency

Description: Sets the start frequency. Note that changing the value of the start frequency will also change the value of coupled parameters: `Center Frequency` and `Span`.

Query: `[:SENSe]:FREQuency:STARt?`

Syntax: `[:SENSe]:FREQuency:STARt <freq>`

Parameter: `<freq>`

Default Value: 5000 Hz

Default Units: Hz

Range: 5 kHz to 20 GHz for MS2028B

5 kHz to 6 GHz for MS2026B

Example: Sets the start frequency to 10000 HZ:

```
:SENSe:FREQuency:STARt 10000
```

Sets the start frequency to 5 MHz:

```
:SENSe:FREQuency:STARt 5MHZ
```

Sets the start frequency to 1 GHz:

```
:SENS:FREQ:STAR 1GHZ
```

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Start Freq

Stop Frequency

[:SENSe]:FREQuency:STOP <freq>

Title: Stop Frequency

Description: Sets the stop frequency. Note that changing the value of the stop frequency will change the value of coupled parameters: `Center Frequency` and `Span`.

Query: `[:SENSe]:FREQuency:STOP?`

Syntax: `[:SENSe]:FREQuency:STOP <freq>`

Parameter: `<freq>`

Default Value: 20000000000 Hz for MS2028B

6000000000 Hz for MS2026B

Default Units: Hz

Range: 5 kHz to 20 GHz for MS2028B

5 kHz to 6 GHz for MS2026B

Example: Sets the stop frequency to 10000 Hz:

```
:SENSe:FREQuency:STOP 10000
```

Sets the stop frequency to 5 MHz:

```
:SENSe:FREQuency:STOP 5MHZ
```

Sets the stop frequency to 1 GHz:

```
:SENS:FREQ:STOP 1GHZ
```

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Stop Freq

Get Frequency List

:SENSe<Tr>:FREQuency:DATA?

Title: Get Frequency List

Description: Produces the frequency list in Hz for the given trace. `<Tr>` is the trace number in the range 1 to 8 (1 to 4 for Traces TR1 to TR4 and 5 to 8 for Memory M1 to M4). If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header. Each frequency point is in scientific notation and separated by a comma delimiter.

Query: Query only

Syntax: `:SENSe<Tr>:FREQuency:DATA?`

Parameter: `<freq>`

Default Units: Hz

Related Command: `:CALCulate<Tr>:TRANsform:TIME:DATA?`

`:CALCulate<Tr>:TRANsform:DISTance:DATA?`

Front Panel Access: **NA**

3-14 [:SENSe]:SWEep Subsystem

This subsystem includes commands that affect the sweep parameters of the instrument.

Table 3-26. [:SENSe]:SWEep Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:SWEep			
:IFBW	<char>	100000|50000|20000|10000|5000|2000|1000|500|200|100|50|20|10	Query Exists
:IFBW?	<char>	100000|50000|20000|10000|5000|2000|1000|500|200|100|50|20|10	Query Form
:POINts	<NR1>	integer	Query Exists
:POINts?	<NR1>	integer	Query Form
:TYPE	<char>	SINGle|CONTinuous	Query Exists
:TYPE?	<char>	SING|CONT	Query Form

IF Bandwidth

[:SENSe]:SWEep:IFBW <freq value>

Title: IF Bandwidth

Description: Sets the IF Bandwidth. The `<freq value>` in Hz must be one of the following 13 values:

`100000, 50000, 20000, 10000, 5000, 2000, 1000, 500, 200, 100, 50, 20, 10`

The query form of this command returns the frequency in Hz.

Query: `[:SENSe]:SWEep:IFBW?`

Syntax: `[:SENSe]:SWEep:IFBW <freq value>`

Parameter: `<freq value>`

Default Value: 10000

Default Units: Hz

Range: 10 to 100000 Hz

Example: Sets the IF Bandwidth frequency to 20 Hz:

```
:SENS:SWE:IFBW 20
```

Sets the IF Bandwidth frequency to 100 kHz:

```
:SENS:SWE:IFBW 100000
```

Front Panel Access: **Shift-3** (Sweep), IFBW

Number of Sweep Points

[:SENSe]:SWEep:POINts <integer>

Title: Number of Sweep Points

Description: Sets the total number of measurement points per sweep. Note that a sweep with a lower number of data points will complete in less time than a sweep with a higher number of data points.

Query: `[:SENSe]:SWEep:POINts?`

Syntax: `[:SENSe]:SWEep:POINts <integer>`

Parameter: `<integer>`

Default Value: 201

Range: 2 to 4001

Front Panel Access: **Shift-3** (Sweep), Data Points

Sweep Type

[:SENSe]:SWEep:TYPE SINGle|CONTinuous

Title: Sweep Type

Description: Sets the sweep type. The query version of this command returns "SING" if current sweep is set to single sweep, and returns "CONT" if set to continuous sweep. Note that setting the sweep type to SINGle sets the sweep to hold.

Query: [:SENSe]:SWEep:TYPE?

Syntax: [:SENSe]:SWEep:TYPE SINGle|CONTinuous

Parameter: SINGle|CONTinuous

Default Value: CONT

Front Panel Access: **Shift-3** (Sweep), Sweep Type

3-15 [:SENSe]:TRACe Subsystem

This subsystem includes commands that provide general settings for each trace.

Table 3-27. [:SENSe]:TRACe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:TRACe{1-4}			
:DOMain	<char>	FREQency|TIME|DISTance	Query Exists
:DOMain?	<char>	FREQ|TIME|DIST	Query Form
:SELect	NA	NA	No Query
:SPARams	<char>	S11|S21|S12|S22|SD1D1	Query Exists
:SPARams?	<char>	S11|S21|S12|S22|SD1D1	Query Form
:TRACe			
:TOTal	<char>	1|2|3|4	Query Exists
:TOTal?	<char>	1|2|3|4	Query Form
:SELect?	<char>	TR1|TR2|TR3|TR4	Query Only

Trace Domain

[:SENSe]:TRACe<Tr>:DOMain FREQuency|TIME|DISTance

Title: Trace Domain

Description: Defines the domain for the given trace <Tr>. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. The query version of this command returns "FREQ" if domain is Frequency, "TIME" if domain is Time, and "DIST" if domain is distance.

Query: [:SENSe]:TRACe<Tr>:DOMain?

Syntax: [:SENSe]:TRACe<Tr>:DOMain FREQuency|TIME|DISTance

Parameter: FREQuency|TIME|DISTance

Default Value: Trace 1: FREQ

Trace 2: FREQ

Trace 3: FREQ

Trace 4: FREQ

Example: To assign Time domain to trace 2:

```
:SENSe:TRACe2:DOMain TIME
```

Front Panel Access: **Measurement**, Domain Selection

Trace Select

[:SENSe]:TRACe<Tr>:SELect

Title: Trace Select

Description: Selects the given trace, <Tr>, as the active trace. <Tr> is the trace number in the range 1 to 4. If no trace number is specified, then the <Tr> parameter defaults to trace number 1. Note that this may also change the total number of traces.

Query: No Query

Syntax: [:SENSe]:TRACe<Tr>:SELect

Default Value: TR1

Example: To set trace 2 as the active trace:

```
:SENSe:TRACe2:SELect
```

OR

```
:SENS:TRAC2:SEL
```

To set trace 1 as the active trace:

```
:SENSe:TRACe1:SELect
```

OR

```
:SENSe:TRACe:SELect
```

Front Panel Access: **Measurement**, Active Trace

S Parameter

[:SENSe]:TRACe<Tr>:SPARams S11|S21|S12|S22|SD1D1

Title: S Parameter

Description: Defines the S-parameter for the given trace, `<Tr>`.

`<Tr>` is the trace number in the range 1 to 4. If no trace number is specified, then the `<Tr>` parameter defaults to trace number 1. The query version of this command returns `"S11"` if the S-parameter is set to S11, `"S21"` if set to S21, `"S12"` if set to S12, `"S22"` if set to S22, and `"SD1D1"` if set to SD1D1.

Note that S-parameter SD1D1 is available only if option 77 is installed.

Query: `[:SENSe]:TRACe<Tr>:SPARams?`

Syntax: `[:SENSe]:TRACe<Tr>:SPARams S11|S21|S12|S22|SD1D1`

Parameter: `S11|S21|S12|S22|SD1D1`

Default Value: Trace 1: S11

Trace 2: S12

Trace 3: S21

Trace 4: S22

Example: To assign S11 to trace 2:

```
:SENSe:TRACe2:SPARams S11
```

Front Panel Access: **Measurement**, S Parameter

Number of Traces

[:SENSe]:TRACe:TOTal <integer>

Title: Number of Traces

Description: Sets the number of traces to display.

Query: `[:SENSe]:TRACe:TOTal?`

Syntax: `[:SENSe]:TRACe:TOTal <integer>`

Parameter: `<integer>`

Default Value: 4

Range: 1 to 4

Example: To set number of traces to 3:

```
:SENSe:TRACe:TOTal 3
```

Front Panel Access: **Measurement**, Number of Traces

Active Trace

[:SENSe]:TRACe:SELect?

Title: Active Trace

Description: This command returns the current active trace number in the format `TR#`.

Query: Query Form

Syntax: `[:SENSe]:TRACe:SELect?`

Example: To query for the active trace number:

```
:SENS:TRAC:SEL?
```

Front Panel Access: **Measurement**, Active Trace

3-16 :SOURce Subsystem

The commands in this subsystem control the internal signal source.

Table 3-28. :SOURce Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SOURce			
:POWer	<char>	LOW|HIGH	Query Exists
:POWer?	<char>	LOW|HIGH	Query Form
:CORRection		Refer to Table 3-29 on page 3-114	

Power Levels

:SOURce:POWer LOW|HIGH

Title: Power Levels

Description: Sets the power levels.

Query: :SOURce:POWer?

Syntax: :SOURce:POWer LOW|HIGH

Parameter: LOW|HIGH

Default Value: HIGH

Range: HIGH: 3 dBm to −3 dBm

LOW: −15 dBm to −25 dBm

Front Panel Access: **Shift-3** (Sweep), Configure Ports, Source Power

:SOURce:CORRection:RVELocity Subsystem

Commands in this subsystem deal with the parameters of the physical media of the Device Under Test.

Table 3-29. :SOURce:CORRection:RVELocity Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SOURce			
:CORRection			
:RVELocity	<NRf>	unitless	Query Exists
:RVELocity?	<NR3>	unitless	Query Form
:CABLoss	<NRf>	unitless	Query Exists
:CABLoss?	<NR3>	unitless	Query Form
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form
:MEDium	<char>	COAX|WGUide	Query Exists
:MEDium?	<char>	COAX|WGUide	Query Form
:WGLoss	<NRf>	unitless	Query Exists
:WGLoss?	<NR3>	unitless	Query Form

Propagation Velocity

:SOURce:CORRection:RVELocity <number>

Title: Propagation Velocity

Description: Sets the propagation velocity of the cable for DTF measurements.

Query: :SOURce:CORRection:RVELocity?

Syntax: :SOURce:CORRection:RVELocity <number>

Parameter: <number>

Default Value: 1

Range: 0.001 to 1.0

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Domain Setup, Setup Distance, Additional Dist Setup, Propagation Velocity

Cable Loss

:SOURce:CORRection:RVELocity:CABLoss <number>

Title: Cable Loss

Description: Sets the cable loss for DTF measurements. The query version of this command returns the cable loss in dB/m.

Query: `:SOURce:CORRection:RVELocity:CABLoss?`

Syntax: `:SOURce:CORRection:RVELocity:CABLoss <number>`

Parameter: `<number>`

Default Value: 0.0

Range: 0.0 to 5

Front Panel Access: **Freq**/**time**/**Dist** (or **Freq**), Domain Setup, Setup Distance, Additional Dist Setup, Cable Loss (when DUT Line Type is Coax)

Cutoff Freq

:SOURce:CORRection:RVELocity:FCUToff <freq>

Title: Cutoff Freq

Description: Sets the Cutoff Frequency for DTF measurements.

Query: `:SOURce:CORRection:RVELocity:FCUToff?`

Syntax: `:SOURce:CORRection:RVELocity:FCUToff <freq>`

Parameter: `<freq>`

Default Value: 5000 Hz

Default Units: Hz

Range: 5 kHz to 20 GHz for MS2028B

5 kHz to 6 GHz for MS2026B

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Domain Setup, Setup Distance, Additional Dist Setup, Cutoff Freq (when DUT Line Type is Waveguide)

DUT Line Type

:SOURce:CORRection:RVELocity:MEDium COAX|WGUide

Title: DUT Line Type

Description: Sets the calibration line type.

Query: :SOURce:CORRection:RVELocity:MEDium?

Syntax: :SOURce:CORRection:RVELocity:MEDium COAX|WGUide

Parameter: COAX|WGUide

Default Value: COAX

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Domain Setup, Setup Distance, Additional Dist Setup, DUT Line Type

Waveguide Loss

:SOURce:CORRection:RVELocity:WGLoss <number>

Title: Waveguide Loss

Description: Sets the waveguide loss for DTF measurements. The query version of this command returns the waveguide loss in dB/m.

Query: :SOURce:CORRection:RVELocity:WGLoss?

Syntax: :SOURce:CORRection:RVELocity:WGLoss <number>

Parameter: <number>

Default Value: 0.0

Range: 0.0 to 5

Front Panel Access: **Freq**/**Time**/**Dist** (or **Freq**), Domain Setup, Setup Distance, Additional Dist Setup, Waveguide Loss (when DUT Line Type is Waveguide)

3-17 :STATus Subsystem

The commands in this subsystem relate to the current operating state of the instrument.

Table 3-30. :STATus Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:STATus			
:OPERation?	<Decimal>	0 to15 bit	Query Only

Query Operation Status

:STATus:OPERation?

Title: Query Operation Status

Description: This command requests information about the current status of the instrument. Each bit of the return value represents some operation. Only a subset of the bits are implemented for each application. The number returned is the decimal representation of the bit-wise OR of the enabled bits.

Bit	Decimal Value	Description
0	1	Not implemented
1	2	Not implemented
2	4	Not implemented
3	8	Not implemented
4	16	Not implemented
5	32	Not implemented
6	64	Not implemented
7	128	Not implemented
8	256	Sweep Complete – This bit will be set to 0 when the command :INITiate[:IMMediate] is sent to trigger a sweep. It will have a value of 1 when the sweep has completed.
9	512	Not implemented
10	1024	Not implemented
11	2048	Not implemented
12	4096	Not implemented
13	8192	Not implemented
14	16384	Not implemented
15	0	Will always be 0

Query: Query Form

Syntax: `:STATus:OPERation?`

Front Panel Access: **NA**

3-18 :SYSTem Subsystem

The commands in this subsystem relate to the current operating state of the instrument.

Table 3-31. :SYSTem Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SYSTem			
:MBTemperature?	<NR3>	Degree Celsius	Query Only
:PRESet	NA	NA	No Query

Motherboard Temperature

:SYSTem:MBTemperature?

Title: Motherboard Temperature

Description: This command returns the current mother board temperature in degrees Celsius.

Query: Query Only

Syntax: :SYSTem:MBTemperature?

Front Panel Access: **NA**

Preset

:SYSTem:PRESet

Title: Preset

Description: This command restores all application parameters to their factory preset values. This command does not modify system parameters such as Ethernet configuration, language, volume, or brightness

Query: No Query

Syntax: :SYSTem:PRESet

Related Command: *RST

Front Panel Access: **Shift-1** (Preset), Preset

3-19 :Trace Subsystem

This subsystem contains commands related to the transfer of trace data to and from the instrument.

Table 3-32. :TRACe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
[:DATA]?	<char>	1|2|3|4 Returns block data	Query Only
:PREamble?	<char>	1|2|3|4 Returns block data	Query Only

Trace Data Transfer

:TRACe[:DATA]? [1]|2|3|4

Title: Trace Data Transfer

Description: Transfers the trace data of the given trace from the instrument to the controller.

The format of the block data that is returned can be specified by the command :FORMat:DATA. The response begins with an ASCII header that specifies the number of data bytes. It appears in the format #AX, where A is the number of digits in X, and X is the number of bytes that follow the header. Each data point is separated by a comma delimiter. Independent of the Graph Type that is associated with the trace, each data point that is transferred by this command consists of complex measurement data (Real and Imaginary values for that point). A 551 point trace therefore has a total of 1102 points that get transferred.

Query: Query Only

Syntax: :TRACe[:DATA]? [1]|2|3|4

Parameter: [1]|2|3|4

Related Command: :FORMat:DATA;

:CALCulate<Tr>:DATA?

Front Panel Access: **NA**

Trace Header Transfer

`:TRACe:PREamble? [1]|2|3|4`

Title: Trace Header Transfer

Description: Returns trace header information for the specified trace. Data can be transferred from the 4 available display traces. Use the commands in the **MMEMory** subsystem to store and recall traces from the instrument memory. The response begins with an ASCII header. The header specifies the number of following bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header. Refer to section "Example Response Format:".

Parameters are returned in comma-delimited ASCII format. Each parameter is returned as `"NAME=VALUE[UNITS]"`. Note that the parameters that are returned depend on the firmware version and that this document does not cover all parameter values that are returned by the command.

Query: Query Only

Syntax: `:TRACe:PREamble? [1]|2|3|4`

Parameter: `[1]|2|3|4`

Front Panel Access: **NA**

Example Response Format:

#AX is `#40078`, where `A = 4` (the number of digits in number X), and `X = 0078` (the response has 78 characters).

`#40078``SN=6897458,TYPE=DATA,DATE=2009-03-18-03-13-20-00,INT_BIAS_TEE_CURRENT=0.000000`

Parameters are returned in comma-delimited ASCII format. Each parameter is returned as "NAME=VALUE[UNITS]". For the example response, the serial number (SN) is 6897458 and is returned as `"SN=6897458"`.

Note	The parameters that are returned depend on the firmware version in the VNA Master, and this document does not cover all possible parameter values that can be returned by the command.

The following 3 tables describe parameters that can be returned by the `:TRACe:PREamble?` command:

- Table 3-33, "Trace Header Parameters" on page 3-122
- Table 3-34, "Trace Header Marker Parameters" on page 3-128
- Table 3-35, "Trace Header Limits Parameters" on page 3-129

Table 3-33. Trace Header Parameters (Sheet 1 of 6)

Parameter Name	Description
SN	Instrument serial #
UNIT_NAME	Instrument name
DATE	Trace date/time
APP_NAME	Application name
APP_VER	Application firmware (FW) version
SUB_MODE	Sub Mode type, where: 0 is for Vector Network Analyzer, 1 is for Power Monitor, and 2 is for Vector Voltmeter
S_TYPE	Active trace S type. Current available S Types are: S11 = 0, S21 = 1, S12 = 2, S22 = 3, SD1D1 = 4
TRACE_S_TYPES	S types for all 4 traces. This uses a bit mask, where the bit shift mask is defined as: S_TYPE_BIT_SHIFT 4 S_TYPE_BIT_MASK 0xF For example, to get the S type for trace 1: (int) (sTypes >> (S_TYPE_BIT_SHIFT * 0)) & S_TYPE_BIT_MASK
GRAPH_TYPE	Active Trace graph type. Current available graph types are: Log Mag = 0, SWR = 1, Phase = 2, Real = 3, Imaginary = 4, Group delay = 5, Smith Chart = 6, Log Mag/2 = 7
TRACE_GRAPH_TYPES	Graph types for all 4 traces. This uses a bit mask shift, where the bit shift mask is defined as: GRAPH_TYPE_BIT_SHIFT 16 GRAPH_TYPE_BIT_MASK 0xFFFF
DOMAIN	Active Trace domain type, where: 0 is frequency domain, 1 is time domain, and 2 is for distance domain

Table 3-33. Trace Header Parameters (Sheet 2 of 6)

Parameter Name	Description
TRACE_DOMAIN_TYPES	Domain types for all 4 traces. This uses a bit mask shift, where the bit shift mask is defined as: DOMAIN_TYPE_BIT_SHIFT 4 DOMAIN_TYPE_BIT_MASK 0xF
DOMAIN_SETUP	Current Domain Setup. Available Domain setups are: Freq = 0, Time = 1, Dist = 2
TRACE_MATH_TYPES	Trace Math types. This uses a bit mask shift, where the bit shift mask is defined as: MATH_TYPE_BIT_SHIFT 4 MATH_TYPE_BIT_MASK 0xF Available math type are: None = 0, Subtract = 1, Add = 2, Multiply = 3, Divide = 4
TRACE_DISPLAY_TYPES	Trace display types. Available trace types are: Trace Only = 0, Memory Only = 1, Trace and Memory = 2
TRACE_MEMORY_STATE	For save/recall purpose. Where 0 is Off and 1 is On.
SMITH_CHART_TYPE	Current active trace Smith Chart type. Available Smith Chart type are: Normal = 0, Expand 10dB = 1, Expand 20dB = 2, Expand 30dB = 3, Compress 3dB = 4
TRACE_SMITH_CHART_TYPES	Smith Chart type. This uses a bit mask shift, where the bit shift mask is defined as: SMITH_CHART_TYPE_BIT_SHIFT 4 SMITH_CHART_TYPE_BIT_MASK 0xF For available types, refer to "SMITH_CHART_TYPE".
SMITH_REF_IMPED	Reference Impedance. Where: 50 ohm = 0. and 75 ohm = 1
TOTAL_CHANNELS	Trace Format. Available trace format are: Single = 1, Dual = 2, Tri = 3, Quad = 4
ACTIVE_TRACE	Current active trace. Where: 0 is for trace 1, 1 for trace 2, 2 for trace 3, and 3 for trace 4
TOTAL_TRACE	Total number of traces
AVERAGING_COUNT	Current Averaging Count

Table 3-33. Trace Header Parameters (Sheet 3 of 6)

Parameter Name	Description
AVERAGING_FACTOR	Averaging factor
EXTERNAL_REFERENCE	Currently not being used.
EXT_REF_FREQ_LIST	Currently not being used.
SWEEP_TYPE	Sweep type. Available sweep types are: Single = 0, Continuous = 1, and External = 2
EXTERNAL_TRIGGER	Currently not being used.
BIAS_TEE_STATE	Bias Tee State. Currently available Bias Tee states are: Off = 0, External = 1, Internal = 2
BIAS_TEE_PORT_SELECTION	Bias Tee port selection. Where: 0 is port 1, and 1 is port 2.
BIAS_TEE_VOLTAGE_Px	Internal Bias tee voltage, where: x is the port number. Return value is 1000 times the current voltage value in Volts.
EXT_BIAS_TEE_VOLTAGE_Px	External Bias tee voltage, where: x is the port number. Return value is 1000 times the current voltage value in Volts.
BIAS_TEE_CURRENT_LIMIT_Px	Internal Bias tee current limit, where: x is the port number. Return value is in mA.
EXT_BIAS_TEE_CURRENT_Px	External Bias tee current, where: x is the port number. Return value is in mA.
INT_BIAS_TEE_CURRENT	Internal Bias tee current. Return value is in mA.
RF_SOURCE_POWER	Source Power. Current valid source power: low = 0, and high = 1.
CABLE	The index of the selected cable list, where 0 is the first in the list.
WAVEGUIDE	The index of the selected waveguide list, where 0 is the first in the list.
DIST_UNITS	Distance units. Available distance units are: Meter = 0, Feet = 1
IFBW	The index of the selected IFBW list, where 0 is the first in the list.

Table 3-33. Trace Header Parameters (Sheet 4 of 6)

Parameter Name	Description
DUT_LINE_TYPE	DUT Line Type, where Coax = 0, and Waveguide = 1.
CUTOFF_FREQ	Cutoff Freq. Returns in units of megahertz.
PROP_VEL	Propagation Velocity. Value returned is 1000 times the propagation velocity value.
WAVEGUIDE_LOSS	Waveguide Loss. Value returned is 1000 times the waveguide loss value.
CABLE_LOSS	Cable Loss. Value returned is 1000 times the cable loss value.
PORT_x_REF_PLANE_LENGTH	Reference Plane Length, where x is the port number. Returns in units of meter.
TRACE_SMOOTHING_PERCENT	Trace smoothing percent. This uses a bit mask shift, where the bit shift mask is defined as: PERC_SMOOTHING_BIT_SHIFT 8 PERC_SMOOTHING_BIT_MASK 0xFF
SMOOTHING_PERCENT	Current active trace smoothing percent.
TRACE_x_START_FREQ	Start freq, where x is the trace number. Returns in units of megahertz.
TRACE_x_STOP_FREQ	Stop frequency, where x is the trace number. Returns in units of megahertz.
TRACE_x_CENTER_FREQ	Center frequency, where x is the trace number. Returns in units of megahertz.
TRACE_x_SPAN	Frequency span, where x is the trace number. Returns in units of megahertz.
TRACE_x_CENTER_TIME	Center time, where x is the trace number. Returns in units of picoseconds.
TRACE_x_START_TIME	Start time, where x is the trace number. Returns in units of picoseconds.
TRACE_x_STOP_TIME	Stop time, where x is the trace number. Returns in units of picoseconds.
TRACE_x_START_DIST	Start distance, where x is the trace number. Depending on the given distance unit, value is returned in units of either microfeet or micrometer.
TRACE_x_STOP_DIST	Stop distance, where x is the trace number. Depending on the given distance unit, value is returned in units of either microfeet or micrometer.
TRACE_x_SMOOTHING_PERCENT	Currently not used.
TRACE_x_GATE_START_TIME	Currently not used.

Table 3-33. Trace Header Parameters (Sheet 5 of 6)

Parameter Name	Description
TRACE_x_GATE_STOP_TIME	Currently not used.
TRACE_x_GATE_FUNCTION_STATE	Currently not used.
TRACE_x_WINDOWING	Windowing, where x is the trace number. Available windowing settings are: Rectangular = 0, Nominal Side Lobe = 1, Low Side Lobe = 2, Minimum Side Lobe = 3
TRACE_x_GD_APERTURE	Group Delay Aperture, where x is the trace number.
TRACE_x_DSP_DATA_POINTS	Number of data points, where x is the trace number.
TRACE_x_LOG_MAG_RESOLUTION	Log Mag Resolution, where x is the trace number. Returned value is in dB.
TRACE_x_LOG_MAG_REFERENCE	Log Mag Reference value, where x is the trace number. Returned value is in dB.
TRACE_x_LOG_MAG_REFERENCE_LINE	Log Mag Reference Line, where x is the trace number.
TRACE_x_SWR_RESOLUTION	SWR Resolution, where x is the trace number. Returned value is 1000 times the SWR Resolution.
TRACE_x_SWR_REFERENCE	SWR Reference value, where x is the trace number. Returned value is 1000 times the SWR Reference value.
TRACE_x_SWR_REFERENCE_LINE	SWR Reference Line, where x is the trace number.
TRACE_x_PHASE_RESOLUTION	Phase Resolution, where x is the trace number. Returned value is 1000 times the phase resolution.
TRACE_x_PHASE_REFERENCE	Phase Reference value, where x is the trace number. Returned value is 1000 times the phase reference value.
TRACE_x_PHASE_REFERENCE_LINE	Phase Reference Line, where x is the trace number.
TRACE_x_REAL_RESOLUTION	Real Resolution, where x is the trace number. Returned value is 1000 times the resolution per div value.
TRACE_x_REAL_REFERENCE	Real Reference value, where x is the trace number. Returned value is 1000 times the reference value.
TRACE_x_REAL_REFERENCE_LINE	Real Reference line, where x is the trace number.

Table 3-33. Trace Header Parameters (Sheet 6 of 6)

Parameter Name	Description
TRACE_x_IMAG_RESOLUTION	Imaginary Resolution, where x is the trace number. Returned value is 1000 times the reference value.
TRACE_x_IMAG_REFERENCE	Imaginary Reference value, where x is the trace number. Returned value is 1000 times the reference value.
TRACE_x_IMAG_REFERENCE_LINE	Imaginary Reference line, where x is the trace number.
TRACE_x_GD_RESOLUTION	Group Delay Resolution, where x is the trace number. Returns in units of picoseconds.
TRACE_x_GD_REFERENCE	Group Delay Reference value, where x is the trace number. Returns in units of picoseconds.
TRACE_x_GD_REFERENCE_LINE	Group Delay Reference line, where x is the trace number.
TRACE_x_SMITH_SCALE	Currently not used.
TRACE_x_SMITH_IMPEDANCE	Currently not used.
TRACE_x_SMITH_IMPEDANCE_LINE	Currently not used.
TRACE_x_1PCL_RESOLUTION	Log Mag/2 resolution, where x is the trace number. Returned value is in dB.
TRACE_x_1PCL_REFERENCE	Log Mag/2 Reference value, where x is the trace number. Returned value is in dB.
TRACE_x_1PCL_REFERENCE_LINE	Log Mag/2 Reference line, where x is the trace number.
TRACE_x_POLAR_RESOLUTION	Currently not used.
TRACE_x_POLAR_REFERENCE	Currently not used.
TRACE_x_POLAR_REFERENCE_LINE	Currently not used.
CAL_TYPE	The index of the selected calibration type list, where 0 is the first in the list.
CAL_LINE_TYPE	Calibration Line Type, where coax = 0, and waveguide = 1.
CAL_PORTx_DUT	The index of the selected Calibration Coax DUT Selector list for port x, where 0 is the first in the list.
CAL_PORTx_WG	The index of the selected Calibration Waveguide DUT Selector list for port x, where 0 is the first in the list.
CAL_CORRECTION	Calibration correction, where On = 0, and Off = 1
TRACE_LABEL_STATE	Trace label On/Off, where On = 0, Off = 1

Table 3-34. Trace Header Marker Parameters

Markers Parameter Name	Description
MKR_MWVNA_Xx	Marker x X value (where x is the marker number 1 to 8)
MKR_MWVNA_POINTx	Marker x display point
MKR_MWVNA_REALx	Marker x Real value
MKR_MWVNA_IMAGx	Marker x Imaginary value
MKR_MWVNA_READOUTx	Marker x readout style. Available readout styles are: Graph = 0, Log Mag = 1, Log Mag and Phase = 2, Phase = 3, Real and Imaginary = 4, SWR = 5, Impedance = 6, Admittance = 7, Normalized Impedance = 8, Normalized Admittance = 9, Polar Impedance = 10, Group Delay = 11, Log Mag/2 = 12
MKR_MWVNA_FLAGSx	Marker x flags: MWVNA_MARKER_REF_BIT ..... 0x00000001 MWVNA_MARKER_DELTA_BIT ..... 0x00000002 MWVNA_MARKER_ALL_BIT ..... 0x00000004 MWVNA_MARKER_INIT_BIT ..... 0x00000008 MWVNA_MARKER_ZERO_SPAN_BIT ..... 0x00000010 MWVNA_MARKER_OUT_OF_RANGE_BIT ... 0x00000020
MKR_TRACEx	Specifies to which trace the marker x is attached
MKR_DELTA_TOx	Specifies to which trace the marker x is delta

Table 3-35. Trace Header Limits Parameters

Limits Parameter Name	Description

LIMIT_MWVNA_FLAGS_UPx
LIMIT_MWVNA_FLAGS_LOx
	Upper(UP)/Lower(LO) Limit flags for trace x:
	`LIMIT_LEFT_OF_SCREEN .... 0x00000001`
	`LIMIT_RIGHT_OF_SCREEN ... 0x00000002`
	`LIMIT_IS_ON ..... 0x00000004`
	`LIMIT_IS_RELATIVE ..... 0x00000008`
	`LIMIT_ALARM_IS_ON ..... 0x00000010`
	`LIMIT_LIMIT_UNITIALIZED . 0x00000020`
	`LIMIT_MESSAGE_ON ..... 0x00000040`

LIMIT_MWVNA_POINT_UPx_# LIMIT_MWVNA_POINT_LOx_#	Upper/Lower Limit point value for trace x, where # is the limit point number. Each point value contains the X-axis value, Y-axis value, limit point, and limit flags, separated by a space. **Note:** Limit point and limit flags are not currently used and will always return a value of 0.000000 for limit point and 0 for limit flags.
LIMIT_MWVNA_GRAPH_TYPE_UPx LIMIT_MWVNA_GRAPH_TYPE_LOx	Upper/Lower Limits Graph type. For available graph types, refer to “GRAPH_TYPE”.
LIMIT_MWVNA_TOTAL_POINTS_UPx LIMIT_MWVNA_TOTAL_POINTS_LOx	Upper/Lower Limit total points.

Chapter 4 — Vector Voltmeter Commands

4-1 Introduction

This chapter describes commands for Vector Voltmeter mode. Only the commands that are listed in this chapter and in Chapter 6, “All Mode Commands” can be used in Vector Voltmeter mode. Using commands from other modes may produce unexpected results.

4-2 VVM Commands

Table 4-1. VVM Commands Subsystems

Keyword	Parameter Data or Units
:TRACe	Refer to Table 4-2, ":TRACe VVM Subsystem Commands" on page 4-3
[:SENSe]	
:VVM	Refer to Table 4-4, "[:SENSe]:VVM Subsystem Commands" on page 4-6
:CABLe	Refer to Table 4-5, "[:SENSe:]:VVM:CABLe Subsystem Commands" on page 4-9
:FREQuency	Refer to Table 4-6, "[:SENSe]:VVM:FREQuency Commands" on page 4-10
:REFerence	Refer to Table 4-7, "[:SENSe:]:VVM:REFerence Commands" on page 4-11
:FETCh	
:VVM	Refer to Table 4-8, ":FETCh:VVM Subsystem Commands" on page 4-12
:REFerence	Refer to Table 4-10, ":FETCh:VVM:REFerence Subsystem Commands" on page 4-15
The following commands are described in Chapter 3.	
[:SENSe]:CALibration	Refer to Table 3-17, "[:SENSe]:CALibration Subsystem" on page 3-77
[:SENSe]:CORRection	Refer to Table 3-18, "[:SENSe]:CORRection Subsystem" on page 3-78
[:SENSe]:CORRection :CKIT	Refer to Table 3-19, "[:SENSe]:CORRection:CKIT Subsystem" on page 3-81
[:SENSe]:CORRection :CKIT:USER	Refer to Table 3-20, "[:SENSe]:CORRection:CKIT:USER Subsystem" on page 3-83
[:SENSe]:CORRection :COLLect	Refer to Table 3-21, "[:SENSe]:CORRection:COLLect Subsystem" on page 3-88

4-3 :TRACe VVM Subsystem

This subsystem contains commands pertaining to the Vector Voltmeter mode.

Table 4-2. :TRACe VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
:PREamble?	<char>	Returns block data	Query Only

Trace Header Transfer

:TRACe:PREamble?

Title: Trace Header Transfer

Description: Returns trace header information. The response begins with an ASCII header. The header specifies the number of following bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header.

Parameters are returned in comma-delimited ASCII format. Each parameter is returned as `"NAME=VALUE[UNITS]"`. Note that the parameters that are returned depend on the firmware version and that this document does not cover all parameter values that are returned by the command. Refer to Table 4-3, "Trace Header Parameters.

For the example response, the serial number (SN) is 83320012 and is returned as "SN=83320012". Refer to section "Example Response Format:" on page 4-4.

Query: Query Only

Syntax: `:TRACe:PREamble?`

Front Panel Access: **NA**

Example Response Format:

[#800001070SN=83320012,UNIT_NAME=,TYPE=DATA,DATE=1999-11-30-02-00-10-10,
APP_NAME=MWVNA,APP_VER=T0.00.1001,VVM_MODE=0.000000,VVM_CW_FREQ=
0.005000,VVM_MEAS_TYPE=0.000000,VVM_RETURN_MEAS_FORMAT=0.000000,
VVM_CABLE=1.000000,VVM_PORT_1_SAVE_RETURN_REF=0.000000,VVM_PORT_1_
SAVE_INSERTION_REF=0.000000,VVM_PORT_2_SAVE_RETURN_REF=0.000000,VVM_
PORT_2_SAVE_INSERTION_REF=0.000000,VVM_PORT_1_RETURN_REF_AMP=
0.000000,VVM_PORT_1_RETURN_REF_PHASE=0.000000,VVM_PORT_1_RETURN_REF_
VSWR=1000.000000,VVM_PORT_1_RETURN_REF_REAL=0.000000,VVM_PORT_1_
RETURN_REF_IMAG=0.000000,VVM_PORT_1_INSERTION_REF_AMP=0.000000,VVM_
PORT_1_INSERTION_REF_PHASE=0.000000,VVM_PORT_1_RETURN_REF_RAW_
REAL=1000000.000000,VVM_PORT_1_RETURN_REF_RAW_IMAG=0.000000,VVM_PORT
_2_RETURN_REF_AMP=0.000000,VVM_PORT_2_RETURN_REF_PHASE=0.000000,VVM_
PORT_2_RETURN_REF_VSWR=1000.000000,VVM_PORT_2_RETURN_REF_REAL=
0.000000,VVM_PORT_2_RETURN_REF_IMAG=0.000000,VVM_PORT_2_INSERTION_
REF_AMP=0.000000,VVM_PORT_2_INSERTION_REF_PHASE=0.000000,VVM_PORT_2_
RETURN_REF_RAW_REAL=1000000.000000,
VVM_PORT_2_RETURN_REF_RAW_IMAG=0.000000, CAL_PORT=1]

Trace Header Parameters

Table 4-3 describes parameters that can be returned by the `:TRACe:PREamble?` command.

Table 4-3. Trace Header Parameters (Sheet 1 of 2)

Parameter Name	Description
SN	Instrument Serial #
UNIT_NAME	Instrument name
DATE	Trace date/time
APP_NAME	Application name
APP_VER	Application firmware (FW) version

VVM_MODE	Mode
	`0 = CW`
	`1 = Table`

VVM_CW_FREQ	CW frequency

VVM_MEAS_TYPE	Measurement Type
	`0 = Return`
	`1 = Insertion`

VVM_RETURN_MEAS_FORMAT	Return Type Measurement Format
	`0 = dB`
	`1 = VSWR`
	`2 = Impedance`

VVM_CABLE	Selected Cable number 1 to 12

Table 4-3. Trace Header Parameters (Sheet 2 of 2)

Parameter Name	Description
VVM_PORT_X_SAVE_RETURN_REF	Saved status for Port x Return reference, where x = 1 or 2
VVM_PORT_X_SAVE_INSERTION_REF	Saved status for Port x Insertion reference, where x = 1 or 2
VVM_PORT_X_RETURN_REF_AMP	Return reference amplitude for Port x, where x = 1 or 2
VVM_PORT_X_RETURN_REF_PHASE	Return reference phase for Port x, where x = 1 or 2
VVM_PORT_X_RETURN_REF_VSWR	Return reference VSWR for Port x, where x = 1 or 2
VVM_PORT_X_RETURN_REF_REAL	Return reference real for Port x, where x = 1 or 2
VVM_PORT_X_RETURN_REF_IMAG	Return reference imaginary for Port x, where x = 1 or 2
VVM_PORT_X_INSERTION_REF_AMP	Insertion reference amplitude for Port x, where x = 1 or 2
VVM_PORT_X_INSERTION_REF_PHASE	Insertion reference phase for Port x, where x = 1 or 2
CAL_PORT	Port # (where 0 is Port 1, and 1 is Port 2)

4-4 [:SENSe]:VVM Subsystem

This subsystem contains commands pertaining to the Vector Voltmeter mode.

Table 4-4. [:SENSe]:VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:CABLe		Refer to Table 4-5 on page 4-9.	
:FORMat	<char>	DB|VSWR|IMPedance	Query Exists
:FORMat?	<char>	DB|VSWR|IMP	Query Form
:FREQuency		Refer to Table 4-6 on page 4-10	
:MODE	<char>	CW|TABLe	Query Exists
:MODE?	<char>	CW|TABL	Query Form
:PORT	<char>	1|2	Query Exists
:PORT?	<char>	1|2	Query Form
:REFerence		Refer to Table 4-7 on page 4-11	
:TYPE	<char>	RETurn|INSertion	Query Exists
:TYPE?	<char>	RET|INS	Query Form

Return Measurement Format

[:SENSe]:VVM:FORMat DB|VSWR|IMPedance

Title: Return Measurement Format

Description: Sets the VVM Return type measurement format. The query format of the command returns the VVM Return type measurement format.

Query: `[:SENSe]:VVM:FORMat?`

Syntax: `[:SENSe]:VVM:FORMat DB|VSWR|IMPedance`

Parameter: `DB|VSWR|IMPedance`

Default Value: DB

Example: To set the type to VSWR:

```
:SENSe:VVM:FORMat VSWR
```

Front Panel Access: **CW**, Return Meas Format

Measurement Mode

[:SENSe]:VVM:MODE CW|TABLe

Title: Measurement Mode

Description: Sets the VVM measurement mode. The query format of the command returns the VVM measurement mode.

Query: `[:SENSe]:VVM:MODE?`

Syntax: `[:SENSe]:VVM:MODE CW|TABLe`

Parameter: `CW|TABLe`

Default Value: CW

Example: To set the mode to Table:

`:SENSe:VVM:MODE TABLe`

Front Panel Access: CW: **Hard Key 1**

TABLe: **Hard Key 2**

Port

[:SENSe]:VVM:PORT 1|2

Title: Port

Description: Selects the VVM measurement port. The query format of the command returns the current VVM measurement port.

Query: `[:SENSe]:VVM:PORT?`

Syntax: `[:SENSe]:VVM:PORT 1|2`

Parameter: `1|2`

Default Value: 1

Example: To set the Port to 2:

`:SENSe:VVM:PORT 2`

Front Panel Access: **CW**/**Table**, Cal Port

Measurement Type

[:SENSe]:VVM:TYPE RETurn|INSertion

Title: Measurement Type

Description: Sets the VVM measurement type. The query format of the command returns the VVM measurement type.

Query: `[:SENSe]:VVM:TYPE?`

Syntax: `[:SENSe]:VVM:TYPE RETurn|INSertion`

Parameter: `RETurn|INSertion`

Default Value: RET

Example: To set the type to Insertion:

```
:SENSe:VVM:TYPE INSertion
```

Front Panel Access: **CW**/**Table**, Measurement Type

[:SENSe:]:VVM:CABLe Subsystem

This subsystem contains commands to select/query the VVM cable.

Table 4-5. [:SENSe:]:VVM:CABLe Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:CABLe			
:SELect	<char>	1|2|3|4|5|6|7|8|9|10|11|12	Query Exists
:SELect?	<char>	1|2|3|4|5|6|7|8|9|10|11|12	Query Form

Cable

[:SENSe]:VVM:CABLe:SELect 1|2|3|4|5|6|7|8|9|10|11|12

Title: Cable

Description: Selects the VVM cable. The query format of the command returns the current VVM cable number.

Query: [:SENSe]:VVM:CABLe:SELect?

Syntax: [:SENSe]:VVM:CABLe:SELect 1|2|3|4|5|6|7|8|9|10|11|12

Parameter: 1|2|3|4|5|6|7|8|9|10|11|12

Default Value: 1

Example: To set the Cable to 6:

```
:SENSe:VVM:CABLe:SELect 6
```

Front Panel Access: **Table**, Select Cable

[:SENSe]:VVM:FREQuency Subsystem

This subsystem contains commands pertaining to the frequency settings of the Vector Voltmeter.

Table 4-6. [:SENSe]:VVM:FREQuency Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:FREQuency			
:CW	<NRf>	Hertz	Query Exists
:CW?	<NR3>	Hertz	Query Form

CW Frequency

[:SENSe]:VVM:FREQuency:CW <freq>

Title: CW Frequency

Description: Sets the VVM CW frequency. The query format of the command returns the CW frequency.

Query: [:SENSe]:VVM:FREQuency:CW?

Syntax: [:SENSe]:VVM:FREQuency:CW <freq>

Parameter: <freq>

Default Value: 5000 Hz

Default Units: Hz

Range: 5 kHz to 20 GHz

Front Panel Access: **CW**/**Table**, CW Frequency

[:SENSe:]:VVM:REFerence Subsystem

This subsystem contains commands to set and clear the reference VVM data.

Table 4-7. [:SENSe:]:VVM:REFerence Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:REFerence			
:CLEar	NA	NA	No Query
:MEMorize	NA	NA	No Query

Clear Reference

[:SENSe]:VVM:REFerence:CLEar

Title: Clear Reference

Description: Clears the reference data for the current port and measurement type.

Query: No Query

Syntax: `[:SENSe]:VVM:REFerence:CLEar`

Default Value: No Reference

Example: To clear the Reference:

`:SENSe:VVM:REFerence:CLEar`

Front Panel Access: **CW**/**Table**, Clear Reference

Set Reference

[:SENSe]:VVM:REFerence:MEMorize

Title: Set Reference

Description: Sets the reference data for the current port and measurement type.

Query: No Query

Syntax: `[:SENSe]:VVM:REFerence:MEMorize`

Default Value: No Reference

Example: To set the new Reference:

`:SENSe:VVM:REFerence:MEMorize`

Front Panel Access: **CW**/**Table**, Save New Reference

4-5 :FETCh:VVM Subsystem

This subsystem contains commands to fetch the VVM reference data and relative data.

Table 4-8. :FETCh:VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:VVM			
:DATA?	NA	Comma separated values	Query Only
:REFerence		Refer to Table 4-10 on page 4-15.	

Data

:FETCh:VVM:DATA?

Title: Data

Description: Returns the most recent VVM measurement results. Data is returned as 2 or 4 comma-separated values depending upon the measurement type, measurement format, measurement mode, port, and the reference setting. A "–" is returned for any data that is not valid at that instance.

Table 4-9. VVM Measurement Results (Sheet 1 of 2)

If	Then	Data Values
If the measurement type is Insertion, and if the measurement mode is CW,	then data is returned as 4 comma-separated values	Amplitude Phase Reference Amplitude Reference Phase.
If the measurement type is Insertion, and if the measurement mode is CW with save new reference set,	then data is returned as 4 comma-separated values	Relative Amplitude Relative Phase Reference Amplitude Reference Phase.
If the measurement type is Return, and if the measurement mode is CW, and if format is set to dB,	then data is returned as 4 comma-delimited values	Amplitude Phase Reference Amplitude Reference Phase.
If the measurement type is Return, and if the measurement mode is CW with save new reference set, and if format is set to dB,	then data is returned as 4 comma-delimited values	Relative Amplitude Relative Phase Reference Amplitude Reference Phase.
If the measurement type is Return, and if format is set to VSWR,	then data is returned as 2 comma-delimited values	VSWR Reference VSWR.
If the measurement type is Return, and if the measurement mode is CW with save new reference set, and if format is set to VSWR,	then data is returned as 2 comma-delimited values	Relative VSWR Reference VSWR.
If the measurement type is Return, and if the measurement mode is CW, and if format is set to Impedance,	then data is returned as 4 comma-delimited values	Real Imaginary Reference Real Reference Imaginary.

Table 4-9. VVM Measurement Results (Sheet 2 of 2)

If	Then	Data Values
If the measurement type is Return, and if the measurement mode is CW with save new reference set, and if format is set to Impedance,	then data is returned as 4 comma-delimited values	Relative Real Relative Imaginary Reference Real Reference Imaginary.
If the measurement mode is Table with save new reference set,	then data is returned as 4 comma-separated values	Amplitude Phase Relative Amplitude Relative Phase.

Query: Query Only

Syntax: `:FETCh:VVM:DATA?`

Example: To fetch the VVM data:

```
:FETCh:VVM:DATA?
```

Front Panel Access: **NA**

FETCh:VVM:REFerence Subsystem

This subsystem contains commands to fetch VVM reference data.

Table 4-10. :FETCh:VVM:REFerence Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:VVM			
:REFerence			
:DATA?	NA	Comma separated values	Query Only

Reference Data

:FETCh:VVM:REFerence:DATA?

Title: Reference Data

Description: Returns the reference data depending upon the measurement type, the measurement format, and the current port.

Query: Query Only

Syntax: :FETCh:VVM:REFerence:DATA?

Example: To fetch the VVM reference data:

```
:FETCh:VVM:REFerence:DATA?
```

Front Panel Access: **NA**

Chapter 5 — Power Monitor Commands

5-1 Introduction

This chapter describes commands for Power Monitor mode. Only the commands that are listed in this chapter and in Chapter 6, “All Mode Commands” can be used in Power Monitor mode. Using commands from other modes may produce unexpected results.

5-2 Power Monitor Commands

Table 5-1. Power Monitor Commands Subsystems

Keyword	Parameter Data or Units
:TRACe	Refer to Table 5-2, “:TRACe Power Monitor Subsystem Commands” on page 5-2
:CALCulate	
PMONitor	Refer to Table 5-5, “:CALCulate:PMONitor Subsystem” on page 5-5
:RELative	Refer to Table 5-6, “:CALCulate:PMONitor:RELative Subsystem” on page 5-7
:ZERO	Refer to Table 5-7, “:CALCulate:PMONitor:ZERO Subsystem” on page 5-8
:FETCh	
PMONitor	Refer to Table 5-8, “:FETCh:PMONitor Subsystem” on page 5-9
:RELative	Refer to Table 5-9, “:FETCh:PMONitor:RELative Subsystem” on page 5-10
:ZERO	Refer to Table 5-10, “:FETCh:PMONitor:ZERO Subsystem” on page 5-11

5-3 :TRACe Power Monitor Subsystem

This subsystem contains commands pertaining to the Vector Voltmeter mode.

Table 5-2. :TRACe Power Monitor Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
:PREamble?	<char>	Returns block data	Query Only

Trace Header Transfer

:TRACe:PREamble?

Title: Trace Header Transfer

Description: Returns trace header information. The response begins with an ASCII header. The header specifies the number of following bytes. It appears in the format `#AX`, where `A` is the number of digits in `X`, and `X` is the number of bytes that follow the header.

Parameters are returned in comma-delimited ASCII format. Each parameter is returned as `"NAME=VALUE[UNITS]"`. Note that the parameters that are returned depend on the firmware version and that this document does not cover all parameter values that are returned by the command. Refer to Table 5-3.

For the example response, the serial number (SN) is 83320013 and is returned as "SN=83320013". Refer to section "Example Response Format:".

Query: Query Only

Syntax: `:TRACe:PREamble?`

Front Panel Access: **NA**

Example Response Format:

[#800000414SN=83320013,UNIT_NAME=,TYPE=DATA,DATE=1999-11-30-02-00-01-42,APP_NAME=MWVNA,APP_VER=T0.00.1001,PM_RELATIVE=1.000000,PM_OFFSET=0.000000,PM_UPPER_THRESHOLD_STATE=0.000000,PM_LOWER_THRESHOLD_STATE=0.000000,PM_UPPER_THRESHOLD=0.000000,PM_LOWER_THRESHOLD=0.000000,PM_DBMUNITS=0.000000,PM_ZERO=1.000000,PM_DBUNITS=0.000000,PM_DATA=-200000.000000,PM_STATUS=1.000000,PM_ZERO_DATA=-200000.000000,PM_REL_DATA=-200000.000000,]

Trace Header Parameters

Table 5-3 describes parameters that can be returned by the :TRACe:PREamble? command.

Table 5-3. Trace Header Parameters

Parameter Name	Description
SN	Instrument Serial #
UNIT_NAME	Instrument name
DATE	Trace date/time
APP_NAME	Application name
APP_VER	Application firmware (FW) version
PM_RELATIVE[a]	Relative State (Off/On), where 0 is On and 1 is Off
PM_OFFSET[b]	Offset value
PM_DBMUNITS	Specifies the unit (dBm or watts), when Relative is Off, where 0 is returned for “dBm”, and 1 for “watts”
PM_DBUNITS	Specifies the unit (dB or Percent), when Relative is On, where 0 is returned for “dB”, and 1 for “Percent”
PM_ZERO[a]	Zero State (Off/On), where 0 is On and 1 is Off
PM_DATA[c]	Power Monitor reading
PM_ZERO_DATA[d]	Zero data
PM_REL_DATA[e]	Reference data

a.For both PM_RELATIVE and PM_ZERO, the :TRACe:PREamble? command returns 0 for On, and returns 1 for Off. This is not the same as the values that are returned from :CALCulate:PMONitor:RELative[:STATe]? and from :CALCulate:PMONitor:ZERO[:STATe]?, where 0 is returned for Off, and 1 is returned for On.

b.The value that is returned by PM_OFFSET is in units of millidecibel (mdB). (For example: When “1” is returned, the measurement value is 1 mdB. When “2000” is returned, the measurement value is 2000 mdB, or 2 dB.)

c.The value that is returned by PM_DATA is in the units that have been set with the Units command (:CALCulate:PMONitor:UNITs DBM|WATT|DB|PERCent).
If the set Unit is dBm or percent or dB, then the returned value is 1000 times the unit value.
If the unit is watt, then the returned value is 10 times nW (in other words, the units are in 0.1 nanowatt (0.1 nw) increments). Examples:
When the unit is in percent, and 1000 is returned, then the measurement value is 1 percent.
When the unit is in dB, and −1000 is returned, then the measurement value is −1 dB.
When the unit is in dBm, and −1000 is returned, then the measurement value is −1 dBm.
When the unit is in dBm, and −4600 is returned, then the measurement value is −4.6 dBm.
When the unit is in watts, and 1 is returned, then the measurement value is 0.1 nW.
When the unit is in watts, and 3500000 is returned, then the measurement value is 350 µW.

d.The value that is returned by PM_ZERO_DATA is in 0.1 nanowatt (0.1 nw) increments. (For example: When “1” is returned, then the measurement value is 0.1 nw. When “20” is returned, then the measurement value is 2.0 nw.)

e.The value that is returned by PM_REL_DATA is 1000 times the unit value in dBm (in other words, the units are in 0.001 dBm increments, or 1 millidBm (mdBm) increments. Examples:
When “1000” is returned, then the measurement value is 1 dBm.
When “20000” is returned, then the measurement value is 20 dBm.)

5-4 :CALCulate Subsystem

This subsystem contains commands for the power monitor mode.

Table 5-4. :CALCulate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor		Refer to Table 5-5 on page 5-5	
:RELative		Refer to Table 5-6 on page 5-7	
:ZERO		Refer to Table 5-7 on page 5-8	

5-5 :CALCulate:PMONitor Subsystem

This subsystem contains commands for the power monitor mode.

Table 5-5. :CALCulate:PMONitor Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:OFFSet	<NR1>	0 to 60000 millidecibels	Query Exists
:OFFSet?	<NR1>	0 to 60000 millidecibels	Query Form
:UNITs	<char>	DBM|WATT|DB|PERCent	Query Exists
:UNITs?	<char>	DBM|WATT|DB|PERC	Query Form
:RELative		Refer to Table 5-6 on page 5-7	
:ZERO		Refer to Table 5-7 on page 5-8	

Offset

:CALCulate:PMONitor:OFFSet <val>

Title: Offset

Description: Sets the offset power level in millidecibels (mdB).

Query: :CALCulate:PMONitor:OFFSet?

Syntax: :CALCulate:PMONitor:OFFSet <val>

Parameter: <val>

Default Value: 0 dB

Default Units: millidecibels (mdB)

Range: 0 to 60000 mdB

Example: To set the offset power level at 1 dB:

```
:CALCulate:PMONitor:OFFSet 1000
```

Front Panel Access: **Measurement** or **Shift-4** (Measure), Offset

Units

:CALCulate:PMONitor:UNITs DBM|WATT|DB|PERCent

Title: Units

Description: Sets the units to a particular type depending upon whether the relative power level is turned ON or OFF.

Setting the value to DBM or to WATT when the relative power level is OFF sets the display units accordingly.

Setting the value to DBM or to WATT when the relative power level is ON **does not change** the display units. The change becomes effective after the relative power level is turned OFF.

Setting the value to DB or to PERC when the relative power level is ON sets the display units accordingly.

Setting the value to DB or to PERC when the relative power level is OFF **does not change** the display units. The change becomes effective after the relative power level is turned ON.

When the relative power level is OFF, the query version of the command returns DBM if the unit is dBm and returns WATT if the unit is watts. When the relative power level is ON, it returns DB if the unit is dB and returns PERC if the unit is percentage.

Query: `:CALCulate:PMONitor:UNITs?`

Syntax: `:CALCulate:PMONitor:UNITs DBM|WATT|DB|PERCent`

Parameter: `DBM|WATT|DB|PERCent`

Default Value: DBM

Default Units: DBM, WATT, DB, PERCent when setting.

DBM, WATT, DB, PERC for query.

Example: To show the units in watts (if the relative power level is Off):

```
:CALCulate:PMONitor:UNITs WATT
```

To show the units in dB (if the relative power level is On):

```
:CALCulate:PMONitor:UNITs DB
```

Related Command: `:CALCulate:PMONitor:RELative`

Front Panel Access: **Measurement** or **Shift-4** (Measure), Units

:CALCulate:PMONitor:RELative Subsystem

This subsystem contains commands to turn the relative power level on/off.

Table 5-6. :CALCulate:PMONitor:RELative Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:RELative			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

Relative State

:CALCulate:PMONitor:RELative[:STATe] OFF|ON|0|1

Title: Relative State

Description: Enables/disables the Relative power level. Setting the value to ON or 1 turns on the relative power level. Setting the value to OFF or 0 turns off the relative power level. The query version of the command returns a 1 if the relative power level is ON and returns a 0 if the relative power level is OFF.

Query: `:CALCulate:PMONitor:RELative[:STATe]?`

Syntax: `:CALCulate:PMONitor:RELative[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: 0

Example: To turn Off the relative power:

```
:CALCulate:PMONitor:RELative:STATe OFF
```

OR

```
:CALCulate:PMONitor:RELative 0
```

To turn On the relative power:

```
:CALCulate:PMONitor:RELative:STATe ON
```

OR

```
:CALCulate:PMONitor:RELative 1
```

Front Panel Access: **Measurement** or **Shift-4** (Measure), Relative Power

:CALCulate:PMONitor:ZERO Subsystem

This subsystem contains commands to turn the zero power level on/off.

Table 5-7. :CALCulate:PMONitor:ZERO Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:ZERO			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

Zero State

:CALCulate:PMONitor:ZERO[:STATe] OFF|ON|0|1

Title: Zero State

Description: Enables and disables the Zero power level. Setting the value to ON or 1 turns On the Zero power level. Setting the value to OFF or 0 turns Off the Zero power level. The query version of the command returns a 1 if the Zero power level is ON and returns a 0 if the Zero power level is OFF.

Query: `:CALCulate:PMONitor:ZERO[:STATe]?`

Syntax: `:CALCulate:PMONitor:ZERO[:STATe] OFF|ON|0|1`

Parameter: `OFF|ON|0|1`

Default Value: 0

Example: To turn Off the Zero power:

```
:CALCulate:PMONitor:ZERO:STATe OFF
```

OR

```
:CALCulate:PMONitor:ZERO 0
```

To turn On the Zero power:

```
:CALCulate:PMONitor:ZERO:STATe ON
```

OR

```
:CALCulate:PMONitor:ZERO 1
```

Front Panel Access: **Measurement** or **Shift-4** (Measure), Zero

5-6 :FETCh:PMONitor Subsystem

This subsystem contains commands to fetch the power monitor reference power level data, zero power level data and the displayed power level data.

Table 5-8. :FETCh:PMONitor Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:PMONitor			
:DATA?	<NR3>	Depends on set unit	Query Only
:RELative		Refer to Table 5-9 on page 5-10	
:ZERO		Refer to Table 5-10 on page 5-11	

Displayed Data

:FETCh:PMONitor:DATA?

Title: Displayed Data

Description: Fetches the displayed power level data. The returned value is returned in the units that have been set with the Units command (:CALCulate:PMONitor:UNITs DBM|WATT|DB|PERCent).

If units are in dBm, then the returned value is in dBm.

If units are in percent, then the returned value is in percent.

If units are in dB, then the returned value is in dB.

If units are in watts, then the returned value is in 0.1 uW (0.1 microwatt) increments. For example:

Returned Value	Measurement Value
1	0.1 microwatt
10	1 microwatt
25000	2500 microwatts or 2.50 milliwatts
12000000	1200000 microwatts or 1.2000000 watts

Returned value.

Query: Query Only

Syntax: :FETCh:PMONitor:DATA?

Example: To fetch the displayed power level data:

:FETCh:PMONitor:DATA?

Front Panel Access: NA

:FETCh:PMONitor:RELative Subsystem

This subsystem contains commands to fetch the power monitor reference power level.

Table 5-9. :FETCh:PMONitor:RELative Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
PMONitor			
:RELative			
:DATA?	<NR3>	Units in dBm	Query Only

Reference Power Level

:FETCh:PMONitor:RELative:DATA?

Title: Reference Power Level

Description: Fetches the reference power level data. The returned value is in dBm.

Query: Query Only

Syntax: :FETCh:PMONitor:RELative:DATA?

Example: To fetch the reference power level data:

:FETCh:PMONitor:RELative:DATA?

Front Panel Access: NA

:FETCh:PMONitor:ZERO Subsystem

This subsystem contains commands to fetch the power monitor zero power level.

Table 5-10. :FETCh:PMONitor:ZERO Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:PMONitor			
:ZERO			
:DATA?	<NR3>	Units in nW (nanowatts)	Query Only

Zero Power Level

:FETCh:PMONitor:ZERO:DATA?

Title: Zero Power Level

Description: Fetches the zero power level data in nanowatts. The returned value is in nW (nanowatts).

Query: Query Only

Syntax: :FETCh:PMONitor:ZERO:DATA?

Example: To fetch off the Zero power level data:

```
:FETCh:PMONitor:ZERO:DATA?
```

Front Panel Access: NA

Chapter 6 — All Mode Commands

6-1 Introduction

The commands that are listed in this chapter are functional in the following instrument modes of operation:

- Vector Network Analyzer
- Vector Voltmeter
- Power Monitor

6-2 All Mode Commands

Table 6-1. All Mode Commands Subsystems

Keyword	Parameter Data or Units
`:INSTrument`	Refer to Table 6-2, ":INSTrument Subsystem Commands" on page 6-2
`:MMEMory`	Refer to Table 6-3, ":MMEMory Subsystem" on page 6-5
`:SYSTem`	Refer to Table 6-7, ":SYSTem Subsystem" on page 6-13

6-3 :INSTrument Subsystem

One instrument may contain many logical instruments (“modes”). This subsystem controls the selection of the current instrument mode.

Table 6-2. :INSTrument Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:INSTrument			
:CATalog			
:FULL?	NA	Comma separated list	Query Only
:NSELect	<NR1>	10 for HI_PM[a] 26 for MWVNA[b] 101 for Power Monitor[c] 102 for VVM[d]	Query Exists
:NSELect?	<NR1>	10 for HI_PM 26 for MWVNA 101 for Power Monitor 102 for VVM	Query Form
[:SELect]	<string>	HI_PM|MWVNA|Power Monitor|VVM	Query Exists
[:SELect]?	<string>	HI_PM|MWVNA|Power Monitor|VVM	Query Form

a.“HI_PM” is for High Accuracy Power Meter mode.

b.“MWVNA” is for Microwave Vector Network Analyzer mode.

c.“Power Monitor is for Power Monitor mode.

d.“VVM” is for Vector Voltmeter mode.

:INSTrument:CATalog:FULL?

Title: Query Available Modes

Description: Returns a comma-separated list of available modes. Mode names are enclosed in double quotes (“ ”). The application number immediately follows the string name. For example: `"HI_PM"10,"MWVNA"26`

Query: Query Only

Syntax: `:INSTrument:CATalog:FULL?`

Front Panel Access: **Shift-9** (Mode)

Select Mode by Number

`:INSTrument:NSELect <integer>`

Title: Select Mode by Number

Description: Sets the instrument mode based on the value of `<integer>`. The query version returns the number that is associated with the current mode. Use `:INSTrument:CATalog:FULL?` to get a list of available mode names and their integer representations.

Query: `:INSTrument:NSELect?`

Syntax: `:INSTrument:NSELect <integer>`

Parameter: `<integer>`

`10` = High Accuracy Power Meter

`26` = Microwave Vector Network Analyzer

`101` = Power Monitor

`102` = Vector Voltmeter

Parameter Type: <integer>

Related Command: `:INSTrument:CATalog:FULL?`

`:INSTrument[:SELect]:INITiate:CONTinuous`

`:STATus:OPERation?`

Front Panel Access: **Shift-9** (Mode)

Note	Switching modes can take longer than 60 seconds, depending on the application. Anritsu Company advises you to set the remote PC time-out to 120 seconds in order to avoid unexpected time-out errors.

Select Mode by Name

:INSTrument[:SELect] <string>

Title: Select Mode by Name

Description: Sets the instrument mode based on the mode name that is specified by <string>. The query version returns the name of the current mode. Use :INSTrument:CATalog:FULL? to get a list of available modes. For Power Monitor, use "Power Monitor", and for Vector Voltmeter, use "VVM".

Query: :INSTrument[:SELect]?

Syntax: :INSTrument[:SELect] <string>

Parameter: <string>

HI_PM = High Accuracy Power Meter

MWVNA = Microwave Vector Network Analyzer

Power Monitor = Power Monitor

VVM = Vector Voltmeter

Related Command: :INSTrument:CATalog:FULL?

:INSTrument:NSELect

Front Panel Access: **Shift-9** (Mode)

Note	Switching modes can take longer than 60 seconds, depending on the application. Anritsu Company advises you to set the remote PC time-out to 120 seconds in order to avoid unexpected time-out errors.

6-4 :MMEMory Subsystem

The Mass MEMory subsystem contains functions that provide access to the instrument setup and data storage.

Table 6-3. :MMEMory Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:DELete	<string>	filename	No Query
:LOAD		Refer to ":MMEMory:LOAD Subsystem" on page 6-7	
:MSIS?			
:MSIS		Refer to ":MMEMory:MSIS Subsystem" on page 6-9	
:STORe		Refer to ":MMEMory:STORe Subsystem" on page 6-11	

Delete Data/Location

:MMEMory:DELete <file name>

Title: Delete Data/Location

Description: This command deletes a file. `<file name>` must be enclosed in either single quotes (‘ ‘) or double quotes (“ “) and must include the file extension.

Query: No Query

Syntax: `:MMEMory:DELete <file name>`

Parameter: `<file name>`

Front Panel Access: **Shift-7** (File), Delete, Select or De-Select, Delete

:MMEMory:LOAD Subsystem

The Mass MEMory LOAD subsystem contains commands to transfer from the mass memory device to the internal memory.

Table 6-4. :MMEMory:LOAD Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:LOAD			
:STATe	<integer>, <string>	1, filename	No Query
:TRACe	<integer>, <string>	1, filename	No Query

Recall Setup

:MMEMory:LOAD:STATe <integer>,<file name>

Title: Recall Setup

Description: Recalls a previously stored setup from the current storage location. The saved setup that is to be loaded is specified by <file name>. <file name> must be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and must include the extension ".stp". The <integer> parameter is not currently used, but it must be sent. Send a value of 1.

Query: No Query

Syntax: :MMEMory:LOAD:STATe <integer>,<file name>

Parameter: <integer>,<file name>

Related Command: :MMEMory:STORe:STATe

:MMEMory:MSIS INTernal|USB

Front Panel Access: **Shift-7** (File), Recall

Recall Measurement

:MMEMory:LOAD:TRACe <integer>,<file name>

Title: Recall Measurement

Description: Recalls a previously stored measurement trace from the current storage location. The saved measurement trace that is to be loaded is specified by `<file name>`. `<file name>` must be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and must contain a file extension of `".mna"`. Note that the trace that is specified by `<file name>` must be available at the current mass storage location. The `<integer>` parameter is not currently in use, but it must be sent. Send a 1. File Extensions: `".mna"`.

Query: No Query

Syntax: `:MMEMory:LOAD:TRACe <integer>,<file name>`

Parameter: `<integer>,<file name>`

Example: To recall trace with file name “trace”:

```
:MMEMory:LOAD:TRACe 1,"trace.mna"
```

Related Command: `:MMEMory:STORe:TRACe`

`:MMEMory:MSIS INTernal|USB`

Front Panel Access: **Shift-7** (File), Recall

:MMEMory:MSIS Subsystem

The Mass MEMory "Mass Storage IS" subsystem contains commands for selecting a mass storage device that is used by all of the MMEMory commands.

Table 6-5. :MMEMory:MSIS Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:MSIS?	<char>	INT|USB	Query Form
:MSIS	<char>	INTernal|USB	Query Exists
:COPY	NA	NA	No Query
:DESTination	<char>	INTernal|USB	Query Exists
:DESTination?	<char>	INT|USB	Query Form

Storage Location

:MMEMory:MSIS INTernal|USB

Title: Storage Location

Description: Sets the storage location. Setting the storage location to INTernal sets the current storage location to be the internal memory. Setting the storage location to USB sets the current storage location to be the USB Flash drive. Note that changing the current location to save files causes the "Copy to Destination" on the front panel to be automatically changed if the selected current location is the same as the destination. When the change occurs, the instrument cycles through each of the available storage locations.

Note that the storage location can be set independently and can be different for remote operation and front panel operation. Changing the copy location remotely does not change the location that is set and displayed on the front panel. Similarly, changing the copy location via the front panel does not affect the location that is used by the remote operation commands.

Note that the storage location must be available in order for it to be set.

Query: `:MMEMory:MSIS?`

Syntax: `:MMEMory:MSIS INTernal|USB`

Parameter: `INTernal|USB`

Related Command: `:MMEMory:MSIS:DESTination`

Front Panel Access: **NA**

Copy From Current Location To Destination

:MMEMory:MSIS:COPY

Title: Copy From Current Location To Destination

Description: Copies all measurements, setups, and `*.jpg` files that are stored in the current storage location to the "copy to destination" location.

Query: No Query

Syntax: `:MMEMory:MSIS:COPY`

Related Command: `:MMEMory:MSIS`

`:MMEMory:MSIS:DESTination`

Front Panel Access: **NA**

Copy to Destination

:MMEMory:MSIS:DESTination INTernal|USB

Title: Copy to Destination

Description: Sets the destination to where measurements and setups in the current storage location are to be copied.

Setting the location to INTernal copies the files that are stored at the current storage location into the internal memory when the command :MMEMory:MSIS:COPY is sent.

Setting the location to USB copies the files that are stored at the current storage location into the USB Flash drive when the command :MMEMory:MSIS:COPY is sent.

Note that the storage location can be set independently and can be different for remote operation and front panel operation. Changing the save location remotely does not change the location that is set and displayed on the front panel. Similarly, changing the save location via the front panel does not affect the location that is used by the remote operation commands.

Query: `:MMEMory:MSIS:DESTination?`

Syntax: `:MMEMory:MSIS:DESTination INTernal|USB`

Parameter: `INTernal|USB`

Related Command: `:MMEMory:MSIS`

`:MMEMory:MSIS:COPY`

Front Panel Access: **Shift-7** (File), Copy, Scroll Destination Folder, Select or De-Select

:MMEMory:STORe Subsystem

The Mass MEMory STORe subsystem contains commands to transfer from the internal memory to the mass memory device.

Table 6-6. :MMEMory:STORe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:STORe			
:STATe	<integer>, <string>	1|2, filename	No Query
:TRACe	<integer>, <string>	1|2, filename	No Query

Save Setup

:MMEMory:STORe:STATe <integer>,<file name>

Title Save Setup

Description Stores the current setup into the file that is specified by <file name>. <file name> must be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and must not contain a file extension. The <integer> is used to distinguish whether the calibration should be saving with the setup. Send a 1 to save setup without a calibration. Send a 2 to save setup with calibration.

Query No Query

Syntax :MMEMory:STORe:STATe <integer>,<file name>

Front Panel Access: **NA**

Save Measurement

:MMEMory:STORe:TRACe <integer>,<file name>

Title: Save Measurement

Description: Stores the trace into the file that is specified by `<file name>`. `<file name>` must be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and must not contain a file extension. The `<integer>` parameter is used to distinguish which type of files to save. The following types are available:

<Integer>	:	File type
1	:	Measurement file (default, if number is not 1 to 6)
2	:	S2P Real/Imag
3	:	S2P Lin Mag/Phase
4	:	S2P Log Mag/Phase
5	:	Text
6	:	CSV

Query: `No Query`

Syntax: `:MMEMory:STORe:TRACe <integer>,<file name>`

Parameter: `<integer>,<file name>`

Example: To save the trace into the file named “trace”.

```
:MMEMory:STORe:TRACe 1,"trace"
```

Related Command: `:MMEMory:LOAD:TRACe`

Front Panel Access: **Shift-7** (File), Save

6-5 :SYSTem Subsystem

This subsystem contains commands that affect instrument functionality. This functionality does not directly relate to data collection, display, or transfer.

Table 6-7. :SYSTem Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SYSTem			
:OPTions?	NA	Options separated by "/" or "NONE"	Query Only

:SYSTem:OPTions?

Title: Query Installed Options

Description: Returns a string of the installed options. Options are separated by a "/". The string returns "NONE" if no options are installed.

Query: Query Only

Syntax: :SYSTem:OPTions?

Related Command: *IDN?

Appendix A — Example

A-1 Introduction

This appendix provides examples of C/C++ and Visual Basic coding.

A-2 C/C++

This example is run on the command line. It sends the *IDN? query to the instrument and prints the response to the console.

```
// IdnExample.cpp : Microsoft Visual Studio-Generated Example
//    Based on Example 2-1 in the NI-VISA User Manual
//    Usage : IdnExample "TCPIP::xxx.xxx.xxx.xxx::inst0::INSTR"
//       where xxx.xxx.xxx.xxx is the IP address of the
//       instrument.
//    Output : The string identity string returned from the
//       instrument.
//    VISA Header : visa.h (must be included)
//    VISA Library : visa32.lib (must be linked with)

#include "stdafx.h"
#include "stdio.h"
#include "string.h"
#include "visa.h"

#define BUFFER_SIZE 255

int main(int argc, char* argv[])
{
    ViStatus status; /* For checking errors */
    ViSession defaultRM, instr; /* Communication channels */
    ViUInt32 retCount; /* Return count from string I/O */
    ViChar buffer[BUFFER_SIZE]; /* Buffer for string I/O */
    char tempDisplay[BUFFER_SIZE]; /* Display buffer for example */
    char *pAddress;

    /* Make sure we got our address. */
    if ( argc < 2 )
    {
      printf("Usage: IdnExample
      \"TCPIP::xxx.xxx.xxx.xxx::inst0::INSTR\"\n");
      printf("\t where xxx.xxx.xxx.xxx is the IP address of your
      instrument.\n");
      return -1;
    }
```

```
/* Store the address. */
pAddress = argv[1];

/* Begin by initializing the system*/
status = viOpenDefaultRM(&defaultRM);

if (status < VI_SUCCESS)
{
     /* Error Initializing VISA...exiting*/
     printf("Can't initialize VISA\n");
     return -1;
}

/* Open communication with TCP/IP device at xxx.xxx.xxx.xxx*/
/* NOTE: For simplicity, we will not show error checking*/
/* TODO: Add error handling. */
status = viOpen(defaultRM, pAddress, VI_NULL, VI_NULL, &instr);

/* Set the timeout for message-based communication*/
/* TODO: Add error handling. */
status = viSetAttribute(instr, VI_ATTR_TMO_VALUE, 120000);

/* Ask the device for identification */
sprintf(buffer, "*IDN?\n");
status = viWrite(instr, (unsigned char *)&buffer[0], 6, &retCount);
status = viRead(instr, (unsigned char *)buffer, BUFFER_SIZE,
&retCount);

/* TODO: Add code to process data. */
strncpy(tempDisplay, buffer, retCount);
tempDisplay[retCount] = 0;   /* Null-terminate display string. */
printf("*IDN? Returned %d bytes: %s\n", retCount, tempDisplay);
```

```
    /* Close down the system */
    /* TODO: Add error handling. */
    status = viClose(instr);
    status = viClose(defaultRM);

    return 0;
}
```

A-3 Visual Basic

This function can be called in a Visual Basic program. It sends the *IDN? query to the instrument and returns the byte count and ASCII response string.

```
Rem This example is based on Example 2-1 from the NI-VISA User Manual.


Public Sub IdnMain(ByVal address As String, ByRef byteCount As String,
ByRef returnBytes As String)
     Const BUFFER_SIZE = 200
     Dim stat As ViStatus
     Dim dfltRM As ViSession
     Dim sesn As ViSession
     Dim retCount As Long
     Dim buffer As String * BUFFER_SIZE

     Rem ***Include visa32.dll as a reference in your project.***

     Rem Begin by initializing the system
     stat = viOpenDefaultRM(dfltRM)
     If (stat < VI_SUCCESS) Then
       Rem Error initializing VISA...exiting
       MsgBox "Can't initialize VISA"
       Exit Sub
     End If

     Rem Open communication with Device
     Rem NOTE: For simplicity, we will not show error checking
     Rem TODO: Add error handling.
     stat = viOpen(dfltRM, address, VI_NULL, VI_NULL, sesn)
```

```
    Rem Set the timeout for message-based communication
    Rem TODO: Add error handling.
    stat = viSetAttribute(sesn, VI_ATTR_TMO_VALUE, 120000)

    Rem Ask the device for identification
    Rem TODO: Add error handling.
    stat = viWrite(sesn, "*IDN?", 5, retCount)
    stat = viRead(sesn, buffer, BUFFER_SIZE, retCount)

    Rem TODO: Add code to process the data.
    byteCount = retCount
    returnBytes = Left(buffer, retCount)

    Rem Close down the system
    Rem TODO: Add error handling.
    stat = viClose(sesn)
    stat = viClose(dfltRM)
End Sub
```

Appendix B — List of Commands by Mode

B-1 Introduction

This appendix lists all of the SCPI commands in 4 groups: VNA, VVM, Power Monitor, and All Mode Commands. Note that these commands are hypertext links to the command lines within the individual chapters.

B-2 VNA Commands

:CALCulate<Tr>:DATA? FDATa|SDATa|FMEM|SMEM
:CALCulate<Tr>:FORMat <Graph Type>
:CALCulate:LIMit:ALARm OFF|ON|0|1
:CALCulate<Tr>:LIMit:LOWer:POINt?
:CALCulate<Tr>:LIMit:LOWer:POINt:ADD
:CALCulate<Tr>:LIMit:LOWer:POINt:DELete
:CALCulate<Tr>:LIMit:LOWer:POINt:LEFT
:CALCulate<Tr>:LIMit:LOWer:POINt:RIGHt
:CALCulate<Tr>:LIMit:LOWer:POINt:X <x-parameter>
:CALCulate<Tr>:LIMit:LOWer:POINt:Y <y-parameter>
:CALCulate<Tr>:LIMit:LOWer[:STATe] OFF|ON|0|1
:CALCulate<Tr>:LIMit:LOWer:X <x-parameter>
:CALCulate<Tr>:LIMit:LOWer:Y <y-parameter>
:CALCulate:LIMit:POINt?
:CALCulate:LIMit:POINt:ADD
:CALCulate:LIMit:POINt:DELete
:CALCulate:LIMit:POINt:LEFT
:CALCulate:LIMit:POINt:RIGHt
:CALCulate:LIMit:POINt:X <x-parameter>
:CALCulate:LIMit:POINt:Y <y-parameter>
:CALCulate:LIMit[:STATe] OFF|ON|0|1
:CALCulate:LIMit:TYPE 0|1
:CALCulate<Tr>:LIMit:UPPer:POINt?
:CALCulate<Tr>:LIMit:UPPer:POINt:ADD
:CALCulate<Tr>:LIMit:UPPer:POINt:DELete
:CALCulate<Tr>:LIMit:UPPer:POINt:LEFT
:CALCulate<Tr>:LIMit:UPPer:POINt:RIGHt
:CALCulate<Tr>:LIMit:UPPer:POINt:X <x-parameter>
:CALCulate<Tr>:LIMit:UPPer:POINt:Y <y-parameter>
:CALCulate<Tr>:LIMit:UPPer[:STATe] OFF|ON|0|1

:CALCulate<Tr>:LIMit:UPPer:X <x-parameter>
:CALCulate<Tr>:LIMit:UPPer:Y <y-parameter>
:CALCulate:LIMit:X <x-parameter>
:CALCulate:LIMit:Y <y-parameter>
:CALCulate:MARKer:AOFF
:CALCulate:MARKer:DATA?
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa:REFerence <Mk>
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:STATe] OFF|ON|0|1
:CALCulate:MARKer:DISPlay:FORMat NONE|SCREen|TABLe|TRACe
:CALCulate:MARKer<Mk>:DOMain?
:CALCulate:MARKer<Mk>:FORMat <Style>
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum
:CALCulate:MARKer<Mk>:REFerence[:STATe] OFF|ON|0|1
:CALCulate:MARKer<Mk>:SOURce <Tr>
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TYPE REFerence|DELTa|OFF
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X <x-parameter>
:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?
:CALCulate:MATH:FUNCtion NORMal|ADD|SUBTract|MULTiply|DIVide
:CALCulate:MATH:MEMorize
:CALCulate<Tr>:SMOothing:APERture <integer>
:CALCulate:TRANsform:DISTance:MAXimum?
:CALCulate:TRANsform:DISTance:RESolution?
:CALCulate:TRANsform:DISTance:STARt
:CALCulate:TRANsform:DISTance:STOP
:CALCulate:TRANsform:DISTance:UNIT METers|FEET
:CALCulate:TRANsform:TIME:MAXimum?
:CALCulate:TRANsform:TIME:RESolution?
:CALCulate:TRANsform:TIME:START
:CALCulate:TRANsform:TIME:STOP
:DISPlay[:WINDow]:TRACe TRACe|MEMory|BOTH
:DISPlay[:WINDow]:TRACe:FORMat SINGle|DUAL|TRI|QUAD
:DISPlay:WINDow:TRACe:Y[:SCALe]:GDAPerture <integer>
:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:PDIVision <value>
:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RLEVel <value>
:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:RPOSition <number>
:DISPlay:WINDow:TRACe<Tr>:Y[:SCALe]:SMCHart 0|10|20|30|-3
:FORMat[:READings][:DATA] ASCii|INTeger,32|REAL,32
:INITiate:CONTinuous OFF|ON|0|1
:INITiate:HOLD OFF|ON|0|1
:INITiate[:IMMediate]
:INPut<port_no>:BIAS:CURRent <current>
:INPut<port_no>:BIAS:EXTernal:CURRent?

:INPut:BIAS:EXTernal:TRIPped[:STATe]?
:INPut<port_no>:BIAS:EXTernal:VOLTage?
:INPut:BIAS:INTernal:TRIPped[:STATe]?
:INPut:BIAS:PORT:SELect 1|2
:INPut:BIAS:STATe OFF|EXTernal|INTernal
:INPut<port_no>:BIAS:VOLTage <voltage>
[:SENSe]:APPLication:TST? NORMal|PWRon
[:SENSe]:APPLication:TST:RESult?
[:SENSe]:AVERage:CLEar
[:SENSe]:AVERage:COUNt <integer>
[:SENSe]:CALibration:STATe?
[:SENSe]:CORRection:DATA? <error terms parameters>
[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]:SMCHart 50|75
[:SENSe]:CORRection[:STATe] OFF|ON
[:SENSe]:CORRection:CKIT:INFormation? <connector>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SOLT:C[0]|1|2|3 <capacitance>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:WGUide:SSLT|SSST
:FCUToff <freq>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SOLT|SSLT|SSST:NAME <string>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:OPEN <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SSLT:SHORt[1]|2 <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SSST:SHORt[1]|2|3 <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:SHORt <length>
[:SENSe]:CORRection:COLLect:ABORt:ALL
[:SENSe]:CORRection:COLLect[:ACQUire] <cal steps>,<port_no>
[:SENSe]:CORRection:COLLect:ACQUire:STATus? [<cal steps>,<port_no>]
[:SENSe]:CORRection:COLLect:CONNector<port_no> <connector>
[:SENSe]:CORRection:COLLect:MEDium COAX|WGUide
[:SENSe]:CORRection:COLLect:METHod SOLT|SSLT|SSST
[:SENSe]:CORRection:COLLect:SAVe
[:SENSe]:CORRection:COLLect:STATus?
[:SENSe]:CORRection:COLLect:TYPE <cal type>
[:SENSe]:FREQuency:CENTer <freq>
[:SENSe]:FREQuency:SPAN <freq>
[:SENSe]:FREQuency:DSPAn?
[:SENSe]:FREQuency:TSPAn?
[:SENSe]:FREQuency:STARt <freq>

[:SENSe]:FREQuency:STOP <freq>
[:SENSe]:SWEep:IFBW <freq value>
[:SENSe]:SWEep:POINts <integer>
[:SENSe]:SWEep:TYPE SINGle|CONTinuous
[:SENSe]:TRACe<Tr>:DOMain FREQuency|TIME|DISTance
[:SENSe]:TRACe<Tr>:SELect
[:SENSe]:TRACe<Tr>:SPARams S11|S21|S12|S22|SD1D1
[:SENSe]:TRACe:TOTal <integer>
:SOURce:POWer LOW|HIGH
:SOURce:CORRection:RVELocity <number>
:SOURce:CORRection:RVELocity:CABLoss <number>
:SOURce:CORRection:RVELocity:FCUToff <freq>
:SOURce:CORRection:RVELocity:MEDium COAX|WGUide
:SOURce:CORRection:RVELocity:WGLoss <number>
:STATus:OPERation?
:SYSTem:MBTemperature?
:SYSTem:PRESet
:TRACe[:DATA]? [1]|2|3|4
:TRACe:PREamble? [1]|2|3|4

B-3 Vector Voltmeter Commands

:TRACe:PREamble?
[:SENSe]:VVM:FORMat DB|VSWR|IMPedance
[:SENSe]:VVM:MODE CW|TABLe
[:SENSe]:VVM:PORT 1|2
[:SENSe]:VVM:TYPE RETurn|INSertion
[:SENSe]:VVM:CABLe:SELect 1|2|3|4|5|6|7|8|9|10|11|12
[:SENSe]:VVM:FREQuency:CW <freq>
[:SENSe]:VVM:REFerence:CLEar
[:SENSe]:VVM:REFerence:MEMorize
:FETCh:VVM:DATA?
:FETCh:VVM:REFerence:DATA?
[:SENSe]:CALibration:STATe?
[:SENSe]:CORRection:DATA? <error terms parameters>
[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]:SMCHart 50|75
[:SENSe]:CORRection[:STATe] OFF|ON
[:SENSe]:CORRection:CKIT:INFormation? <connector>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SOLT:C[0]|1|2|3 <capacitance>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:WGUide:SSLT|SSST
:FCUToff <freq>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SOLT|SSLT|SSST:NAME <string>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:OPEN <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SSLT:SHORt[1]|2 <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide
:SSST:SHORt[1]|2|3 <length>
[:SENSe]:CORRection:CKIT:USER[1]|2|3|4:COAX|WGUide:SOLT
:SHORt <length>
[:SENSe]:CORRection:COLLect:ABORt:ALL
[:SENSe]:CORRection:COLLect[:ACQUire] <cal steps>,<port_no>
[:SENSe]:CORRection:COLLect:ACQUire:STATus? [<cal steps>,<port_no>]
[:SENSe]:CORRection:COLLect:CONNector<port_no> <connector>
[:SENSe]:CORRection:COLLect:MEDium COAX|WGUide
[:SENSe]:CORRection:COLLect:METHod SOLT|SSLT|SSST
[:SENSe]:CORRection:COLLect:SAVe
[:SENSe]:CORRection:COLLect:STATus?
[:SENSe]:CORRection:COLLect:TYPE <cal type>

B-4 Power Monitor Commands

:TRACe:PREamble?
:CALCulate:PMONitor:OFFSet <val>
:CALCulate:PMONitor:UNITs DBM|WATT|DB|PERCent
:CALCulate:PMONitor:RELative[:STATe] OFF|ON|0|1
:CALCulate:PMONitor:ZERO[:STATe] OFF|ON|0|1
:FETCh:PMONitor:DATA?
:FETCh:PMONitor:RELative:DATA?
:FETCh:PMONitor:ZERO:DATA?

B-5 All Mode Commands

:INSTrument:CATalog:FULL?
:INSTrument:NSELect <integer>
:INSTrument[:SELect] <string>
:MMEMory:DELete <file name>
:MMEMory:LOAD:STATe <integer>,<file name>
:MMEMory:LOAD:TRACe <integer>,<file name>
:MMEMory:MSIS INTernal|USB
:MMEMory:MSIS:COPY
:MMEMory:MSIS:DESTination INTernal|USB
:MMEMory:STORe:STATe <integer>,<file name>
:MMEMory:STORe:TRACe <integer>,<file name>
:SYSTem:OPTions?

Appendix C — Command Tables

C-1 Introduction

This appendix is a collection of the command subsystem tables.

C-2 VNA Commands

Table C-1. VNA Commands Subsystems

Keyword	Parameter Data or Units
:CALCulate{1-4}	Table C-2, ":CALCulate Subsystem" on page C-2
:DISPlay	Table C-9, ":DISPlay Subsystem" on page C-8
:FORMat	Table C-10, ":FORMat Subsystem" on page C-9
:INITiate	Table C-11, ":INITiate Subsystem" on page C-9
:INPut	Table C-12, ":INPut Subsystem" on page C-10
[:SENSe]	Table C-13, "[:SENSe] Subsystem" on page C-11
:SOURce	Table C-24, ":SOURce Subsystem" on page C-18
:STATus	Table C-26, ":STATus Subsystem" on page C-19
:SYSTem	Table C-27, ":SYSTem Subsystem" on page C-19
:TRACe	Table C-28, ":TRACe Subsystem" on page C-20

C-3 :CALCulate Subsystem

Table C-2. :CALCulate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate{1-4}			
:DATA?	<char>	FDATa|SDATa|FMEM|SMEM Returns block data	Query Only
:FORMat		Refer to Table C-3 on page C-2	Refer to Subsystem
:LIMit		Refer to Table C-4 on page C-3	Refer to Subsystem
:MARKer		Refer to Table C-5 on page C-5	Refer to Subsystem
:MATH		Refer to Table C-6 on page C-6	Refer to Subsystem
:SMOothing		Refer to Table C-7 on page C-6	Refer to Subsystem
:TRANsform		Refer to Table C-8 on page C-7	Refer to Subsystem

:CALCulate:FORMat Subsystem

Table C-3. :CALCulate:FORMat Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate{1-4}			
:FORMat	<char>	LMAGnitude|SWR|PHASe|REAL|IMAGinary|GDELay|SMITh|LM/2	Query Exists
:FORMat?	<char>	LMAG|SWR|PHAS|REAL|IMAG|GDEL|SMIT|LM/2	Query Form

:CALCulate:LIMit Subsystem

Table C-4. :CALCulate:LIMit Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:LIMit			
:ALARm	<boolean>	OFF|ON|0|1	Query Exists
:ALARm?	<boolean>	0|1	Query Form
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:TYPE	<char>	0|1	Query Exists
:TYPE?	<char>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
:CALCulate{1-4}			
:LIMit			
:LOWer			
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists

Table C-4. :CALCulate:LIMit Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
:UPPer			
:POINT?	<NR1>	Integer	Query Only
:POINT			
:ADD	NA	NA	No Query
:DELete	NA	NA	No Query
:LEFT	NA	NA	No Query
:RIGHt	NA	NA	No Query
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y	<NRf>	Depends on display type	Query Exists
:Y?	<NR3>	Depends on display type	Query Form

:CALCulate:MARKer Subsystem

Table C-5. :CALCulate:MARKer Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:MARKer			
:AOFF	NA	NA	No Query
:DATA?	<char>	comma separated data	Query Only
:DISPlay			
:FORMat	<char>	NONE|SCREen|TABLe|TRACe	Query Exists
:FORMat?	<char>	NONE|SCRE|TABL|TRAC	Query Form
:CALCulate			
:MARKer{1-8}			
:DELTa			
:REFerence	<char>	1|2|3|4|5|6|7|8|	Query Exists
:REFerence?	<char>	1|2|3|4|5|6|7|8|	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:DOMain?	<char>	FREQ|TIME|DIST	Query Only
:FORMat	<char>	GRAPh|LMAGnitude| LOGPhase|PHASe| RLIMaginary|SWR| IMPedance|ADMittance| NIMPedance|NADMittance| PIMPedance|GDELay|LM/2	Query Exists
:FORMat?	<char>	GRAPh|LMAG|LOGP| PHAS|RLIM|SWR|IMP|ADM| NIMP|NADM|PIMP|GDEL|LM/2	Query Form
:MAXimum	NA	NA	No Query
:MINimum	NA	NA	No Query
:REFerence			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form
:SOURce	<char>	TR1|TR2|TR3|TR4|MEM1|MEM 2|MEM3|MEM4|ALL	Query Exists
:SOURce?	<char>	TR1|TR2|TR3|TR4|MEM1|MEM 2|MEM3|MEM4|ALL	Query Form

Table C-5. :CALCulate:MARKer Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:TYPE	<char>	REFerence|DELTa|OFF	Query Exists
:TYPE?	<char>	REF|DELT|OFF	Query Form
:X	<NRf>	Hertz, Seconds, Meters, or Feet	Query Exists
:X?	<NR3>	Hertz, Nanoseconds, Meters, or Feet	Query Form
:Y?	<NR3>	Depends on display type	Query Only

:CALCulate:MATH Subsystem

Table C-6. :CALCulate:MATH Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:MATH			
:FUNCtion	<char>	NORMal|ADD|SUBTract|MULTiply|DIVide	Query Exists
:FUNCtion?	<char>	NORM|ADD|SUBT|MULT|DIV	Query Form
:MEMorize	NA	NA	No Query

CALCulate:SMOothing Subsystem

Table C-7. :CALCulate:SMOothing Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SMOothing			
:APERture	<NR1>	Integer	Query Exists
:APERture?	<NR1>	Integer	Query Form

:CALCulate:TRANsform Subsystem

Table C-8. :CALCulate:TRANsform Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:TRANsform			
:DISTance			
:MAXimum?	<NR3>	MilliMeters or Feet	Query Only
:RESolution?	<NR3>	MilliMeters or Feet	Query Only
:START	<NRf>	Meters or Feet	Query Exists
:START?	<NR3>	MilliMeters or Feet	Query Form
:STOP	<NRf>	Meters or Feet	Query Exists
:STOP?	<NR3>	MilliMeters or Feet	Query Form
:UNIT	<char>	METers | FEET	Query Exists
:UNIT?	<char>	METER | FEET	Query Form
:TIME			
:MAXimum?	<NR3>	MilliMeters or Feet	Query Only
:RESolution?	<NR3>	MilliMeters or Feet	Query Only
:START	<NRf>	Seconds	Query Exists
:START?	<NR3>	Nanoseconds	Query Form
:STOP	<NRf>	Seconds	Query Exists
:STOP?	<NR3>	Nanoseconds	Query Form
:CALCulate{1-8}			
:TRANsform			
:DISTance			
:DATA?	<char>	Returns block data (meters)	Query Only
:TIME			
:DATA?	<char>	Returns block data (nanoseconds)	Query Only

C-4 :DISPlay Subsystem

Table C-9. :DISPlay Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:DISPlay			
[:WINDow]			
:TRACe	<char>	TRACe|MEMory|BOTH	Query Exists
:FORMat	<char>	SINGle|DUAL|TRI|QUAD	Query Exists
:FORMat?	<char>	SING|DUAL|TRI|QUAD	Query Form
:Y			
[:SCALe]			
:GDAPerture	<NR1>	integer	Query Exists
:GDAPerture?	<NR1>	integer	Query Form
:TRACe?	<char>	TRAC|MEM|BOTH	Query Form
:WINDow			
:TRACe{1-4}			
:Y			
[:SCALe]			
:PDIVision	<NRf>	Depends on display type	Query Exists
:PDIVision?	<NR3>	Depends on display type	Query Form
:RLEVel	<NR3>	Depends on display type	Query Exists
:RLEVel?	<NR3>	Depends on display type	Query Form
:RPOSition	<NR1>	Integer	Query Exists
:RPOSition?	<NR1>	Integer	Query Form
:SMCHart	<char>	0|10|20|30|-3	Query Exists
:SMCHart?	<char>	0|10|20|30|-3	Query Form

C-5 :FORMat Subsystem

Table C-10. :FORMat Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FORMat			
[:READings]			
[:DATA]	<char>	ASCii|INTeger,32|REAL,32	Query Exists
[:DATA]?	<char>	ASC|INT,32|REAL,32	Query Form

C-6 :INITiate Subsystem

Table C-11. :INITiate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:INITiate			
:CONTinuous	<boolean>	OFF|ON|0|1	Query Exists
:CONTinuous?	<boolean>	0|1	Query Form
:HOLD	<boolean>	OFF|ON|0|1	Query Exists
:HOLD?	<boolean>	0|1	Query Form
[:IMMediate]	NA	NA	No Query

C-7 :INPut Subsystem

Table C-12. :INPut Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:INPut{1-2}			
:BIAS			
:CURRent	<NRf>	milliampere	Query Exists
:CURRent?	<char>	0|1 ; returns value in milliampere	Query Form
:EXTernal			
:CURRent?	<NR3>	milliampere	Query Only
:VOLTage?	<NR3>	Volts	Query Only
:VOLTage	<NRf>	Volts	Query Exists
:VOLTage?	<char>	0|1 ; returns value in Volts	Query Form
:INPut			
:BIAS			
:EXTernal			
:TRIPped			
[:STATe]?	<boolean>	1|0	Query Only
:EXTernal			
:TRIPped			
[:STATe]	<boolean>	1|0	Query Only
:PORT			
:SELect	<char>	1|2	Query Exists
:SELect?	<char>	1|2	Query Form
:STATe	<char>	OFF|EXTernal|INTernal	Query Exists
:STATe?	<char>	OFF|EXT|INTl	Query Form

C-8 [:SENSe] Subsystem

Table C-13. [:SENSe] Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:APPLication		Refer to Table C-14 for Subsystem	
:AVERage		Refer to Table C-15 for Subsystem	
:CALibration		Refer to Table C-16 for Subsystem	
:CORRection		Refer to Table C-17 for Subsystem	
:FREQuency		Refer to Table C-21 for Subsystem	
:SWEep		Refer to Table C-22 for Subsystem	
:TRACe		Refer to Table C-23 for Subsystem	

[:SENSe]:APPLication Subsystem

Table C-14. [:SENSe]:APPLication Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:APPLication			
:TST?	<char>	NORMal | PWRon	Query Only
:TST			
:RESult?	<block>	NA	Query Only

[:SENSe]:AVERage Subsystem

Table C-15. [:SENSe]:AVERage Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:AVERage			
:CLEar	<char>		No Query
:COUNt	<NR1>	integer	Query Exists
:COUNt?	<NR1>	integer	Query Form

[:SENSe]:CALibration Subsystem

Table C-16. [:SENSe]:CALibration Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CALibration			
:STATe?	<NR1>	0-15	Query Only

[:SENSe]:CORRection Subsystem

This subsystem provides commands for losses or gains external to the instrument.

Table C-17. [:SENSe]:CORRection Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT		Refer to Table C-18 for Subsystem	
:COLLect		Refer to Table C-20 for Subsystem	
:DATA?	<char>	ERF|EDF|ESF|ETF|ELF|EXF|ETFS|ELFS|EXFS|ERR|EDR|ESR|ETR|ELR|EXR|ETRS|ELRS|EXRS Returns block data	Query Only
:IMPedance			
[:INPut]			
[:MAGNitude]			
:SMCHart	<char>	50|75	Query Exists
:SMCHart?	<char>	50|75	Query Form
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

[:SENSe]:CORRection:CKIT Subsystem

Table C-18. [:SENSe]:CORRection:CKIT Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT			
:INFormation?	<char>	NMALe|NFEMale|KMALe| KFEMale|716Male| 716Female|TNCMale| TNCFemale|SMAMale| SMAFemale|USR1|USR2| USR3|USR4|WG11|WG12| WG13|WG14|WG15|WG16| WG17|WG18|WG20|USR1| USR2|USR3|USR4 Returns comma-delimited ASCII format	Query Only
:USER{1-4}		Refer to Table C-19 on page C-14	

[:SENSe]:CORRection:CKIT:USER Subsystem

Table C-19. [:SENSe]:CORRection:CKIT:USER Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:CKIT			
:USER{1-4}			
:COAX|WGUide			
:SOLT			
:C{0-3}	<NRf>	e-15, e-27, e-36, e-45	Query Exists
:C{0-3}?	<NR3>	e-15, e-27, e-36, e-45	Query Form
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:OPEN	<NRf>	millimeters	Query Exists
:OPEN?	<NR3>	millimeters	Query Form
:SHORt	<NRf>	millimeters	Query Exists
:SHORt?	<NR3>	millimeters	Query Form
:SSLT			
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:SHORt{1-2}	<NRf>	millimeters	Query Exists
:SHORt{1-2}?	<NR3>	millimeters	Query Form
:SSST			
:NAME	<string>	NA	Query Exists
:NAME?	<string>	NA	Query Form
:SHORt{1-3}	<NRf>	millimeters	Query Exists
:SHORt{1-3}?	<NR3>	millimeters	Query Form
:WGUide			
:SSLT			
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form
:SSST			
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form

[:SENSe]:CORRection:COLLect Subsystem

Table C-20. [:SENSe]:CORRection:COLLect Subsystem (Sheet 1 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:CORRection			
:COLLect			
:ABORt			
:ALL	NA	NA	No Query
[:ACQUire]	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOLation, 1|2|3	Query Exists
[:ACQUire]?	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOL, 1|2|3	Query Form
:ACQUire			
:STATus?	<char>	OPEN|SHORT|SHORT1| SHORT2|SHORT3|LOAD| THRU|ISOLation, 1|2|3	Query Only
:CONNector{1-2}	<char>	NMALe|NFEMale| KMALe|KFEMale| 716Male|716Female| TNCMale|TNCFemale| SMAMale|SMAFemale| USR1|USR2|USR3|USR4 WG11|WG12|WG13| WG14|WG15|WG16| WG17|WG18|WG20| USR1|USR2|USR3|USR4	Query Exists
:CONNector{1-2}?	<char>	NMAL|NFEM|KMAL| KFEM|716M|716F| TNCM|TNCF|SMAM| SMAF|USR1|USR2| USR3|USR4 WG11|WG12|WG13| WG14|WG15|WG16| WG17|WG18|WG20| USR1|USR2|USR3|USR4	Query Form
:MEDium	<char>	COAX|WGUide	Query Exists

Table C-20. [:SENSe]:CORRection:COLLect Subsystem (Sheet 2 of 2)

Keyword	Parameter Form	Parameter Data or Units	Notes
:MEDium?	<char>	COAX|WGU	Query Form
:METHod	<char>	SOLT|SSLT|SSST	Query Exists
:METHod?	<char>	SOLT|SSLT|SSST	Query Form
:SAVe	NA	NA	No Query
:STATus?	<char>	OPEN|SHORT|SHORT1|SHORT2|SHORT3|LOAD|THRU|ISOLation,1|2|3	Query Only
:TYPE	<char>	RF2P|RFP1|RFP2|RFBP|TRFP|TRRP|TRBP|RRP1|RRP2|RRBP|2PFP|2PRP	Query Exists
:TYPE?	<char>	RF2P|RFP1|RFP2|RFBP|TRFP|TRRP|TRBP|RRP1|RRP2|RRBP|2PFP|2PRP	Query Form

[:SENSe]:FREquency Subsystem

Table C-21. [:SENSe]:FREquency Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:FREquency			
:CENTer	<NRf>	Hertz	Query Exists
:CENTer?	<NR3>	Hertz	Query Form
:DSPAn?	<NR3>	Hertz	Query Only
:SPAN	<NRf>	Hertz	Query Exists
:SPAN?	<NR3>	Hertz	Query Form
:STARt	<NRf>	Hertz	Query Exists
:STARt?	<NR3>	Hertz	Query Form
:STOP	<NRf>	Hertz	Query Exists
:STOP?	<NR3>	Hertz	Query Form
:TSPAn?	<NR3>	Hertz	Query Only
[:SENSe]{1-8}			
:FREQuency			
:DATA?	<char>	Hertz (Returns block data)	Query Only

[:SENSe]:SWEep Subsystem

Table C-22. [:SENSe]:SWEep Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:SWEep			
:IFBW	<char>	100000|50000|20000|10000|5000|2000|1000|500|200|100|50|20|10	Query Exists
:IFBW?	<char>	100000|50000|20000|10000|5000|2000|1000|500|200|100|50|20|10	Query Form
:POINts	<NR1>	integer	Query Exists
:POINts?	<NR1>	integer	Query Form
:TYPE	<char>	SINGle|CONTinuous	Query Exists
:TYPE?	<char>	SING|CONT	Query Form

[:SENSe]:TRACe Subsystem

Table C-23. [:SENSe]:TRACe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:TRACe{1-4}			
:DOMain	<char>	FREQency|TIME|DISTance	Query Exists
:DOMain?	<char>	FREQ|TIME|DIST	Query Form
:SELect	NA	NA	No Query
:SPARams	<char>	S11|S21|S12|S22|SD1D1	Query Exists
:SPARams?	<char>	S11|S21|S12|S22|SD1D1	Query Form
:TRACe			
:TOTal	<char>	1|2|3|4	Query Exists
:TOTal?	<char>	1|2|3|4	Query Form
:SELect?	<char>	TR1|TR2|TR3|TR4	Query Only

C-9 :SOURce Subsystem

Table C-24. :SOURce Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SOURce			
:POWer	<char>	LOW|HIGH	Query Exists
:POWer?	<char>	LOW|HIGH	Query Form
:CORRection		Refer to Table C-25 on page C-19	

C-10 :SOURce:CORRection:RVELocity Subsystem

Table C-25. :SOURce:CORRection:RVELocity Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SOURce			
:CORRection			
:RVELocity	<NRf>	unitless	Query Exists
:RVELocity?	<NR3>	unitless	Query Form
:CABLoss	<NRf>	unitless	Query Exists
:CABLoss?	<NR3>	unitless	Query Form
:FCUToff	<NRf>	Hertz	Query Exists
:FCUToff?	<NR3>	Hertz	Query Form
:MEDium	<char>	COAX|WGUide	Query Exists
:MEDium?	<char>	COAX|WGUide	Query Form
:WGLoss	<NRf>	unitless	Query Exists
:WGLoss?	<NR3>	unitless	Query Form

C-11 :STATus Subsystem

Table C-26. :STATus Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:STATus			
:Operation?	<Decimal>	0 to15 bit	Query Only

C-12 :SYSTem Subsystem

Table C-27. :SYSTem Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SYSTem			
:MBTemperature?	<NR3>	Degree Celsius	Query Only
:PRESet	NA	NA	No Query

C-13 :TRACe Subsystem

Table C-28. :TRACe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
[:DATA]?	<char>	1 | 2 | 3 | 4 Returns block data	Query Only
:PREamble?	<char>	1 | 2 | 3 | 4 Returns block data	Query Only

C-14 VVM Commands

Table C-29. VVM Commands Subsystems

Keyword	Parameter Data or Units
:TRACe	Refer to Table C-30, ":TRACe VVM Subsystem Commands" on page C-22
[:SENSe]	
:VVM	Refer to Table C-31, "[:SENSe]:VVM Subsystem Commands" on page C-22
:CABLe	Refer to Table C-32, "[:SENSe:]:VVM:CABLe Subsystem Commands" on page C-23
:FREQuency	Refer to Table C-33, "[:SENSe]:VVM:FREQuency Commands" on page C-23
:REFerence	Refer to Table C-34, "[:SENSe:]:VVM:REFerence Commands" on page C-23
:FETCh	
:VVM	Refer to Table C-35, ":FETCh:VVM Subsystem Commands" on page C-24
:REFerence	Refer to Table C-36, ":FETCh:VVM:REFerence Subsystem Commands" on page C-24
The following commands are described in Chapter 3, "VNA Commands".	
[:SENSe]:CALibration	Refer to Table 3-17, "[:SENSe]:CALibration Subsystem" on page 3-77
[:SENSe]:CORRection	Refer to Table 3-18, "[:SENSe]:CORRection Subsystem" on page 3-78
[:SENSe]:CORRection :CKIT	Refer to Table 3-19, "[:SENSe]:CORRection:CKIT Subsystem" on page 3-81
[:SENSe]:CORRection :CKIT:USER	Refer to Table 3-20, "[:SENSe]:CORRection:CKIT:USER Subsystem" on page 3-83
[:SENSe]:CORRection :COLLect	Refer to Table 3-21, "[:SENSe]:CORRection:COLLect Subsystem" on page 3-88

C-15 :TRACe VVM Subsystem

Table C-30. :TRACe VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
:PREamble?	<char>	Returns block data	Query Only

C-16 [:SENSe]:VVM Subsystem

Table C-31. [:SENSe]:VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:CABLe		Refer to Table C-32 on page C-23.	
:FORMat	<char>	DB|VSWR|IMPedance	Query Exists
:FORMat?	<char>	DB|VSWR|IMP	Query Form
:FREQuency		Refer to Table C-33 on page C-23	
:MODE	<char>	CW|TABLe	Query Exists
:MODE?	<char>	CW|TABL	Query Form
:PORT	<char>	1|2	Query Exists
:PORT?	<char>	1|2	Query Form
:REFerence		Refer to Table C-34 on page C-23	
:TYPE	<char>	RETurn|INSertion	Query Exists
:TYPE?	<char>	RET|INS	Query Form

[:SENSe:]:VVM:CABLe Subsystem

Table C-32. [:SENSe:]:VVM:CABLe Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:CABLe			
:SELect	<char>	1|2|3|4|5|6|7|8|9|10|11|12	Query Exists
:SELect?	<char>	1|2|3|4|5|6|7|8|9|10|11|12	Query Form

[:SENSe]:VVM:FREQuency Subsystem

Table C-33. [:SENSe]:VVM:FREQuency Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:FREQuency			
:CW	<NRf>	Hertz	Query Exists
:CW?	<NR3>	Hertz	Query Form

[:SENSe:]:VVM:REFerence Subsystem

Table C-34. [:SENSe:]:VVM:REFerence Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
[:SENSe]			
:VVM			
:REFerence			
:CLEar	NA	NA	No Query
:MEMorize	NA	NA	No Query

C-17 :FETCh:VVM Subsystem

Table C-35. :FETCh:VVM Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:VVM			
:DATA?	NA	Comma separated values	Query Only
:REFerence		Refer to Table C-36 on page C-24.	

FETCh:VVM:REFerence Subsystem

Table C-36. :FETCh:VVM:REFerence Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:VVM			
:REFerence			
:DATA?	NA	Comma separated values	Query Only

C-18 Power Monitor Commands

Table C-37. Power Monitor Commands Subsystems

Keyword	Parameter Data or Units
:TRACe	Refer to Table C-38, ":TRACe Power Monitor Subsystem Commands" on page C-25
:CALCulate	
PMONitor	Refer to Table C-40, ":CALCulate:PMONitor Subsystem" on page C-26
:RELative	Refer to Table C-41, ":CALCulate:PMONitor:RELative Subsystem" on page C-26
:ZERO	Refer to Table C-42, ":CALCulate:PMONitor:ZERO Subsystem" on page C-26
:FETCh	
PMONitor	Refer to Table C-43, ":FETCh:PMONitor Subsystem" on page C-27
:RELative	Refer to Table C-44, ":FETCh:PMONitor:RELative Subsystem" on page C-27
:ZERO	Refer to Table C-45, ":FETCh:PMONitor:ZERO Subsystem" on page C-27

C-19 :TRACe Power Monitor Subsystem

Table C-38. :TRACe Power Monitor Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:TRACe			
:PREamble?	<char>	Returns block data	Query Only

C-20 :CALCulate Subsystem

Table C-39. :CALCulate Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor		Refer to Table C-40 on page C-26	
:RELative		Refer to Table C-41 on page C-26	
:ZERO		Refer to Table C-42 on page C-26	

:CALCulate:PMONitor Subsystem

Table C-40. :CALCulate:PMONitor Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:OFFSet	<NR1>	0 to 60000 millidecibels	Query Exists
:OFFSet?	<NR1>	0 to 60000 millidecibels	Query Form
:UNITs	<char>	DBM|WATT|DB|PERCent	Query Exists
:UNITs?	<char>	DBM|WATT|DB|PERC	Query Form
:RELative		Refer to Table C-41 on page C-26	
:ZERO		Refer to Table C-42 on page C-26	

:CALCulate:PMONitor:RELative Subsystem

Table C-41. :CALCulate:PMONitor:RELative Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:RELative			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

:CALCulate:PMONitor:ZERO Subsystem

Table C-42. :CALCulate:PMONitor:ZERO Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:CALCulate			
:PMONitor			
:ZERO			
[:STATe]	<boolean>	OFF|ON|0|1	Query Exists
[:STATe]?	<boolean>	0|1	Query Form

C-21 :FETCh:PMONitor Subsystem

Table C-43. :FETCh:PMONitor Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:PMONitor			
:DATA?	<NR3>	Depends on set unit	Query Only
:RELative		Refer to Table C-44 on page C-27	
:ZERO		Refer to Table C-45 on page C-27	

:FETCh:PMONitor:RELative Subsystem

Table C-44. :FETCh:PMONitor:RELative Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
PMONitor			
:RELative			
:DATA?	<NR3>	Depends on set unit	Query Only

:FETCh:PMONitor:ZERO Subsystem

Table C-45. :FETCh:PMONitor:ZERO Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:FETCh			
:PMONitor			
:ZERO			
:DATA?	<NR3>	Depends on set unit	Query Only

C-22 All Mode Commands

Table C-46. All Mode Commands Subsystems

Keyword	Parameter Data or Units
:INSTrument	Refer to Table C-47, ":INSTrument Subsystem Commands" on page C-28
:MMEMory	Refer to Table C-48, ":MMEMory Subsystem" on page C-29
:SYSTem	Refer to Table C-52, ":SYSTem Subsystem" on page C-30

C-23 :INSTrument Subsystem

Table C-47. :INSTrument Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:INSTrument			
:CATalog			
:FULL?	NA	Comma separated list	Query Only
:NSELect	<NR1>	10 for HI_PM[a] 26 for MWVNA[b] 101 for Power Monitor[c] 102 for VVM[d]	Query Exists
:NSELect?	<NR1>	10 for HI_PM 26 for MWVNA 101 for Power Monitor 102 for VVM	Query Form
[:SELect]	<string>	HI_PM|MWVNA|Power Monitor|VVM	Query Exists
[:SELect]?	<string>	HI_PM|MWVNA|Power Monitor|VVM	Query Form

a."HI_PM" is for High Accuracy Power Meter mode.
b."MWVNA" is for Microwave Vector Network Analyzer mode.
c."Power Monitor is for Power Monitor mode.
d."VVM" is for Vector Voltmeter mode.

C-24 :MMEMory Subsystem

Table C-48. :MMEMory Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:DELete	<string>	filename	No Query
:LOAD		Refer to Table C-49, ":MMEMory:LOAD Subsystem Commands" on page C-29	
:MSIS?			
:MSIS		Refer to Table C-50, ":MMEMory:MSIS Subsystem" on page C-30	
:STORe		Refer to Table C-51, ":MMEMory:STORe Subsystem" on page C-30	

:MMEMory:LOAD Subsystem

Table C-49. :MMEMory:LOAD Subsystem Commands

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:LOAD			
:STATe	<integer>, <string>	1, filename	No Query
:TRACe	<integer>, <string>	1, filename	No Query

:MMEMory:MSIS Subsystem

Table C-50. :MMEMory:MSIS Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:MSIS?	<char>	INT|USB	Query Form
:MSIS	<char>	INTernal|USB	Query Exists
:COPY	NA	NA	No Query
:DESTination	<char>	INTernal|USB	Query Exists
:DESTination?	<char>	INT|USB	Query Form

:MMEMory:STORe Subsystem

Table C-51. :MMEMory:STORe Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:MMEMory			
:STORe			
:STATe	<integer>, <string>	1|2, filename	No Query
:TRACe	<integer>, <string>	1|2, filename	No Query

C-25 :SYSTem Subsystem

Table C-52. :SYSTem Subsystem

Keyword	Parameter Form	Parameter Data or Units	Notes
:SYSTem			
:OPTions?	NA	Options separated by "/" or "NONE"	Query Only

Appendix D — Revision History

D-1 Master Programming Manual Revision History

Document Part Number: 10580-00221

Date	Revision	Change Description
June 2009	A	Initial release, firmware V1.10
August 2009	B	Firmware V1.21
January_2010	C	Firmware V1.24

Anritsu Company prints on Recycled Paper with Vegetable Soybean Oil Ink

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