SERIES
37XXXD
VECTOR NETWORK ANALYZER

PROGRAMMING MANUAL

490 JARVIS DRIVE • MORGAN HILL, CA 95037-2809

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Model Number: 371XXA, 372XXA, 373XXA, 371XXB, 372XXB, 373XXB
371XXC, 3722XXC, 373XXC

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
EN 61000-3-2:1995 Class A
EN 61000-3-3:1995 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 61000-4-8:1994/EN61326: 1998 – 3A/m
EN 61000-4-11:1994/EN61326: 1998 – 100% @ 20msec

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Electromagnetic Interference:

Emissions: CISPR 11:1990/EN55011: 1991 Group 1 Class A
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EN 61000-3-3:1995 Class A

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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 – 100% @ 20msec

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Part 3 — Programming Reference

Chapter 10 — Command Dictionary

This chapter provides an alphabetically-ordered, dictionary-type listing and description of all 37XXXD GPIB programming commands. The listing for each command includes relevant details about the command.

Chapter 11 — Instrument Data

This chapter provides general (non-command specific) tabular information for the 37XXXD. Much of this information is presented in Chapters 4 through 10, but is provided in this chapter for easy access.

Chapter 12 — Error Messages

This chapter provides a list of all Error Messages including those related to remote-only (GPIB) operation of the 37XXXD.

Part 4 — Supplemental Data

Appendix A — Introduction to the IEEE 488 Bus

This appendix contains an introduction to the IEEE 488 Bus (GPIB). This material is intended to assist new users in understanding GPIB basics.

Appendix B — GPIB Quick Reference Guide

This appendix provides a quick reference to all 37XXXD GPIB commands. Each reference lists the command name, a brief description of the command function, and a reference to the pertinent Chapter in this manual.

Part 1 The GPIB Interface

This part consists of three chapters that describe how the IEEE- 488 (GPIB) interface is implemented within the 37XXXD Vector Network Analyzer and how to perform basic GPIB communications operations.

***Chapter 1** – briefly describes the 37XXXD GPIB programmer interface and describes the communication to and from the interface during remote-only (GPIB) operation of the 37XXXD.*

***Chapter 2** – provides a tutorial for performing basic GPIB operations such as sending and receiving messages, synchronizing instrument operations, setting timeouts, and status checking.*

***Chapter 3** – provides sample program elements to familiarize the user with 37XXXD programming techniques. They are also useful as an aid in developing 37XXXD programs.*

Chapter 1
Series 37XXXD GPIB Programmer Interface

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Chapter 1
Series 37XXXD GPIB Programmer Interface

1-1 MANUAL SCOPE

This manual provides IEEE 488 bus (GPIB) programming information and data for all models of the Series 37000C Vector Network Analyzer. It contains the entire command set for programming all features. Consequently, not all of the codes documented in this manual apply to all models within the series (372XXD, 373XXD). The reader needs to be aware of the feature set available within the model for which programming is being written. Feature set information is documented in the applicable operation manual (OM) for any particular model.

1-2 INTRODUCTION

This chapter contains a brief introduction to the 37XXXD GPIB interface and programming environment.

1-3 RELATED MANUALS

The series contains an operation manual, a maintenance manual, and a GPIB Quick Reference Guide (Appendix B). ANRITSU Part numbers and manual titles are given below:

Manual Title	Part Number
37XXXD Operation Manual (OM)	10410-00261
37XXXD Maintenance Manual (MM)	10410-00264
37XXXD GPIB Quick Reference Guide	10410-00263

1-4 REMOTE OPERATION

The following sections describe the 37XXXD facilities for remote operation.

The 37XXXD fully supports the IEEE 488.2–1992 GPIB standard. All 37XXXD front panel functions (except Power on/off and GPIB Test) can be controlled remotely using the GPIB commands listed in this manual and an external computer equipped with an IEEE 488 GPIB controller. When in the GPIB operating mode, the 37XXXD VNA functions as both a listener and a talker.

GPIB Setup Menu The 37XXXD VNA GPIB address defaults to 6. This value may be changed via the Utility Menu key's GPIB ADDRESSES menu (below).

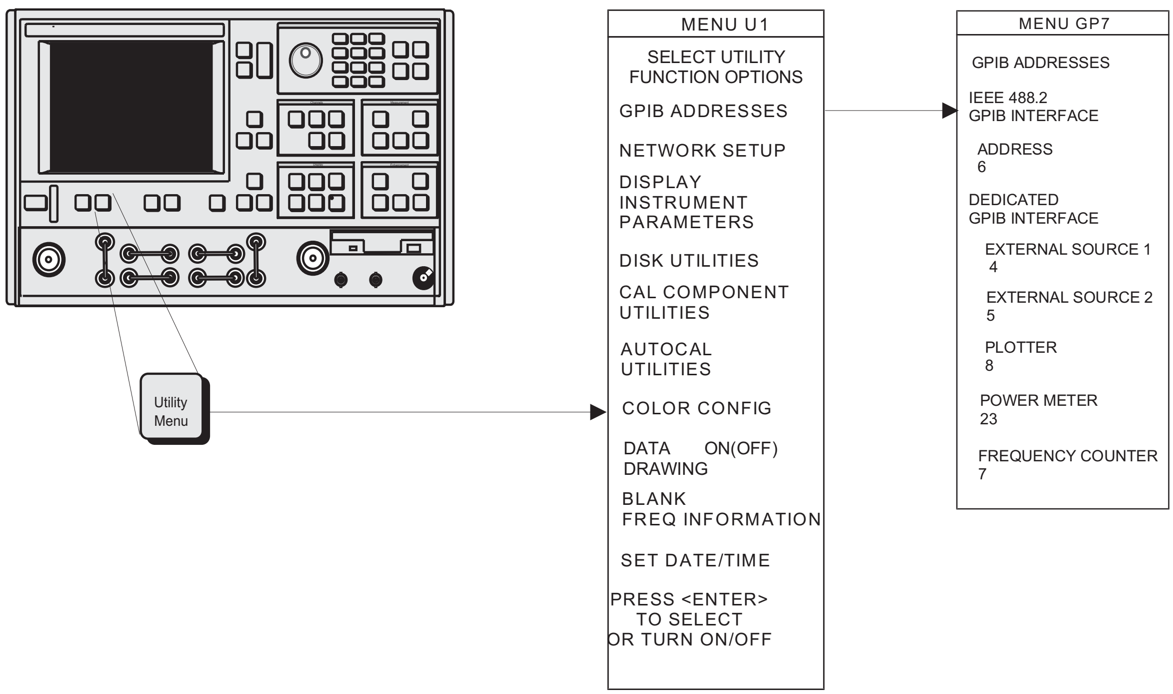
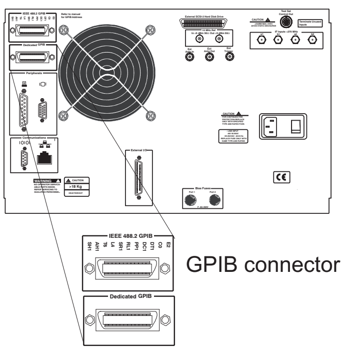


Figure 1-1. *GPIB Address Menu*

Interface Connection



Connect your external controller to the IEEE 488.2 GPIB interface connector on the rear panel (left). A pinout listing of this connector is contained in Figure 1-2.

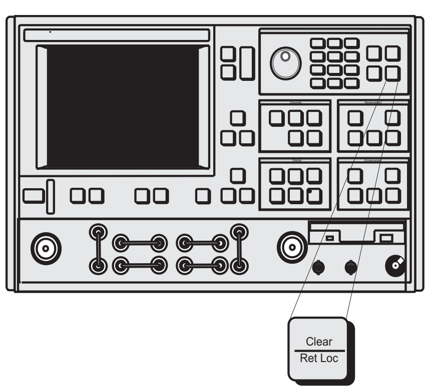
NOTE

Do not connect your external GPIB controller to the "Dedicated GPIB Interface" connector (located below the "IEEE 488.2 GPIB interface" connector (left). This dedicated GPIB port is used by the 37XXXD to control external GPIB devices, such as a plotter, second frequency source, frequency counter, or a power meter.

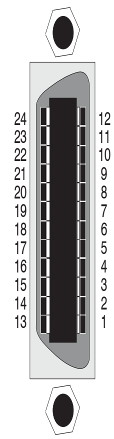
The GPIB system can accommodate up to 15 devices at any one time. To achieve maximum performance on the bus, proper timing and voltage level relationships must be maintained. If either the cable length between separate instruments or the accumulated cable length between all instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. The following guidelines should be observed:

- No more than 15 instruments may be installed on the bus (including the controller).
- Total accumulative cable length (in meters) may not exceed two times the number of bus instruments or 20 meters—whichever is less.
- Individual cable length should not exceed 4 meters.
- 2/3 of the devices must be powered on.
- Devices should not be powered on while bus is in operation (that is; actively sending or receiving messages, data, etc.).
- Minimize cable lengths to achieve maximum data transfer rates.

Local Operation Key



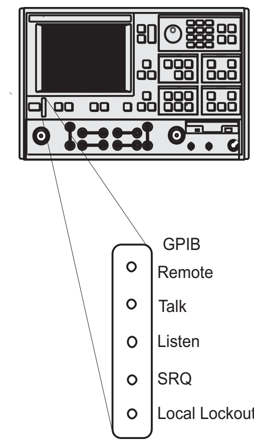
Press the Ret Loc key (below) to quickly restore the 37XXXD to local operation. Local operation will be restored unless the 37XXXD is programmed for local lockout; the Local Lockout LED indicator will be lit.



Pinout Diagram

PIN	NAME	DESCRIPTION
1-4	DIO 1 thru DIO 4	*Data Input/Output.* Bits are HIGH with the data is logical 0 and LOW when the data is logical 1.
5	EOI	*End Or Identify.* A low-true state indicates that the last byte of a multibyte message has been placed on the line.
6	DAV	*Data Valid.* A low-true state indicates that the talker has (1) sensed that NRFD is LOW, (2) placed a byte of data on the bus, and (3) waited an appropriate length of time for the data to settle.
7	NRFD	*Not Ready For Data.* A high-true state indicates that valid data has not yet been accepted by a listener.
8	NDAC	*Not Data Accepted.* A low-true state indicates that the current data byte has been accepted for internal processing by a listener.
9	IFC	*Interface Clear.* A low-true state places all bus instruments in a known state—such as, unaddressed to talk, unaddressed to listen, and service request idle.
10	SRQ	*Service Request.* A low-true state indicates that a bus instrument needs service from the controller.
11	ATN	*Attention.* A low-true state enables the controller to respond to both it's own listen/talk address and to appropriate interface messages — such as, device clear and serial poll.
12	Shield	Ground Point.
13-16	DIO 5 thru DIO 8	*Data Input/Output.* Bits are high with the data is logical 0 and LOW when the data is logical 1.
17	REN	*Remote Enable.* A low-true state enables bus instruments to be operated remotely, when addressed.
18-24	GND	Logic ground.

Figure 1-2. *Pinout Diagram, IEEE 488.2 GPIB Connector*



Remote Operation LED Indicators

GPIB Remote Indicators (above) signal operational status of the GPIB, as described below:

Remote:
Lights when the 37XXXD switches to remote (GPIB) control. It remains lit until the unit returns to local control.

Talk:
Lights when you address the 37XXXD to talk and remains lit until unaddressed to talk.

Listen:
Lights when you address the 37XXXD to listen and remains lit until unaddressed to talk.

SRQ:
Lights when the 37XXXD sends a Service Request (SRQ) to the external controller. The LED remains lit until the 37XXXD receives a serial poll or until the controller resets the SRQ function.

Local Lockout:
Lights when a local lockout message is received. The LED remains lit until the message is rescinded. When lit, you cannot return the 37XXXD to local control via the front panel.

Audible Indicators

A single beep is issued as follows:
(1) on a GPIB error,
(2) when a user warning is issued (see Chapter 12, Operational Error Messages)
(3) when a test limit line has been exceeded, if the limits testing beep function has been set (see Chapter 6)
(4) on system reset.
(5) any time the user's attention is required, such as at the end of a calibration step.

1-5 GPIB COMMUNICATION

The following sections present a short summary of 37XXXD GPIB communication. Subjects covered are program messages, separator/termination characters, status reporting, and GPIB error conditions and corresponding 37XXXD responses. Refer to Chapter 7, Remote-Only Operation, for detailed description of these topics.

The primary GPIB messages that effect 37XXXD operation consist of two major groups; Bus Interface Function messages, and Instrument Specific messages.

Bus Interface Function Messages

These are low level bus messages defined by IEEE 488.1. A discussion of these messages is beyond the scope of this programming manual. For further information, please refer to your GPIB controller documentation and/or to IEEE 488.1 Standards documents. Also refer to Appendix A at the end of this Programming Manual for a brief primer on the GPIB Interface. Table 1-1 summarizes some of the key Interface Function Messages and the 37XXXD response to them.

Table 1-1. *IEEE-488 Interface Function Messages*

Interface Function Message	Message Function	Addressed Command	37XXXD VNA Response
DCL	Device Clear	No	Resets the 37XXXD GPIB communication functions.
SDC	Selected Device Clear	Yes	Resets the 37XXXD GPIB communication functions.
GTL	Go To Local	Yes	Returns the 37XXXD to local (front panel) control.
GET	Group Execute Trigger	Yes	Executes a string of commands defined by the IEEE 488.2 common command *DDT. A GET is also done by using the *TRG command (see Chapter 10, Command Dictionary).
IFC	Interface Clear	No	Stops the 37XXXD GPIB from talking/listening.
LLO	Local Lockout	No	Disables the front panel RETURN TO LOCAL key.
REN	Remote Enable	No	Places the 37XXXD in remote when addressed to listen.

37XXXD Specific Messages

The 37XXXD specific GPIB messages (also known as commands, queries, and mnemonics) are used to control 37XXXD front panel functions. They also provide for remote only operations such as data transfers, status reporting and service request generation, error reporting, and instrument-to-application program timing synchronization.

Refer to Chapter 10, Command Dictionary; Appendix B, Quick Reference Guide; and Chapters 4-9 for information on all 37XXXD commands. The commands are organized both alphabetically and by command function groups. There are many examples throughout this manual to assist you in learning and using a desired command.

Most 37XXXD commands are three character contractions of their functional descriptions. Examples include: **OM1** (Output Marker 1),

IFV (input Frequency List), **TRS** (Trigger Sweep), **WFS** (Wait for a Full Sweep), **OFD** (Output Final [display format] Data), and **PFS** (Print Full Screen).

Numeric parameter entry commands *must* be followed by a numeric value. These commands can optionally accept a units or suffix terminator mnemonic. For example, **SRT 2 GHZ** (set start frequency to 2 GHz.)

Query commands, typically ending in a question mark (?), are used to inquire about the state of a particular instrument function. Many 37XXXD setup commands have corresponding query commands listed in the same section as the basic setup command. An example is the **MK1?** query. It *outputs* the setting of Marker 1 Frequency, where the **MK1** command *sets* Marker 1 frequency.

IEEE 488.2 Common commands, which always start with the asterisk character (*), are defined by the IEEE 488.2 Standard. They are used to implement many standard instrument GPIB operations such as querying when an operation completes, status reporting, self test, and querying the instrument identification string. These commands are described throughout the Programming Manual in the specific funtional group where they are used. A consolidated listing of these commands can be found in Table 1-2, item 12 below and in Chapter 7. An example IEEE 488.2 Common command is the **`*IDN?`** query (Output Instrument ID String.)

Separator Characters

Separator characters are used to delimit program message elements sent to or received from the 37XXXD. The permitted characters: semicolon (;), comma (,), and space ( ) and their usage is shown below.

Character	Used to separate
;	Multiple commands and multiple output response messages.
,	Multiple ASCII data elements for a single command.
Space	A command, its numerical entry value, and suffix mnemonic.

Terminator Character

The only allowed terminator character for 37XXXD GPIB messages is the linefeed character (0A, decimal 10).

GPIB Error Conditions

The 37XXXD responds to GPIB errors in the following manner:

- A beep is issued.
- An error message is displayed on the screen.
- A bit is set in the Standard Event Status Register, and, if enabled, an SRQ is generated.

- An entry is written into the non-volatile Service Log describing the error condition, along with time and date and, often, details helpful in handling the error. When full, error entries at the bottom of the log are removed to make room for new entries.
- If the error is GPIB related, the error message and the offending program message, if applicable, can be output over the GPIB via a query command. The previous error, if any, is also available via another query.

The bits set in the Standard Event Status Register for GPIB errors are as follows:

Bit 5 - Command Error (CME)
Invalid syntax, unrecognized command or command arguments, separaters or terminators that do not conform to correct IEEEE 488.2 formats. *The 37XXXD will ignore the remainder of commands in that program message.*

Bit 4 - Execution Error (EXE)
This bit is set if:
(1) A data entry parameter is out of range or not applicable.
(2) Action is impossible.
(3) Action is not possible in the current context or instrument state, or if a required option is not fitted.

Bit 3 - Device Dependent Error (DDE)
This bit is set if a valid requested action failed due to an instrument specific error condition, such as attempting to access a bad floppy disk.

Bit 2 - Query Error (QYE)
This bit is set if the 37XXXD cannot provide the requested data. For example, if an output is attempted when no data has been requested or available, or if the output buffer is cleared due to sending more commands when data from a previous request has not yet been output.

Refer to Chapter 12, Error messages, for a listing of all 37XXXD error messages (including GPIB errors).

Testing the 37XXXD GPIB Operation

The following test can be used to check your GPIB cable and 37XXXD GPIB connectors.

1. Disconnect all GPIB cables from the 37XXXD.
2. Connect your GPIB cable between the two GPIB connectors on the 37XXXD rear panel.
3. Invoke the test from the front panel as follows: Option Menu key, DIAGNOSTICS, PERIPHERAL TESTS, GPIB TEST. The test will run for a few seconds, then report the result on the front panel display.

1-6 IEEE 488.2 SUMMARY

Table 1-2 provides answers to the "Device Documentation Requirements" listed in the IEEE Standard 488.2-1992. It is also a good summary of the GPIB operational characteristics of the 37XXXD.

Table 1-2. 37XXXD IEEE 488.2 Standard Documentation Summary (1 of 3)

Number	Requirement Item	Implementation in VNA
1	Interface Function Subsets Implemented	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0, E2.
2	Device behavior when the user (unit) GPIB address is set outside of the 0–30 range	VNA returns an Out-of-Range error, issues an audible beep, and the entry color on front panel menu display is changed to red. Entered address is not accepted.
3	When is a user address change recognized?	New address is accepted and entry color remains green.
4	Description of settings at power-on	The front panel setup that was in effect prior to power down will be restored, *except:* the 37XXXD will be taken out of hold if it was previously set. Periodic IF Cal will be returned to timed operation. **Memories saved:** 1. GPIB address 2. Internal hardware calibration data 3. Information reported via the *IDN? and *OPT? queries. 4. Calibration coefficients 5. Normalized trace data 6. Stored front panel setups **Memories Cleared:** 1. Service Request message. 2. Standard event status register (except the Power-On bit is set) 3. Extended event status register 4. Limit pass/fail status register 5. Enable registers for items 2 thru 4, above. 6. GPIB input and output queues. 7. Trigger action for *TRG and GET reset to null. **Data Transfer:** 1. Data transfer is reset to MSB first for numerical array data transfers. 2. Data transfer format is reset to default, ASCII mode (FMA) for numerical array transfers. 3. Data pair format for OFD/IFD/OM1-OM6 commands is set to default (off) mode. (See command DPR0.) **Menu Displayed:** Setup Menu

Table 1-2. 37XXXD IEEE 488.2 Standard Documentation Summary (2 of 3)

Number	Requirement Item	Implementation in VNA
5	Message exchange options a. Size and behavior of input buffer b. Queries that return more than one <RESPONSE MESSAGE UNIT> c. Queries that generate a response when parsed d. Queries that generate a response when read e. Commands that are coupled	a. Default size = 3 KByte. Size increases to required amount, as needed, for <Arbitrary Block> transfers. For the <Indefinite Length Arbitrary Block> data elements, the input buffer size for that element is 64 Kbyte. Attempting to program more data than 64 KByte will cause a loss of all data for that element. A DDE error message will be issued to indicate this condition. For <Definite Length Arbitrary Block> data elements, an attempt is made to set the buffer size for that element to the size indicated in the header. If there is insufficient system memory available at the time, all data for that element is lost. A DDE error message will be issued to indicate this condition. b. None c. All d. None e. None
6	Functional elements used in construction of device-specific commands.	See command descriptions.
7	Buffer size limitations	37XXXD Attempts to allocate amount required; sets DDE error if not possible. (See 5a., above)
8	<PROGRAM DATA> elements that may appear within an <expression>	N/A (expressions are not used)
9	Response syntax for queries	See command descriptions.
10	Description of device-to-device message transfer traffic that does not follow the rules for <RESPONSE MESSAGES>	None
11	Size of block data responses	Variable, See command descriptions for details.
12	IEEE.488.2 Common commands and queries that are implemented	*CLS, *DDT, *DDT?, *ESE, *ESE?, *ESR?, *IDN?, *IST?, *OPC, *OPC?, *OPT?, *PRE, *PRE?, *RST, *SRE, *SRE?, *STB?, *TRG, *TST?, *WAI
13	State of VNA following the successful completion of the Calibration query	Normal State
14	Maximum length of the block used to define the trigger macro (1.) The method of interpreting *TRG within a *DDT command sequence (2.)	1. 255 characters. 2. On execution, the 37XXXD returns a command error and ignores the rest of the string.

Table 1-2. 37XXXD IEEE 488.2 Standard Documentation Summary (3 of 3)

Number	Requirement Item	Implementation in VNA
15	Maximum length and complexity of macro labels; maximum length of block used to define a macro; and how recursion is handled during macro expansion, if macro commands are implemented.	N/A
16	Response to common query *IDN?.	ANRITSU, <Model>, <SN>, <SW revision>
17	Size of the protected user data storage area, if the *PUD command or *PUD? query are implemented.	N/A
18	Size of resource description, if the *RDT command or *RDT? query are implemented.	N/A
19	States affected by *RST, *LRN?, *RCL, and *SAV.	*RST = default state (see Chapter 11), *LRN, *RCL, *SAV not implemented
20	Scope of the self test performed by *TST? command.	Fully automated internal hardware testing/reporting. Failure results, if any, are written to the internal non-volatile service log for user access.
21	Additional status data structures used in status reporting.	Limits Event Status and Extended Event Status registers; refer to Chapter 7 for details.
22	Statement describing whether each command is overlapped or sequential.	All commands are sequential.
23	Functional criteria that is met when an operation complete message is generated in response to that command.	N/A – No overlapped commands.
24	Descriptions used for infinity and not-a-number.	N/A

Chapter 2
GPIB and Ethernet Programming Basics

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Table of Contents (Continued)

Chapter 2
GPIB and Ethernet Programming Basics

2-1 INTRODUCTION

This chapter contains a brief introduction to GPIB and Ethernet programming techniques and describes procedures to be used when preparing programs for the 37XXXD VNA. It includes information about equipment requirements and configuration for GPIB control of the 37XXXD VNA, and many programming tips.

Familiarity with manual (front panel) operation of the 37XXXD is assumed. (Throughout this section, the 37XXXD VNA is referred to simply as “37XXXD”.) A complete description of front panel operation is contained in the appropriate 372XXD or 373XXD Vector Network Analyzer System Operation Manual.

2-2 EQUIPMENT AND CONFIGURATION

The GPIB programming examples contained in this chapter assume the equipment listed below is present and configured as described.

Required Equipment

The following equipment represents a minimum GPIB controllable 37XXXD VNA system:

- A 37XXXD Vector Network Analyzer.
- A computer/controller that supports the IEEE 488 GPIB standard. The examples in this chapter address the IBM compatible computers.
- An IEEE-488 GPIB interface (built in, or add-in peripheral card) with appropriate driver software. The National Instruments GPIB IEEE-488.2 interface is assumed for all examples in this chapter.
- Appropriate software (any of the following):

  Microsoft QuickBASIC, version 4.0 (or later)
  Microsoft “C”, version 5.1 or later, or Quick C, version 2.5.
  Any other programming language, or application software, that supports the IEEE 488 GPIB interface (Pascal, Fortran, etc.).
- A GPIB cable (preferably 2 meters long).

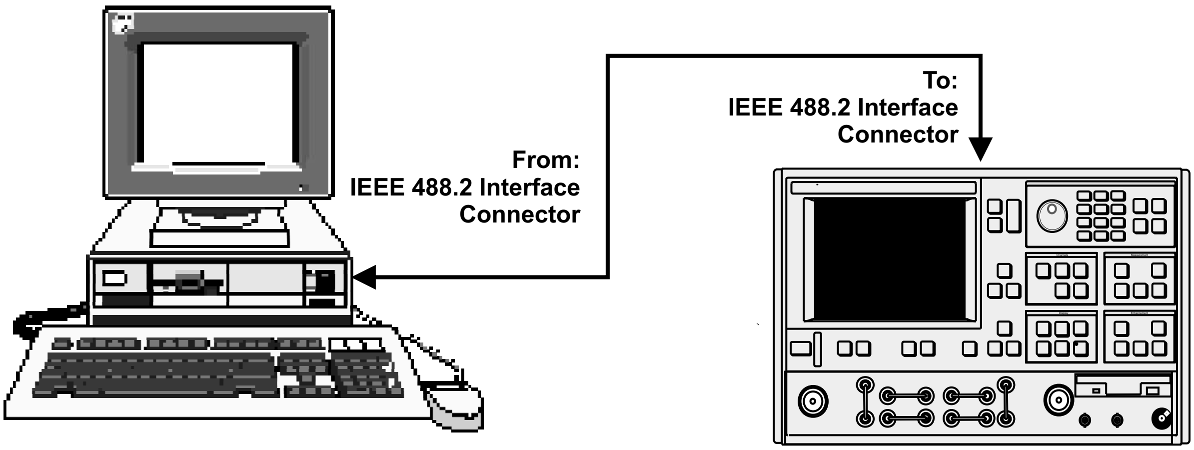
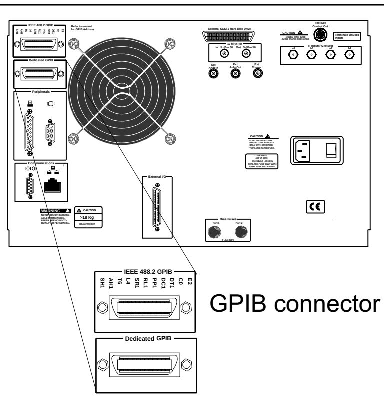


Figure 2-1. *Model 37XXXD Shown Connected to an IEEE 488.2 Controller*

NOTE

The IBM PC and National Instruments GPIB interface were chosen for demonstrating the 37XXXD GPIB operation in this manual. Any other GPIB controller that conforms to the IEEE 488 standard can be used to interface to the 37XXXD.

Configuration



Configure the 37XXXD as shown in Figure 2-1. Apply power to the 37XXXD and allow the system software to load from disk. Once the software has finished loading and start-up testing is complete, the 37XXXD is ready to be remotely controlled via the GPIB. It is important to note that *the 37XXXD will not respond to GPIB commands until the 37XXXD system software has been loaded.*

Connect a GPIB cable from the computer/controller to the rear panel IEEE 488.2 GPIB connector (left).

Apply power to the computer/controller and load the appropriate programming language software (QuickBASIC, “C”, etc.).

The default GPIB address for the 37XXXD (6) is assumed for all examples in this chapter.

2-3 GPIB PROGRAM ELEMENTS

The discussions in this chapter demonstrate basic GPIB programming concepts that are typical elements of most GPIB application programs.

The controller used to demonstrate these concepts is the National Instruments 488.2 GPIB Interface which will be referred to as NI488 throughout this chapter.

NOTE

Regardless of the controller used, consult its documentation and software distribution disks for complete details and examples on setup and use of the controller's hardware and interface software functions.

National Instruments GPIB Interface

Throughout this chapter references will be made to variables, constants, and controller function calls declared in the NI488 file that your application uses to interface to the GPIB controller. This file is **decl.h** for C and **qbdecl.bas** for QuickBASIC, and it must be included in your GPIB program. Consult your documentation for the files used for other environments.

Including and compiling the appropriate NI488 file when preparing your application is what allows use of the NI488 GPIB interface procedures and function calls in your program. Also, the file named **gpib.com** must be installed in memory upon bootup of your computer. Typically, access to this file is through your system configuration file (that is, config.sys for DOS based computers).

The **gpib.com** is what allows your GPIB program to physically interface to the installed GPIB controller and to execute GPIB function calls during operation.

NOTE

Consult your controller's documentation for complete details on software and hardware setup, test, and use prior to proceeding with the following discussion. Knowledge of your controller and its operation will be assumed from this point forward.

Definitions

The following definitions apply for the remainder of this chapter:

- board = 0, Active controller board number
- address = 6, GPIB address of the instrument.
- Address List = addresList, list of GPIB addresses terminated with the NI488 constant NOADDR. For our examples the list consists of two elements (6, NOADDR).

2-4 INITIALIZING THE GPIB

Initializing is the process of directing your controller to take control of the bus (become CIC — Controller In Charge) and setting the GPIB software to initial default settings.

NOTE

Default initial installation configuration is assumed for the NI488 hardware and software.

NI488 does this by sending an interface clear to the desired board using:

```
SendIFC(board)
```

The board will become CACS (Active controller). NI488 software allows use of up to 4 controllers. The board specified by the `SendIFC()` function must be designated CIC – Controller In Charge in its setup and configuration. See NI488 config utility in NI488 documentation.

`SendIFC()` is also useful anytime you want to insure that your GPIB controller has control over the bus, the GPIB software is in its default parameters, and GPIB of all instruments on the bus is cleared and in idle state.

The following NI488 functions are also useful when initializing your application.

- To place all instruments in remote state, use:

```
EnableRemote(board, addressList)
```

- To clear GPIB operation of all instruments use:

```
DevClearList(board, addressList)
```

2-5 SHUTTING DOWN THE GPIB SYSTEM

An important step in quitting a GPIB application is to shut down the GPIB interface. For the NI488 this is done by

- Insuring that you have control over the bus.
- Clearing all instruments' GPIB and placing them in an idle state.
- Releasing the controller GPIB software and hardware.

Implement the above by sending:

```
SendIFC(board)
ibonl(board, 0)
```

2-6 DETECTING GPIB ERRORS

It is important to use error checking code throughout your application program. Error checking usually does not significantly impact the speed of a GPIB application. This is because the GPIB bus operations are I/O operations whose execution time depends on a handshake process. This process is typically much slower than executing (error checking) code in your computer's memory.

Full Error Detection

Full error detection and handling is an invaluable debugging tool that should be used to its fullest during development of your application.

Limited Handling Error Detection

Error detection with at least a limited amount of handling should be used after each GPIB I/O operation in your final program. This will insure predictable operation of your application, proper system control, and accurate data processing.

NI488 Global Variables

The NI488 interface maintains three global variables useful in determining correct GPIB operations. These variables are updated after, and reflect the condition of, the last GPIB call to the interface. The variables are:

- **IBSTA**
  This variable provides the latest bus activity status; that is, errors, completions, time outs, etc.
- **IBERR**
  This variable provides information on the type of error, if an error was reported in IBSTA.
- **IBCNT/IBCNTL**
  The number of data bytes transferred on the bus in the last operation. IBCNTL is the “long integer” version of IBCNT.

Example

Error checking for the NI488 interface is as follows. After each GPIB call, the IBSTA is checked for errors using the NI488 declared constant EERR - in BASIC, or ERR in C. If true, the gpiberr() function is called to decode and display the global variables IBSTA, IBERR, and IBCNT. For example, for QuickBASIC, the following code is inserted after a GPIB call:

```
IF IBSTA% AND EERR THEN
  CALL gpiberr (error during GPIB operation)
END IF
```

NOTE

The NI488 disks and documentation contain the source listing of the gpiberr() function. This function should be copied into your code and used after each GPIB function call. Use the example programs provided on the NI488 distribution disks. Note that gpiberr() can also be modified to fit a particular application's requirements.

2-7 GPIB OPERATION TIME OUT

Setting GPIB time out is necessary to allow for lengthy instrument operations to complete before the application program continues with its processing. (Refer to section 2-1, Waiting for Instrument Operations to Complete.)

Example The NI488 time out is set using the `ibtmo()` interface call, as follows:

```
ibtmo(instrument_handle, timeout_setting)
```

Where:

- `instrument_handle` = The value returned by the `ibfind()` or `ibdev()` interface call for the instrument.
- `timeout_setting` = A value that disables or sets the time out setting. NI488 uses declared constants to represent the allowable time out settings, for example, the T100s constant is 100 seconds, T30ms is 30 milliseconds, TNone is 0, etc. The complete list is in the NI488 include file for your language (**`qbdecl.bas`**, **`decl.h`**).

NOTE

Consult NI488 documentation and distribution disks for information and an example on using `ibtmo()`, `ifbind()`, and `ibdev()`.

2-8 SENDING GPIB COMMANDS

GPIB controllers provide for sending GPIB commands to an instrument (or the controller itself if its address is used). The NI488 uses several commands, the most common is:

```
Send (board, address, buffer, numBytes, eot_mode)
```

Where:

- board, address = see section 2-3 for definitions.
- buffer = String of one or more instrument specific GPIB commands from the defined list in the instrument's GPIB documentation.
- buffer = String of one or more instrument specific GPIB commands from the defined list in the instrument's GPIB documentation.
- numBytes = The number of bytes contained in the buffer.
- eot_mode = The method used to signal end of transmission. This is typically done using ASCII linefeed character `0A hex` (10 decimal) and then setting EOI state (end of transmission) on the bus. The NI488 defines the following constants for use to setup end of transmission methods:
  - `NLend` - Linefeed with EOI
  - `DABend` - EOI only
  - `NULLend` -Do nothing to mark end of transmission

Example: Send the 37XXXD at address 6, the commands "**CH2;DSP;MAG**", from controller number 0, using the linefeed with EOI to mark the end of transmission:

```
Send (0, 6, "CH2;DSP;MAG",11,NLend)
```

37XXXD Commands Used The above example uses the following commands defined in the 37XXXD command set:

CH2 - sets active channel to 2,

DSP - displays only the active channel on the whole screen,

MAG - displays the active channel's data in log magnitude format (dB).

NOTE

The semicolon (;) is used to separate the different commands.

2-9 RECEIVING GPIB DATA

In order to receive data from an instrument over the GPIB, you must first instruct the instrument to output the desired data. You do this by using one of the instrument's defined data output commands and the controller Send() function (see section 2-8, "Sending commands").

The instrument must then be given permission to start sending data (talk). The NI488 call to do this is:

```
Receive(board, address, buffer, numBytes,
        eod_mode)
```

Where:

- `board, address` = see section 2-3 for definitions.
- `buffer` = The name of the memory address of the buffer where the received data is to be placed. Typically this is an array of type characters (a string). Although, for binary data transfers, the NI488 software will accept an array of almost any type; that is. integer, floating point, etc.
- `numBytes` = The maximum number of bytes to read from the instrument. Insure that "buffer" above is of at least this size.
- `eod_mode` = The method used to signal the controller to stop receiving data. Typically the NI488 constant `STOPend` is used (EOI state – end of transmission – set with the last byte). If you want to stop receiving when a certain transmission terminator character is received, then use the hex value of that character instead of the `STOPend`.

Example: Use the NI488 controller number 0, to send the 37XXXD at address 6, the command "ONP" using the line feed with EOI to mark end of transmission:

```
Send(0, 6, "ONP", 3, NLend)
```

Upon receiving a data output command, the 37XXXD will prepare the data requested and wait for the controller to put it in the talk state so it can put the data out on the bus. This is done by:

```
numBytes = 20
Receive(0, 6, buffer, numBytes, STOPend)
```

Error Handling: The number of bytes actually sent on the bus can now be retrieved from the NI488 interface software by immediately storing the value of the `IBCNT` global variable in a program variable as follows:

```
actualReceivedBytes = IBCNT
```

If we expected an exact number of bytes to be received, we can compare the requested number of bytes "numBytes" with the actual received "actualReceievedBytes" and take some corrective action if they do not match. You should do this before continuing to the data processing section of the program:

```
If numBytes ISNOTEQUALTO actualReceivedBytes then
   Call gpiberr("incorrect number of bytes
   received")
END IF
```

NOTE

Consult your programming language syntax for the operator used to check in-equality, to use in place of ISNOTEQUALTO.

37XXXD Commands Used

The above example uses the following commands defined in the 37XXXD command set:

- **ONP** – Outputs the number of data points in the current sweep. It will output the number represented in ASCII format.

2-10 GPIB SRQ HANDLING

Controllers use a dedicated line on the GPIB to detect if an instrument has requested service. An instrument sets this line when a predetermined set of conditions inside it have been met. These conditions are selected and programmed into the instrument by setting the Service Request Enable Register to a decimal value that corresponds to the bit values which, when true, will generate an SRQ. This is a binary weighted decimal value in the range 0 – 255.

Calculating the Binary Weighted Bit Value

The decimal value of a bit in a register is equal to the number 2 raised to a power equal to the bit number. For example, the decimal value of bit 4 in the Service Request Enable Register is 2 raised to the power 4 which is: $2^4 = 16$. Similarly, the decimal value of bit 0 is: $2^0 = 1$.

Enabling Service Request

To enable service request in the 37XXXD, use the command ***SRE** - Service Request Enable, with the desired value.

Example

Command the 37XXXD to request service; that is, generate an SRQ, when it has data to send, then output the number of points in the current sweep. We need to enable bit 4 (MAV), Message Available, in the Service Request Enable Register, so a service request will be generated when the data is ready. The decimal value of bit 4 is 16 ($2^4 = 16$).

The NI488 Send() function is used to send the 37XXXD at address 6, the commands "`*SRE 16;ONP`" (12 ASCII bytes), from controller number 0, using the linefeed with EOI to mark end of transmission:

```
Send(0, 6, "*SRE 16;ONP", 12, NLend)"
```

Commands Used

The above example uses the following commands defined in the 37XXXD command set:

`*SRE` – `Sends a Status Request Enable mask.`

`ONP` – `Outputs the number of sweep points.`

NI488 RQ Functions

The following NI488 functions are useful in handling SRQ operations. Consult your NI488 documentation for full details.

- To test for occurrence of SRQ:

  ```
  TestSRQ(board, SRQset)
  ```

  Where:

  SRQset contains 1 if SRQ is set, or 0 if it is not.

- To wait for occurrence of SRQ and report if it was set:

  ```
  WaitSRQ(board, SRQset)
  ```

  Where:

  SRQset contains 1 if SRQ was set within the time out allowed, or 0 if it was not. (See section 2-8, Setting GPIB Operation Time Out.)

- To find out which instrument is requesting service (`set SRQ`), instruct the controller to perform a serial poll and return the results as follows:

  ```
  FindRQS(board, addressList, statusByte)
  ```

  Where:

  `statusByte` = The status byte of the first requester found is returned in this variable.
  The index in `addressList` that contains the address of the instrument requesting service is returned in the `IBCNT` global variable.

- To read out the SRQ byte from an instrument:

  ```
  ReadStatusByte(board, address, statusByte)
  ```

- To parallel poll, see the following functions in the NI488 documentation.

  ```
  PPoll()
  PPollConfig()
  PPollUnconfig()
  ```

2-11 COMPLETE GPIB OPERATIONS

Instruments often require a period of time to complete certain operations such as disk I/O, measurement sweep, data preparation, etc.. Your application program must allow the instrument time to complete these operations and be able to detect when operations are completed.

The simplest mechanism for synchronizing operations over the GPIB involve using the ***OPC?** -Operation Complete query and the ***OPC** - Operation Complete command.

Example 1 Command the 37XXXD to perform a sweep and hold then place an ASCII "1" in its output buffer (***OPC?**) when done.

The NI488 `Send()` function is used to send the 37XXXD at address 6, the commands, "**HLD;TRS;WFS;*OPC?**", from controller number 0, using the linefeed with EOI to mark end of transmission. The `Receive()` function is then used to hold the program from continuing processing until it receives the output of the ***OPC** command (or times out):

```
buffer = "HLD;TRS;WFS;*OPC?"
Send(0, 6, buffer, 17, NLend)
oneByte = 1
Receive(0, 6, buffer, oneByte, STOPend)
```

NOTE

The time out must be set high enough to allow the sweep to complete (see "Setting time outs" in section 2-8).

Example 2 Now we will modify the above example to request service when bit 4 (MAV) in the Status Byte Register is set (***SRE 16**) to let the program know when the ***OPC?** data is ready to be output. This overcomes the time out problem but it does increase program complexity.

```
buffer = "*SRE 16;HLD;TRS;WFS;*OPC?"
Send(0, 6, buffer, 25, NLend)
SRQset = 0
WHILE (SRQset = 0)
    WaitSRQ(board, SRQset)
ReadStatusByte(board, address, statusByte)
oneByte = 1
Receive(0, 6, buffer, oneByte, STOPend)
```

NOTE

`TestSRQ()` can be used instead of `WaitSRQ()` to check for the occurrence of SRQ in the WHILE loop. This would allow your program to perform other tasks while waiting for SRQ inside the WHILE loop.

37XXXD Commands Used

Examples 1 and 2 above used the following commands defined in the 37XXXD command set:

***SRE** - sends a Status Request Enable value.

HLD - places VNA into hold mode

TRS - triggers a sweep. Since the VNA is already in hold mode, the hold mode is changed to single sweep and hold.

WFS - waits one full sweep and stops

***OPC?** - outputs an ASCII “1” when operation is complete

NOTE

Refer to Chapter 7, Remote Only Operations for more information and examples on status reporting and service request generation.

2-12 ETHERNET PROGRAMMING

The syntax of programming the Lightning D Series VNA over the Ethernet is the same as the syntax of programming the VNA over the GPIB. Most of the commands supported over GPIB are supported over the Ethernet and the data returned from queries is in the same format as that of the GPIB.

Ethernet and GPIB Differences

During communication over the GPIB, the start and end of a program message are well defined and important. On reception of a program message, the VNA does nothing until the message has been completely received (an end message indicator is detected). With TCP/IP communication, the concept of the end of a message is somewhat blurred. Consider what happens when you receive a Web page over the Internet. The reception of a Web page takes place over a period of time where different elements are received until the viewer is unable to perceive any further change.

Because all Anritsu VNAs assert the EOI line at the end of a program message during GPIB data transfer, a user can receive GPIB data as rapidly as is possible until the EOI signal is detected. Ethernet communications has no such thing as an EOI line; therefore, the user must employ some other mechanisms to find the end of a program message. IEEE488.2 provides just such a mechanism by allowing the instrument receiving the data to discover the end of the program message by either scanning for the end message byte during reception of ASCII data, and/or utilizing the byte count in arbitrary block headers during binary data transfer.

NOTE

The Arbitrary Length Arbitrary Block header format of IEEE488.2 requires the EOI signal; therefore, this form of arbitrary block cannot be used with TCP/IP communication. Anritsu VNAs do not send this type of arbitrary block, so reception of VNA data is not affected by this issue.

A GPIB device does not send data out without first being addressed to talk, and the data transfer mode set. Over TCP/IP, there is no waiting to be addressed to talk. The VNA has no idea whether the controller is actually listening or not. The data is just simply sent out whenever it appears in the output routine.

A technique commonly used to measure the bus transfer speed was to command the VNA to output Bitmap image data, or some other large piece of data, and then wait several seconds to insure that the data had been completely generated and ready to go. Then the controller would read the data in as fast as possible while keeping track of the elapsed time. This technique does not work at all over TCP/IP because the data comes out whether the controller is reading or not. What would happen is that the communications channel would be hopelessly blocked with individual messages bouncing back and forth over the Ethernet in a flurry of activity, finally dying out when their transfer timeout occurred. To prevent this, The controller should start listening for data as soon as it is done sending the query message.

IEEE488.2 specifies that all output data is thrown away when a new program message is received before the previously generated data is read completely. The embedded operating system employed in the VNA does not provide a mechanism to throw away TCP/IP data that has been buffered up to be output, short of closing the socket. Of course, if the VNA is receiving data on the socket, closing the socket is not a good idea. Therefore, the data is allowed to linger and will be available until it is completely read out.

If the VNA input routine has to wait long periods of time without receiving any commands, it will periodically transmit a null byte to test if the connection is still alive. This can cause several leading null bytes in the VNA data. Leading null bytes are known as WHITE space and are permitted in a 488.2 response. So, when receiving data, be sure to check for the leading null characters.

Ethernet Communication Steps

In order to communicate over the Ethernet using TCP/IP and the Winsock dll, a program must perform the following steps:

1 - Load the Winsock dll at the start of the program

2 - Create a local socket for Ethernet communication using the TCP protocol

3 - Connect the local socket to the VNA

4 - Write commands to the VNA and Read data back as necessary

5 - Close the local socket when done

6 - Unload the Winsock dll at the end of the program

An example program etherapp.cpp is included at the end of the chapter; we will be discussing the important parts of it in this section.

Step 1. Load the Winsock dll at the start of the program.

The Winsock library includes a function that loads the dll. The version must be specified when the call is made. The code that loads Winsock 2.2 is shown below:

```
// Load Winsock
//
status = TRUE;
winsockok = TRUE;
if (WSAStartup(MAKEWORD(2,2), &wsd) != 0)
{
  printf("Failed to load Winsock library!\n");
  status = FALSE;
  winsockok = FALSE;
}
```

Where:

wsd is a WSADATA structure. The structure is unimportant to us since it is only referenced when the Winsock dll is loaded and nowhere else in the program. Notice there are 2 flags associated with loading the dll.

status is a variable that starts out with the value TRUE. If anything goes wrong, it is set FALSE. The intent of status is to bypass any subsequent program operations, seemingly to cause the program to immediately exit.

winsockok is a variable that starts out TRUE, but if the dll loading fails for some reason, it is nice to know when it comes time to unload the dll.

Step 2. Create a local socket for Ethernet communication using the TCP protocol.

The socket is created using the function socket() which returns the socket handle sock. If the value of sock is INVALID_SOCKET the function call failed. We should not try to access this socket value. Use the variable status to prevent any further access.

```
// Create the socket
//
if (status == TRUE)
{
  sock = socket(AF_INET, SOCK_STREAM,IPPROTO_TCP);
  if (sock == INVALID_SOCKET)
  {
    printf("socket() failed: %d\n",
    WSAGetLastError());
    status = FALSE;
  }
}
```

NOTE

Do not try to create the socket if the status is FALSE. If we fail to create the socket, we set the status as FALSE. SOCK_STREAM is the type of socket used with TCP and IPPROTO_TCP is the protocol used with TCP. The argument AF_INET is always used regardless.

Step 3. Connect the local socket to the VNA.

This step is actually two steps. The first is to send the connection request to the VNA using the function connect(), as follows:

```
// Connect to the VNA
//
if (status == TRUE)
{
  // Set up the VNA address first
  // The port number is always 5000
  //
vna.sin_family = AF_INET;
vna.sin_port = htons(Port);
vna.sin_addr.s_addr = inet_addr(ipaddr);
// Now connect
//
if (connect(sock, (struct sockaddr *)&vna,
sizeof(vna)) == SOCKET_ERROR)
{
  printf("connect() failed: %d\n",
  WSAGetLastError());
  status = FALSE;
}
```

The second part of the connect is to get the VNA acceptance status back from the VNA.

NOTE

We must look at the return code for the function call recv() to see if it failed. If that is OK, we have to check if the VNA refused the connection. Lightning has two available sockets it can assign. If both of those are in use by someone else. The acceptance message will be:

`000 Connection refused`

The following example shows how to get the VNA acceptance status back from the VNA:

```
// Get the connection OK from the VNA
// will be one message as below
// 100 Connection accepted - 23 bytes
// 000 Connection refused - 22 bytes
if (status == TRUE)
{
  ret = recv(sock, idn_buff, sizeof(idn_buff), 0);
  if (ret == SOCKET_ERROR)
    {
    printf("recv() failed: %d\n",
    WSAGetLastError());
    status = FALSE;
    }
  // Test if connection is accepted
  else
  {
    // Print out response
    idn_buff[ret] = 0;
    printf("%s\n", idn_buff);
    // Set flags
    if (strncmp(idn_buff, "100 Connection accepted",
    23) != 0)
    status = FALSE;
  }
}
```

Step 4. Write the commands to the VNA and read back the data as necessary.

For this particular example there are also two steps, to send a command and to receive an ASCII response back.

```
// Send the query
//
if (status == TRUE)
{
  sprintf(say_buff, " %s \n", message);
  ret = send(sock, say_buff, strlen(say_buff), 0);
  if (ret == SOCKET_ERROR)
  {
    printf("send(%s) failed: %d\n", message,
    WSAGetLastError());
    status = FALSE;
  }
  else printf("Sent '%s' %d bytes\n", message, ret);
}
```

The second part is to receive the response.

NOTE

It is a little more complex since we have to loop until a line feed is received. This is the clue that an ASCII response is complete. Notice at the lower section where the response is printed, leading nulls are skipped over. As mentioned earlier, the receive code may be sending these periodically.

```
// Receive the response
//
if (status == TRUE)
{
  byte_count = 0;
  done_flag = FALSE;
  aux_ptr = idn_buff;
  while ((done_flag == FALSE) && (status == TRUE))
  {
    ret = recv(sock, aux_ptr, sizeof(idn_buff), 0);
    if (ret == SOCKET_ERROR)
      {
```

```
  printf("recv() failed: %d\n",
  WSAGetLastError());
  status = FALSE;
}
else
{
  // Do a test for the line feed at the end
  aux_ptr[ret] = 0;
  end_ptr = strchr(aux_ptr, (int)'\n');
  // Bump up to the end of the received stuff
  // Update the running byte count
  aux_ptr += ret;
  byte_count += ret;
  // If a line feed was found, we are done
  if (end_ptr != NULL)
  {
    done_flag = TRUE;
    // Overwrite the line feed at the end
    *end_ptr = 0;
    }
  }
}
// If we received something print it out
if (status == TRUE)
{
  // Bump over any leading nulls
  aux_ptr = idn_buff;
  while(*aux_ptr == 0) aux_ptr++;
  // Print out the ltrimmed string
  printf("RECV [%d bytes]: '%s'\n", byte_count,
  aux_ptr);
  }
}
```

Step 5. Close the local socket when done.

Closing the socket is very important. If you close the socket, it will be detected almost immediately by the VNA, any lingering data is cleared, and the memory is returned to the memory pool. More importantly, the socket will be closed making it available for another connection later. Lightning only has two sockets it can use to connect. If these sockets are not closed, communication will come to a screeching halt. Eventually, a VNA socket will be closed when the receive code sends a null byte, but this normally takes several seconds. Be sure to CLOSE THE SOCKET when you are done with it. It is good programming practice to take care of loose ends before closing a program.

```
// Close the socket if it was created
if (sock != INVALID_SOCKET) closesocket(sock);
```

Step 6. Unload the Winsock dll at the end of the program.

This is another one of those loose ends that you must take care of. If the Winsock dll is not unloaded, it leaves a process still running, even though the program has terminated. In most cases, this running process will not permit a new instance of the program, evidenced by clicking on the program and nothing happening. Be sure to UNLOAD THE WINSOCK DLL when you are done with it.

```
// Unload the Winsock dll if it was loaded
if (winsockok == TRUE) WSACleanup();
```

Example Program

Unlike all those example Winsock TCP/IP programs you find on the internet, this program was specifically written for a Lightning VNA using Microsoft Visual Studio 6.0. You might want to try it and see how easy it is to write TCP/IP applications.

This is a console program. You can open a DOS window, change to the directory where you have the program and type:

```
etherapp onp;oid 172.26.208.126
```

If the device whose address is 172.26.208.126 is a VNA, you will get something similar to the following displayed on the screen:

```
100 Connection accepted
Sent 'onp;oid' 10 bytes
RECV [49 bytes]:
'401;37247A,0.040000,20.000000,-15.00,0.00,004.81'
```

Here is the source code for the program:

```
// Etherapp.cpp
// A simple console application that performs sends a
// query command to the vna and gets the response back
// Be sure to link this with the library ws2_32.lib
// winsock2.h is part of windows
#include <winsock2.h>
#include <ctype.h>
#include <string.h>
#include <stdio.h>
#include <stdlib.h>
#define TRUE   1
#define FALSE  0
int main(int argc, char **argv)
{
  short status;
  short winsockok;
  short done_flag;
  WSADATA wsd;
  SOCKET sock;
  int ret;
  int byte_count;
  unsigned short Port;
  struct sockaddr_in vna;
  char ipaddr[32];
  char message[128];
  char say_buff[256];
  char idn_buff[256];
  char *aux_ptr;
  char *end_ptr;
  // The query command we will be sending
  //
  Port = 5000;
  // Take the query from the command line
  //
  if (argc > 1) strcpy(message, argv[1]);
  else strcpy(message, "*IDN?");
  // Take the vna ip address from the command line
  //
```

```
if (argc > 2) strcpy(ipaddr, argv[2]);
else strcpy(ipaddr, "172.26.208.131");
// Load Winsock
//
status = TRUE;
winsockok = TRUE;
if (WSAStartup(MAKEWORD(2,2), &wsd) != 0)
{
  printf("Failed to load Winsock library!\n");
  status = FALSE;
  winsockok = FALSE;
}
// Create the socket, and attempt to connect to the server
//
if (status == TRUE)
{
  sock = socket(AF_INET, SOCK_STREAM, IPPROTO_TCP);
  if (sock == INVALID_SOCKET)
  {
    printf("socket() failed: %d\n", WSAGetLastError());
    status = FALSE;
    }
  }
  // Connect to the VNA
  //
  if (status == TRUE)
  {
    // Set up the VNA address first
    //
    vna.sin_family = AF_INET;
    vna.sin_port = htons(Port);
    vna.sin_addr.s_addr = inet_addr(ipaddr);
    // Now connect
    //
    if (connect(sock, (struct sockaddr *)&vna, sizeof(vna)) == SOCKET_ERROR)
    {
       printf("connect() failed: %d\n", WSAGetLastError());
       status = FALSE;
```

```
        }
        // Get the connection OK from the VNA
        // will be one message as below
        // 100 Connection accepted - 23 bytes
        // 000 Connection refused - 22 bytes
        if (status == TRUE)
        {
            ret = recv(sock, idn_buff, sizeof(idn_buff), 0);
            if (ret == SOCKET_ERROR)
            {
                printf("recv() failed: %d\n", WSAGetLastError());
                status = FALSE;
            }
            // Test if connection is accepted
            else
            {
                // Print out response
                idn_buff[ret] = 0;
                printf("%s\n", idn_buff);
                // Set flags
                if (strncmp(idn_buff, "100 Connection accepted", 23) != 0)
                    status = FALSE;
            }
        }
    }
    // Send the query
    //
    if (status == TRUE)
    {
        sprintf(say_buff, " %s \n", message);
        ret = send(sock, say_buff, strlen(say_buff), 0);
        if (ret == SOCKET_ERROR)
        {
            printf("send(%s) failed: %d\n", message, WSAGetLastError());
            status = FALSE;
        }
        else printf("Sent '%s' %d bytes\n", message, ret);
    }
```

```
// Receive the response
//
if (status == TRUE)
{
   byte_count = 0;
   done_flag = FALSE;
   aux_ptr = idn_buff;
   while ((done_flag == FALSE) && (status == TRUE))
   {
      ret = recv(sock, aux_ptr, sizeof(idn_buff), 0);
      if (ret == SOCKET_ERROR)
      {
         printf("recv() failed: %d\n", WSAGetLastError());
         status = FALSE;
      }
      else
      {
         // Do a test for the line feed at the end
         aux_ptr[ret] = 0;
         end_ptr = strchr(aux_ptr, (int)'\n');
         // Bump up to the end of the received stuff
         // Update the running byte count
         aux_ptr += ret;
         byte_count += ret;
         // If a line feed was found, we are done
         if (end_ptr != NULL)
         {
            done_flag = TRUE;
            // Overwrite the line feed at the end
            *end_ptr = 0;
         }
      }
   }
   // If we received something print it out
   if (status == TRUE)
   {
      // Bump over any leading nulls
      aux_ptr = idn_buff;
```

```
        while(*aux_ptr == 0) aux_ptr++;
        // Print out the ltrimmed string
        printf("RECV [%d bytes]: '%s'\n", byte_count, aux_ptr);
     }
  }
  // Close the socket if it was created
  if (sock != INVALID_SOCKET) closesocket(sock);
  // Unload the Winsock dll if it was loaded
  if (winsockok == TRUE) WSACleanup();
  return 0;
}
```

Chapter 3
Series 37XXXD
Programming Examples

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Chapter 3
Series 37XXXD
Programming Examples

3-1 INTRODUCTION

This chapter contains example programs to familiarize the user with 37XXXD programming. Familiarity with manual (front panel) operation of the 37XXXD is assumed. Throughout this section, the 37XXXD VNA is referred to simply as "37XXXD." A complete description of front panel operation is contained in the 37XXXD Vector Network Analyzer System Operation Manual.

Also, it is assumed that you have read Chapters 1 and 2 and are familiar with the information they contain. This information describes the various syntax and functions used in the example sequences presented throughout the chapter. This includes: Send, Receive, IBCNT, IBERR, ISNOTEQUALTO, and others.

3-2 37XXXD PROGRAMMING EXAMPLES

The main sequences for five example 37XXXD programs are listed and explained in the following pages. In these examples, the NI488 function calls are abbreviated; refer to Chapter 2 and the NI488 documentation for full details. Refer to the 37XXXD Command Function groups and the Command listings in this manual for complete details on 37XXXD command operations.

NOTE

The functions and procedures called from the example sequences in sections 3-3 through 3-7 are provided at the end of this chapter in sections 3-8 through 3-10.

The intent of these example program sequences is to provide algorithms useful when programming various features of the 37XXXD. You are encouraged to study these algorithms, copy them into your programming environment, and tailor them for your language and application.

3-3 EXAMPLE 1

This example sequence lists and explains some common 37XXXD operations.

- Setup display and sweep frequencies

  ```
  Send (0,6,"CH2;DSP;MPH;SRT 40 MHZ;STP 20 GHZ",NLend)
  ```

- Setup markers

  ```
  Send (0,6,"MK1 40 MHZ;MK2 20 GHZ",NLend)
  ```

- Read and store current instrument setup
  - Request instrument setup string

    ```
    Send (0,6,"OFP",NLend)
    ```

  - Read instrument setup string

    ```
    Receive(instrSetup, MAXSIZE, STOPend)
    ```

  - Get number of bytes transferred3

    ```
    sizeInstrSetup = IBCNT
    ```

NOTE

Program variables *instrSetup* and *sizeInstrSetup* will be used later with the **IFP** command to input the saved setup string.

- Read sweep frequencies
  - Trigger and wait for full sweep then hold

    ```
    Send (0,6,"HLD;TRS;WFS",NLend)
    ```

  - Wait for operations to complete (See "Wait for Instr()" example, page 3-12.)

    ```
    WaitForInstr()
    ```

  - Request sweep frequencies (**OFV**):
    Use floating point (64 bit) binary format (**FMB**), Least Significant Byte first ordering (**LSB** for IBM/compatible PCs only).

    ```
    Send (0,6,"LSB;FMB;OFV",NLend)
    ```

  - Get number of bytes to read:
    See Chapter 7, "Data Transfer" section for details on <Arbitrary Block> data transfers and structure of the header used to precede and give number of bytes in data block. (See "GetNumBytes( )" example, page 3-13.)

    ```
    numBytes = GetNumBytes(address, headerString)
    ```

  - Read frequencies
    `freqArray` is a floating point double precision array of up to 1601 elements.

    ```
    Receive(freqArray, numBytes, STOPend)
    ```

- ❑ Check for complete transfer

```
if (numBytes ISNOTEQUALTO IBCNT then
  gpiberr("Could not read freq list correctly")
```

- ■ Reset instrument
  - ❑ Send reset command

```
Send (0,6,"*RST",NLend)
```

  - ❑ Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- ■ Download and restore a previously saved setup
  - ❑ Command instrument to receive a setup string. Use "NULLend" (see Chapter 2, section 2-9.)

```
Send (0,6,"IFP ",NLend)
```

NOTE

The space after the **IFP** command is needed to separate it from the setup string, which follows.

  - ❑ Send the setup string. Use "NLend" (see Chapter 2, section 2-9.)

```
Send (0,6,(instrSetup, sizeInstrSetup),NLend)
```

  - ❑ Check if all data was sent correctly

```
if (sizeInstrSetup ISNOTEQUALTO IBCNT then
 gpiberr("Error sending setup string")
```

- ■ Select instrument Marker 1 active

```
Send (0,6,"MR1",NLend)
```

- ■ Read measurement trace
  - ❑ Trigger and wait for full sweep then hold

```
Send (0,6,"TRS;WFS;HLD",NLend)
```

  - ❑ Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

  - ❑ Request trace data:
    in final trace graph type values (**OFD**), in floating point (32 bit) binary format (**FMC**). Use Least significant Byte first ordering (**LSB**, for IBM/compatible PCs only)

```
Send (0,6,"LSB;FMC;OFD",NLend)
```

- ❑ Get number of bytes to read (page 3-13)

```
numBytes = GetNumBytes
```

- ❑ Read out the trace data values.

```
Receive(traceData, numBytes, STOPend)
```

- ❑ Check if all data was transferred

```
if (numBytes ISNOTEQUALTO IBCNT then
  gpiberr("Could not receive data.")
```

- ❑ Calculate number of sweep points in data string POINTSIZE is 8 bytes for data transfers using the **FMB** format and 4 bytes if using the **FMC** format. See Chapter 7, "Data Transfer Commands."

```
numFreqs = numBytes / POINTSIZE
```

- Put instrument(s) in local to allow use of front panel

```
EnableLocal(board, addressList)
```

3-4 EXAMPLE 2

This example sequence lists and explains 37XXXD commands used for automated 12 Term Calibration.

- Display instructions to operator on computer screen

```
PRINT "Install 33KFKF Phase Equal Insertable on
       Port 1"
PRINT "Install 3670K502 Thru Line female side to
       Port 2"
PRINT "so the new Port 2 is the male end of the
       thru"
PRINT "Shape the end of the thru so it is near
       Port 1"
PRINT "(Press a key when ready)"
```

- Set up calibration parameters

```
Send (0,6,"SCM;LTC;C12;ISN",NLend)
```

- Set up calibration frequencies

```
Send (0,6,"DFC;FRS 1 GHZ;FRI 100 MHZ;FRP 41;FIL;DFD",NLend)
```

- Set up connectors and loads

```
Send (0,6,"P1C;CFK;P2C;CMK;BBL",NLend)
```

- Begin calibration data collection

```
Send (0,6,"BEG",NLend)
```

- Wait for operations to complete (page 3-12)

```
WaitForInstr()
```

- Instruct operator via the controller screen...
  To connect ISOLATION DEVICES between Ports 1 and 2 and wait for him; then measure devices. (See TakeCalData(), pg 3-14).

```
PRINT "Connect ISOLATION DEVICES between
       Ports 1 and 2"
PRINT "Press ENTER when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect BROADBAND LOADS between Ports 1 and 2 and wait for him; then measure devices.

```
PRINT "Connect BROADBAND LOADS between
       Ports 1 and 2."
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect OPEN to Port 1 and SHORT to Port 2 and wait for him; then measure devices.

```
PRINT "Connect OPEN to Port 1 and SHORT
       to Port 2"
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect SHORT to Port 1 and OPEN to Port 2 and wait for him; then measure devices.

```
PRINT "Connect SHORT to Port 1 and OPEN
       to Port 2
PRINT "Press a key when ready"
TakeCalData()
```

- Instruct operator via the controller screen....
  To connect Port 1 and Port 2 with the reminder to NOT INSTALL ADDITIONAL THRU LINES/ADAPTERS BETWEEN PORTS, and wait for him; then measure devices.

```
PRINT "Connect Port 1 and Port 2 but
       DO NOT INSTALL ADDITIONAL THRU
       LINES/ADAPTERS BETWEEN PORTS
PRINT "Press a key when ready"
TakeCalData()
```

3-5 EXAMPLE 3

This example sequence lists and explains 37XXXD commands for transferring calibration error terms/coefficients.

- Setup a Frequency Response Transmission Calibration.
  - Set up calibration parameters

    ```
    Send (0,6,“SCM;LTC;CFT”,NLend)
    ```

  - Set up calibration frequencies

    ```
    Send (0,6,“DFC;FRS 1 GHZ;FRI 100 MHZ;FRP 41;FIL;DFD”,NLend)
    ```

  - Begin calibration data collection

    ```
    Send (0,6,“BEG”,NLend)
    ```

- Wait for operations to complete (page 3-12)

  ```
  WaitForInstr()
  ```

- Instruct operator via the controller screen...
  To connect THRU LINE between Ports 1 and 2 and wait for him.

  ```
  PRINT “Connect THRU LINE between
         Ports 1 and 2"
  PRINT “Press ENTER when ready”
  ```

  - Measure thruline (page 3-12).

    ```
    TakeCalData()
    ```

  - Read Calibration Coefficient Data from instrument and store the 488.2 data transfer header which is useful for sending the same size data array back to the 37XXXD later. Also calculate and store the number of frequency points read in.
  - Request the error term/coefficient array (**OC1**) in 64 bit Floating Point format (**FMB**), Least Significant Byte order (**LSB**, for PCs only). See Chapter 7, “Data Transfer Commands” for the error terms returned by the OCx series commands.

    ```
    Send (0,6,“LSB;FMB;OC1”,NLend)
    ```

  - Get number of bytes contained in the data string and store the header read from the 37XXXD into calHeader (string of characters). See GetNumBytes(), page 3-13.

    ```
    numBytes = GetNumBytes(address, calHeader)
    ```

  - Read calibration data values
    calData is an 82 element double precision floating point array.

    ```
    Receive(calData, numBytes, STOPend)
    ```

- Check if all data was transferred

```
if (numBytes ISNOTEQUALTO IBCNT) then
   gpiberr("Could not receive data.")
```

- Store number of calibration data bytes transferred

```
calDataSize = IBCNT
```

- Calculate number of frequency points in the data trace if desired. POINTSIZE is 8 bytes for data transfer using the **FMB** format. See Chapter 7, "Data Transfer Commands." The division by two is because each data point represents a complex data pair (real, imaginary).

```
numFreqs = (CalDataSize / 2) / POINTSIZE
```

■ Send Calibration Coefficient Data to instrument

- Simulate a Transmission Calibration
  Command the 37XXXD to apply transmission calibration coefficients to data (**AFT**), then input the calibration coefficient array for transmission error term (**IC1**), in 64 bit Floating Point format (**FMB**), Least Significant Byte order (**LSB**, for use with PCs only). Use "NULLend" (see Chapter 2, section 2-9.)

```
Send (0,6,"AFT;LSB;FMB;IC1",NLend)
```

NOTE

Note the space after the **IC1** command; it is needed to separate it from the calibration coefficient data array, which follows.

- Send cal coefficient #1 data transfer header (same one that was received from the **OC1** transfer). Use "NULLend" (see Chapter 2, section 2-9.)

```
calHeaderSize = LENGTHOFSTRING(calHeader)
Send (0,6, (calHeader, calHeaderSize, NULLend),NLend)
```

NOTE

Consult your compiler documentation for a function that returns length of a string.

- Check for proper transfer

```
if (CalHeaderSize ISNOTEQUALTO IBCNT) then
  gpiberr("Data not sent properly")
```

- Send cal coefficient #1 data. Use "NLend" (see Chapter 2, section 2-9.)

```
Send (0,6,(calData, calDataSize),NLend)
```

- Check for proper transfer

```
if (calDataSize ISNOTEQUALTO IBCNTl then
   gpiberr("Data not sent properly")
```

- Wait for operation to complete (page 3-12)

```
WaitForInstr()
```

- Turn on/apply error correction

```
Send "CON"
```

3-6 EXAMPLE 4

This is an example sequence showing data string input to the 37XXXD. The string sent below is used to set hardcopy data output labels.

The 37XXXD requires the double quote characters (" ") to delimit ASCII strings being sent to it. That is, to send a string called *mystring* you would actually send "*mystring*". This presents a problem since programming languages also delimit a character string with double quotes. In order to send the 37XXXD a quote (") as a regular character, you must precede it with the backslash (\) character in the C language and with a quote character (") in BASIC.

NOTE

A 37XXXD ASCII string may also be delimited using a single quote character (') at the beginning and end of the string. In which case, the backslash (\) for C and the double quote (") in BASIC are not required.

- Define DUT Model in the data label.
  The following command sequence needs to be sent to the 37XXXD:

```
LMS "4_8_FILTER"
```

- If using C use this syntax

```
Send (0,6,"LMS \"4_8_FILTER\"",NLend)
```

- If using BASIC use this syntax

```
Send (0,6,"LMS ""4_8_FILTER""",NLend)
```

- Here the same command sequence can be sent with the single quotes (' ') without the need for additional character as above.

```
Send (0,6,"LMS '4_8_FILTER'",NLend)
```

- If shutting down the GPIB immediately after this series of commands, then you must also make the controller wait for the 37XXXD to completely receive this data before shut down.

```
WaitForInstr()
```

3-7 EXAMPLE 5

This example sequence lists and explains 37XXXD commands for 37XXXD internal disk operations.

- Sweep, and store channel 1 trace data to memory

  `Send (0,6,"CH1;S11;CH3;S21;WFS;CH1;STD",NLend)`

- Store trace memory data to hard disk
  The following command sequence needs to be sent to the 37XXXD:

  `Send (0,6,"SAVE 'C:\CH1_S21.NRM'",NLend)`

- Wait for operations to complete (page 3-12)

  `WaitForInstr()`

- Output channels 1 Tabular Data to instrument floppy disk

  `Send (0,6,"SAVE 'A:\CH1_S21.DAT'",NLend)`

- Wait for operations to complete

  `WaitForInstr()`

- Save Front Panel and Calibration setup to hard disk

  `Send (0,6,"SAVE 'C:\SETUP1.CAL'",NLend)`

- Wait for operations to complete

  `WaitForInstr()`

- Reset system to default state

  `Send (0,6,"*RST",NLend)`

- Recal Front Panel and Calibration setup from hard disk

  `Send (0,6,"RECALL 'C:\SETUP1.CAL'",NLend)`

- Wait for operations to complete

  `WaitForInstr()`

- Recall channel trace/noramlization data from hard disk to CH3

  `Send (0,6,"CH3; RECALL 'C:\CH1_S21.NRM'; WFS",NLend)`

- Wait for operations to complete

  `WaitForInstr()`

- Delete channel 1 trace/normalization data file from hard disk

  `Send (0,6,"DEL 'C:\CH1_S21.NRM'",NLend)`

- Wait for operations to complete

  `WaitForInstr()`

3-8 EXAMPLE PROCEDURE 1

This example sequence provides coding for the Wait for Instr () procedure used earlier in this chapter's example sequences.

NOTE

Do not use this procedure if the instrument was commanded to output data that has yet to be read by the program since the **`*OPC?`** query will, in itself, output data (the character “1”)when done with previous operation.

- Set GPIB time out limit to insure enough time is allowed for instrument operations to complete. See `ibtmo()` in the NI488 documentation for details.

```
ibtmo(instrument_handle, T1000s)
```

- Send the Operation Complete query

```
Send (0,6,"*OPC?",NLend)
```

- Wait for instrument to output the ASCII character “1”

```
numBytes=1
Receive(buffer, numBytes, STOPend)
```

- Restore default time out limit

```
ibtmo(instrument_handle, T10s)
```

3-9 EXAMPLE FUNCTION 1

This example sequence provides coding for the `GetNumBytes()` function used earlier in this chapter's example sequences.

GetNumBytes() reads the 37XXXD output buffer and returns the number of data bytes to be transfered in the ensuing <Arbitrary Block> data string (see Chapter 7, "Data Transfers"). It does this by reading out and decoding the string data header. It will copy the header read out of the 37XXXD into headerString so the calling program can use it in cases where the same data block will be sent back to the 37XXXD, i.e., **`OC1`**/**`IC1`**.

NOTE

Consult your programming language documentation for string functions to copy, concatenate, and return value of string.

- Read the first byte in the instrument output buffer. Buffer is a temporary array of characters of size 10.

```
numBytes = 1
Receive(buffer, numBytes, STOPend)
```

- Check to be sure it is the "#" character then copy it to `headerString`

```
if (buffer[0] ISNOTEQUALTO '#') then
  gpiberr("Invalid data string")
else COPY(buffer, headerString)
```

- Read second header byte from the instrument output buffer and append it (concatenate) to `headerString`

```
numBytes = 1
Receive(buffer, numBytes, STOPend)
CONCATENATE(buffer, headerstring)
```

- Save the buffer value as a number...

```
numBytes = VALUEOF(buffer)
```

NOTE

This number is the next set of bytes to read. Those bytes when taken as a number will yield the number of actual data bytes contained in the binary string.

- Read the number of bytes indicated by numBytes and append them (concatenate) to `headerString`

```
Receive(buffer, numBytes, STOPend)
CONCATENATE(buffer, headerString)
```

- Save the buffer value as a number
  `numBytes` = VALUEOF(buffer)

NOTE

numBytes is the number of bytes, of actual data requested, waiting in the output buffer of the 37XXXD.

- Return number of bytes to calling program

```
Return numBytes
```

NOTE

At this point headerString is exactly the same as the data transfer header output by the 37XXXD. Recall that this is useful to the calling program in cases where the same data read out is to be sent back to the instrument.

3-10 EXAMPLE PROCEDURE 2

This example sequence provides coding for the TakeCalData() procedure used earlier in this chapter's example sequences.

The TakeCalData() procedure will wait for the operator to press a key on the computer then measure the cal standard installed.

- Wait for operator to press a key on computer when he is ready

```
WAITUNTIL (key is pressed)
```

NOTE

Consult your compiler documentation for a function that waits for a key to be pressed.

- Take cal data then go on to next calibration step

```
Send (0,6,"TCD;NCS",NLend)
```

- Wait for operation to complete (page 3-12)

```
WaitForInstr()
```

Part 2 GPIB Function Groups

This part consists of six chapters that relate the 37XXXD GPIB commands to functional groups. Tables within each group provide command descriptions and relationships to front panel keys and their associated menu functions.

Chapter 4 – *describes the commands and suffix mnemonics that relate to Measurement Functions.*

Chapter 5 – *describes the commands that relate to Calibration Functions.*

Chapter 6 – *describes the commands that relate to Markers and Limits Functions.*

Chapter 7 – *describes the commands that relate to Remote-Only Functions.*

Chapter 8 – *describes the commands that relate to System Functions.*

Chapter 9 – *describes the commands that relate to Special Applications Functions.*

Chapter 4
Measurement Functions

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Chapter 4
Measurement Functions

4-1 INTRODUCTION

This chapter describes the measurement function commands (and suffix mnemonics) that control the channel control, measurement control, display control, and enhancement group functions.

NOTE

See Chapter 9, Special Applications Functions for measurement applications.

4-2 SUFFIX CODES

Many 37XXXD GPIB commands require a following numeric value (or values) that quantify the 37XXXD operational parameters being controlled (i.e., frequency, power, etc). These numeric values are scaled to the following units as appropriate:

DECIBELS	METERS	SECONDS
DEGREES	OHMS	VOLTS
HERTZ		

All numeric data entries can be followed by an optional suffix mnemonic (see example). The suffix mnemonics for the 37XXXD are listed in Table 4-1. These mnemonics define a weighting factor that is applied to the associated numeric data value. (They perform the same function as the data entry termination keys on the 37XXXD front panel.) Furthermore, suffix mnemonics imply unit type, thus enhancing the readability of application programs.

Example: "`SRT 2 GHz`"

Table 4-1. Numeric Data Suffix Mnemonics

Code	Parameter Type	Weighting Factor
DB, DBL, DBM	Power	1.0
DEG	Phase	1.0
RAD	Phase	$180^{\circ}/\pi$
HZ	Frequency	1.0
KHZ	Frequency	10E+3
MHZ	Frequency	10E+6
GHZ	Frequency	10E+9
REU	Real	1.0
IMU	Imaginary	1.0
S	Time	1.0
MS	Time	10E-3
US, USC	Time	10E-6
NS, NSC	Time	10E-9
PS, PSC	Time	10E-12
FS	Time	10E-15
M, MTR	Distance	1.0
CM, CMT	Distance	10E-2
MM, MMT	Distance	10E-3
OHM	Impedance	1.0
V, VLT	Voltage	1.0
MV	Voltage	10E-3
K, KS	Temperature	Degrees Kelvin
XM3	Unitless	10E-3
XX1	Unitless	1.0
XX3	Unitless	10E+3

4-3 CHANNELS GROUP

The commands listed in Table 4-2 perform two separate sets of functions:

- Select the currently active channel (CH1–CH4). The active channel is that channel to which any subsequent channel-based commands are applied.
- Select single or multi-channel display mode (commands D13, D14, D24, DSP, T13, and T24). Commands T13 and T24 each produce a single display frame containing overlaid traces for the two channels specified.

Table 4-2. *Channel Command Group*

Front Panel Key/Function	Command	Description
Ch1 key	CH1	Selects channel 1 as active channel.
Ch2 key	CH2	Selects channel 2 as active channel.
Ch3 key	CH3	Selects channel 3 as active channel.
Ch4 key	CH4 CHX?	Selects channel 4 as active channel. Active channel query.
Display Key/menus, Display Mode, Display Mode menus	D13	Selects dual channel display, channels 1 & 3.
	D14	Selects quad display, all four channels.
	D24	Selects dual channel display, channels 2 & 4.
	DSP	Selects single channel display, using the currently active channel.
	DSP?	Channel display mode query.
	T13	Selects overlaid dual channel (1 & 3) display (one display frame).
	T24	Selects overlaid dual channel (2 & 4) display (one display frame).

4-4 DISPLAY GROUP

The Display key offers menu selections that provide Display Mode, Trace Memory, Limits, Scale, and Graph Type functions, all of which are described below.

Display Mode Function: This function provides selections for the display mode: Single, Dual 1&3, Dual 2&4, Overlay 1&3, Overlay 2&4, or Four Channel.

Trace Memory Function: This function provides a sequence of menus that provide memory and math functions. Memory functions allow viewing of Data, Memory, Data & Memory, Data times Memory, Store Memory, and Disk Operations. Math functions provide Add, Substract, Multiply, and Divide operations.

Limits Function: This function is closely related to the Marker key functions; therefore, it is described in Chapter 7, along with markers.

Scale Functions: This function provides for resolving measurement values. There are selections for Log or Linear Magnitude, Phase, Smith Chart, Group Delay, Real or Imaginary. The operation of these commands are obvious, except for SCL, REF, and OFF.

SCL Command
This command sets the scaling-per-division characteristics of the graph on the active channel. The associated data value determines the resultant scaling factor. The SCL command can also be used to set the scaling on Smith chart type display as follows:

VALUE	SCALING
–3	Sets a 3 dB compressed scale
0	Sets the normal Smith chart scale
10	Sets a 10 dB expanded scale
20	Sets a 20 dB expanded scale
30	Sets a 30 dB expanded scale

REF Command
This command selects the graticule line of the active channel data display on which to place the "REFERENCE LINE." The Reference Line is the graticule line to which the caret points on the 37XXXD display, or graph. (Lines 0, 4, and 8 are the bottom, middle, and top of the graph respectively.)

NOTE

There is no reference line defined for Smith charts, inverted Smith charts, and linear polar or log polar displays.

OFF Command
This command sets the value of the offset associated with the "REFERENCE LINE" in the data graph display.

Changing the scaling-per-division (SCL), the Reference Line position (REF), or the offset value (OFF) in the bottom (secondary) graph of a two graph display is accomplished by using the appropriate suffix mnemonic for that graph, as shown in the table below. For example: to set the scaling value for the phase display of a log/phase type graph, use:

"SCL 20 DEG".

Command	Graph Type		
	Log Mag / Phase	**Lin Mag / Phase**	**Real / Imaginary**
SCL / OFF	DEG / RAD	DEG / RAD	IMU
REF	DEG	DEG	IMU

Graph Type Functions: This function provides for selecting any of the various type of display graphs: Log or Linear Magnitude, Phase, Real, Imaginary, Log or Linear Polar, Smith Chart (Impedance), Smith Chart (Admittance), Group Delay, Power Out, SWR, Log Magnitude and Phase, Linear Magnitude and Phase, Real and Imaginary.

The usage of most of these commands is obvious, except SME, ISE, SMC and ISC.

NOTE

All the commands in the Display Group act on the currently selected active channel (see section 4-3, Channels Group).

Both the SME and ISE commands require an associated data value to be included with the command (Table 4-3). The allowable data values for these commands are: 0, 10, 20, and 30. The example below selects a 20 dB expanded Smith chart on the active channel.

Example: **"SME 20 DBL"**

Commands SMC and ISC also require an associated data value to be included with the command. The allowable data values for these commands are 0 and 3. The example below selects a 3 dB compressed Smith chart on the active channel.

Example: **"SMC 3 DBL"**

The Display key commands are listed in Table 4-3.

Table 4-3. Display Group Commands (1 of 2)

Command	Description
ADD	Select addition as trace math for active channel
APR	Enter group delay aperture setting on active channel
APR?	Output group delay aperture setting on active channel
ASC	Autoscale the active channel display
ASP	Enter polar stop sweep position angle
ASP?	Output polar stop sweep position angle
AST	Enter polar start sweep position angle
AST?	Output polar start sweep position angle
DAT	Display data only on active channel
DAT?	Output trace memory display mode
DIA	Select air as active dielectric
DIE	Enter a dielectric value
DIM	Select microporous teflon as active dielectric
DIP	Select polyethylene as active dielectric
DIT	Select Teflon as active dielectric
DIV	Select division as trace math for active channel
DIX?	Output dielectric constant
DLA	Select group delay display for active channel
DNM	Display data normalized to trace memory on active channel
DTM	Display measurement data and trace memory on active channel
GRF?	Output graph type for active channel
IMG	Select imaginary display for active channel
ISC	Enter scale and select inverted compressed Smith Chart display
ISE	Enter scale and select inverted expanded Smith Chart display
ISM	Select normal inverted Smith Chart for active channel
LIN	Select linear magnitude display for active channel
LPH	Select linear magnitude and phase display for active channel
MAG	Select log magnitude display for active channel
MEM	Display trace memory on active channel
MIN	Select subtraction as trace math for active channel
MOSET	Enter constant offset log magnitude for active channel
MOSET?	Output constant offset log magnitude for active channel
MPH	Select log magnitude and phase display for active channel
MTH?	Output trace math math type
MUL	Select multiplication as trace math for active channel
OFF	Enter offset value for top graph of active channel
OFF2	Enter offset value for bottom graph of active channel
OFF2?	Output offset value for bottom graph of active channel
OFF?	Output offset value for top graph of active channel
PCP	Select measurement phase polar chart mode
PCS	Select sweep position polar chart mode
PCX?	Output polar chart mode
PHA	Select phase display for active channel
PHO	Enter phase offset for display channel
PHO?	Output phase offset for display channel
PLG	Select log polar display for active channel
PLR	Select linear polar display for active channel
POSET	Enter constant offset phase for active channel
POSET?	Output constant offset phase for active channel
POW	Select power out display for active channel

Table 4-3. Display Group Commands (2 of 2)

Command	Description
RDA	Select automatic reference delay calculation
RDD	Enter reference delay in distance for active channel
RDD?	Output reference delay in distance for active channel
RDT	Enter reference delay in time for active channel
RDT?	Output reference delay in time for active channel
REF	Enter reference line for top graph of active channel
REF2	Enter reference line for bottom graph of active channel
REF2?	Output reference line for bottom graph of active channel
REF?	Output reference line for top graph of active channel
REL	Select real display for active channel
RIM	Select real and imaginary display for active channel
SCL	Enter Scale Resolution for top graph of active channel
SCL2	Enter Scale Resolution for bottom graph of active channel
SCL2?	Output Scale Resolution for bottom graph of active channel
SCL?	Output Scale Resolution for top graph of active channel
SETUP	Display setup menu
SMC	Enter scale and select compressed Smith Chart display
SME	Enter scale and select expanded Smith Chart display
SMI	Select normal Smith Chart for active channel
STD	Store trace to memory on active channel
SWR	Select SWR display for active channel

4-5 MEASUREMENT GROUP

The commands listed in Table 4-4 control sweep and test signal funcions. This inicludes frequency, power, attenuation, Hold functions, and Trigger/IF calibration.

Table 4-4. Measurement Group Commands (1 of 3)

Command	Description
AH0	Turn automatic DUT protection off
AH1	Turn automatic DUT protection on
AHX?	Output automatic DUT protection on/off status
BH0	Turn bias off while in hold
BH1	Turn bias on while in hold
BHX?	Output bias on/off during hold status
CNTR	Enter center frequency
CNTR?	Output center frequency
CTN	Continue sweeping from current point
CWDEC	Subtract 1 from the current CW index
CWF	Enter CW frequency and turn CW on
CWF?	Output CW frequency
CWI	Enter index for CW frequency and turn CW on
CWI2F?	Output frequency for index given
CWI?	Output current index number
CWINC	Add 1 to the current CW index
CWN2I	Add N to the current CW index

Table 4-4. Measurement Group Commands (2 of 3)

Command	Description
CWON	Turn CW on at current CW frequency
CWON?	Output CW on/off status
CWP	Enter number of points drawn in CW
CWP?	Output number of points drawn in CW
CWSRT	Set CW frequency to the start frequency
CWSTP	Set CW frequency to the stop frequency
EANAIN	Measure External Analog In on active channel
FHI	Set data points to 1601
FIL	Fill defined discrete frequency range
FLO	Set data points to 101
FME	Set data points to 401
FP0	Turn flat power correction off
FP1	Turn flat power correction on
FRC	Clear all defined discrete frequency ranges
FRI	Enter Discrete Fill increment frequency
FRP	Enter Discrete Fill number of points
FRS	Enter Discrete Fill start frequency
HC0	Disable internal IF calibration
HC1	Enable internal IF calibration and trigger an IF calibration
HCT	Trigger an IF calibration
HCX?	Output internal IF calibration enable/disable status
HLD	Put sweep into hold mode
HLD?	Output the sweep hold status
HLDX?	Output hold mode (continue, restart, or single sweep)
IFP	Enter current front panel setup
IFV	Enter frequency values
IS1	Enter front panel setup 1
IS10	Enter front panel setup 10
IS2	Enter front panel setup 2
IS3	Enter front panel setup 3
IS4	Enter front panel setup 4
IS5	Enter front panel setup 5
IS6	Enter front panel setup 6
IS7	Enter front panel setup 7
IS8	Enter front panel setup 8
IS9	Enter front panel setup 9
LA1	Select a1 = Ra as phase lock for parameter being defined
LA2	Select a2 = Rb as phase lock for parameter being defined
LAX?	Output phase lock selection for parameter being defined
NP101	Set data points to 101
NP1601	Set data points to 1601
NP201	Set data points to 201
NP401	Set data points to 401
NP51	Set data points to 51
NP801	Set data points to 801
ONDF	Output number of discrete frequencies
PTP	Enter the target power for flat power correction
PTP?	Output the target power for flat power correction
PW1	Enter external source 1 power level
PW1?	Output external source 1 power level
PW2	Enter external source power level
PW2?	Output external source power level

Table 4-4. Measurement Group Commands (3 of 3)

Command	Description
PWR	Enter internal source power level
PWR?	Output internal source power level
RH0	Select RF off in hold mode
RH1	Select RF on in hold
RHX?	Output RF on/off during hold status
RT0	Turn retrace rf off
RT1	Turn retrace rf on
RTX?	Output retrace rf on/off status
S11	Measure S11 on active channel
S12	Measure S12 on active channel
S21	Measure S21 on active channel
S22	Measure S22 on active channel
SA1	Enter port 1 source attenuator value
SA1?	Output port 1 source attenuator value
SA1MAX?	Output port 1 source attenuator max value
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements
SAMP?	Output the number of samplers used for measurements
SELSP	Select S-Parameter test set operation
SPAN	Enter frequency span
SPAN?	Output frequency span
SRC2?	Output external source 2 existence information
SRT	Enter start frequency
SRT?	Output start frequency
STP	Enter stop frequency
STP?	Output stop frequency
SWP	Return to normal sweep mode
SWP?	Output sweep mode
SWPDIR?	Output instantaneous sweep direction forward/reverse
SXX?	Output s parameter or user defined parameter of active channel
TA2	Enter port 2 test attenuator value
TA2?	Output port 2 test attenuator value
TA2MAX?	Output port 2 test attenuator max value
TEX	Select external measurement triggering
TIN	Select internal measurement triggering
TRS	Trigger/restart sweep
TXX?	Output trigger source
WFS	Wait full sweep until all display data is valid

4-6 ENHANCEMENT GROUP

The commands listed in Table 4-5 control the data enhancement functions of the 37XXXD, which include IF bandwidth, averaging, and smoothing. These functions are the same as those controlled by the 37XXXD front panel Enhancement key group.

NOTE

Most of the commands associated with the Options Menu key are contained in Chapter 9, Special Applications Functions. However, the Triggers and I.F. Cal commands are contained in Table 4-4 in section 4-5, Measurement Control.

Table 4-5. *Enhancement Group Commands*

Command	Description
AOF	Turn averaging off
AOF?	Output averaging on/off status
AON	Turn averaging on
AVG	Enter averaging count and turn on
AVG?	Output averaging count
AVGCNT?	Output the current sweep-by-sweep average sweep count
IF1	Select 10 Hz IF bandwidth
IF2	Select 100 Hz IF bandwidth
IF3	Select 1 KHz IF bandwidth
IF4	Select 10 KHz IF bandwidth
IFA	Select 30 KHz IF bandwidth
IFM	Select 10 Hz IF bandwidth
IFN	Select 1 KHz IF bandwidth
IFR	Select 100 Hz IF bandwidth
IFX?	Output IF bandwidth
MEASDLY	Set Measurement Delay time
MEASDLY0	Disable Measurement Delay
MEASDLY1	Enable Measurement Delay
MEASDLY?	Output Measurement Delay time
MEASDLYX?	Output Measurement Delay on/off status
PTAVG	Set averaging type to point-by-point averaging
RSTAVG	Reset the sweep-by-sweep averaging sweep count
SOF	Turn off smoothing
SOF?	Output smoothing on/off status
SON	Enter smoothing value and turn on
SON?	Output smoothing value
SPLN	Select normal source lock polarity
SPLR	Select reverse source lock polarity
SPLX?	Output source lock polarity normal/reverse status
SPR0	Turn spur reduction off
SPR1	Turn spur reduction on
SPRX?	Output spur reduction on/off status
SWAVG	Set averaging type to sweep-by-sweep averaging
SWAVG?	Output averaging type (sweep-by-sweep or point-by-point)

Chapter 5
Calibration Functions

Table of Contents

Chapter 5
Calibration Functions

5-1 INTRODUCTION

This chapter describes the 37XXXD S-Paremter error correction (calibration) functions. It describes the commands used to perform the following:

- Specify the calibration method, type, standards, and parameters.
- Control the calibration data-taking process.

NOTES

- See Measurement/Test Signals Group for a description of the flat test port power calibration commands.
- The 37XXXD calibration functions require operator intervention. However, it is possible to use the external controller to guide the operator through the calibration process using a suitable program containing the calibration commands described in this chapter.

5-2 RELATED COMMANDS

Related, non-calibration commands used during the calibration process are described in Table 5-1. The use of these commands, in relation to calibration activities, is described throughout this chapter, where appropriate. These command sets are fully described in their respective chapters as indicated in Table 5-1.

NOTE

See **ICx** and **OCx** series commands in the Data Transfer group (Chapter 7) for information on inputting and outputting calibration terms coefficients (error terms).

Table 5-1. Related Commands

Command	Command Function Group
FHI, FLO, FME NP51–NP1601	Measurement Group, Data Points (Ch 5)
SRT, STP, CWF, DFQ, DFD, FRS, FRI, FRP, FIL, FRC	Measurement Group, Frequency (Ch 5)
IFV, ICx, OCx	Data Tranfer Group (Ch 8)
*OPC, *OPC?	IEEE 488.2 Group, Synchronization (Ch 8)
All	Measurement, Test Signals (Ch 5)
All	Display, Graph Type (Ch 5)
All	Display, Scaling (Ch 5)
AVG, AOF. AON	Enhancement, Averaging (Ch 5)
IFA, IFN, IFR, IFM, IF1–IF4	Enhancement, Video IF Bandwidth (Ch 5)
CH1–CH4	Channels Group (Ch 5)

5-3 REQUIRED COMMAND SEQUENCE

A program used to control the calibration process *must* follow a specific order for the GPIB calibration commands that are used. Table 5-2 lists this acceptable order.

Table 5-2. *Calibration Command Ordering*

Order	Item	Typical Commands Used
1	Calibration Type	C12, C8R, C8T, CRB, CRF, CRR, CBT, CFT, CRT
2	Calibration Method	SCM, OCM, LCM, TCM
3	Line Type	LTC, LTW, LTU
4	Isolation Usage	ISN, ISF
5	Data Points	NOC, DFC, TDC, CWC
6	Frequency:*	
	Sweep	SRT, STP
	Discrete Fill	DFQ, DFD, FRS, FRI, FRP, FIL, FRC,
	User Defined List**	IFV
	CW	
7	Test Port Connector	P1C, P2C
	Connector Type	CMS, CFS, CMK, CFK, CMV, CFV, CMC, CFC, CM2, CF2, CMN, CFN, CM3, CF3, CNG
	User Defined Connector	CND, COO, COS, CC0, CC1, CC2, CC3, CL0, CL1, CL2, CL3
	Offset-Short Values	SH1, SH2
8	Reflection Pairing	MAT, MIX
9	Load Type/Parameters	SLD, BBL, BBZ, BBZL
10	Through Parameters	TOL, TLZ
11	LRL Band	LR2, LR3
12	LRL Parameters	RM1, RRP, LL1, LL2, LL3, LM2, LM3, BPF, ROL, RLZ, RGZ
13	Reference Impedance	LLZ
14	Test Signals*	PWR, SA1, TA2
15	Flat Test Port Calibration *	PTP, PTS, SFC, FP0, FP1
16	Microstrip Parameters	U10, U15, U25, USW, SBT, SBD, USE, USZ
17	Waveguide Param's	WKI, WKD, WCO, WSH1, WSH2
18	Begin Calibration (Data Collection)	BEG
19	Take Cal Data	TCD, TC1, TC2
20	Next Cal Step	NCS

* Refer to Chapter 5, "Measurement Group" for details on these commands.
** See Chapter 8, Measurement Points Data Transfer Commands) CWF

5-4 FUNCTIONAL COMMANDS

Commands used for special types of calibrations are described in Table 5-3. The commands are used to invoke options and non-standard calibration procedures, and to simulate a calibration process.

Table 5-3. *Functional Commands Listing (1 of 2)*

Command	Function	Description
NOC	Specify Normal Sweep Calibration	This command sets up a normal frequency range calibration.
DFC	Specify Discrete Frequency Calibration	This command sets up a calibration at discrete frequencies only. Use discrete fill commands to input frequency list for calibration. Refer to Chapter 5, Measurement Functions, section 5-4. Alternatively, the IFV command allows for a frequency list input of calibration frequencies. Refer to “Data Transfer Commands Group (Chapter 8),” for more details.
CWC	Specify CW Calibration	This command sets up a continuous wave (CW) calibration. Use CWF to input CW frequency.
P1C, P2C	Set up to Specify Port 1 (PIC) or Port 2 (P2C) Standards	This command specifies Port 1 or Port 2 as the port to which subsequent connector-related commands will apply. Example: `“P1C;CFK;P2C;CMK”` This sequence of commands sets up a female K connector for port 1 **(P1C CFK)** and a male K connector for port 2 **(P2C CMK).**
CND	Other Connector Specification	This command allows a non-standard connector to be specified. This is the same as selecting OTHER from the front panel menu. When specifying the CND command, the connector offset for the open and/or short device and the capacitance coefficients for the open device also need to be entered to characterize the connector.
SLD, BBL	Specify Sliding Load or Broad Band Load for Calibration	Thie SLD command specifies a sliding load. The data-taking process for the load includes six slide positions. If any frequencies are below 2 GHz, you must also use a broadband load.
LM2, LM3		These commands are used to select a match for the second or the third device respectively during a LRM type calibration.
A12, A8T, A8R, ARF, AFT, ARB, ARR, ABT, ART	Calibration simulation	These commands simulate the completion of a calibration. The Axx series commands must be followed with the corresponding calibration error term coefficients using the ICx commands (see Chapter 8). The Axx series commands match up with corresponding calibration type commands. For example, A12 simulates C12, A8T simulates C8T, etc. **NOTE** If you attempt to apply a calibration without first having entered calibration coefficient data, the error correction may not be applied (as indicated by the Apply Cal LED being momentarily turned on, then off).

Table 5-3. Functional Commands Listing (2 of 2)

Command	Function	Description
CON, COF	Turn on/off vector error correction	These commands are not used during calibration. They are used during normal measurements to apply the current calibration error correction to the measured data (CON) or to turn off error correction calibration (COF).
BEG, TC1, TC2, TCD, NCS, KEC, RPC	Calibration Sequencing and Control commands	These commands are used to start and control the data-taking process. KEC will keep existing calibration error corrections and return to the measurement mode. Command TC1 takes calibration data for the current (calibration) standard for port 1 using a separate forward measurement sweep. Command TC2 performs the same function for port 2 using a separate (reverse) sweep. (Note that command TCD performs these identical operations, using consecutive forward and reverse measurement sweeps.) Using the TC1 and TC2 commands allows one calibration standard of each type to be used for both ports.
U10, U15, U25	Calibration Kit selection commands	These commands are used to select 10, 15, or 25 mil UTF calibration kits respectively. These calibration kits are used to perform a 37XXXD calibration for microstrip device measurements.
MAT, MIX	Load match for Reflection devices measurement sequences	The MAT (MATched) command changes the measurement sequence for the standard 12 term, coaxial, two-channel calibration so that the “open” measurements are performed in sequence, followed by the “short” measurements. The MIX (MIXed) command returns to the normal sequence for a two-channel 12 term calibration.

5-5 EXAMPLE PROGRAM

The following is an example of how to set up a calibration sequence for the 37XXXD VNA:

```
"SCM;LTC;C12;DFC;FRS 1.0 GHZ;FRI 100 MHZ;FRP 41 XX1;
FIL;DFD;P1C;CFK;P2C;CMK;BBL;BEG"
```

This example code sets up a calibration using standard calibration mode (**SCM**), coax cable media (**LTC**), and 12-term calibration type (**C12**). A discrete set of points is defined for frequency operation starting at 1 GHz (**FRS 1.0 GHZ**), spaced 100 MHz apart (**FRI 100 MHZ**), at 41 consecutive points (**FRP 41 XX1**). This range is confirmed or "filled" (**FIL**), then completed (**DFD**).

The Port 1 test port connector is defined as a female type K connector (**P1C CFK**) and the Port 2 test port connector is defined as a male K type connector (**P2C CMK**). Broadband loads are selected as the default load type (**BBL**). The **BEG** command instructs the 37XXXD to begin the calibration-data-taking-process.

The calibration control program should contain commands to control the data-collection portion of the calibration process. Typical commands used for this process are:

- Take Calibration Data for Current Standard (**TCD**, or **TC1**, or **TC2**)
- Go on to the Next Calibration Step **(NCS**)
- Averaging On and Set to Value (**AVG**)
- Set IF Bandwidth to 10 Hz (**IF1**)
- Set IF Bandwidth to 100 Hz (**IF2**)
- Set IF Bandwidth to 1 KHz (**IF3**)
- Set IF Bandwidth to 10 KHz (**IF4**)
- Any Graph Type Specification or Scaling Change
- Active Channel Specification (**CH1–CH4**)

The TCD (or **TC1**, or **TC2**) and **NCS** commands control the data-taking process. Commands **AVG, IFN, IFR, IFA**, and **IFM** control the data-enhancement function used for a particular measurement (refer to Chapter 3, section 5-6, Enhancement Commands).

Before the **TCD** (or **TC1**, or **TC2**) and **NCS** commands are invoked in the program, the system operator must be instructed to perform the *exact* steps necessary to setup the calibration sequence for the type of 37XXXD calibration to be used. An example program segment to continue the 12-term calibration started in the previous example is shown on the next page. This example program segment is written in HP-BASIC.

The calibration control program should determine if the 37XXXD is ready for the next step of the calibration sequence before prompting the system operator to connect new calibration standards to the test ports. This can be done by monitoring the status byte of the 37XXXD or by waiting for the operation to complete after executing the **NCS** command.

For example, the commands in the following example instruct the 37XXXD to take calibration data (**TCD**), go to the next calibration step (**NCS**), then output the number "1" (***OPC?**). When the controller is able to read the number "1" from the 37XXXD, the calibration step is complete.

```
260 OUTPUT 706;"TCD;NCS;*OPC?"
270 ENTER 706; N$ ! READ AND DISCARD ASCII '1' WHEN
STEP IS COMPLETE
280 DISP "CALIBRATION STEP COMPLETE"
```

5-6 FLAT TEST PORT

Signal source power correction data produced during this type of 37XXXD calibration is used to flatten the signal power output from the test set port(s) over a specified frequency range. This feature is used to provide flat test stimulus signals to the device-under-test while performing normal measurements.

This process requires operator intervention. The system operator is guided through a sequence of operations and measurements that make up the flat test port calibration sequence. Before attempting to write a GPIB controlled program to produce this calibration sequence, first become thoroughly familiar with the manual procedure.

Flat test port calibrations require considerable time to perform. The time required is dependent upon the number of points selected; For these calibrations, the GPIB timeout value must be increased accordingly, or the control program must generate an appropriate time delay before executing subsequent commands. See the documentation for your GPIB controller for timeout-setting procedures.

The commands listed in Table 5-4 are used to invoke and control flat test port calibrations.

Flat Test Port Power Calibration Coefficients

The coefficients are input and output using the following codes:

- ❑ IFPC – Enter the power sweep linearity calibration coefficients
- ❑ OFPC – Output the power sweep linearity calibration coefficients

These codes would be useful in applications where there is no power meter to hook up to the 37000 to perform the calibration normally, or the power meter is not one of the ones that the 37000 has been programmed to interface with.

The code OFPC outputs an arbitrary block of binary or ASCII data depending on the output mode selected with the codes FMA, FMB, FMC, LSB and MSB. See the description of these codes in Chapter 10. See Chapter 10, section 10-3 for a description of the arbitrary block format. Each coefficient represents the adjustment in dB (correct to a hundredth of a dB) required to achieve the correct power at the particular frequency point. There will be as many coefficients as there are frequency points in the sweep. If a VNA does not currently have a valid power sweep linearity calibration in place when the OFPC is received, an arbitrary block will be sent with zeros for each coefficient.

The code IFPC is used to input coefficients into the VNA and set up a valid flat test port power calibration. The coefficients are contained in an arbitrary block, which follows IFPC. The makeup of the arbitrary block is identical to the one described above. The VNA must be programmed with the appropriate number of frequency points prior to receiving IFPC. If the number of coefficients in the arbitrary block does not match what would be required by the current VNA setup, the data will be rejected and an error message displayed on the screen and recorded in the service log.

Table 5-4. *Flat Test Port Power Commands*

Commands	Description
PTP	Enter target power for calibration.
PTP?	Output target power for calibration.
PTS	Selects the number of frequency points (1 – 65) to be skipped between each measured point on the power measurement sweep. It therefore determines the number of points measured on each sweep .
PTS?	Skipped points for flat test port power calibration query.
SFC	Starts the flat test port calibration sequence.
FP1	Causes the flat test port power correction data to be used during normal measurement mode.
FP0	Turns off the flat test port power correction for normal measurement mode.
FPX?	Flat power ON/OFFstatus query.
IFPC	Enter the power sweep linearity calibration coefficients
OFPC	Output the power sweep linearity calibration coefficients

5-7 CALIBRATION COMMANDS

Table 5-5 provides a listing of the commands used to perform measurement calibrations. Unless otherwise noted, all front panel menus mentioned in Table 5-5 are accessed by first pressing the Begin Cal key.

Table 5-5. *Calibration Commands (1 of 4)*

Command	Description
A12	Simulate 12-term calibration
A8R	Simulate 1-path 2-port calibration reverse path
A8T	Simulate 1-path 2-port calibration forward path
ABT	Simulate trans freq response calibration forward and reverse
AFT	Simulate transmission frequency response calibration forward path
ARB	Simulate reflection only calibration both ports
ARF	Simulate reflection only calibration port 1
ARR	Simulate reflection only calibration port 2
ART	Simulate trans freq response calibration reverse path
BBL	Select broadband load for calibration
BBZ	Enter broadband load impedance for calibration
BBZL	Enter broadband load inductance for calibration
BEG	Begin taking calibration data
BPF	Enter break point frequency for 3 line LRL calibration
C12	Select 12 term calibration
C8R	Select 1-path 2-port calibration reverse path
C8T	Select 1-path 2-port calibration forward path
CBT	Select trans freq response calibration forward and reverse
CC0	Enter capacitance coefficient 0 for open
CC1	Enter capacitance coefficient 1 for open
CC2	Enter capacitance coefficient 2 for open
CC3	Enter capacitance coefficient 3 for open
CF1	Select female 1.0 mm connector for current port
CF2	Select female 2.4mm connector for current port
CF3	Select female GPC-3.5 connector for current port
CF716	Select female 7/16 connector for current port
CFC	Select female TNC connector for current port
CFK	Select female K connector for current port
CFN	Select female Type N connector for current port
CFN75	Select Female type N 75-ohm connector for current port
CFS	Select female SMA connector for current port
CFSP	Select Special Female connector for current port
CFSPA	Select Band A special female connector for current port
CFSPB	Select Band B special female connector for current port
CFSPC	Select Band C special female connector for current port
CFT	Select trans freq response calibration forward path
CFV	Select female V connector for current port
CL0	Enter inductive coefficient 0 for short
CL1	Enter inductive coefficient 1 for short
CL2	Enter inductive coefficient 2 for short
CL3	Enter inductive coefficient 3 for short
CM1	Select male 1.0 mm connector for current port
CM2	Select male 2.4mm connector for current port
CM3	Select male GPC-3.5 connector for current port
CM716	Select male 7/16 connector for current port

Table 5-5. *Calibration Commands (2 of 4)*

Command	Description
CMC	Select male TNC connector for current port
CMK	Select male K connector for current port
CMN	Select male N connector for current port
CMN75	Select Male type N 75-Ohm connector for current port
CMS	Select male SMA connector for current port
CMSP	Select Special Male connector for current port
CMSPA	Select Band A special male connector for current port
CMSPB	Select Band B special male connector for current port
CMSPC	Select Band C special male connector for current port
CMV	Select male V connector for current port
CMX?	Output calibration method
CND	Select user specified connector for current port
CNG	Select GPC-7 connector for current port
COF	Turn error correction off
CON	Turn error correction on
CON?	Output error correction on/off status
COO	Enter offset for open for user specified connector (Standard Calibration)
COS	Enter offset for short for user specified connector
CRB	Select reflection only calibration both ports
CRF	Select reflection only calibration port 1
CRR	Select reflection only calibration port 2
CRT	Select trans freq response calibration reverse path
CSF?	Output cal start frequency
CTF?	Output cal stop frequency
CWC	Select CW frequency calibration data points
CXX?	Output calibration type
DFC	Select discrete frequency calibration data points
DFD	Done specifying discrete frequency ranges
DFQ	Enter single discrete frequency
IC2	Input Calibration Coefficient 2
IC3	Enter calibration coefficient 3
IC4	Enter calibration coefficient 4
IC5	Enter calibration coefficient 5
IC6	Enter calibration coefficient 6
IC7	Enter calibration coefficient 7
IC8	Enter calibration coefficient 8
IC9	Enter calibration coefficient 9
ICA	Enter calibration coefficient 10
ICB	Enter calibration coefficient 11
ICC	Enter calibration coefficient 12
ICD	Enter corrected data for active channel parameter
ICF	Enter front panel setup and calibration data
ICL	Enter all applicable calibration coefficients for cal type
IFD	Enter final data for active channel parameter
ISF	Exclude isolation
ISN	Include isolation
KEC	Keep existing calibration data
LCM	Select LRL calibration method
LL1	Enter length of line 1 for LRL calibration
LL2	Enter length of line 2 for LRL calibration
LL3	Enter length of line 3 for LRL calibration

Table 5-5. Calibration Commands (3 of 4)

Command	Description
LLZ	Enter line impedance for LRL calibration
LM2	Select a match for the second device during a LRM type calibration
LM3	Select a match for the third device during a LRM type calibration
LMZ	Enter match impedance for LRM calibration
LMZ?	Output match impedance for LRM calibration
LMZL	Enter match inductance for LRM calibration
LMZL?	Output match inductance for LRM calibration
LR2	Specify 2 line LRL calibration
LR3	Specify 3 line LRL calibration
LTC	Select coaxial transmission line for calibration
LTU	Select microstrip transmission line for calibration
LTW	Select waveguide transmission line for calibration
LTX?	Output line type
MAT	Select matched reflective devices during cal
MIX	Select mixed reflective devices during calibration
NCS	Go to next calibration step
NOC	Select normal calibration data points
O3CM	Select Triple Offset Short calibration method
OCM	Select offset short calibration method
ONCT	Output number of cal terms for current calibration
P1C	Select port 1 for connector specification
P1C?	Output port 1 connector type
P1P?	Output approximate power level at port 1
P2C	Select port 2 for connector specification
P2C?	Output port 2 connector type
PSP	Enter number of power sweeps for flat power correction (obsolete)
PSP?	Output number of power sweeps for flat power correction (obsolete)
PTS	Enter number of points to be skipped during flat power correction
PTS?	Output number of points to be skipped during flat power correction
RGZ	Select reflective device greater than Z0
RLZ	Select reflective device less than Z0
RM1	Select reference plane at line 1 midpoint
ROL	Enter reflective device offset length
RPC	Repeat previous calibration
RRP	Select reference plane at reflection plane
SBD	Enter substrate dielectric for microstrip calibration
SBT	Enter substrate thickness for microstrip calibration
SCM	Select standard calibration method
SFC	Perform flat test port calibration
SH1	Set offset short 1 or 2 offset length for offset short calibration
SH2	Set offset short 1 or 2 offset length for offset short calibration
SLD	Select sliding load for calibration
TC1	Take calibration data for port 1
TC2	Take calibration data for port 2
TCD	Take calibration data on one or both ports as necessary
TCM	Select the TRM calibration method
TDC	Select time domain harmonic frequency calibration data points
TLZ	Enter through line impedance for calibration
TOL	Enter through offset length for calibration
U10	Select 10 mil UTF calibration kit

Table 5-5. *Calibration Commands (4 of 4)*

Command	Description
U15	Select 15 mil UTF calibration kit
U25	Select 25 mil UTF calibration kit
USE	Enter effective dielectric for microstrip calibration
USW	Enter microstrip width for microstrip calibration
USZ	Enter microstrip impedance for microstrip calibration
WCO	Enter waveguide cutoff frequency for user defined kit
WKD	Select user defined waveguide calibration kit
WKI	Select installed waveguide calibration kit
WSH1	Enter waveguide short offset 1 for user defined kit
WSH2	Enter waveguide short offset 2 for user defined kit
WSH3	Enter waveguide short 3 offset for user defined kit

5-8 AUTOCAL FUNCTIONS

This function requires an optional AutoCal module that provides an automated method for performing fast, repeatable high-quality calibrations. The AutoCal module is inserted between the VNA test ports to perform the calibration. The commands for implementing this function remotely are provided in Table 5-6.

Table 5-6. *List of AutoCal Commands (1 of 2)*

Command	Description
ABORTCAL	Abort calibration in progress and keep existing calibration data
ACAA	Set AutoCal standard to assurance
ACADPL	Enter AutoCal adapter length
ACADPL?	Output AutoCal adapter length
ACADR	Set AutoCal type to adapter removal
ACAL1R2	Set adapter removal port configuration to ADAPT & L=1 and R=2
ACAR1L2	Set adapter removal port configuration to ADAPT & R=1 and L=2
ACARP?	Output AutoCal adapter removal port configuration
ACDEF	Select default AutoCal isolation averaging factor
ACF2P?	Output AutoCal full 2 port configuration
ACF2TC	Set AutoCal 2 port thru type to calibrator
ACF2TT	Set AutoCal 2 port thru type to true thru
ACF2TX?	Output AutoCal 2 port thru type selection
ACHFD	Save AutoCal characterization data to floppy disk
ACHHD	Save AutoCal characterization data to hard disk
ACIAF	Enter user AutoCal isolation averaging factor
ACIAF?	Output user AutoCal isolation averaging factor
ACIAX?	Output AutoCal isolation averaging factor omit/default/user selection
ACISO	Enter AutoCal isolation averaging number
ACISO?	Output AutoCal isolation averaging number
ACL1AR2	Set adapter removal port configuration to L=1 and ADAPT & R=2
ACL1R2	Set AutoCal full 2 port configuration to L=1 and R=2
ACLO	Enter AutoCal load averaging number
ACLO?	Output AutoCal load averaging number
ACLOAD	Set AutoCal standard to load
ACOMIT	Omit using AutoCal isolation averaging factor
ACOPEN	Set AutoCal standard to open
ACP1?	Output AutoCal S11 port configuration
ACP1L	Set AutoCal S11 port configuration to left
ACP1R	Set AutoCal S11 port configuration to right
ACP2?	Output AutoCal S22 port configuration
ACP2L	Set AutoCal S22 port configuration to left
ACP2R	Set AutoCal S22 port configuration to right
ACPL	Set AutoCal S11 port configuration to left
ACPR	Set AutoCal S11 port configuration to right
ACR1AL2	Set adapter removal port configuration to R=1 and ADAPT & L=2
ACR1L2	Set AutoCal full 2 port configuration to R=1 and L=2
ACRFL	Enter AutoCal reflection averaging number
ACRFL?	Output AutoCal reflection averaging number
ACS11	Set AutoCal type to S11
ACS22	Set AutoCal type to S22
ACSF2P	Set AutoCal type to full 2 port

Table 5-6. *List of AutoCal Commands (2 of 2)*

Command	Description
ACSHORT	Set AutoCal standard to short
ACSTD?	Output AutoCal standard
ACSW	Enter AutoCal switch averaging number
ACSW?	Output AutoCal switch averaging number
ACTHRU	Set AutoCal standard to thru
ACTU	Enter AutoCal thru averaging number
ACTU?	Output AutoCal thru averaging number
ACTUAVG	Enter AutoCal thru update averaging number
ACTUAVG?	Output AutoCal thru update averaging number
ACTULS	Apply last thru update cal setup
ACX?	Output AutoCal type
BEGAC	Start AutoCal
BEGCH	Start AutoCal characterization
BEGTU	Start AutoCal thru update
IACCHAR	Input AutoCal characterization data from the GPIB
OACCHAR	Output AutoCal characterization data to the GPIB
TACD	Take AutoCal data

Chapter 6
Markers and Limits Functions

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Chapter 6 Markers and Limits Functions

6-1 INTRODUCTION

This chapter describes markers and limits commands.

6-2 MARKERS

The commands listed in Table 6-1 (next page) control the location and display of the markers and the functions related to the markers. A full description of each command mnemonic is contained in Chapter 11, Command Dictionary.

A marker is turned on whenever any of the following conditions occur:

- ❑ When the marker is set to a value

  Example: **"MK2 20 GHZ"**

- ❑ When the marker is selected for readout

  Example: **"MR2"**

- ❑ When the marker is selected as the delta reference marker (left)

  Example: **"DR2 4.5632 GHZ"**

MMN and MMX Commands — The MMN and MMX commands move the active marker to the minimum and maximum trace values on the active channel, respectively. There must be an active marker selected for these command to execute.

Example: **"WFS;MR1;MMX"**

This code instructs the 37XXX to:

- ❑ Wait for a full sweep of data to be present (WFS)
- ❑ Turn on marker 1 and select it for readout (MR1)
- ❑ Move marker 1 to the maximum value of the trace on the active channel (MMX)

Table 6-1. Marker Commands (1 of 3)

Command	Description
AMKR	Select active marker on all channels marker mode
BWL3	Set bandwidth loss value to 3 dB
BWLS	Enter bandwidth loss value
BWLS?	Output bandwidth loss value
DR1	Select Marker 1 as Delta Reference Marker
DR2	Select Marker 2 as Delta Reference Marker
DR3	Select Marker 3 as Delta Reference Marker
DR4	Select Marker 4 as Delta Reference Marker
DR5	Select Marker 5 as Delta Reference Marker
DR6	Select Marker 6 as Delta Reference Marker
DRF	Turn delta reference mode on
DRO	Turn delta reference mode off
DRO?	Output delta reference mode on/off status
DRX?	Output delta reference marker number
DSF0	Disable filter shape factor calculation
DSF1	Enable filter shape factor calculation
DSFX?	Output filter shape factor calculation enable/disable status
DSQ0	Disable filter Q calculation
DSQ1	Enable filter Q calculation
DSQX?	Output filter Q calculation enable/disable status
FLTBW?	Output filter bandwidth
FLTC?	Output filter center frequency
FLTL?	Output filter loss at reference value
FLTQ?	Output filter Q
FLTS?	Output filter shape factor
FMKR	Select filter parameters marker mode
M1C	Set CW mode at marker 1 frequency
M1E	Set sweep/zoom end to marker 1 frequency distance or time
M1S	Set sweep/zoom start to marker 1 frequency distance or time
M2C	Set CW mode at marker 2 frequency
M2E	Set sweep/zoom end to marker 2 frequency distance or time
M2S	Set sweep/zoom start to marker 2 frequency distance or time
M3C	Set CW mode at marker 3 frequency
M3E	Set sweep/zoom end to marker 3 frequency distance or time
M3S	Set sweep/zoom start to marker 3 frequency distance or time
M4C	Set CW mode at marker 4 frequency
M4E	Set sweep/zoom end to marker 4 frequency distance or time
M4S	Set sweep/zoom start to marker 4 frequency distance or time
M5C	Set CW mode at marker 5 frequency
M5E	Set sweep/zoom end to marker 5 frequency distance or time
M5S	Set sweep/zoom start to marker 5 frequency distance or time
M6C	Set CW mode at marker 6 frequency
M6E	Set sweep/zoom end to marker 6 frequency distance or time
M6S	Set sweep/zoom start to marker 6 frequency distance or time
MK1	Enter marker 1 frequency distance or time and turn on
MK1?	Output marker 1 frequency distance or time
MK2	Enter marker 2 frequency distance or time and turn on
MK2?	Output marker 2 frequency distance or time
MK3	Enter marker 3 frequency distance or time and turn on

Table 6-1. Marker Commands (2 of 3)

Command	Description
MK3?	Output marker 3 frequency distance or time
MK4	Enter marker 4 frequency distance or time and turn on
MK4?	Output marker 4 frequency distance or time
MK5	Enter marker 5 frequency distance or time and turn on
MK5?	Output marker 5 frequency distance or time
MK6	Enter marker 6 frequency distance or time and turn on
MK6?	Output marker 6 frequency distance or time
MKRC	Select interpolated marker functionality
MKRD	Select discrete marker functionality
MKRX?	Output interpolated/discrete marker functionality
MKSL	Marker search left
MKSR	Marker search right
MKT0	Turn marker tracking off
MKT1	Turn marker tracking on
MKTX?	Output marker tracking on/off status
MMN	Move active marker to minimum trace value
MMX	Move active marker to maximum trace value
MO1	Turn off marker 1
MO2	Turn off marker 2
MO3	Turn off marker 3
MO4	Turn off marker 4
MO5	Turn off marker 5
MO6	Turn off marker 6
MOF	Turn marker display off
MON	Turn marker display on
MON?	Output marker display on/off status
MR1	Turn marker 1 on and make it the active marker
MR1?	Output marker 1 on/off status
MR2	Turn marker 2 on and make it the active marker
MR2?	Output marker 2 on/off status
MR3	Turn marker 3 on and make it the active marker
MR3?	Output marker 3 on/off status
MR4	Turn marker 4 on and make it the active marker
MR4?	Output marker 4 on/off status
MR5	Turn marker 5 on and make it the active marker
MR5?	Output marker 5 on/off status
MR6	Turn marker 6 on and make it the active marker
MR6?	Output marker 6 on/off status
MRM	Display the Marker Readout menu
MRX?	Output active marker number
MSFH	Enter high loss value for shape factor calculation
MSFH?	Output high loss value for shape factor calculation
MSFL	Enter low loss value for shape factor calculation
MSFL?	Output low loss value for shape factor calculation
MSR0	Select 0 as reference for marker search and bandwidth calculation
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation
MSRM	Select maximum as reference for marker search and bandwidth calculation
MSRX?	Output reference selection for marker search and bandwidth calculation
NMKR	Select normal markers on active channel marker mode
SMKR	Select marker search marker mode

Table 6-1. Marker Commands (3 of 3)

Command	Description
SRCH	Enter marker search value
SRCH?	Output marker search value
XMKR?	Output marker mode

6-3 LIMITS

The Limits commands perform the functions that are available via the Display key and Limits menus. Figure 6-1 shows the relationship between the major limits commands and the single and segmented limits displays. The various limit-types are described below and the limits commands are listed in Table 6-2 (page 6-9).

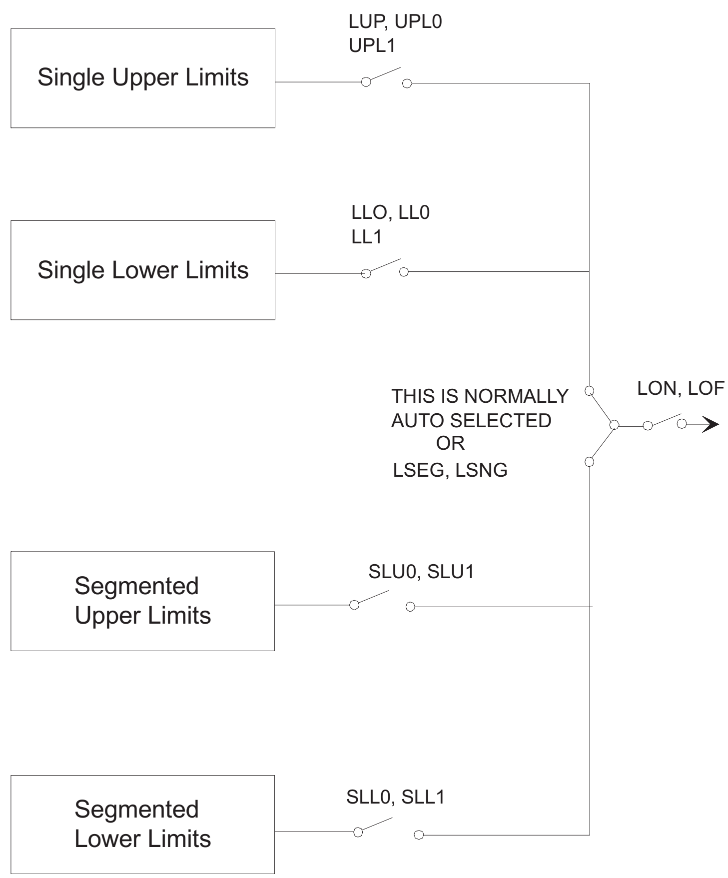

Figure 6-1. *Relationship Between Limits Commands and Limits Displays*

Single (Non-Segmented) Limits

The Non-Segmented Limits Commands do the following:

- Set up the upper and lower limit values for the active channel.
- Set the limit delta for the limit frequency readout function. The range of values and allowable terminator mnemonics are dependent on the graph type of the active channel, much like the SCL and REF commands.

The LFR, LFP, and LFD commands that define limit frequency readouts, are only available on the following graph types: log magnitude (MAG), log magnitude and phase (MPH), phase (PHA), linear magnitude (LIN), linear magnitude and phase (LPH), standing wave ratio (SWR), and group delay (DLA). The active channel must be a frequency domain channel. The LFP command can be used to select phase limit frequency readouts on log magnitude and phase and linear magnitude and phase graph types.

To change values for the LFD, LLO, and LUP commands for the bottom graph of two graph display, use the appropriate suffix mnemonic as shown below:

Graph Type	Appropriate Suffix Mnemonic
Log Mag / Phase	DEG / RAD
Lin Mag / Phase	DEG / RAD
Real / Imag	IMU

Segmented Limits

Segmented limits (Table 6-4) allow different upper and lower limit values to be set at up to ten segments across the measurement range.

Limits Example

This example makes limit 2 the active segment, sets its vertical start to 10 dB, its horizontal start to 10 GHz, its vertical stop to 12 dB, its horizontal stop to 16 GHz, and sets it to display on the 37XXX screen.

```
"SL02;SPV 10 DBL;STH 10 GHZ;SPV 12 DBL;SPH 16 GHZ;
 SLA;SLL;DIS"
```

Limits Pass/FailTesting

Limits pass/fail testing commands are listed in Table 6-5. These commands are used to produce a beep and/or a TTL voltage at the rear panel External I/O connector when a measurement exceeds any of the set limits (refer to the 37XXX Operation Manual).

NOTE

Pass/fail testing, when turned on, will generate an SRQ (if enabled) whenever a test failure occurs. Refer to Chapter 7, "Status Reporting" for details.

Table 6-2. *Limit Commands (1 of 2)*

Command	Description
ATTN	Attach next segment and make the active segment
BEGN	Begin next segment and make it the active segment
CAS	Clear active segmented limit vertical/horizontal definitions
DIS	Display active segmented limit
DIS?	Output active segmented limit on/off status
HID	Hide active segmented limit
LB0	Turn limits testing beep on failure off
LB1	Turn limits testing beep on failure on
LBX?	Output limits testing beeper enable status
LFD	Enter limit frequency readout delta value
LFD2	Enter limit frequency readout delta value for bottom graph
LFD2?	Output limit frequency readout delta value for bottom graph
LFD?	Output limit frequency readout delta value
LFP	Select limit frequency readout for phase displays
LFR	Select limit frequency readout for active channel
LLM?	Output limit line display mode single or segmented
LLO	Enter lower limit value for top graph on active channel
LLO2	Enter lower limit value for bottom graph on active channel
LLO2?	Output lower limit value for bottom graph on active channel
LLO?	Output lower limit value for top graph on active channel
LOF	Limits display off
LOL0	Turn lower limit off
LOL1	Turn lower limit on at current value
LOL20	Turn lower limit off for bottom graph
LOL21	Turn lower limit on at current value for bottom graph
LOL2X?	Output lower limit on/off status for bottom graph
LOLX?	Output lower limit on/off status
LON	Limits display on
LON?	Output limits display on/off status
LPF1?	Output limit test failure status on channel 1
LPF2?	Output limit test failure status on channel 2
LPF3?	Output limit test failure status on channel 3
LPF4?	Output limit test failure status on channel 4
LPF?	Output limit test failure status all channels
LS1	Set lower segmented limit 100 as the active segment
LS10	Select lower segmented limit 10 as the active segment
LS2	Select lower segmented limit 2 as the active segment
LS3	Select lower segmented limit 3 as the active segment
LS4	Select lower segmented limit 4 as the active segment
LS5	Select lower segmented limit 5 as the active segment
LS6	Select lower segmented limit 6 as the active segment
LS7	Select lower segmented limit 7 as the active segment
LS8	Select lower segmented limit 8 as the active segment
LS9	Select lower segmented limit 9 as the active segment
LSEG	Select segmented limit line display mode
LSNG	Select single limit line display mode
LSX?	Output active segmented limit
LT0	Turn limits testing off
LT1	Turn limits testing on
LT1?	Output limits testing enable status

Table 6-3. *Limit Commands (2 of 2)*

Command	Description
LTST	Display the limits testing menu
LUP	Enter upper limit value for top graph on active channel
LUP2	Enter upper limit value for bottom graph on active channel
LUP2?	Output upper limit value for bottom graph on active channel
LUP?	Output upper limit value for top graph on active channel
LVH	Select high as limits testing TTL level
LVL	Select low as limits testing TTL level
LVX?	Output limits testing ttl level status
SLC	Clear all segmented limits definitions
SLH	Enter segmented limits horizontal offset
SLH?	Output segmented limits horizontal offset
SLL0	Turn lower segmented limits display off
SLL1	Turn lower segmented limits display on
SLLX?	Output lower segmented limits display on/off status
SLU0	Turn upper segmented limits display off
SLU1	Turn upper segmented limits display on
SLV	Enter segmented limits vertical offset
SLV?	Output segmented limits vertical offset
SPH	Enter active segmented limit horizontal stop position
SPH?	Output active segmented limit horizontal stop position
SPV	Enter active segmented limit vertical stop position
SPV?	Output active segmented limit vertical stop position
STH	Enter active segmented limit horizontal start position
STH?	Output active segmented limit horizontal start position
STV	Enter active segmented limit vertical start position
STV?	Output active segmented limit vertical start position
UPL0	Turn upper limit off
UPL1	Turn upper limit on at current value
UPL20	Turn upper limit off for bottom graph
UPL21	Turn upper limit on at current value for bottom graph
UPL2X?	Output upper limit on/off status for bottom graph
UPLX?	Output upper limit on/off status
US1	Select upper segmented limit 1 as the active segment
US10	Select upper segmented limit 10 as the active segment
US2	Select upper segmented limit 2 as the active segment
US3	Select upper segmented limit 3 as the active segment
US4	Select upper segmented limit 4 as the active segment
US5	Select upper segmented limit 5 as the active segment
US6	Select upper segmented limit 6 as the active segment
US7	Select upper segmented limit 7 as the active segment
US8	Select upper segmented limit 8 as the active segment
US9	Select upper segmented limit 9 as the active segment

Chapter 7 Remote-Only Functions

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Chapter 7 Remote-Only Functions

7-1 INTRODUCTION

This chapter describes 37XXXD GPIB functions that support operations typically required when in remote mode:

- Data transfers (sections 7-2 through 7-11)
- Error reporting, including the Service Log (sections 7-12 through 7-14)
- Status reporting (sections 7-15, 7-16)
- IEEE 488.2 Common commands (section 7-17)
- Synchronization commands (section 7-18)

7-2 DATA TRANSFER PROTOCOL

There are several basic ideas associated with transferring data between your controller and the 37XXXD. This section introduces data transfer terminology, message terminator and separator characters, and data transfer methods (protocols) used by the 37XXXD.

GPIB Messages

A GPIB message is any information sent over GPIB to a device. This includes instrument commands or data that you send to or receive from the 37XXXD.

Program Message (PM)

This is the message string that your controller *sends to* the 37XXXD.

The message can contain commands, queries (or other requests for data transfer), and data strings.

Response Message

This is the data your controller *receives from* the 37XXXD.

The data can contain ASCII or binary represented numerical values, character strings or other arbitrary ASCII data, and 37XXXD internally represented binary strings.

Separation and Termination Methods

Termination and separation protocols of messages transmitted over the GPIB are specified by the IEEE 488.2 GPIB Standard. The 37XXXD conforms to those specifications as described below.

Message Elements Separator

A program or response message can consist of one or more elements, called units. Units are separated with the semi-colon (;) character.

Units in a program message are complete valid 37XXXD commands or queries. For example, "**CH1;PHA;SRT 2 GHZ;SRT?**" consist of four commands or queries that make channel 1 active, set it to phase display, sets start frequency to 2 GHz, then outputs the start frequency.

A single unit in a response message is the complete data output in response to a single command. For example, the command sequence "**ONP;CHX?**" – Output Number of Points and Output Currently Active Channel, will output a response message that contains two units separated by a semi-colon (;). The first unit of data is the response to the **ONP** command. The second unit of data is the response to the **CHX?** query.

Message Unit Data Separator

The comma (,) character separates multiple ASCII data elements of a single command or response message unit. For example, the command **OM1** – Output Marker 1 Value, will output a complex data value (two values, that is, dB and degrees) representing the measurement data at the marker. The two values in the complex data will be separated with a comma.

Message Terminator

A complete program or response message is terminated by sending the linefeed character (0A, or decimal 10) at the same time (concurrent with) setting the EOI state on the GPIB. The notation <0A^END> will be used throughout this Programming Manual to reference the message terminator. Simply put, the message terminator signals the end of transmission.

NOTE

EOI is the GPIB End of Transmission state that is set by the controller, or an instrument, when it is done "talking," i.e., done sending a message on the GPIB and therefore releasing the GPIB for use by another device.

Separation and Termination Example

The following example shows how a program message with multiple units is sent to the 37XXXD. Also shown is the response message the 37XXXD will send back to the controller.

PROGRAM MESSAGE (to 37XXXD):

```
"CH2;LPH;MK6 2.5 GHZ;OM6;OFV"
```

This program message makes channel 2 active (**CH2**), sets it to linear magnitude and phase display (**LPH**), activates and sets marker 6 to 2.5 GHz (**MK6 2.5 GHZ**), outputs its value (**OM6**), then outputs the list of current sweep frequencies (**OFV**).

Response message elements:

<marker 6 dB value>**,**<marker 6 degrees value>**;**<frequency list header> <frequency 1>**,**<frequency 2>**,**...**,**<frequency 101><0A^EOI>

NOTE

The (< >) characters in the message elements list are not actually transmitted in the response message; they are shown here in the text to distinguish the various data fields from each other.

A representative response from a Model 37325A:

```
1.00620877743E+00,-3.65609092712E+01;#418
174.00000000000E+7,1.74600000000E+08,...
...,1.35000000000E+100A
```

Response Description:

OM6 outputs 2 ASCII data items (dB,degrees). They are sent separated with a comma (**,**).

The output of **OM6** and **OFV** is separated with a semicolon (**;**). This was done because the external controller requested two outputs before reading the first one from the 37XXXD.

NOTE

Note that certain data transfer commands require that you read their output before another data output command is sent [see <Arbitrary ASCII> format and <Arbitrary Block> format (Example 3), in section 7-3].

The **OFV** command outputs data using the <Arbitrary Block> format (see description in section 7-3). The frequency values are preceded by a <frequency list header> (#41817). This is an ASCII text string that is encoded with the number of bytes to follow. This data transmission method, used by the **OFV** and other 37XXXD block data transfer commands, allows you to prepare an appropriate size memory block to receive the data in your application.

The first frequency value (4.00000000000E+7) is then transmitted immediately after the header followed by a comma. This continues until all 101 frequency values are transmitted.

NOTE

The commas are used because the values are in ASCII format. If binary format was selected (see **FMA**, **FMB**, **FMC** format commands, section 7-4), the frequency values would have been sent without commas.

The linefeed character (**0A**) signals the end of transmission at the end of the response message. The end of transmission **(EOI)** is set by the 37XXXD at the same time the linefeed is sent and thus the GPIB is released for use by another device.

7-3 DATA TRANSMISSION METHODS

Data transmissions to and from the 37XXXD conform to the protocols specified by the IEEE 488.2 GPIB Standard. The 488.2 Standard specifies how any data, such as ASCII numbers, strings, or blocks of data bytes, will be transmitted over the GPIB. This section describes the various transmission methods in use by the 37XXXD.

The transmission method names described below (also called notations) will be used throughout the Programming Manual when describing specific 37XXXD data transfer commands.

Data transmission notations are easily distinguished in text as they are always shown surrounded by the “less than” and the “greater than” characters (< >). The transmission type notations used in describing various 37XXXD data transmissions are:

For ASCII numbers, the notations are:

<NR1>, <NR2>, <NR3>, or <NRf>

For ASCII strings (printable characters and print formatting codes), the notation is:

<ASCII String>

For generic (7-bit) ASCII characters, the notation is:

<ASCII Block>.

For generic binary bytes, (i.e. 7-bit ASCII or binary), the notation is:

<Arbitrary Block>

<NR1>

This notation represents ASCII integer values. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR1> notation:

1
0
-29,179

<NR2>

This notation represents ASCII floating point values in decimal point format. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR2> notation:

1.0
-0.00015
12.743,-180.07

<NR3>

This notation represents ASCII floating point values in exponential format (scientific notation). A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR3> notation:

1.0E9
-7.056E3
9.0E-2,3.42E2

<NRf>

This notation is used to signify that data can be in either <NR1>, <NR2>, or <NR3> format as described above.

Examples of values that can be represented by <NRf> notation:

1.0E-9
10.005
-83,4.5E2,-234.9901

<String>

This notation represents a string of ASCII characters (including non-printable characters) that is delimited (surrounded) with either single quotes (' ') or double quotes (" "). The string can include text formatting characters such as linefeed, space, carriage return, or printer control characters.

Note that if a double quote character must be sent as part of the string, then it must be followed by an additional double quote. Alternatively, the string can be sent using single quotes (See "cal_file" example below).

Examples of data represented by <String> notation:

"1/15/98"
"Save ""cal_file"" now"
'Save "cal_file" now'

<Arbitrary ASCII>

This notation represents undelimited 7-bit ASCII text. The end of the text must be terminated with the 0A character (decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <Arbitrary ASCII> text to be transmitted only at the end of a program or response message, i.e., at the end of a multiple input or output statement.

Example of data represented by <Arbitrary ASCII> notation:

ANRITSU,37247C,123456,1.0<0A^EOI>

The example shows a sample response from the *IDN?, 488.2 common query. In the example, the instrument identifies itself as an ANRITSU

37247C, with serial number 123456, and software version 1.0 installed.

Note that decimal 10 (0A character) must be sent with the EOI to signal end of transmission

<Arbitrary Block>

This notation represents data that is transmitted as 8-bit data bytes (00–FF hex, 0–255 decimal, notation is <DAB>). This is useful for transmitting large blocks of formatted ASCII or binary data or unformatted binary data. The data stream is immediately preceded by a variable length ASCII header that is encoded with the number of data bytes to be sent. The header always starts with the pound (#) character. Figure 7-1 below describes the header and the transmitted data messages.

```
#nm1..mn<DAB>1..<DAB>m
```

Where:

# = The pound sign character. Required for binary data transfer.
n = Number of digits to follow ($m_1..m_n$) that make up the number m.
$m_1..m_n$ = Taken together, this makes up the number m which is the number of data bytes to follow that constitute the requested data.
<DAB> = An 8 bit binary data byte. This is the data (or information) being sent.

NOTE

If n = 0, then m is omitted, and transmission end is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End Of Transmission State (EOI) immediately following the last <DAB>.

Figure 7-1. *<Arbitrary Block> Data Format*

EXAMPLE 1 : #3204<DAB_1>...<DAB_{204}>

Example 1 shows how 204 7-bit bytes are transmitted using the proper header. The header in this example is comprised of 5 characters (#3204). It begins with with the pound character (#). The next character (3) indicates there are 3 digits to follow that indicate the number of bytes being transmitted (204). The next three characters (204) indicate the number of data bytes being transmitted immediately after the header. Next comes the actual data bytes, or information, being transmitted (<DAB_1>...<DAB_{204}>).

EXAMPLE 2: #512808<DAB_1>...<DAB_{12808}>

Example 2 shows how 12808 bytes are transmitted using the proper header. The header in this example is comprised of 7 characters (#512808). It begins with with the pound character (#). The next character (5) indicates there are 5 digits to follow that indicate the number of bytes being transmitted (12808). The next five characters (12808) indicate the number of data bytes being transmitted immediately after the header. Next comes the actual data bytes, or information, being transmitted (<DAB_1>...<DAB_{12808}>).

NOTE

Examples 1 and 2 above demonstrate the <Arbitrary Block> form referred to as <*Definite* Length Arbitrary Block>. It is so called because the number of data bytes being transmitted is *known* from the encoded header.

EXAMPLE 3: #0<DAB_1>...<DAB_n><0A^EOI>

Example 3 shows how an *unknown* number of bytes are transmitted using the proper header. The header in this example is comprised of 2 characters (#0). As usual, the header begins with the pound character (#). The next character (0) indicates there is an unknown number of data bytes being transmitted immediately after the header. Next comes the actual data bytes being transmitted (<DAB_1>...<DAB_n>). The end of the data stream is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI).

NOTES

- Example 3, above, demonstrates a special form of the <Arbitrary Block> referred to as the <*Indefinite* Length Arbitrary Block>. It is so called because the number of data bytes being transmitted is unknown, and therefore can not be encoded in the header. Instead, the header *always* consists of the pound and zero characters (#0) and end of the data stream is *always* signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <*Indefinite* Length Arbitrary Block> text to be transmitted only at the end of a program or response message, i.e., at the end of a multiple input or output statement.

- When using this method to input data you must not exceed the 37XXXD input buffer size (refer to Chapter 1, Table 1-2.)

Three commands are provided to alter the way the arbitrary block header for output data is formed.

FDH0: Specifies that the length of the arbitrary block header will be minimized; that is, the byte count section will not contain leading zeros, thus its length is indeterminate. This means that a program must decode the header in order to skip over it.

FDH1: Specifies that the length of the arbitrary block header will be fixed at 11 characters. This is accomplished by forcing leading zeros as required in the byte count section. This means that a program can skip over the arbitrary block header by skipping 11 characters.

FDH2: Specifies that no arbitrary block header will be sent with the next transmission. This mode is not in compliance with IEEE 488.2 specifications and will only be in effect for the current program message. Afterwards, it will change to FDH1.

FDHX?: FDH mode query.

7-4 ASCII OR BINARY DATA FORMAT

The following sections discuss the various data output formats.

- Data transfers *involving* numerical data arrays.
- Data transfers *not involving* numerical data arrays.
- Enhanced ASCII formatting.

Non-Array Data

The formats used for data transfers *not* involving numerical data arrays are preset. They always occur in either binary format or ASCII format, depending on the data.

These data transfers include a variety of information. Examples include: instrument setup strings, marker data, queries, and disk directory listings. See the desired data transfer command description for its applicable data transfer format.

Numerical Data Arrays

Numerical data array transfers are used to transfer the following types of data:

- Measurement data
- Calibration data
- Sweep frequency, time, or distance values.

Each of these data transfer types are individually explained in following sections.

You can select either binary or ASCII format for data transfers involving numerical data arrays. The five commands described below will select and keep the format for all subsequent transfers (these commands are also listed and described in Table 7-1).

ASCII Format:

FMA: ASCII formatted values represented in <NR1>, <NR2>, <NR3>, or <NRf> formats as described in section 7-3. The 37XXXD will accept any of the above formats as input. It will *always* output values using

<NR3> exponential format with each value represented using 18 characters, plus a comma to separate multiple values.

Binary Format:

FMB: Each *eight* consecutive data bytes represent one floating point value in IEEE 754 64-bit format (double precision, 8 byte, floating point value).

FMC: Each *four* consecutive data bytes represent one floating point value in IEEE 754 32-bit format (single precision, 4 byte, floating point value).

FMX?: FMA, FMB, FMC format selection query.

MSB: Byte ordering is *most* significant byte first. For use only with FMB and FMC. This the default byte ordering mode for the 37XXXD.

LSB: Byte ordering is *least* significant byte first. For use with FMB and FMC. This is required for transferring data to/from Intel/IBM based computers.

XSB?: MSB, LSB format selection query.

FMT0: Turn ASCII enhancement off (normal default mode).

FMT1: Turn ASCII enhancement on.

FMTX?: ASCII enhancement ON/OFF status query.

Enhanced ASCII Formatting

Enhanced ASCII formatting can be applied to both non-array ASCII data and numerical data arrays in the FMA format when this data is output within an <arbitrary block> format. The format selectively replaces comma data element separators with a line feeds (ASCII 10) in order to enhance the visual effect. Figure 7-2 provides two examples of this enhanced structure.

7-5 DATA TRANSFER COMMANDS

Table 7-1 is an alphabetical listing of all data transfer commands. Tables 7-2 through 7-4 list these commands separately, with each table listing the commands for a particular data transfer type. These tables are located with the explanatory sections.

A Note On Query Commands

Query commands are a special form of data transfer commands. They are used to query (or output) a variety of 37XXXD setup parameters. For example, **SRT?** will output the current sweep start frequency. Query command mnemonics typically closely resemble the corresponding setup command mnemonic but with an added question mark (?). For example, **CH1** is used to set the active channel to channel 1, **CHX?** is used to query the currently active channel setting. Query commands are listed in their respective Command Function Group chapter. For example, since **SRT?** queries a Measurement Function, it will be listed in Chapter 4, Measurement Group.

Error And Status Reporting Commands Commands associated with transferring error and status reporting data are described in detail in sections 7-11 and 7-15 respectively.

An unenhanced directory listing

#9000000392Directory of C:\ 1-30-96 13:03,UTIL <DIR> 1-25-96 12:58,PLOT BMB 38462 1-22-96 14:41,PLOT BMC 307446 1-22-96 14:41,TTT CAL 44174 1-22-96 17:02,TTT2 CAL 44174 1-22-96 17:16,PLOT1 DAT 10323 1-22-96 14:03,PLOT1 HGL 19899 1-22-96 14:02,PLOT2 HGL 38462 1-25-96 13:16,8 Files 502940 Bytes

An enhanced directory listing

```
#9000000392
Directory of  C:\   1-30-96  13:03
UTIL        <DIR>        1-25-96  12:58
PLOT     BMB      38462   1-22-96  14:41
PLOT     BMC     307446   1-22-96  14:41
TTT      CAL      44174   1-22-96  17:02
TTT2     CAL      44174   1-22-96  17:16
PLOT1    DAT      10323   1-22-96  14:03
PLOT1    HGL      19899   1-22-96  14:02
PLOT2    HGL      38462   1-25-96  13:16
8 Files          502940 Bytes
```

An unenhanced response to OCD

#9000000189-9.99750733376E-01, 3.21409821510E-01, 3.60706359148E-01, 9.82860028744E-01, 7.7 6742696762E-01,-5.06587028503E-01,-5.07535457611E-01,-8.45697641373E-01,-6.10321164131E-01, 6.05827927589E-01

An enhanced response to OCD

```
#9000000189
-9.99750733376E-01, 3.21409821510E-01
 3.60706359148E-01, 9.82860028744E-01
 7.76742696762E-01,-5.06587028503E-01
-5.07535457611E-01,-8.45697641373E-01
-6.10321164131E-01, 6.05827927589E-01
```

Figure 7-2. *Examples of Enhanced ASCII Formatting*

Table 7-1. Alphabetical Listing of All 37XXXD Data Transfer Commands (1 of 2)

Command	Description
DPR0	Visible data only OFD format
DPR1	Data pair always OFD format
FDE0	Disable Output Data End Message
FDE1	Enable Output Data End Message
FDEX?	Output Output Data End Message enable/disable status
FMA	Select ASCII data transfer format
FMB	Select IEEE754 64 bit data transfer format
FMC	Select IEEE754 32 bit data transfer format
FMX?	Output data output mode FMA FMB or FMC
IC1	Enter calibration coefficient 1
IC10	Enter calibration coefficient 10
IC11	Enter calibration coefficient 11
IC12	Enter calibration coefficient 12
IFPC	Enter flat power coefficients
LSB	Select least significant byte first binary transfer
MSB	Select most significant byte first binary transfer
O4FD	Output final data for all 4 channels to the GPIB
O4SC	Output corrected data for all four S-parameters
O4SR	Output raw data for all four S-parameters
OAM1	Output channel 1 active marker value
OAM2	Output channel 2 active marker value
OAM3	Output channel 3 active marker value
OAM4	Output channel 4 active marker value
OC1	Output calibration coefficients 1
OC10	Output calibration coefficients 10
OC11	Output calibration coefficients 11
OC12	Output calibration coefficients 12
OC2	Output calibration coefficients 2
OC3	Output calibration coefficients 3
OC4	Output calibration coefficients 4
OC5	Output calibration coefficients 5
OC6	Output calibration coefficients 6
OC7	Output calibration coefficients 7
OC8	Output calibration coefficients 8
OC9	Output calibration coefficients 9
OCA	Output calibration coefficient A
OCB	Output calibration coefficient B
OCC	Output calibration coefficient C
OCD	Output corrected data for active channel parameter
OCF	Output front panel setup and calibration data

Table 7-1. *Alphabetical Listing of All 37XXXD Data Transfer Commands (2 of 2)*

Command	Description
OCL	Output all applicable calibration coefficients for cal type
ODR	Output directory listing of the floppy drive
ODRH	Output directory listing of the hard drive
ODV	Output distance values for time domain
OEL	Output error list
OFD	Output final data for active channel parameter
OFD1	Output final data for channel 1 parameter
OFD2	Output final data for channel 2 parameter
OFD3	Output final data for channel 3 parameter
OFD4	Output final data for channel 4 parameter
OFP	Output current front panel setup
OFPC	Output flat power coefficients
OFV	Output frequency values
OGE	Output extended description of current GPIB error
OGL	Output extended description of previous GPIB error
OID	Output instrument identification string
OLM	Output limits status byte mask
OM1	Output marker 1 value
OM2	Output marker 2 value
OM3	Output marker 3 value
OM4	Output marker 4 value
OM5	Output marker 5 value
OM6	Output marker 6 value
ONCP	Output number of points for current calibration
OND	Output Normalization data
ONE	Output number of lines in the error list
ORD	Output raw data for active channel parameter
OS1	Output front panel setup number 1
OS10	Output front panel setup number 10
OS2	Output front panel setup number 2
OS3	Output front panel setup number 3
OS4	Output front panel setup number 4
OS5	Output front panel setup number 5
OS6	Output front panel setup number 6
OS7	Output front panel setup number 7
OS8	Output front panel setup number 8
OS9	Output front panel setup number 9
OSL	Output service log
XSB?	Output byte order for output data LSB or MSB

7-6 MEASUREMENT POINTS DATA

The Sweep Measurement Points Data Transfer Commands are listed in Table 7-2. These commands are described in the following sections.

The OFV command

Output Frequency Values, will output the current sweep measurement frequencies.

The OTV command

Output Time Values, and the **ODV** command - Output Distance Values, will output the current time domain sweep measurement points.

The IFV command

Used to input a user defined set of frequencies for measurement or calibration.

NOTE

The **IFV** command will delete the existing sweep frequency list and replace it with the newly input list. Therefore all existing calibration data will be lost.

The ONP command

Output Number of Points, can be used to allocate enough memory in your program to receive the measurement frequencies. For example, sending "**ONP**;**OFV**" to the 37XXXD when a 401 data point sweep is in progress will output the ASCII value 401. This value can now be used to set up an array of the correct size to receive the output of the **OFV** command.

Table 7-2. *Sweep Measurement Points Data Transfer Commands*

Command	Brief Description	Allowable Data Formatting
ODV	Output distance values for time domain sweep points	FMA, FMB, FMC
IFV	Input frequency list	FMA, FMB, FMC
OFV	Output measurement frequency values	FMA, FMB, FMC
OGCFV	Output gain compression frequency values	FMA, FMB, FMC
ONP	Output number of points currently being measured	None - Always ASCII
ONPV	Output the number of power sweep power values	None - Always ASCII
OPSV	Output power sweep power values	FMA, FMB, FMC
OTV	Output time values for time domain measurement points	FMA, FMB, FMC

Sweep Measurement Points Data Transfer Example

The following is an example of Sweep Measurement Points Data Transfer commands usage:

```
"NP101;FMB;LSB;OFV"
```

These commands will perform the following functions:

NP101 will set up a 101 point sweep.

FMB will output data using 64-bit (eight bytes) floating-point format.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

OFV uses the <Arbitrary Block> format. It will output the current list of measurement frequencies, f_1 thru f_{101}, using eight bytes each. The ASCII header (#3808), which shows that 808 data bytes follow, precedes the frequency values. The linefeed character (0A, decimal 10) signals the end of the data block.

EXAMPLE:

#3808<f_1, 8 bytes>...<f_{101}, 8 bytes>0A

NOTE

The (< >) characters are not output from the 37XXXX. They are used in the text above to distinguish each frequency's 8 byte segments.

7-7 FAST CW OPERATION

Fast CW operation is a special mode where the instrument is in CW and measurements are made very rapidly. The measurement data is sent directly to the GPIB task which can either make the data available to the GPIB bus or store it in an internal buffer to be output later. To achieve a faster measurement rate, the display is not updated. See the next section on Internal Buffer Data Collection for a description of how the Fast CW Data can be stored in an internal buffer and output at a later time.

There are currently 2 modes for fast CW: Mode 1 outputs the active channel S-Parameter or User Defined Parameter as a complex number. Mode 2 outputs the measurements B1, B2 and A as 3 complex numbers. When the data is output to the GPIB directly, it is output one point at a time. No intervening query mnemonics are required. The byte order of the floating point numbers is always Most Significant Byte first (MSB). If a data point is not read when available, it may be overwritten by a subsequent data point and lost. No indication is made if this happens as it is very likely that many data points will be lost if the controller is not fast enough to keep up with the measurement rate.

Fast CW Mode 1 Each data point is output in binary and consists of two IEEE 754 4-byte floating point numbers (one for the real part and one for the imaginary) encapsulated within an <arbitrary block> header (section 7-3) and a trailing Line Feed with EOI. A total of 12 bytes:

#18 <4-byte float> <4-byte float><LF/EOI>

Fast CW Mode 2 Each data point is output in binary and consists of 3 sets of IEEE 754 4-byte floating point numbers (one for the real part and one for the imaginary) encapsulated within an <arbitrary block> header (section 7-3) and a trailing Line Feed with EOI. A total of 29 bytes. The parameter order is [B1][B2][A1] for the forward sweep direction and [B1][B2][A2] for the reverse sweep direction:

#224<4-byte float><4-byte float><4-byte float> <4-byte float><4-byte float><4-byte float><LF/EOI

Most GPIB mnemonics interfere with proper Fast CW operation and are therefore not permitted. Refer to Table 7-3 for a list of Fast CW mnemonics and Table 7-4 for a list of Fast CW permitted mnemonics.

Table 7-3. Fast CW Mnemonics

Command	Description
FCW0	Turn fast CW measurement mode off
FCW1	Turn fast CW measurement mode on
FCW2	Turn Fast CW mode 2 on
FCWX?	Output fast CW measurement mode on/off status

Table 7-4. Mnemonics Permitted During Fast CW Mode

Command	Description
ADDFC	Enter frequency counter GPIB address
ADDPLT	Enter plotter GPIB address
ADDPM	Enter power meter GPIB address
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements

7-8 INTERNAL BUFFER

Internal Buffer Data Collection (Table 7-5) provides for saving active channel measurement data from multiple sweeps without having to synchronize and collect data at the end of each sweep. The instrument can store up to 50,000 data point measurements; each one consisting of two IEEE 754 4-byte floating point numbers.

The mnemonics CCD, CFD and CRD initialize the collection process and specify which type of data will be collected: either Corrected Data, Final Data or Raw Data respectively. The measurement data in Fast CW mode is considered to be Raw Data. Once initialized, the collection process can be started by issuing the mnemonic DCCTN.

Before changing instrument parameters, temporarily suspend the collection process with the mnemonic DCHLD. After changes are completed, restart with DCCTN.

Sections of collected data can be delimited using the mnemonic DCMRK, which puts user specified values into the data buffer in real time.

The mnemonic OCS will output the data and reset the data collection buffer. The output format is fixed at FMC and DPR1. The user may, however, specify MSB or LSB. As is the case with all binary data transfers, the data will be encapsulated with an Arbitrary Block header (section 7-3). The size of the output data is 2 X 4 X number of data points collected. The absolute maximum number of data points that can be collected is 50,000. Sometimes, depending on internal memory usage, the maximum count can be less. Use DCPMAX? to determine the maximum. If the internal buffer becomes completely filled, subsequent data is discarded. The CBF bit of the Extended Event Status Register will also be set.

Table 7-5. Internal Buffer Data Collection Mnemonics

Command	Description
CCD	Collect corrected data in an internal buffer
CFD	Collect final data in an internal buffer
CRD	Collect raw data in an internal buffer
CXD?	Output internal buffer data collection mode
DCCTN	Resume internal buffer data collection
DCCTN?	Output internal buffer data collection resume/suspend status
DCHLD	Suspend internal buffer data collection
DCMRK	Inserts the mark value into the internal buffer
DCOFF	Turn internal buffer data collection mode off
DCPCUR?	Outputs the current point count in the collect buffer
DCPMAX?	Outputs the maximum number of points that can be collected in the collect buffer
OCS	Output internal buffer collected data

7-9 TRIGGERS

Table 4-4, in Chapter 4, lists the mnemonics TEX and TIN which control the triggers that are visible from the front panel. There are, however, two additional trigger configurations controllable only from the GPIB.

The mnemonic TIB sets up the instrument similar to TEX except the GPIB Group Execute Trigger provides the trigger to go to the next frequency and take a measurement. Thus the user can cause the instrument to step along and take measurements as quickly or as slowly as desired. If the instrument has not finished with the measurement cycle from a previous GET and another GET is received, the GET will be lost. To show that this has happened, the TRH bit in the Limit Event Status Register is set.

The mnemonic TEB allows the rear panel external trigger to execute the program message contained in the *DDT trigger definition. This allows the rear panel trigger to control almost any instrument function(s) that can be controlled from the GPIB. Such as restarting the sweep, or even resetting the instrument. If the instrument has not finished with the *DDT trigger definition when another rear panel trigger is received, the trigger will be lost. To show that this has happened, the TRH bit in the limit event status register is set.

Table 7-6 contains the GPIB trigger mnemonics only. Table 7-7 shows the relationships set up by the various trigger modes.

Table 7-6. Trigger Mnemonics

Command	Description
TEB	Select external trigger executes *DDT definition
TIB	Select GPIB measurement triggering

Table 7-7. Trigger Relationships

Trigger Mode	Data Measurement Triggering	*DDT Trigger Definition Triggering
TIN	Internal	GPIB GET
TEX	External	GPIB GET
TIB	GPIB GET	None
TEB	Internal	External

7-10 CALIBRATION COEFFICIENTS

The Calibration Coefficients Data Transfer commands are listed in Table 7-8. These commands are described in the following sections.

The **OCx** and **ICx** commands provide for outputting and inputting calibration error terms (coefficients). The **ONCT** command outputs the number of error terms available for the currently set calibration. For example, **ONCT** would output the number 12 for a 12-Term calibration and 2 for a Transmission Frequency Response calibration. The ordering of the calibration error terms for the various calibration types is shown in Chapter 12, Table 12-3. For example, to output the ETF error term from a 12-Term calibration use the **OC4** command.

Table 7-8. *Calibration Coefficients Data Transfer Commands*

Command	Brief Description	Allowable Data Formatting
IC1 – IC12	Input calibration coefficient 1-12	FMA, FMB, FMC
ICA, ICB, ICC	Input calibration coefficient 10–12	FMA, FMB, FMC
OC1 – OC12	Output calibration coefficient 1–12	FMA, FMB, FMC
OCA, OCB, OCC	Output calibration coefficient 10, 11, 12	FMA, FMB, FMC
OCL	Output all calibration coefficients for existing calibration	FMA, FMB, FMC
ONCT	Output number of cal terms for current calibration	None - Always ASCII
ICL	Input all calibration coefficients for existing clibration	FMA, FMB, FMC

The **ICx** commands are used to input user defined calibration error terms. The 37XXXD must be prepared to accept the appropriate calibration error terms using the Simulate Calibration commands, such as **A12**, **A8T**, etc.. These commands use the same mnemonic syntax as their related calibration selection commands (which are used to actually perform a calibration), except they start with the letter "A" instead of "C". For example, the **A12** command is used to simulate a 12-Term calibration where as the command **C12** is used to actually perform a 12-Term calibration. Similarly, the **A8T** command is used to simulate a 1 Path 2 Port FWD calibration where as the command **C8T** is used to actually perform a 1 Path 2 Port FWD calibration. Refer to Chapter 12, Table 12-3 and to Chapter 6, “Calibration Functions” for more information about calibration coefficients, and performing calibrations).

Calibration error terms (coefficients) are output, or expected as input, only for the currently defined set of sweep frequencies. If data points are not at the maximum values set during calibration and/or the frequency range has been zoomed-in (with error correction turned on), not all calibration coefficients will be output or used as input. Refer to section 7-6, “Sweep Measurement Points Data Transfer,” for details on outputting the current sweep measurement points.

If an attempt is made to transfer an unavailable calibration error term, that is, the EXR term from a Reflection Only calibration, the 37XXXD will issue an Execution Error (refer to section 7-12, “The 37XXXD Error Reporting System”).

Calibration Coefficients Data Transfer Example

The following is an example usage of Calibration Coefficients Data Transfer commands (assumes a 12-term calibration is in effect):

```
"NP101;ONCT;FMB;LSB;OC1"
```

These commands will perform the following functions:

NP101 will set up a 101 point sweep. This is only allowed if the calibration was done with at least 101 points in the sweep.

ONCT will output the number 12, since there are 12 error terms in a 12-term calibration.

The 37XXXD will then output a semi-colon (**;**) to separate the **ONCT** output data from the oncoming **OC1** data.

FMB will output the calibration data using 64-bit (eight bytes) floating-point format.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

OC1 uses the <Arbitrary Block> format. It will output 101 real and imaginary data pairs (202 values). Each two consecutive values, 8 bytes each, represent the error term EDF at each measurement point. The total number of bytes expected (1616) is encoded in the ASCII header (#41616). The linefeed character (0A, decimal 10) signals the end of the data block.

EXAMPLE:

12**;**#41616<f_1 EDF real, 8 bytes> <f_1, EDF imaginary, 8 bytes>
<f_2 EDF real, 8 bytes> <f_2, EDF imaginary, 8 bytes>...
....<f_{101}, EDF real, 8 bytes> <f_{101}, EDF imaginary, 8 bytes>**0A**

NOTES

- The (< >) characters shown in the example are not output from the 37XXXD. They are used in the text above to distinguish each 8 byte data segments.

- Note the number 12, output in response to the **ONCT** command, and the semi-colon separator, that precede the EDF data output.

Your program can now iteratively issue and output the remaining 11 error terms using the commands **OC2**, **OC3**, ..., **OC12**.

7-11 MEASUREMENT DATA TRANSFER

The Measurement Data Transfer commands are listed in Table 7-9. These commands are described in the following sections.

Table 7-9. Measurement Data Transfer Commands

Command	Brief Description	Allowable Data Formatting
DPR0	Turn **off** outputting of data pairs for single graph data types only (when using OFD/IFD command)	N/A
DPR1	Turn **on** outputting of data pairs for single graph data types only (when using OFD/IFD commands)	N/A
DPRX?	Data pair mode query on/off.	N/A
ICD	Input corrected data for S-parameter on active channel	FMA, FMB, FMC
IFD	Input final (display format) data for S-parameter on active channel	FMA, FMB, FMC
OAM1–OAM4	Output active marker value on channel indicated	None - Always ASCII
OGCFD	Output gain compression final data to GPIB	FMA, FMB, FMC
OCD	Output corrected data for S-parameter on active channel	FMA, FMB, FMC
OFD	Output final (disp. format) data for S-parameter on active channel	FMA, FMB, FMC
OM1 – OM6	Output marker 1-6 value in display format. NOTE: Use MK1?-MK6? to output marker frequency. Refer to Chapter 6, Data Analysis, for more details.)	None - Always ASCII
OS11C	Output corrected S11 data to GPIB	FMA, FMB, FMC
OS11R	Output raw S11 data to GPIB	FMA, FMB, FMC
OS12C	Output corrected S12 data to GPIB	FMA, FMB, FMC
OS12R	Output raw S12 data to GPIB	FMA, FMB, FMC
OS21C	Output corrected S21 data to GPIB	FMA, FMB, FMC
OS21R	Output raw S21 data to GPIB	FMA, FMB, FMC
OS22C	Output corrected S22 data to GPIB	FMA, FMB, FMC
OS22R	Output raw S22 data to GPIB	FMA, FMB, FMC
O4SC	Output corrected data for all four S-parameters	FMA, FMB, FMC
O4FD	Output final (display format) data for the S-parameters of all four channels	FMA, FMB, FMC
O4SR	Output raw data for all four S-parameters	FMA, FMB, FMC
OFD1-OFD4	Output final (display format) data for the S-parameters of the indicated channel	FMA, FMB, FMC

The traditional method to get S-parameter measurement data out of the VNA is to set the desired channel and output using **OCD**, **OFD**, or **ORD**. Corrected data **OCD** and raw data **ORD** are always output in real/imaginary format and include the averaging and IF bandwidth enhancements. Final data **OFD** also includes the smoothing enhancement and can be output in any of the supported display formats. Time domain data and some gain compression **OGCFD** data are only available as final data. If corrected data is requested and correction is not applied, then raw data will be output instead.

Since changing the active channel takes time, it can become a major concern when trying to achieve rapid data extraction of all four channels or all four S-parameters. Therefore, several new codes were developed that do not require you to change the channel:

- ❑ O4SC, O4SD, and O4SR returns all four parameters in one arbitrary data block.
- ❑ OFD1, OFD2, OFD3, and OFD4 returns one S-parameter for the channel indicated.
- ❑ OS11C, OS11R, OS12C, OS12R, OS21C, OS21R, OS22C and OS22R returns the indicated S-parameter, either raw or corrected.

Several of the graph types for final data OFD display only one parameter, for example, the LOG-MAG graph type only displays the log-magnitude of an S-parameter. Usually, the undisplayed part of the S-parameter is not measured and would be output as invalid. Therefore, these graph types only output one parameter in response to a GPIB request instead of two. You can override this behavior by using the DPR1 code (data pair always), which forces the VNA to output two parameters regardless of their validity. In most cases, the invalid parameter will be set to zero. Use the DPR0 code to return the output mode back to default. DPRX? can be used to query which behavior is currently active.

The following table lists the graph types and the associated data output values based on the DPR0 and DPR1 (data pair) modes:

Table 7-10. *Output Value vs. Graph Display Types*

Graph Display Type	Data Units and Ordering	
	w/DPR0	w/DPR1
Log magnitude	dB	dB, 0
Phase	degrees	0, degrees
Log mag & phase	dB, degrees	dB, degrees
Linear magnitude	Rho or Tau, degrees	Rho or Tau, 0
Linear mag & phase	Rho or Tau, degrees	Rho or Tau, degrees
Smith chart	Ohms	Ohms, j-Ohms
Inverted Smith	Siemens	Siemens, j-Siemens
Group delay	Seconds	Seconds, 0
Log polar	dB, degrees	dB, degrees
Linear polar	Rho or Tau, degrees	Rho or Tau, degrees
Real	Real	Real, 0
Imaginary	Imag	0, imag
Real & Imaginary	Real, imag	Real, imag
SWR	SWR	SWR, 0

NOTE

The **DPR1** format will remain in effect until the 37XXXD receives the **DPR0** command—that is, Data Pair Format Off. This mode is the default data transfer format.

There are two sets of marker value codes, OM1 through OM6, which output the normal marker values (markers 1 through 6) on the cative channel. These function properly when in any of the normal marker modes. When in the active marker an all channels mode, the OAM1 through OAM4 codes function to return the value of the active marker on the indicated channel. the marker codes alwyas return their values in NR3 ASCII format. The marker values returned are based on the graph type being displayed and therefore, return one or two parameter values. See the previous section about data pair format behavior for OFD.

NOTE

Use the **MK1?-MK6?** queries to output the marker frequency. Refer to Chapter 4, Data Analysis, for full details on Markers.

Two codes, **ICD** and **IFD**, are provided to allow the user to display data that is input from the GPIB. Use **IFD** if the data was previously obtained with the **OCD** or **ORD** codes or the data to display is in real and imaginary format. The number of data points and data format (**FMA**, **FMB**, **FMC**, **MSB**, and **LSB**) currently programmed in the instrument must match that of the data being input. Otherwise, the input operation may fail or produce unsatisfactory results. The transfer will also fail if the data format is **FMA** and the **FMT1** enhanced ASCII data mode is selected.

The **ORD** command **-** Output Raw Data, and the **OCD**/**ICD** commands — Output/Input Corrected Data — all transfer data in real and imaginary pairs (real value, imag value). Raw data is uncorrected measurement data from a sweep without a calibration applied. Corrected data is measurement data which has been corrected according to the currently applied calibration type.

When S-parameter data input to the 37XXXD is complete (**ICD** and **IFD**) the 37XXXD redraws the parameter on the active channel using this data.

NOTE

Always place the 37XXXD in hold (**HLD**) prior to inputting data using the **IFD** or **ICD** commands. This is to prevent the newly input data from being overwritten by subsequent sweeps.

Measurement Data Transfer Example

The following is an example usage of Measurement Data Transfer commands:

```
"NP101;CH2;MAG;HLD;TRS;WFS;FMC;LSB;OFD"
```

NP101 will set up a 101 point sweep. If a calibration is applied, this will only be allowed if the calibration was done with at least 101 points.

CH2 makes channel 2 the active channel for all subsequent channel specific commands.

MAG displays S-parameter data in Log Magnitude format on the active channel.

HLD places the VNA into hold.

TRS triggers a new sweep. Since the VNA is in hold, the hold is changed to single sweep and hold.

WFS waits for a full sweep to ensure the data is valid. A full sweep is a complete forward sweep and a complete reverse sweep when a 12-term calibration is applied. It also includes time/distance data processing time if in time domain mode.

NOTES

- You must wait for two full consecutive sweeps after first connecting a device, and prior to outputting data, when a 12-term calibration is applied, that is, "**TRS;WFS; TRS;WFS**".
- Set your controller's time out value high enough to allow the sweep to complete. Refer to Chapter 2 for more details.

FMC will output data using 32-bit (four bytes) floating-point format. The measurement data can be read directly into a floating point array dimensioned to 101 elements.

LSB causes data bytes to be output least significant byte first. This is for compatibility with INTEL/IBM based computer/controllers. If using other types of controllers that represent data in most significant byte format, then use the **MSB** command.

NOTE

It is good practice to always preface a data transfer command with the desired format command(s) every time it is used, that is, `"FMC;LSB;OFD"`, even if they were already set. This will help make your program more readable and easier to maintain and update in the future.

OFD uses the <Arbitrary Block> format. It will output 101 final measurement data values using the active channel's displayed graph units (dB). Each measurement value is represented using 4 bytes. The ASASCII header (#3404), which shows that 404 data bytes follow, precedes the measurement values. The linefeed character (0A, decimal 10) signals the end of the data block.
EXAMPLE:

```
#3404<f1, dB, 4 bytes> <f2, dB, 4 bytes>....
....<f101, dB value, 4 bytes>0A
```

NOTE

The (< >) characters are not output from the 37XXXX. They are used in the text above to distinguish each 8 byte data segment.

The following shows the data stream if "**FMA;DPR0;OFD**" had been sent instead of "**FMC;LSB;OFD**". This produces the data in ASCII format. The **DPR0** is default mode, but it is sent anyway to insure previous data transfers did not change the setting. Note the header is now #41892, signifying that 1892 data bytes follow.

EXAMPLE:

```
#418921.611913055E+01,5.22284173965E+01,..
....,4.74120521545E+010A
```

The following response shows the data output if "**FMA;DPR1;OFD**" had been sent instead of "**FMC;LSB;OFD**". Note that inclusion of **DPR1** while in a single graph type display (**MAG**, magnitude in this case) will double the array size, by sending data pairs for each measurement point. Note also that the additional value is set to zero since the data for it was not measured. Refer to text above for complete details. Note the header is now #43731, signifying that 3731 data bytes follow. EXAMPLE:

```
#437311.611913055E+01,0.00000000000E+00,5.22284173965E+01,
0.00000000000E+00,.....,4.74120521545E+01,0.00000000000E+000A
```

7-12 ERROR REPORTING SYSTEM

The 37XXXD implements a number of error reporting tools to assist you in detecting, reporting, and handling errors and other events in your application program. These tools will also prove invaluable to you during development of your application program. The tools are summarized below:

- ❑ Status Registers that you set to trigger an interrupt (or service request - SRQ) on many events such as GPIB errors, measurement data pass/fail testing, and end of calibration process. Refer to section 7-15, “Status Reporting,” for complete details
- ❑ A time ordered Service Log that stores errors and other important system information in non-volatile memory. The Service Log can easily be accessed via GPIB and from the front panel
- ❑ A GPIB error message structure that contains the last two GPIB errors encountered. This includes details on the program message element that caused the error

Error Reporting Actions

The following summarizes the actions taken by the 37XXXD when it detects an error:

An audible beep is issued to attract the operators attention.

An error message temporarily appears on the display.

An error message, with date and time and other details, is written in the Service Log (refer to section 7-13 for details.) This is *non-volatile* storage, meaning it will survive a power down of the 37XXXD.

An error message string will also be saved internally in the GPIB software's Error Structures (refer to section 7-12 for details.) This is *volatile* memory storage, meaning it will be lost when the 37XXXD is powered down.

The appropriate bit in the Standard Events Status Register is set, and if enabled, a Service Request (SRQ) will be generated (refer to section 7-15 for details.)

GPIB Error Messages

Refer to Chapter 12 for a complete list of 37XXXD error messages and their descriptions.

37XXXD errors reported in the Service Log include four errors which are detected by the internal GPIB Parser software during remote operation:

7204 GPIB Command Error

7205 GPIB Execution Error

7206 GPIB Device Specific Error

7207 GPIB Query Error

These errors are typically generated as a result of incorrectly programming the 37XXXD. A detailed description of the errors and the data they provide in the Service Log and the GPIB Error Structures follows.

NOTE

Use the 37XXXD error reporting mechanisms to effectively detect and handle error conditions, both during development and when preparing your finished application program.

Each of the GPIB errors will further provide a more precise submessage of the specific condition that caused the error. Refer to Chapter 13, Table 13-3 for a complete list of these sub-messages and their descriptions.

"**7204 GPIB Command Error**"

These are errors in the syntactical correctness of a command, its numeric data entry element, or its data entry terminator code (or suffix mnemonic). As the internal GPIB command parser synchronization can be lost with this type of error, execution of the remainder of the program message is aborted.

If the command error was detected while executing a defined device trigger command sequence (refer to ***DDT** command, Chapter 10), execution of the remainder of the defined device trigger sequence will be aborted.

"**7205 GPIB Execution Error**"

These errors occur when a syntactically correct command fails to execute properly due to the command's parameters being out of range or not appropriate for the current instrument state.

"**7206 GPIB Device Specific Error**"

These errors occur when a command that is free of command and execution errors, fails to execute due to some unexpected instrument condition such as running out of memory.

"**7207 GPIB Query Error**"

These errors occur when the external controller attempts to read data from the 37XXXD output buffer when either no data is available or data in the output buffer is lost.

7-13 SERVICE LOG

The 37XXXD implements a non-volatile record of errors detected during front panel and GPIB operation in a Service Log. The log contains error messages along with the date and time and additional details about the error.

The Service Log can be viewed from the front panel Enhancement key group. Press the Option Menu key, then select DIAGNOSTICS and READ SERVICE LOG soft menus.

Refer to Chapter 8, "System Functions," for details on Service Log action commands such as printing, clearing, and saving it to disk.

Service Log Output Commands

Service Log data can be output via GPIB in two ways depending on the degree of detail desired about the errors. The commands listed in Table 7-11 will output all types of error messages. Refer to section 7-12 for outputting *only* GPIB errors and their related details.

Table 7-11. *Error Data Transfer Commands*

OGE	Output extended description of latest GPIB error	None - Always ASCII
OGL	Output extended description of previous GPIB error	None - Always ASCII
ONE	Output number of error messages stored in Service Log	None - Always ASCII
OEL	Output list of error messages	None - Always ASCII
OSL	Output Service Log	None - Always ASCII

NOTE

The Service Log error messages will remain stored, that is, they will not be deleted, when output via GPIB commands.

The **ONE** command - Output Number of Errors, can be used to periodically check if the 37XXXD detected a new error without having to use SRQ interrupts. The **OEL** command - Output Error List can then be used to output all the error messages in the Service Log. This is an ASCII text, comma separated list of all the error messages in the Service Log. The output is in <Arbitrary Block> format (refer to section 7-3, Data Transfer Protocol Basics, for details.) In the example below, the list is preceded by the output header (#42960), the words ERROR LOG, the current date and time, then the error list.

EXAMPLE:

```
#42960ERROR LOG 01/23/95 19:18,
7205 GPIB EXECUTION ERROR, .....
```

The **OSL** command - Output Service Log, is used to output the complete contents of the Service Log. The output is in ASCII text format, so it can be saved directly to a file for later viewing and analysis. The Service Log output includes:

System identity information such as model, serial number, and software version.

System statistics such as total operational hours, initial turn on date and time, and current date and time.

List of all error messages with date and time of occurrence and other pertinent information.

The Service Log output will look similar to the Service Log as viewed from the front panel menus (Utility key, **DIAGNOSTICS, SERVICE LOG**, then **DISPLAY LOG** soft keys). The only difference is each line of text in the Log as output via **OSL**, will be comma separated from the other lines of text.

GPIB Error Entries Description

This section describes details of Service Log GPIB error entries. Use this information to assist in application program development and to handle GPIB errors in your program.

There are two types of service log entries made in response to GPIB errors (errors 7204, 7205, 7206, 7207):

- The first type is 4 lines long and is made when a program message is currently being parsed and executed (the error can then be associated with a particular command within the message)
- The second type is only 3 lines long and is made when there is no currently active program message

Service Log entries, description:

LINE 1:
The type of error, for example:

7204 GPIB COMMAND ERROR

7205 GPIB EXECUTION ERROR

7206 GPIB DEVICE DEPENDENT ERROR

7207 GPIB QUERY ERROR

LINE 2:
The date and time of the error:

11/14/95 09:26

LINE 3:

For a 3 line service log entry

This line contains only a verbal description of the error:

No response data available

For a 4 line service log entry

The description is followed by an index number which is used to interpret line 4:

Faulty program mnemonic syntax, 13

LINE 4:

This line (approximately 47 characters long) will contain as much of the currently active program message as is possible. The index number from line 3 represents the position of the parser's command pointer when the error occurred. (1 is the first character).

For example, the program message below generated a command error when the parser reached the beginning of the faulty mnemonic CH5 (only **CH1-CH4** are valid). The parser index is placed at position 13 to indicate the the location of the faulty command referenced to the beginning of the line.

```
CH1;WFS;ASC;CH5;WFS;ASC

1           13
```

If the program message is longer than 47 characters, then, as much as possible of the message segment that contained the error will be displayed. The index number in line 3 will be adjusted automatically such that 1 always refers to the first displayed character.

If the error was detected while executing a defined device trigger command sequence (refer to ***DDT** command, Chapter 10), then line 4 will contain as much of the command sequence as possible.

If the error was detected while parsing and converting numeric fields within an <Arbitrary Block> program data element (refer to <Arbitrary Block> in section 7-3), then line 4 will contain as much of the data as possible.

7-14 GPIB ERROR STRUCTURES

The 37XXXD internal GPIB software task (Parser) maintains a list of the current and the previous GPIB errors that it generated. These two errors along with pertinent details can be output over the GPIB.

Refer to section 7-13, Service Log, if you wish to output all 37XXXD errors, including GPIB errors.

NOTE:

Error messages will remain stored, that is, they will not be deleted, when output via the GPIB. Use the ***CLS** or **CSB** to clear the errors reported via the **OGE** and **OGL** commands.

The commands **OGE**—Output Current GPIB Error, and **OGL**—Output Previous GPIB Error (Table 7-6) will output a message in <Arbitrary ASCII> data format (refer to section 7-3 for details.) The data output will contain either 2 or 4 ASCII text fields separated with commas as follows:

<Error Type>,<Error Description>

or,

<Error Type>,<Error Description>,<Index Number>,
<Program Message>

The <Error Type> field will be one of the following:

Command Error

Device Error

Execution Error

Query Error

No errors

The <Error Description> field will contain the same message as reported in LINE 3 of the Service Log GPIB error entry.

The <Index Number> and <Program Message> fields are also included if there is a currently active program message which can be associated with the occurrence of the error. These fields will contain the Index Number and Program Message (refer to LINE 3 and LINE 4 of the Service Log GPIB Error Entry, section 7-13.)

Error Reporting Data Output Example

The following is an example usage of Error Reporting Data Output commands:

```
"*TST?;ONE;OEL;OGE"
```

These commands will perform the following functions:

***TST?** will perform a self test and output the pass/fail status (0=pass, 1=fail). If any tests failed, the test number and error message will be written to the Service Log.

ONE will output the number of errors in the Service Log. The **OEL** will output the error message strings. **OSL** will output the complete Service Log text. If the **ONE** indicates there are errors in the Log, you could use the **OSL** command to output a complete copy of the Service Log to file on your computer for later investigation. This is especially useful during a long un-monitored test, where you may want to save all data for failure analysis.

Investigate any errors prior to proceeding with your application program task. If the error is critical, you should contact a qualified Service Person. Note that you can also output and view the Service Log from the front panel (refer to section 7-13, Service Log.)

NOTE

Errors in the Service Log include certain user errors that may not be actual 37XXXD system failures or errors.

For example, some DISK related errors may have been caused by a bad floppy or a floppy of the wrong media type.

Another example is RF POWER UNLEVELED and RF OVERLOAD errors (see Chapter 13), which are produced if the system reset power is exceeded to a point where the system becomes unleveled. This is normal behavior (the 37XXXD allows you to set power above reset power to accommodate special needs (refer to **OID** command, Chapter 11, “Command Dictionary”).

In fact, the **ONE**, **OEL**, **PWR**, and **P1P?** commands can be used together to check for these errors if you are attempting to find the maximum leveled power setting for a specific frequency range. Refer to Chapter 10, Command Dictionary for command details.

OGE (and **OGL**) can be used to output the GPIB error number, or "No errors" message, if none occurred. This is useful while debugging your application during development for displaying the error on your computer's screen for example. Note that by definition, these errors should not occur on a finished application program or they may be indicative of an error prone application.

7-15 STATUS REPORTING

The following sections describe the 37XXXD service request and status reporting model. The 37XXXD model implements all mandated and many optional status reporting features specified by the IEEE 488.2 Standard. These include the Standard Event Status Register and two additional event status registers, Service Request Enable Register, and Parallel Poll Enable Register. The 37XXXD implements full status and enable registers query capability. A diagram of the 37XXXD Status Reporting Model is shown in Figure 7-3.

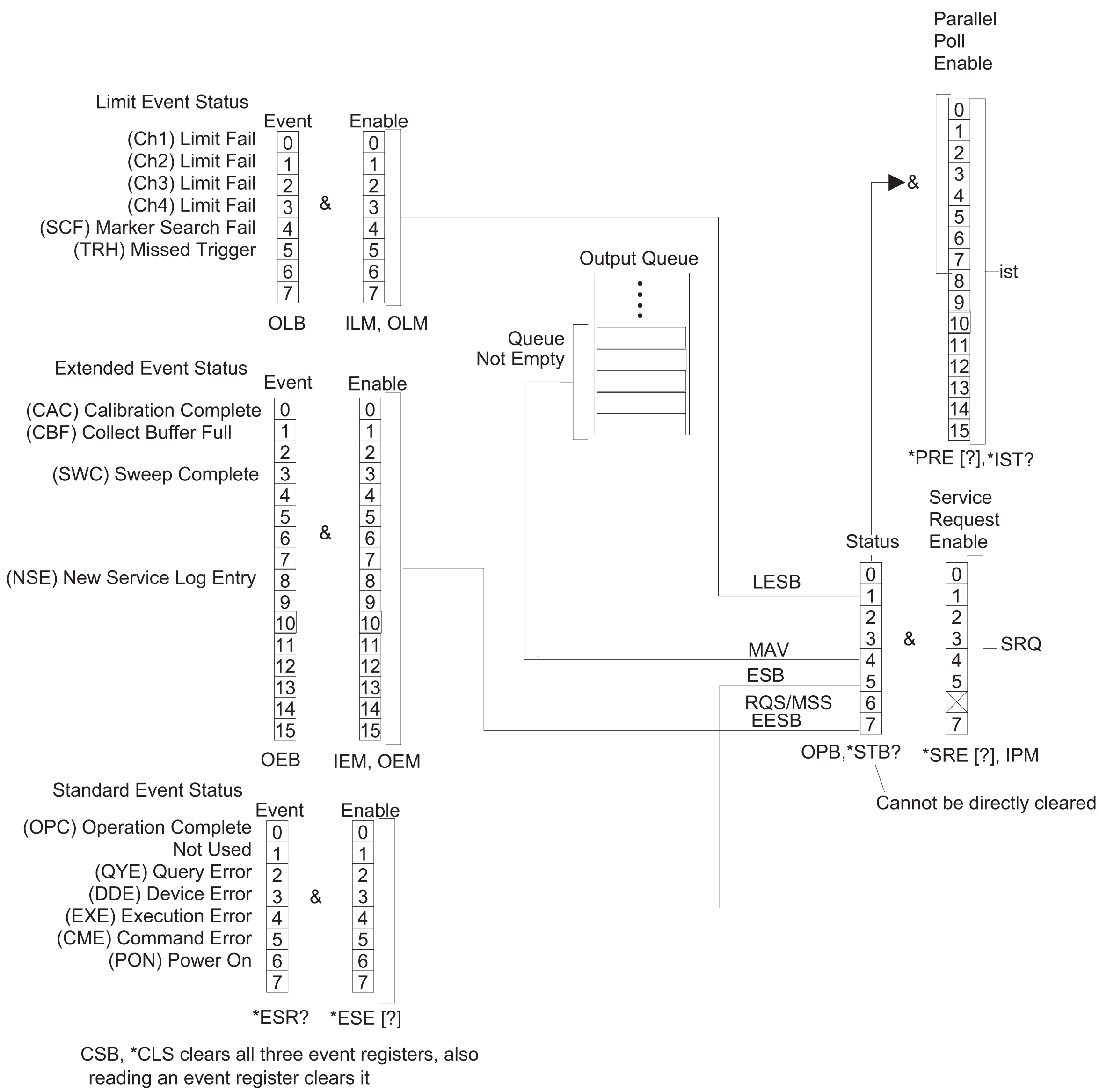

Figure 7-3. 37XXXD Status Reporting Model

Event Status Registers

The 37XXXD implements three *Event Status Registers* (ESRs). These are:

Standard Event Status Register (Standard ESR)

Extended Event Status Register (Extended ESR)

Limits Event Status Register (Limits ESR)

ESR bits always reflect the status of their specified 37XXXA events (refer to section 7-15, Status Events Description.) The registers are cleared (reset) when output by their respective query or output commands: ***ESR?** - Standard ESR Query, **OEB** - Output Extended ESR, **OLB** - Output Limits ESR. ESRs can also be cleared at any time via the Clear Status commands (***CLS** or **CSB**).

The overall summary status of each ESR (that is, whether or not any of its enabled events have occurred), is reported in the Status Byte Register.

Selecting Events for Status Reporting

The 37XXXD *Event Status Enable Registers* (ESERs) allow you to select the specific event, or events, that you want summarized in the Status Byte Register.

The selection of a specific event, or events is done by enabling the desired event's bit. This is done by sending the appropriate ESER command with a binary weighted decimal value of the desired bit pattern.

The following commands are used to set and query ESER values:

***ESE**, ***ESE?** – used to set and query the value of the *Standard* ESER

IEM, **OEM** – used to input and output the value of the Extended ESER

ILM, **OLM** – used to input and output the value of the Limits ESER

Output Queue

The 37XXXD Output Queue holds data which was requested by your application program. At any one time, the status of this queue is either empty (no data bytes available), or not-empty (at least one data byte is available.)

The Output Queue status is always reported in the 37XXXD Status Byte Register. The Output Queue status bit is automatically set and cleared. The Output Queue is emptied when the last data byte it contains is output to the external controller or when the 37XXXD detects a Query Error.

The Status Byte Register

The Status Byte Register is the summary status register of the overall 37XXXD status. It can be directly queried for its value. It is also the basis for generating service requests, serial polling operations, and parallel polling operations. The Status Byte Register consists of a single 7-bit byte comprised of:

The Status Byte (bits 0-5, and bit 7), and

The MSS message or the RQS message (bit 6).

The Status Byte (bits 0-5, and bit 7) contains the overall status of the 37XXXD. This includes the Output Queue status and the summary status of enabled bits in each event register. Once all enabled bits in an event register are cleared, or the Output Queue is emptied, the corresponding summary bit in the Status Byte Register will be reset.

The Master Summary Status (MSS) message is a single bit summary of the Status Byte (bits 0-5, and bit 7). This means bit 6 will be true if any of the other bits in the Status Byte Register are true, otherwise it will be false. The MSS message is sent in bit 6 when querying the status byte register and when generating the *IST message for parallel polling.*

The Requesting Service (RQS) message is true if the 37XXXD has generated an SRQ, that is, it requested service. This message is reset automatically when the 37XXXD is serial polled. The RQS message is sent in bit 6 if a serial poll is used to output the contents of the Status Byte Register.

Querying the Status Byte Register

The ***STB?** – Status Byte Register Query, allows you to output the contents of the Status Byte Register without having to do a serial poll. When output in this manner, the Status Byte Register will contain the MSS message in bit 6 and the normal Status Byte in bits 0-5, and bit 7.

The ***STB?** query will not change; that is, reset, the value of the Status Byte (bits 0-5, and bit 7) and the MSS message (bit 6).

Serial Polling the Status Byte Register

Serial Polling the 37XXXD can also be used to output the contents of the Status Byte Register. The output will still contain the normal Status Byte in bits 0-5 and 7. The difference is this time the RQS message will be output in bit 6 instead of the MSS message.

It is important to note that serial polling will reset the RQS message in bit 6. This allows the 37XXXD to again set the RQS bit true if it has a new reason for requesting service. The value of the Status Byte (bits 0-5, and bit 7) will not be reset or otherwise changed by a serial poll.

SRQ/Service Requests Generation

The 37XXXD can be made to request service; that is. generate an SRQ interrupt, when any of the defined events occur. This is a two step process:

First, you need to enable the desired event (refer to Enabling Status Events)

Second, you need to enable the event's register bit in the Service Request Enable Register.

The ***SRE** and ***SRE?** commands are used to set and query the Service Request Enable Register. Sending "***SRE 0**" to the 37XXXD will disable the 37XXXD service request.

Parallel Polling the 37XXXD

The Parallel Poll Enable Register is used to set the value of the 37XXXD parallel poll status bit. This bit corresponds to the 37XXXD individual status message (***ist***). The ist message can be output without a parallel poll operation using the *IST? query.

The *ist* message is set true when both of the following are true:

- A bit is set true in the Status Byte Register
- The corresponding bit is enabled in the Parallel Poll Enable Register

NOTE

The MSS message is used in bit 6 of the Status Byte Register (refer to Status Byte Register above).

The ***PRE** and ***PRE?** commands are used to set and query the Parallel Poll Enable Register. Sending "***PRE 0**" to the 37XXXD will set the 37XXXD ist message, and therefore the parallel poll status bit, to false, that is, 0.

Binary Weighted Decimal Values

All the enable commands or query commands described above for status reporting take or return a single argument. This is a binary weighted decimal value representing the sum of all the true (or set) bits in the register.

The binary weighted decimal value of a bit in a register is calculated by raising the number 2 to a power equal to the bit position.

For example, the binary weighted decimal value of bit 4 is arrived at by raising the number 2 to the 4^{th} power ($2^4 = 16$). Similarly, the decimal value of bit 0 is the number 2 raised to the 0 power ($2^0 = 1$).

The total decimal value of a register is the sum of the individual binary weighted decimal values of all enabled, or true bits. In the above example, this would be 16 + 1 = 17.

Status Reporting Commands Example

Following are example usages of Status Reporting commands:

EXAMPLE 1:

```
"*CLS;TRS;WFS;OEB"
```

These commands will perform the following functions:

***CLS** will clear all four event status registers.

TRS will trigger a new sweep.

WFS will set bit 4 (SWC) in the Extended Event Status Register when a full sweep is complete.

OEB will output the decimal value of the Extended Event Status Register. This will be the number 8 ($2^4 = 8$).

When a 12-term calibration is applied, a "full sweep" includes a complete forward sweep and a complete reverse sweep. It also includes time/distance data processing time if in the time domain mode. Set your controller's time out value high enough to allow the sweep to complete. Refer to Chapter 2 for more details.

EXAMPLE 2:

```
"*CLS;IEM 8;*SRE 128;TRS;WFS"
```

These commands will perform the following functions:

***CLS** will clear all four event status registers.

IEM 8 will enable bit 4 (SWC) in the Extended Event Status Register (Extended ESR). This will set bit 7 (the summary status bit for the Extended ESR) in the Status Byte Register when the SWC bit gets set true.

***SRE 128** will cause the 37XXXD to issue a service request (SRQ) when the enabled bit in the Extended Event Status Register gets set true.

TRS will trigger a new sweep.

WFS will set bit 4 (SWC) in the Extended Event Status Register when a full sweep is complete. Because of the **IEM** and ***SRE** that were issued, this will cause the 37XXXD to issue a service request (SRQ).

7-16 STATUS EVENT DESCRIPTIONS

The following sections describe the 37XXXD status events functions. Refer to Figure 7-3, 37XXXD Status Reporting Model (page 7-34) for the definition of bits in each of the three event registers described below. (Refer to section 7-15, Status Reporting, for an operational description of the 37XXXD reporting model.)

Standard Event Status Register

This register reports on the following events:

Bit 0:

The Operation Complete bit (OPC) is set true when all pending operations are completed after the ***OPC** command is issued. This is used for synchronization of your application program with 37XXXD operations.

Bit 1:

Not used.

Bit 2:

The Query Error bit (QYE) is set true when the 37XXXD detects an error when attempting to execute an output or query command. Typically, this is due to requesting output when the Output Queue is empty or if the 37XXXD emptied the queue due to an error situation.

The 37XXXD will clear (empty) the Output Queue and issue a query error if it receives a program message while data requested by a previous command still remains in the Output Queue.

Bit 3:

The Device Specific Error bit (DDE) is set true when the 37XXXD detects an error during execution of a valid 37XXXD command and it is not able to complete its execution. An example of this is trying to access a bad floppy disk for read or write.

Bit 4:

The Execution Error bit (EXE) is set true when a valid command's argument is out of the 37XXXD range or operational capabilities. This bit is also set when a valid command cannot be executed due to some 37XXXD condition such as an option not installed or invalid state for the command.

Bit 5:

The Command Error bit (CME) is set true when the 37XXXD Parser detects an invalid command. This is often generated due to unrecognized or invalid command syntax and incorrect use of separators and terminators.

Bit 6:

The User Request bit (URQ) is set true when a front panel key or control is invoked.

Bit 7:

The Power On bit (PON) is set true when the 37XXXD is turned on.

Extended Event Status Register

This register reports on the following events:

Bit 0:

The Calibration Complete bit (CAC) is set true when all the steps of an Error Correction Calibration are complete after issuing the **BEG** or **RPC** commands.

Bits 1 and 2:

Not used.

Bit 3:

The Sweep Complete bit (SWC) is set true when a full sweep is completed after issuing the **WFS** command.

Bits 4 through 7:

Not used.

Bit 8:

The new service log entry bit (NSE) is set whenever a new error is entered in the service log. It can be used to detect lock failure and unleveled conditions.

Bits 9:

The Collect Buffer Full bit (CSF) is set when collecting data into a buffer (see section 7-8) and the buffer becomes full.

Bits 10 through 15

Not used.

Limits Event Status Register

This register reports on the following events:

Bit 0:

The Channel 1 bit (CH1) is set true when a limit line has been exceeded on channel 1 after the **LT1** command has been issued.

Bit 1:

The Channel 2 bit (CH2) is set true when a limit line has been exceeded on channel 2 after the **LT1** command has been issued.

Bit 2:

The Channel 3 bit (CH3) is set true when a limit line has been exceeded on channel 3 after the **LT1** command has been issued.

Bit 3:

The Channel 4 bit (CH4) is set true when a limit line has been exceeded on channel 4 after the **LT1** command has been issued.

Bit 4:

The search failure bitr (SCF) is set TRUE when a marker search command (MKSL or MKSE) was issued but the target value was not found.

Bits 5:

The missed trigger bit (TRH) is set when either the TIB or TEB trigger mode is set and a Group Execute Trigger is received before the previous trigger event has completed. *The trigger is lost*.

Bits 6 through 7:

Not used.

Status Byte Register

This register reports on the following events:

Bit 0:

Not used.

Bit 1:

The Limits Event Status Bit (LESB) is set true if any of the enabled events in the Limits Event Status Register are true.

Bits 2 and 3:

Not used.

Bit 4:

The Message Available bit (MAV) is set true if the Output Queue contains at least one byte of data. refer to related *OPC?, Operation Complete Query.

Bit 5:

The Standard Event Status Bit (ESB) is set true if any of the enabled events in the Standard Event Status Register are true.

Bit 6:

This bit contains either the Master Summary Status message (MSS) or the Request Service message (RQS), depending on how the Status Byte Register contents are output or used.

Refer to Status Byte Register description in section 7-15.

Bit 7:

The Extended Event Status Bit (EESB) is set true if any of the enabled events in the Extended Event Status Register are true.

7-17 IEEE 488.2 COMMON COMMANDS

The IEEE 488.2 GPIB Standard specifies a common set of commands to support many standard instrument operations. The mandated and optional common commands implemented in the 37XXXD are shown in Table 7-12 below.

These commands are fully described in Chapter 11, Command Dictionary. Further, the commands for status reporting are also described in sections 7-15 and 7-16.

Table 7-12. *IEEE 488.2 Commands*

Command	Description
*CLS	Clear status bytes and structures
*DDT	Enter the 488.2 Define Device Trigger command string
*DDT?	Output the 488.2 Define Device Trigger command string
*ESE	Enter the 488.2 Standard Event Status Enable mask
*ESE?	Output the 488.2 Standard Event Status Enable mask
*ESR?	Output the 488.2 Standard Event Status Register value
*IDN?	Output the 488.2 instrument identification string
*IST?	Output the value of the ist message
*OPC	Initiate the 488.2 Operation Complete sequence
*OPC?	Initiate the 488.2 Operation Complete Query sequence
*PRE	Enter the 488.2 Parallel Poll Register Enable mask
*PRE?	Output the 488.2 Parallel Poll Register Enable mask
*RST	Instrument reset
*SRE	Enter the 488.2 Service Request Enable mask
*SRE?	Output the 488.2 Service Request Enable mask
*STB?	Output the 488.2 Status Byte value
*TRG	Initiate a Group Execute Trigger sequence
*TST?	Perform self test and output status
*WAI	Wait to continue
OPB	Output the 488.2 Status Byte value (same as *STB?)
TST	Perform self test and output status (same as *TST?)

7-18 SYNCHRONIZATION COMMANDS

The 37XXXD operation can be synchronized with your application program operations using the commands listed in Table 7-13 below. These commands are from various functional groups in the 37XXXD GPIB command set. Refer to the appropriate references listed in the table and to Chapter 11, "Command Dictionary," for more details.

These commands are helpful in many operations related to outputting data, waiting for the sweep and the display to be updated, and many others. Where applicable, these commands are referenced and shown used in examples throughout the Programming Manual.

NOTE

The two commands, "HLD;TRS" sent together place the VNA into single sweep and hold and triggers a sweep. The sweep will stop after a complete sweep, thus preventing overwriting the first point with new sweep data.

Table 7-13. *37XXXD Synchronization Operations Commands*

Command	Brief Description	References
WFS	Wait for full sweep	Chapter 5, Table 5-4
*OPC	Operation complete status	sections 7-13, 7-14
*OPC?	Operation complete query	sections 7-13, 7-14
TRS	Trigger sweep	Chapter 5, Table 5-4
HLD	Hold Measurement Process	Chapter 5, Table 5-4
SWPDIR?	Output Current Sweep (Phase Lock) direction	Chapter 5, Table 5-4
CTN	Continue sweeping (from HOLD state)	Chapter 5, Table 5-4

7-19 MISCELLANEOUS COMMANDS

The 37XXXD Miscellaneous Data Transfer Commands are listed in Table 7-14, below. The System Setups Commands are listed in Table 7-15.

Table 7-14. *37XXXD Miscellaneous Data Transfer Commands*

Command	Brief Description	Allowable Data Formatting
DIR	Output a disk subdirectory list	None - Always ASCII
IHDW	Enter hardware calibration data from GPIB	None - Always ASCII
IKIT	Enter calibration kit data from GPIB	None - Always ASCII
INRM	Enter trace memory data from GPIB	None - Always ASCII
OHDW	Output hardare calibration data to GPIB	None - Always ASCII
ONRM	Output trace memory data to GPIB	None - Always ASCII

Table 7-15. *37XXXD System State Commands*

Command	Brief Description	Allowable Data Formatting
ICF	Input information for current front panel setup *and* calibration	None - Always Binary
IFP	Input information for current front panel setup	None - Always Binary
IS1 – IS10	Input information for stored front panel setup 1-10	None - Always Binary
OCF	Output front panel setup *and* calibration string	None - Always Binary
OFP	Output current front panel setup string	None - Always Binary
OS1–OS10	Ouput stored front panel setup string 1–10	None - Always Binary

Chapter 8
System Functions

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Chapter 8
System Functions

8-1 INTRODUCTION

This chapter describes the commands used to implement certain system functions. They consist of hard copy commands, system state commands, save/recall commands, disk function commands, and diagnostics commands. For certain functions, tables of commands are identified as being obsolete. This means they are no longer favored for new development. They were written for earlier product versions of the 37XXXX VNA. They still remain to provide backward compatability, and should not be used when developing new program code.

8-2 RELATED COMMANDS

Table 8-1 provides a list of commands related to those used for system diagnostics. Refer to Chapter 8, sections 8-9 through 8-11 for further information.

Table 8-1. *Related Commands*

Command	Description
OGE	Outputs extended description of current GPIB error.
OGL	Outputs extended description of previous GPIB error.
OEL	Outputs error messages from Service Log.
ONE	Output number of error messages stored in service log.
OSL	Output service log.

8-3 HARD COPY COMMANDS

The commands concerned with hard copy output are listed in Table 8-2; obsolete Hard Copy commands are listed in Table 8-3. These commands are straightforward with the exception of commands PT0–PT9. The PT0 – PT9 commands are used to:

- Specify the density of tabular data points output to the printer when using the PTB and PMT commands
- Specify the number of data points included in the disk file created with the SAVE command for tabular data

The value implicit in the PT0 – PT9 commands (0 – 9) specifies the number of points that are *skipped* during printing. Therefore, PT0 selects the *densest* printing mode while PT9 gives the *fewest* number of data points. The HD0 command disables headers and page formatting for tabular printouts. The HD1 command enables headers and page formatting.

The hard copy output commands consist of two categories: *action* and *setup:*

- *Action* commands actually initiate a print/plot for the subset of the display specified by the setup commands
- *Setup* commands are those that specify the desired size and location of the print/plot and the pen numbers for each element of the plot

The LOC, LMS, LID, and LNM commands require a string of characters to be sent over the GPIB along with the command. A string input to the 37XXXD *must* have the double quote characters ("") or single quote characters (') surrounding the desired input.

The SAVE and RECALL commands enable the user to store tabular data to the disk and recall it for output to the printer with the tabular printout points controlled by commands PT0 – PT9. Other types of hard copy data can also be saved, but not recalled.

Text format hard copy data is formatted for Microsoft Excel. Before a user defined logo can be printed, the data file for that logo must exist on the hard drive in the "UTIL" subdirectory. See section 10-6 for the data file names. These files can be created by the Anritsu 37XXXD LOGO editor, a Windows based program for your PC.

Bitmapped hard copy data is formatted as a Windows 3.0 (and later) Device Independent Bitmap. The size is 640 by 480, and if color bitmap is selected, it is in a 256-bit color format. The user can select either black on white, color on white, or true color for the bitmaps.

HPGL format hard copy data is the file of HPGL commands and data normally sent to a plotter connected to the dedicated GPIB port. Microsoft Word has the capability to load and print this file type. It may also be sent to a GPIB plotter.

Table 8-2. Hard Copy Commands (1 of 2)

Command	Description
BMPB	Select Black on White as bitmap type
BMPC	Select Color on White as bitmap type
BMPT	Select true color as bitmap type
DPN	Enter pen number for data
DPN?	Output pen number for data
FFD	Send form feed to printer and stop print/plot
GPN	Enter pen number for graticule
GPN?	Output pen number for graticule
HD0	Turn off tabular data headers and page formatting
HD1	Turn on tabular data headers and page formatting
HIST0	Turns off GPIB history writing to disk
HIST1	Turns on GPIB history writing to disk
HISTX?	Outputs the history writes to hard disk enable/disable status
HPN	Enter pen number for header
HPN?	Output pen number for header
LAND	Select landscape mode for output plot
LDT0	Disable printing date/time
LDT1	Enable printing date/time
LMS	Enter string for DUT model/serial number
LMS?	Output string for DUT model/serial number
LNM	Enter string for operator name
LNM?	Output string for operator name
LOC	Enter string for operator comment
LOC?	Output string for operator comment
LOGO0	Turn hard copy logo off
LOGO1	Turn hard copy logo on
LOGO?	Output hard copy logo selection standard/user defined
LOGOS	Select standard hard copy logo
LOGOU	Select user defined hard copy logo
LOGOX?	Output hard copy logo on/off status
MPN	Enter pen number for markers and limits
MPN?	Output pen number for markers and limits
OBMP	Output the display as a bitmap
ODAT	Output hard copy tabular data to GPIB
OGCTXT	Output text format gain compression data to GPIB
OHDR	Output hard copy header information to GPIB
OHGL	Output HPGL format data to GPIB
OS2P	Output S2P format data to GPIB
OTXT	Output text format data to GPIB
PBL	Select 1/4 size plot bottom left corner

Table 8-2. Hard Copy Commands (2 of 2)

Command	Description
PBR	Select 1/4 size plot bottom right corner
PFL	Select full-size plot
PFS	Print full screen image
PFSC	Configure for printing entire screen graphic image
PGR	Print graph area screen image
PGRC	Configure for printing data area graphic image
PGTC	Configure for plotting graticule
PLD	Plot data area only
PLDC	Configure for plotting data area
PLH	Plot header
PLHC	Configure for plotting header
PLM	Plot markers and limits
PLMC	Configure for plotting markers and limits
PLO?	Output plot mode portrait or landscape
PLS	Plot entire screen
PLSC	Configure for plotting entire screen
PLT	Plot data traces only
PLTC	Configure for plotting data traces
PMK	Print tabular data for Markers
PMKC	Configure for printing tabular data for markers
PMN	Plot menu
PMNC	Configure for plotting menu
PMT	Print tabular data for traces and markers
PMTC	Configure for printing tabular data for traces and markers
PORT	Select portrait mode for output plot
PST	Stop print/plot
PT0	Set tabular printout points skipped to 0
PT1	Set tabular printout points skipped to 1
PT2	Set tabular printout points skipped to 2
PT3	Set tabular printout points skipped to 3
PT4	Set tabular printout points skipped to 4
PT5	Set tabular printout points skipped to 5
PT6	Set tabular printout points skipped to 6
PT7	Set tabular printout points skipped to 7
PT8	Set tabular printout points skipped to 8
PT9	Set tabular printout points skipped to 9
PTB	Print tabular data for Traces
PTBC	Configure for printing tabular data for traces
PTL	Select 1/4 size plot top left corner
PTR	Select 1/4 size plot top right corner

Table 8-3. *Obsolete Hard Copy Commands*

Command	Description
BBMP	Select black background for bit map
LDT	Enter string for test date/time (obsolete)
LDT?	Output string for test date/time (obsolete)
LIST	Output list of all mnemonics
OBMB	Output display as black and white bit map
OBMC	Output display as color bit map
WBMP	Select white background for bit map

8-4 SYSTEM STATE COMMANDS

Tables 8-4 lists the system state commands; obsolete commands are listed in Table 8-5. These commands are used to specify CRT display parameters, information display format, and other parameters that control the operation of the system. The function of approximately half of these commands is to display test set connector type information on the system screen. Table 8-4 list obsolete commands that remain for backward compatibility.

Table 8-4. *System State Commands (1 of 3)*

Command	Description
ANNCOL	Enter the color number for annotation and menu text
ANNCOL?	Output the color number for annotation and menu text
BC0	Turn CRT display off (disabled)
BC1	Turn CRT display on (disabled)
BCKCOL	Enter the color number for background
BCKCOL?	Output the color number for background
BCX?	Output CRT display on/off status
BEEP0	Disable the instrument beeper on GPIB errors
BEEP1	Enable the instrument beeper on GPIB errors
BEEPX?	Output GPIB beep on error enable/disable status
BRILL	Activate color configuration Brilliant
CLASS	Activate color configuration Classic
DATCOL	Enter the color number for data
DATCOL?	Output the color number for data
DATE	Enter the system date
DATE?	Output the system date
DC1	Display channel 1 and 2 operating parameters
DC3	Display channel 3 and 4 operating parameters
DCP	Display calibration parameters 1st page
DCP1	Display calibration parameters 1st page
DCP2	Display calibration parameters 2nd page

Table 8-4. *System State Commands (2 of 3)*

Command	Description
DD0	Turn data drawing off
DD1	Turn data drawing on
DD1?	Output data drawing on/off status
DF1	Display 1.0 mm female connector information
DF2	Display 2.4mm female connector information
DF3	Display GPC-3.5 female connector information
DF716	Display 7/16 female connector information
DFK	Display K female connector information
DFN	Display N female connector information
DFN75	Display N Female 75-Ohm connector information
DFP	Display Front panel instrument state
DFS	Display SMA female connector information
DFSP	Display Special Female connector information
DFT	Display TNC female connector information
DFV	Display V female connector information
DG7	Display GPC-7 Male connector information
DGS	Display GPIB status information
DM1	Display 1.0 mm male connector information
DM2	Display 2.4mm male connector information
DM3	Display GPC-3.5 male connector information
DM716	Display 7/16 male connector information
DMK	Display K male connector information
DMN	Display N male connector information
DMN75	Display N Male 75-Ohm connector information
DMS	Display SMA male connector information
DMSP	Display Special Male connector information
DMT	Display TNC male connector information
DMV	Display V male connector information
DOASF	Display band A special female connector offset-short information
DOASM	Display band A special male connector offset-short information
DOBSF	Display band B special female connector offset-short information
DOBSM	Display band B special male connector offset-short information
DOCSF	Display band C special female connector offset-short information
DOCSM	Display band C special male connector offset-short information
DOF1	Display 1.0 mm female connector offset-short information
DOM1	Display 1.0 mm male connector offset-short information
DWG	Display waveguide parameters
FOF	Blank frequency information
FON	Display frequency information

Table 8-4. System State Commands (3 of 3)

Command	Description
FOX?	Output frequency information on/off status
GRTCOL	Enter the color number for the graticule
GRTCOL?	Output the color number for the graticule
INVER	Activate color configuration Inverse
LAYCOL	Enter the color number for overlay data
LAYCOL?	Output the color number for overlay data
MKRCOL	Enter the color number for the markers
MKRCOL?	Output the color number for the markers
MNUCOL	Enter the color number for the menu headers
MNUCOL?	Output the color number for the menu headers
NEWCO	Activate color configuration New
RST	Instrument reset (same as *RST)
RST0	Reset instrument front panel memories and reserved parameters
RST1	Reset instrument and front panel memories
RSTCOL	Reset color configuration to default
RTL	Return to local
SHARP	Activate color configuration Sharp
SOFTCO	Activate color configuration Soft
SPTS?	Output number of smoothing points
STOCO	Store the current color configuration as Reset
TIME	Enter the system time
TIME?	Output the system time
TRCCOL	Enter the color number for memory data
TRCCOL?	Output the color number for memory data
WIDE	Use entire display width for graphs

Table 8-5. Obsolete System State Commands

Command	Description
BLU	Select blue as third plane color
CYN	Select cyan as third plane color

8-5 SAVE/RECALL COMMANDS

The Save/Recall commands listed in Table 8-6 allow the system user to save and recall the following:

- Front panel setup data to and from internal memory
- Calibration and front panel setup data to/from the disk

Table 8-6. *Front Panel Memory Save/Recall Commands*

Command	Description
RC1	Recall front panel setup number 1 from memory
RC10	Recall front panel setup number 10 from memory
RC2	Recall front panel setup number 2 from memory
RC3	Recall front panel setup number 3 from memory
RC4	Recall front panel setup number 4 from memory
RC5	Recall front panel setup number 5 from memory
RC6	Recall front panel setup number 6 from memory
RC7	Recall front panel setup number 7 from memory
RC8	Recall front panel setup number 8 from memory
RC9	Recall front panel setup number 9 from memory
SV1	Save front panel setup number 1 to memory
SV10	Save front panel setup number 10 to memory
SV2	Save front panel setup number 2 to memory
SV3	Save front panel setup number 3 to memory
SV4	Save front panel setup number 4 to memory
SV5	Save front panel setup number 5 to memory
SV6	Save front panel setup number 6 to memory
SV7	Save front panel setup number 7 to memory
SV8	Save front panel setup number 8 to memory
SV9	Save front panel setup number 9 to memory

8-6 DISK FUNCTION COMMANDS

The Disk Function commands perform the same functions as the Hard Copy key group Menu key selections. These commands are listed in Tables 8-7. They are used for the following:

- Copying files between disks
- Deleting files from disk
- Saving files to a disk
- Recalling files from a disk
- Creating, changing to and deleting disk directories
- Outputting files to the GPIB
- Inputting files from the GPIB
- Loading cal kit files
- Formatting a floppy disk
- Outputting a disk directory listing to the GPIB
- Printing a disk directory listing

Table 8-7. *Disk Function Commands*

Command	Description
ADRIVE	Select the floppy drive as the default drive
CD	Change default directory
CDRIVE	Select the hard disk as the default drive
COPY	Copy a files contents to another file
CWD?	Output current working directory string
DEL	Delete a file from disk
DIR	Output a directory listing to the GPIB
DISKRD	Output disk file data to the GPIB
DISKWR	Write GPIB data to a disk file
EXISTD?	Output directory existence information
EXISTF?	Output file existence information
INT	Initialize (format) floppy disk
LDARF	Load adapter removal files from disk and calibrate
LKT	Load calibration kit information from floppy disk
MD	Create a new disk directory
PDR	Print directory listing of the floppy drive
PDRH	Print directory listing of the hard drive
PGT	Plot graticule
RD	Remove a disk directory
RECALL	Recall a data file from disk to a task
SAVE	Save a data file to disk
SAVEGC	Save text format gain compression data to disk

Most of the file handling commands require a filename as an argument. The filename needs to be enclosed in quotes and listed complete with extention. You may include a path before the filename that may include a drive letter. If a path is not included, the file will be assumed to be in the current default drive and directory.

Drive Letters

Drive letters follow standard MS-DOS conventions:

- A:\for the floppy drive
- C:\ for the hard drive

Subdirectory Naming Conventions

Subdirectory naming conventions are as follows:

- Can have at most 11 characters
- The allowable characters are 1 thru 0, all letters, the period (.) and underscore (_)

File Naming Conventions

File naming conventions are as follows:

- The main portion of the filename can have a maximum of 8 characters
- The extention portion of the filename can have a maximum of 3 characters
- The filename must start with a letter
- The allowable characters are 1 thru 0, all letters and the underscore (_)

List of the Current 37XXXD File Types

A list of current filetypes is shown in Table 8-8.

Table 8-8. *37XXXD File Types*

Filename	File type
<user defined>.BMP	Screen dump in Windows bit map format (version 2.19)
<user defined>.CAL	Front panel and calibration data
<user defined>.DAT	Hard copy tabular data
<user defined>.ELG	Error log listing
<user defined>.HGL	Plotter dump in HPGL format
<user defined>.LOG	Service log listing
<user defined>.NRM	Trace memory data
<user defined>.S2P	Tabular data listing in S2P format
<user defined>.TXT	Tabular data listing in *Microsoft Excel* format
HW_CAL.ALC	ALC calibration data for port 2
HW_CAL.ALC	ALC calibration data
HW_CAL.ALL	Contains all hardware calibration data elements
HW_CAL.FRE	Frequency calibration data
HW_CAL.LO1	1st LO calibration data
HW_CAL.LO2	2nd LO calibration data
HW_CAL.SLT	Source lock threshold calibration data
KIT_INFO.[xyz]	A data file for a connector type from a Cal Kit floppy disk <u>Letter x</u> 2—2.4 mm Connector 3—GPC 3.5 Connector G—GPC 7 Connector K—K Connector N—N connector S—SMA Connector T—TNC connector V—V connector W—Waveguide X—Special Z—N 75 ohm <u>Letter y</u> A—Waveguide F—Female M—Male N—GPC 7 connector <u>Letter z</u> O—Open S—Short V—Waveguide
LOGO.EPS	User defined logo file for use on an Epson type printer
LOGO.HP	User defined logo file for use on an HP type printer
LOGO.PLT	User defined logo file for use on a plotter
MNEMONIC.HLP	GPIB mnemonic help file

Supported Commands for Backward Capability

A listing of commands developed for previous versions of the software, but still supported, are listed in Table 8-9.

Table 8-9. *Obsolete Disk Functions Commands (1 of 3)*

Command	Description
CPYALCFH	Copy ALC cal file from floppy to hard disk
CPYALCHF	Copy ALC cal file from hard to floppy disk
CPYALLFH	Copy combined hardware cal file from floppy to hard disk
CPYALLHF	Copy combined hardware cal file from hard to floppy disk
CPYCALFH	Copy calibration/front panel setup from floppy to hard disk
CPYCALHF	Copy calibration/front panel setup from hard to floppy disk
CPYDATFH	Copy tabular data file from floppy to hard disk
CPYDATHF	Copy tabular data file from hard to floppy disk
CPYELGFH	Copy error list file from floppy to hard disk
CPYELGHF	Copy error list file from hard to floppy disk
CPYFREFH	Copy frequency cal file from floppy to hard disk
CPYFREHF	Copy frequency cal file from hard to floppy disk
CPYLOGFH	Copy service log file from floppy to hard disk
CPYLOGHF	Copy service log file from hard to floppy disk
CPYNRMFH	Copy trace memory file from floppy to hard disk
CPYNRMHF	Copy trace memory file from hard to floppy disk
DEC	Delete calibration/front panel setup from floppy disk
DECH	Delete calibration/front panel setup from hard disk
DED	Delete tabular data file from floppy disk
DEDH	Delete tabular data file from hard disk
DELALC	Delete ALC cal file from floppy disk
DELALCH	Delete ALC cal file from hard disk
DELALL	Delete combined hardware cal file from floppy disk
DELALLH	Delete combined hardware cal file from hard disk
DELCAL	Delete calibration/front panel setup from floppy disk
DELCALH	Delete calibration/front panel setup from hard disk
DELDAT	Delete tabular data file from floppy disk
DELDATH	Delete tabular data file from hard disk
DELELG	Delete error list file from floppy disk
DELELGH	Delete error list file from hard disk
DELFRE	Delete frequency cal file from floppy disk
DELFREH	Delete frequency cal file from hard disk
DELLOG	Delete service log file from floppy disk
DELLOGH	Delete service log file from hard disk
DELNRM	Delete trace memory file from floppy disk
DELNRMH	Delete trace memory file from hard disk
DEN	Delete trace memory file from floppy disk

Table 8-9. Obsolete Disk Functions Commands (2 of 3)

Command	Description
DENH	Delete trace memory file from hard disk
RCK	Recall trace memory file from floppy disk
RCKH	Recall trace memory file from hard disk
RCLALC	Recall ALC calibration file from floppy disk
RCLALCH	Recall ALC calibration file from hard disk
RCLALL	Recall combined hardware calibration file from floppy disk
RCLALLH	Recall combined hardware calibration file from hard disk
RCLCAL	Recall calibration/front panel setup from floppy disk
RCLCALH	Recall calibration/front panel setup from hard disk
RCLDAT	Recall tabular data file from floppy disk to printer
RCLDATH	Recall tabular data file from hard disk to printer
RCLELG	Recall error list file from floppy disk to printer
RCLELGH	Recall error list file from hard disk to printer
RCLFRE	Recall frequency calibration file from floppy disk
RCLFREH	Recall frequency calibration file from hard disk
RCLLOG	Recall service log file from floppy disk to printer
RCLLOGH	Recall service log file from hard disk to printer
RCLNRM	Recall trace memory file from floppy disk
RCLNRMH	Recall trace memory file from hard disk
RLD	Recall calibration/front panel setup from floppy disk
RLDH	Recall calibration/front panel setup from hard disk
RTB	Recall tabular data file from floppy disk to printer
RTBH	Recall tabular data file from hard disk to printer
SAVALC	Save ALC cal to floppy disk
SAVALCH	Save ALC cal to hard disk
SAVALL	Save combined hardware cal to floppy disk
SAVALLH	Save combined hardware cal to hard disk
SAVCAL	Save calibration/front panel setup to floppy disk
SAVCALH	Save calibration/front panel setup to hard disk
SAVDAT	Save tabular data to floppy disk
SAVDATH	Save tabular data to hard disk
SAVELG	Save error list to floppy disk
SAVELGH	Save error list to hard disk
SAVFRE	Save frequency cal to floppy disk
SAVFREH	Save frequency cal to hard disk
SAVLOG	Save service log to floppy disk
SAVLOGH	Save service log to hard disk
SAVNRM	Save trace memory to floppy disk
SAVNRMH	Save trace memory to hard disk

Table 8-9. *Obsolete Disk Functions Commands (3 of 3)*

Command	Description
SDK	Save trace memory to floppy disk
SDKH	Save trace memory to hard disk
STO	Save calibration/front panel setup to floppy disk
STOH	Save calibration/front panel setup to hard disk
TDD	Save tabular data to floppy disk
TDDH	Save tabular data to hard disk

8-7 DIAGNOSTICS COMMANDS

The commands listed in Table 8-10 are used to provide diagnostic help in localizing system malfunctions, performing calibration of internal circuits, testing system functions, and managing error reporting and the service log. (These commands are intended for use only by ANRITSU certified service engineers.)

Table 8-10. *Diagnostics Commands (1 of 1)*

Command	Description
ALC	Perform ALC loop internal calibration
DBP	Select distance bandpass mode for active channel
DCA	Select automatic DC term calculation for lowpass
DCO	Select open for DC term for lowpass
DLP	Select distance lowpass mode for active channel
DRL	Diagnostic read latch
DVM	Enter DVM channel number
DWL	Diagnostic write latch
EDG	End diagnostics mode
EXD	Display external A/D input
FLC	Source frequency linearity internal calibration
FPX?	Output flat power correction on/off status
IFB	Select 1st IF bandpass testing
L1C	Perform LO1 internal calibration
L2C	Perform LO2 internal calibration
LKS0	Disable lock search mode
LKS1	Enable lock search mode
LO11	Select LO1 phase lock voltage testing
LO12	Select LO1 D/A voltage testing
LO21	Select LO2 main phase lock voltage testing
LO22	Select LO2 offset phase lock voltage testing
LO23	Select LO2 DDS phase lock voltage testing
LO24	Select LO2 main D/A voltage testing
LO25	Select LO2 offset D/A voltage testing
NRD	Display non-ratioed parameters on 4 channels
P2ALC	Perform Port 2 ALC loop internal calibration
PSL	Print the service log
SDG	Start diagnostics mode
SDR	Select standard receiver mode
SLT	Perform SLT internal calibration
SRC1	Select source linearity voltage testing

8-8 PERIPHERALS /SELF TESTS

Peripheral tests used to support system diagnostics are listed in Table 8-11. All peripheral tests require user interaction and response to messages displayed on the 37XXXD screen and front panel displays.

Table 8-11. *Peripheral Test Commands*

Command	Description
DGT	Display 1st CRT test pattern
DGT1	Display 1st CRT test pattern
DGT2	Display 2nd CRT test pattern
DGT3	Display 3rd CRT test pattern
EKT	Select external keyboard testing
FPT	Select front panel keypad testing
PRT?	Perform printer test and output status

8-9 SERVICE LOG ACCESS COMMANDS

Commands used to access and control the Service Log functions via the GPIB are listed in Table 8-12.

Table 8-12. *Service Log Commands*

Command	Description
*OPT?	Output the 488.2 options installed string
CSL	Clear service log
PEL	Print the error list
RECALL	Recall a data file from disk to a task
SAVE	Save a data file to disk

8-10 ADDRESSING

The commands used to address system peripherals are listed in Table 8-13.

The GPIB address commands and queries all have the form:

WXYZ nn **Enter [the device] gpib address**
WXYZ? **Output [the device] gpib address**

The VNA communicates with its peripherals over the 'dedicated' GPIB port. During this communication, the VNA is the Controller and the devices are Slaves. The VNA controller uses address 0, therefore the peripherals can be assigned any address in the range 1 to 30.

The VNA communicates with the outside world over the system GPIB port identified on the rear panel as IEEE 488.2 GPIB. Over this bus, the VNA is a slave and the Controller is at the other end of the cable. The VNA GPIB address can be any number from 0 to 30.

Most computers are connected to their Network Interface via an Adapter Card. Each adapter card has a unique six-byte hardware address assigned by the manufacturer. The network interface provided by the 37XXXD is no different, so each has a unique address as well. This address is sometimes referred to as the machine address or MAC address. The VNA hardware address query will get back a twelve-character string that resembles **0101AF0416D2**. This is the six bytes of the hardware address in hexadecimal notation. Other notations you might have seen use decimal numbers with dots (DOT notation). The address above using the DOT notation would be **1.1.175.4.22.210**. The hardware address cannot be changed, therefore there is only a query for it: **ADDHW?**

Another address associated with a Network Interface is the IP address. Before any device can communicate over a network, it must have a unique IP address. This address is currently defined as a four-byte address. Unlike the hardware address, this address can be changed; therefore, a command to change the address and another to query the address are provided: **ADDIP** and **ADDIP?**. This address is input or output as a string using the DOT notation as shown in the example below:

ADDIP "171.26.208.131" **or** **ADDIP '171.26.208.126'**

Most companies have a block of addresses available for use as IP addresses. Usually a lot fewer than the computers which want them. Therefore the addresses are assigned for limited periods of time and managed by server computers set up for just that purpose. These server computers use a protocol called DHCP. There are however many devices (such as printers, routers and servers) that need fixed well-known addresses so that everyone can communicate with them. Therefore, most companies have a block of fixed addresses available for these uses. The network interface provided by the 37XXXD does not support DHCP; therefore, the IP address must be set manually from the front panel or over the GPIB. And, if the VNA is to be connected to the company network, it must be assigned an address from the block of fixed addresses. Contact your company IT department to obtain one of these addresses.

Every Network adapter receives every message that is sent over the network. To determine if the message is actually being sent to the adapter, it must extract the target IP address from the message and test it against the IP address the adapter has been assigned. This sounds like a trivial task until one stops to consider the large volume of traffic that can travel across a network in a large company. To aid in the process, networks in large companies are divided into sub networks and separated with routers. The Subnet Mask is used to mask out those bits of the IP address which will always be the same for any device connected on the sub network. As an example, the IP addresses of a fictitious company might be in the following ranges.

171.26.208.xxx and **171.26.210.xxx**

Clearly, the 171 and the 26 never change. Therefore their corresponding part in the subnet mask would be 255. In the third position, the possible numbers are 208 and 210. If one sets the bits which never change to 1 and those which could possible change to 0 one gets the number 252. Therefore the most efficient subnet mask is **255.255.252.0**.

Your PC also knows what the subnet mask should be because it got it from the DHCP server. If your computer is running a popular brand of Windows®, you can try starting a DOS window and type **IPCONFIG**. Still confused? Don't worry, most people are. Just ask your company IT department. If all else fails, a subnet mask of 0.0.0.0 will work. A command and a query are provided for the Subnet Mask: **SUBMSK** and **SUBMSK?**. An example for our fictitious company might be:

SUBMSK '255.255.252.0'

As mentioned in the last section, chances are that a device is connected to a sub network and communicates with other devices on the network through a router (sometimes called a switch). The routers IP address is referred to as the Default Gateway. To communicate through this router, the VNA needs to know the Default Gateway address. Your PC knows this address since it got it from the DHCP server. Remember the DOS window and **IPCONFIG?**

A command and a query are provided for the Default Gateway: **DEFGT** or **DEFGT?**. A change in the Default Gateway address will not become active until the VNA power is cycled off and on. An example for our fictitious company might be:

```
DEFGT ‘171.26.208.1’
```

CAUTION:

If an incorrect address is entered for the Default Gateway, the VNA will hang on power up trying to communicate with the Gateway. Consequently, if it is known beforehand that the VNA will not be communicating through the Default Gateway, leave the address set to 0.0.0.0. If, however, this feature is needed, be sure to enter a good address.

If VNA hangs, reset the Default Gateway address. Cycle the VNA power on and off and watch the screen. When the message “Press any key within 2 seconds for the VNA Setup Menu“ appears, press any key. This will give the display below:

ANRITSU LIGHTNING D SERIES

```
Startup Firmware Version 2.00
Copyright (c) 1994 - 2004
Anritsu Company, All rights reserved.
VNA Setup Menu
1 - RETURN. Execute Normal Boot
2 - Initialize Ethernet Parameters
3 - Format Hard Disk

Enter Your Selection...
```

Press the 2 key to initialize the Ethernet Parameters. Among otherthings, this sets the Subnet Mask and Default Gateway to 0.0.0.0. The IP address is not changed.

Table 8-13. Addressing Commands

Command	Description
ADDFC	Enter frequency counter GPIB address
ADDFC?	Output frequency counter GPIB address
ADDHW?	Output instrument NI hardware address
ADDIP	Enter instrument network IP address
ADDIP?	Output instrument network IP address
ADDPLT	Enter plotter GPIB address
ADDPLT?	Output plotter GPIB address
ADDPM	Enter power meter GPIB address
ADDPM?	Output power meter GPIB address
DEFGT	Enter instrument default gateway IP address
DEFGT?	Output instrument default gateway IP address
SRC1ADD	Enter external source 1 GPIB address
SRC1ADD?	Output external source 1 GPIB address
SRC2ADD	Enter external source 2 GPIB address
SRC2ADD?	Output external source 2 GPIB address
SUBMSK	Enter instrument Subnet Mask
SUBMSK?	Output instrument Subnet Mask

8-11 PASS-THROUGH COMMANDS

Four mnemonics have been added to turn on and off the RF power of the external sources connected to the dedicated GPIB bus.

- EX1RF0—Turn Extenral Source 1 RF Power off
- EX1RF1—Turn External Source 1 RF Power on
- EX2RF0—Turn External Source 2 RF Power off
- EX2RF1—Turn External Source 2 RF Power on

Two new mnemonics have been added to allow “Pass-through” control of instruments connected to the dedicated GPIB bus. Please review the Arbitrary Block data format in Chapter 10, section 10-3:

`LTWRT adr, arb` **– Sends program data in the arbitrary block arb to the instrument at address adr**

- `LTRD adr [, cnt]` - Reads response data from the instrument at address adr. Data is returned in arbitrary block format. Notice that the comma and the bytecount argument cnt can be omitted. If the bytecount argument cnt is omitted, then the data transfer is assumed to be in ASCII format and data transfer will be terminated whenever an end message is encountered or the maximum size of 1024 bytes is received. If the bytecount argument cnt is included, then the data transfer is assumed to be binary, and data transfer will be terminated whenever the bytecount is satisfied or the GPIB bus EOI line is asserted on the dedicated GPIB bus, to indicate the end of transmission

NOTE

The VNA must be put into Hold Mode before issuing any of the previous commands. If the VNA is not put into hold mode, these commands will disrupt the normal communcations that take place between the VNA and the external sources, sometimes to the point that the power on the sources must be cycled to restore normal operation. Also, lock failures will almost certainly occur when the RF power is turned off while the VNA is still sweeping.

Examples using the pass thru mnemonics are shown below and in Figures 8-1 through 8-2.

In this example the controller sends the mnemonic OI to the Synthesizer at address 4 on the dedicated GPIB bus and then reads the response back.

Controller send: `LTWRT 4, #0 OI`

The mnemonic `OI` is contained in an Indefinite Length Arbitrary Block indicated by the header characters `#0`. Please note that some controllers cannot set the GPIB EOI control line as required by the Indefinite Length Arbitrary Block format and should use the Definite Length Arbitrary Block format instead. The command string below uses a Definite Length Arbitrary Block format and would work just as well.

Controller send: `LTWRT 4, #13 OI`

Controller send: `LTRD 4`

Controller then reads data in. The response received is:

```
#2386837 2.0020.00 –20.013.03.37698008B0
```

The `#238` is the arbitrary block header which says the block to follow contains 38 bytes. 36 bytes for the instrument OI of a 68037B plus the Carriage Return and Line Feed (which also come from the 68037B).

```
This example is a program which loads a power offset table into the Synthesizer:

/**********************
*                    *
*     PERFORM_TASK     *
*                    *
**********************/
/*
Procedure prepares a 51 point flat power table and loads it into an Anritsu 68000
synthesizer. This table steps power from -1 dB to +1 dB in 51 steps to
produce a recognizeable sawtooth on the synthesizer power. As this synthesizer
is attached to the dedicated bus of an Anritsu 37000 VNA, we will use the
pass thru mnemonics to send the table.
*/

void perform_task(void)
{
   long bytecount;
   long headersize;
   short status;
   short power;
   short index;
   short *short_ptr;
   char CommandBuffer[256];
   char TableBuffer[256];
   char bcount[16];
   char *aux_ptr;

   // The first step is to prepare the flat power table
   // Per the 68000 programming manual, the table is of the form:

   // PTL ClCh DlDh DlDh DlDh ... etc

   // Where PTL  - is the mnemonic that puts the synthesizer into the load
   //              a power flattening table mode

   //       ClCh - is the 16 bit integer representation of the number
   //              of points which will follow, Low Byte First

   //       DlDh - is the 16 bit integer representation of the first/next
   //              power offset in hundredths of a dB. Low Byte First


   // First put in the mnemonic PTL
   aux_ptr = TableBuffer;
   strcpy(aux_ptr, "PTL");
   aux_ptr += strlen(aux_ptr);

   // And put in the pointcount ClCh
   // The pointcount of 51
   short_ptr = (short *)aux_ptr;
   *short_ptr = 51;
   short_ptr++;
```

Figure 8-1. *Example 1 Using GPIB Pass-Through Command (1 of 4)*

```
   // Now put in the offsets DlDh ...
   power = -100;
   for (index = 0; index < 51; index++)
   {
      *short_ptr = power;
      short_ptr++;
      power += 4;
   }

   // Calculate the number of bytes in the buffer
   aux_ptr = (char *)short_ptr;
   bytecount = (long)(aux_ptr - TableBuffer);

   // Form the bytecount part of the arbitrary block header
   sprintf(bcount, “%d”, (int)bytecount);

   // Now prepare the pass thru message to send to the VNA
   // Assume the Synthsizer address is 4
   aux_ptr = CommandBuffer;
   sprintf(aux_ptr, “LTWRT 4,#%d%s”, strlen(bcount), bcount);
   aux_ptr += strlen(aux_ptr);
   headersize = (long)(aux_ptr - CommandBuffer);

   // Tack on the tablebuffer contents
   memcpy(aux_ptr, TableBuffer, bytecount);
   aux_ptr += bytecount;
   bytecount += headersize;

   // Tack on a line feed to finish the message
   *aux_ptr = 10;
   bytecount++;

   // Now open the GPIB and send the message
   gpib_timeout(60);
   if ((status = initgpib()) == SUCCESS)
   {
      // First put the VNA in hold
      pna_addr = 6;
      status = ibszoutput(pna_addr, “HLD”);

      // This sets up the table
      status = ibbyoutput(pna_addr, CommandBuffer, bytecount);

      // This turns the power offset table on
      status = ibszoutput(pna_addr, “LTWRT 4, #0 PT1");

      // Now we can sweep again
      status = ibszoutput(pna_addr, “CTN”);
      closegpib();
   }
}
```

Figure 8-1. *Example 1 Using GPIB Pass-Through Command (2 of 4)*

```
/********************
*                   *
*     IBSZOUTPUT    *
*                   *
********************/
/*
Procedure sends a string the the gpib. Appends the end message.
*/

short ibszoutput(short adr_dev, char *string)
{
   short status;
   long byte_count;
   char end_message;

   // If a null string don't do anything
   status = SUCCESS;
   if ((byte_count = (long)strlen(string)) > 0)
   {
      // Otherwise address the device to listen
      enable_it();
      if ((status = listen_to_me(adr_dev)) == SUCCESS)
      {
         // Send the string without EOI
         ibeot(gpib_bd, EOT_OFF);
         error_message = OUTPUTING_STRING;
         ibwrta(gpib_bd, string, byte_count);
         status = check_error(byte_count);

         // Send the end message with EOI
         if (status == SUCCESS)
         {
            end_message = 10;
            ibeot(gpib_bd, EOT_ON);
            error_message = SENDING_END;
            ibwrta(gpib_bd, &end_message, 1);
            status = check_error(1);
         }
      }
   }

   return(status);
}

/********************
*                   *
*     IBBYOUTPUT    *
*                   *
********************/
/*
Procedure sends a string the the gpib. Appends the end message.
*/

short ibbyoutput(short adr_dev, char *string, long byte_count)
{
```

Figure 8-1. *Example 1 Using GPIB Pass-Through Command (3 of 4)*

```
short status;
char end_message;

// If a null string don't do anything
status = SUCCESS;
if (byte_count > 0)
{
   // Otherwise address the device to listen
   enable_it();
   if ((status = listen_to_me(adr_dev)) == SUCCESS)
   {
      // Send the string without EOI
      ibeot(gpib_bd, EOT_OFF);
      error_message = OUTPUTING_STRING;
      ibwrta(gpib_bd, string, byte_count);
      status = check_error(byte_count);

      // Send the end message with EOI
      if (status == SUCCESS)
      {
         end_message = 10;
         ibeot(gpib_bd, EOT_ON);
         error_message = SENDING_END;
         ibwrta(gpib_bd, &end_message, 1);
         status = check_error(1);
      }
   }
}

return(status);

                          }
```

Figure 8-1. *Example 1 Using GPIB Pass-Through Command (4 of 4)*

This last example is a program which reads the user level tables out of the synthesizer. Notice that when the data is read out of the VNA, the bytecount received is 8239. 6 bytes for the arbitrary block header, 8232 for the User Level Tables and 1 for the linefeed at the end.

```
/**********************
*                    *
*     PERFORM_TASK     *
*                    *
**********************/
/*
Procedure reads the user level tables out of an Anritsu synthesizer
connected to the dedicated bus of an Anritsu 37000.
*/

void perform_task(void)
{
   short status;

   // Now open the GPIB and send the message
   gpib_timeout(60);
   if ((status = initgpib()) == SUCCESS)
   {
      // Put the VNA in hold
      // Send LUS mnemonics to the 68000
      // Read back up to 9000 binary bytes
      // Take the VNA out of hold
      pna_addr = 6;
      status = ibszoutput(pna_addr, "HLD; LTWRT 4, #14 LUS ; LTRD 4, 9000; CTN");

      // Get the User Level Tables from the VNA
      status = ibbyinput(pna_addr, user_buffer, long)(sizeof(user_buffer) - 1));

      // Report the number of bytes received
      sprintf(say_buff, "Received %ld bytes", ibcntl);
      color_write(BLACK_COLOR, say_buff);
      new_line();

      // Close the GPIB
      closegpib();

      // Wait for user to acknowledge
      // the bytecount message
      prompt_key();
   }
}
```

Figure 8-2. *Example 2 Using GPIB Pass-Through Command (1 of 2)*

```
/*******************
*                 *
*     IBBYINPUT   *
*                 *
*******************/
/*
Procedure inputs a binary string from a device. Will terminate input
on either of 2 conditions:
1) An EOI is received
2) The bytecount is satisfied
*/

short ibbyinput(short adr_dev, char *array, long arraysize)
{
   short status;

   // Dont do anything if the bytecount requested is zero
   status = SUCCESS;
   if (arraysize > 0)
   {
      // Otherwise address the device to talk and get the input string
      enable_it();
      if ((status = talk_to_me(adr_dev)) == SUCCESS)
      {
         // Input the string
         error_message = INPUTING_STRING;
         ibrda(gpib_bd, array, arraysize);
         status = check_error(0);
         if (status == SUCCESS) array[ibcntl] = 0;
      }
   }

   return(status);

                              }
```

Figure 8-2. *Example 2 Using GPIB Pass-Through Command (2 of 2)*

Chapter 9
Special Applications Functions

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Chapter 9 Special Applications Functions

9-1 INTRODUCTION

This chapter describes commands used to implement special measurement functions. They are associated with the functions controlled by the Domain key in the Measurement key group and the Option Menu key in the Enhancement key group. These include time domain commands, multiple source control commands, and rear panel output control commands.

9-2 TIME DOMAIN

The time domain commands for the 37XXXD are listed below in Table 9-1. Option 2 (High-Speed Time Domain [Distance] Software Option) adds these commands to the 37XXXD software.

The time domain commands are used to:

- Specify the domain of a channel
- Set up operating modes and parameters for the selected processing type of the channel

Table 9-1. *Time Domain Commands (1 of 3)*

Command	Description
DCS	Select short for DC term for lowpass
DCV	Enter value for DC term for lowpass
DCV?	Output lowpass DC term value
DCX?	Output lowpass DC term selection
DCZ	Select line impedance for DC term for lowpass
DDX?	Output active channel domain parameter frequency distance or time
DPI	Select distance phasor impulse mode for active channel
FGT	Select frequency with time gate for active channel
FQD	Select frequency domain for active channel
GCT	Enter gate center value distance or time
GCT?	Output gate center value
GDS	Gate symbols displayed on active channel
GLS	Select low sidelobe gate shape
GMS	Select minimum sidelobe gate shape

Table 9-1. Time Domain Commands (2 of 3)

Command	Description
GNM	Select nominal gate shape
GOF	Turn off gating on active channel
GOF?	Output gating mode on active channel
GON	Turn on gating on active channel
GRT	Select Rectangular gate shape
GSN	Enter gate span value distance or time
GSN?	Output gate span value
GSP	Enter gate stop value distance or time
GSP?	Output gate stop value
GST	Enter gate start value distance or time
GST?	Output gate start value
GSX?	Output gate shape
LPI	Select lowpass impulse response for active channel
LPS	Select lowpass step response for active channel
LPSX?	Output lowpass response for active channel impulse or step
MRR	Restore original marker range
TBP	Select time bandpass mode for active channel
TDDIST	Set time domain parameter to distance for active channel
TDDIST?	Output active channel time domain parameter distance or time
TDPI0	Turn phasor impulse response off for active channel
TDPI1	Turn phasor impulse response on for active channel
TDPIX?	Output phasor impulse on/off status for active channel
TDTIME	Set time domain parameter to time for active channel
TDX?	Output domain mode for active channel
TLP	Select time lowpass mode for active channel
TPI	Select time phasor impulse mode for active channel
WLS	Select low sidelobe window shape
WMS	Select minimum sidelobe window shape
WNM	Select nominal window shape
WRT	Select rectangular window shape
WSX?	Output window shape
ZCT	Enter zoom range center value time or distance

Table 9-1. *Time Domain Commands (3 of 3)*

Command	Description
ZCT?	Output zoom range center value
ZSN	Enter zoom range span value time or distance
ZSN?	Output zoom range span value
ZSP	Enter zoom range stop value time or distance
ZSP?	Output zoom range stop value
ZST	Enter zoom range start value time or distance
ZST?	Output zoom range start value

9-3 MULTIPLE SOURCE

Table 9-2 lists the multiple source control commands. These commands are used to define up to five different "multiple source control bands." In each, the device under test (DUT), source 1, source 2, and receiver frequency ranges may be different.

The DUT frequency range is entered using any of the frequency entry commands. The MSD command puts the 37XXXD in the DEFINE mode, which allows entry of arbitrary frequencies for the DUT. Band equations for source 1, source 2, and the receiver are then set up using the **ED1**, **ED2**, **EDR**, etc, commands. The band equations used are shown below. In these equations, "F" is the DUT frequency range.

For swept operation:

F = *(multiplier / divisor) ∗ (F + offset)*

For CW operation:

F = *(multiplier / divisor) ∗ (offset)*

For a frequency band to be saved, the band equations must produce frequencies within the operating range of the respective system component.

Figure 9-1 shows an example program using multiple source control commands. This program is for a fixed LO, swept IF mixer measurement. The frequency values used are:

DUT range = 2 – 6 GHz
Source 1 = 2 – 6 GHz = (1/1) X (F + 0)
Source 2 = 500 MHz CW = (1/1) X (500 MHz)
Receiver = 1.5 – 5.5 GHz = (1/1) X (F – 500 MHz)

```
10 ! Multiple Source Control Example
20 OUTPUT 706; “MSD; SRT 2 GHZ; STP 6 GHZ”
30 OUTPUT 706; “BD1; BSP 6 GHZ”
40 OUTPUT 706; “ED1; ESW; EML 1 XX1"
50 OUTPUT 706; “EDV 1 XX1; EOS 0 GHZ”
60 OUTPUT 706; “ED2; ECW; EOS 500 MHZ”
70 OUTPUT 706; “EDR; ESW; EML 1 XX1"
80 OUTPUT 706; “EDV 1 XX1; EOS -500 MHZ”
90 OUTPUT 706; “SVB; MS1"
100 END
```

Figure 9-1. *Multiple Source Control Example*

Table 9-2. Multiple Source Control Commands (1 of 2)

Command	Description
BD1	Select band 1 for definition
BD2	Select band 2 for definition
BD3	Select band 3 for definition
BD4	Select band 4 for definition
BD5	Select band 5 for definition
CLB	Clear all multiple source band definitions
CLBMM	Clear the new Millimeter Wave band definitions
ECW	Select CW operation for component being edited
ED1	Edit source 1 equation
ED2	Edit source 2 equation
EDR	Edit receiver equation
EDV	Enter divisor value for equation being edited
EDV?	Output divisor value for equation being edited
EML	Enter multiplier value for equation being edited
EML?	Output multiplier value for equation being edited
EOS	Enter offset frequency for equation being edited
EOS?	Output offset frequency for equation being edited
ESW	Select sweep operation for component being edited
EX1RF0	Turn external source 1 rf off
EX1RF1	Turn external source 1 rf on
EX2RF0	Turn external source 2 rf off
EX2RF1	Turn external source 2 rf on
EXW?	Output multiple source sweep flag for equation being edited
LTRD	Output response data from the dedicated GPIB bus
LTWRT	Send program data to the dedicated GPIB bus
MS0	Turn multiple source mode off
MS1	Turn multiple source mode on
MSD	Select multiple source define mode
MSX?	Output multiple source mode on/off/define
SRC1?	Output external source 1 existence information
SRC1AC	Select source 1 as active
SRC1AC?	Output source 1 active/inactive status

Table 9-2. Multiple Source Control Commands (2 of 2)

Command	Description
SRC1ADD	Enter external source 1 GPIB address (Primarily Addressing commands)
SRC1ADD?	Output external source 1 GPIB address (Primarily Addressing commands)
SRC1EX	Select source 1 as external
SRC1EX?	Output source 1 external/internal status
SRC1G0	Turn source 1 GPIB control off
SRC1G1	Turn source 1 GPIB control on
SRC1GX?	Output source 1 GPIB control on/off status
SRC1MOD?	Output external source 1 model/version string
SRC1NA	Select source 1 as not active
SRC1NT	Select source 1 as internal
SRC2	Select source power voltage testing
SRC2AC	Select source 2 as active
SRC2AC?	Output source 2 active/inactive status
SRC2ADD	Enter external source 2 GPIB address (Primarily Addressing commands)
SRC2ADD?	Output external source 2 GPIB address (Primarily Addressing commands)
SRC2G0	Turn source 2 GPIB control off
SRC2G1	Turn source 2 GPIB control on
SRC2GX?	Output source 2 GPIB control on/off status
SRC2MOD?	Output external Source 2 model/version string
SRC2NA	Select source 2 as not active
SVB	Save current band definitions

9-4 REAR PANEL OUTPUT

Table 9-3 lists the commands for controlling the rear-panel voltage output of the 37XXXD. The **RV1** command enables the output and command **RV0** disables it. The orientation of the output can be set to either horizontal (**RVH**), vertical (**RVV**), lock direction (**RVL**), or DC value (**RVD**).

In the horizontal mode, the voltage output is a digital ramp starting at the voltage start value set by command **VST** and ending at the voltage stop value set by command **VSP**. The start value corresponds to the first point of the sweep and the stop value corresponds to last point of the sweep. In the vertical mode, the output voltage is a measure of the instantaneous data point value. The output voltage is related to the scaling of the graph for channel 1. The reference line corresponds to the zero volt value and each graticule line is equal to a ± 1 volt value span. The values set by the **VST** and **VSP** commands have no effect in the vertical mode.

In the lock direction mode, the start voltage value is output for forward sweeps (lock to Ra). The stop voltage value is output for reverse sweeps (lock to Rb).

In the DC value mode, the rear panel output voltage is set to the DC value programmed with the **RPO** command.

Table 9-3. *Rear Panel Output Control Commands*

Command	Description
RPO	Enter rear panel dc voltage value
RPO?	Output rear panel dc voltage value
RV0	Turn rear panel output voltage off
RV1	Turn rear panel output voltage on
RV1?	Output rear panel output voltage on/off status
RVD	Set rear panel output mode to dc value
RVH	Set rear panel output mode to horizontal
RVL	Set rear panel output mode to lock direction
RVV	Set rear panel output mode to vertical
RVX?	Output rear panel output mode
VSP	Enter rear panel stop voltage value
VSP?	Output rear panel stop voltage value
VST	Enter rear panel start voltage value
VST?	Output rear panel start voltage value

9-5 RECEIVER MODE

The Receiver Mode commands (Table 9-4) allow you to change the way the receiver functions.

Table 9-4. *Receiver Mode Control Commands*

Command	Description
SDR?	Output receiver mode
SL1	Select source lock mode
ST1	Select set on mode
TK1	Select tracking mode

9-6 USER DEFINED PARAMETERS

User defined parameters permit you to substitute a different ratio for S-parameters. The following commands (Table 9-5) are provided to accomplish this task.

Table 9-5. *User-Defined-Parameter Commands*

Command	Description
DA1	Select a1 = Ra as denominator for parameter being defined
DA2	Select a2 = Rb as denominator for parameter being defined
DB1	Select b1 = Ta as denominator for parameter being defined
DB2	Select b2 = Tb as denominator for parameter being defined
DE1	Select unity as denominator for parameter being defined
DEN?	Output denominator selection for parameter being defined
NA1	Select a1 as numerator for parameter being defined
NA2	Select a2 as numerator for parameter being defined
NB1	Select b1 as numerator for parameter being defined
NB2	Select b2 as numerator for parameter being defined
NU1	Select unity as numerator for parameter being defined
NUM?	Output numerator selection for parameter being defined
USL	Enter label string for user parameter being defined
USL?	Output label string for user parameter being defined
USR1	Measure user parameter 1 on active channel
USR2	Measure user parameter 2 on active channel
USR3	Measure user parameter 3 on active channel
USR4	Measure user parameter 4 on active channel

9-7 ADAPTER REMOVAL COMMANDS

The Adapter Removal commands(Table 9-6) let you perform an adapter removal calibration. This application involves performing two very specialized 12-term corrections and saving them to disk or the GPIB to recall later. Before using these commands, become thoroughly familiar with the manual procedure and instructions.

Table 9-6. *Adapter Removal Control Commands*

Command	Description
ADPL	Enter electrical length for adapter removal
ADPL?	Output electrical length for adapter removal
IARF	Enter adapter removal files from GPIB and calibrate

9-8 GAIN COMPRESSION

The 37XXXD uses two gain compression methods for amplifier testing: swept power and swept frequency. The gain compression commands are listed in Table 9-7.

Swept Power Gain Compression

The Swept Power Gain Compression Application lets you see the gain compression of an amplifier-under-test (AUT) at up to 10 continuous wave (CW) frequencies and sweeping power over a predefined range and step size.

There are actually three types of tests in this application. In each, marker search is used to automatically find the gain compression point. The tests are:

- *The swept power gain compression test.* In this test, the frequency is constant at one of the 10 CW frequencies programmed previously, and the power is swept over the power range. The displays are in power out and normalized S21. You can change the frequency and observe the gain compression point at that frequency
- *The swept power gain compression AM/PM test.* This test is identical to the swept power gain compression test above, except the displays are normalized S21 phase and magnitude
- *The multiple frequency swept power gain compression test.* This is an all encompassing test which automatically measures the gain compression at all of the preselected frequencies and graphs the results. It is the results of this test that are referred to by the commands **OGCFD**, **OGCTXT** and **SAVEGC**

Before using these commands, become thoroughly familiar with the manual procedure and instructions.

This application makes use of the Discrete Fill command set to program the test frequencies. The commands will not be relisted here.

Several of the commands listed in Table 10-8 are also applicable to the Swept Frequency Gain Compression Application which is described in another section of this manual. They will be listed again in that section.

Swept Frequency Gain Compression

The Swept frequency gain compression application lets you see the gain compression of an amplifier-under-test (AUT) over the full operating frequency range by creating two calibrated displays. The top display shows power out and the bottom in normalized gain. While sweeping the frequency range, you may vary the input power and observe any change in gain on the bottom graph. You should become thoroughly familiar with the manual procedure and instructions before attempting to control the application from the GPIB.

This application makes use of a Flat Test Port Power Calibration to achieve a higher degree of accuracy. The commands for this calibration are not re-listed here.

Power Sweep Linearity Calibration Coefficients

The coefficients are input and output using the following codes:

- IPSC—Enter the power sweep linearity calibration coefficients
- OPSC—Output the power sweep linearity calibration coefficients

These codes would be useful in applications where there is no power meter to hook up to the 37XXXD to perform the calibration normally, or the power meter is not one for which the 37XXXD has been programmed to interface.

The code **OPSC** outputs an arbitrary block of binary or ASCII data depending on the output mode selected with the codes **FMA**, **FMB**, **FMC**, **LSB** and **MSB**. See the description of these codes in Chapter 10. See section 10-3 for a description of the arbitrary block format. Each coefficient represents the adjustment in dB (correct to a hundredth of a dB) required to achieve the correct power at the particular power point and frequency (except if the power step size is less than 0.10 dB).

The minimum power step size in a linearity calibration is 0.10 dB. If the programmed power sweep step size is less than 0.10 dB, there may actually be fewer coefficients per power sweep, and the coefficients will not necessarily align with the power points in the power sweep. Interpolation between coefficients is used to determine the power adjustment. Suppose the VNA is programmed with four power points per sweep and two frequencies of interest. Then, the first four elements (numbers) in the arbitrary block will be the coefficients for the power sweep at the first frequency of interest, starting at the lowest power and proceeding upward. The next four numbers in the arbitrary block will be the coefficients for the next frequency of interest. The arbitrary block contains two groups of coefficients, one for each frequency of interest. Each group contains four coefficients, one for each power point in the corresponding power sweep. This is represented below:

[arbitrary block header][4 coefficients for frequency 1][4 coefficients for frequency 2]

If a VNA does not currently have a valid power sweep linearity calibration in place when the **OPSC** command is received, an arbitrary block will be sent with zeros for each coefficient.

The **IPSC** command is used to input coefficients into the VNA and set up a valid power sweep linearity calibration. The coefficients are contained in an arbitrary block, which follows **IPSC**. The composition of the arbitrary block is identical to the one described above. The VNA must be programmed with the appropriate number of power points and frequencies prior to receiving **IPSC**. If the number of coefficients in the arbitrary block does not match what would be required by the current VNA setup, the data will be rejected. An error message will be displayed on the screen and recorded in the service log.

To ensure that the correct number of coefficients is contained in the arbitrary block, you should first use the codes:

PSCNFRQ? Output the power sweep linearity cal number of frequency points.

PSCNPWR? Output the power sweep linearity cal number of power points per frequency.

(Not necessarily the number of power points in the power sweep)

PSCSTEP? Output the power sweep linearity cal power step size

(Not necessarily the power sweep power step size)

The number of coefficients in the arbitrary block will be:

[number of power points] X [number of frequencies]

Table 9-7. *Gain Compression Commands (1 of 2)*

Command	Description
CALR	Perform receiver cal for gain compression testing
DSPS21	Select Gain Compression bottom graph displays S21
DSPS21?	Output Gain Compression bottom graph selection Normalized/S2
GCMP	Enter gain compression point search value
GCMP?	Output gain compression point search value
IPSC	Enter power sweep linearity calibration coefficients
MFGCT	Start multiple frequency swept power gain compression test
NOFST	Enter nominal offset value for external gain
NOFST?	Output nominal offset value for external gain
NRMS	Normalize S21 for gain compression testing
NRMS21	Select Gain Compression bottom graph displays Normalized S21
OPSC	Output power sweep linearity calibration coefficients
PSCNFRQ?	Output the power sweep linearity cal number of frequency poi
PSCNPWR?	Output the power sweep linearity cal number of power points

Table 9-7. *Gain Compression Commands (2 of 2)*

Command	Description
PSCSTEP?	Output the power sweep linearity cal power step size
PSPWR	Enter power sweep off power level
PSPWR?	Output power sweep off power level
PSTEP	Enter power sweep step size
PSTEP?	Output power sweep step size
PSTOP	Enter power sweep stop power
PSTOP?	Output power sweep stop power
PSTRT	Enter power sweep start power
PSTRT?	Output power sweep start power
PSWC	Perform power sweep linearity calibration
PSWC0	Turn power sweep linearity calibration off
PSWC1	Turn power sweep linearity calibration on
PSWCX?	Output power sweep linearity calibration on/off status
PSWP0	Turn power sweep off
PSWP1	Turn power sweep on
PSWPX?	Output power sweep on/off status
RSTGC	Reset gain compression parameters to default
SFGCA	Select swept frequency gain compression application
SFGCT	Start swept frequency gain compression test
SPAMPMT	Start swept power gain compression AM/PM test
SPGCA	Select swept power gain compression application
SPGCT	Start swept power gain compression test
UNDOGC	Exit gain compression and undo changes

9-9 TEST SET CONFIGURATIONS

The following test set configurations are discussed for use with the 37XXXD VNAs.

S-parameter

The 371XXD series VNAs provide four wideband microwave receivers that can be used in various configurations not normally provided by S-parameter measuring VNAs. The S-parameter test set provides flexibility for the 371XXD to perform S-parameter measurements. This test set provides a transfer switch, samplers, and additional hardware necessary to support an S-parameter measurement.

Millimeter Wave

Two configurations provide Millimeter Wave S-parameter testing in numerous waveguide bands:

- A 3735B Millimeter Wave Test Set in conjunction with a varied selection of Millimeter Wave Heads, a 371XXD series VNA, and two synthesizers
- A 3738A Broadband Test Set in conjunction with a varied selection of Millimeter Wave Heads, a 37XXXD VNA with Option 12, and two synthesizers

Broadband

A third configuration provides broadband S-parameter testing. This coverage is split into 0.04 to 65 GHz in coax and 65 to 110 GHz in waveguide. These two ranges can be combined with external couplers to provide a continuous 40 MHz to 110 GHz sweep in coax. This configuration consists of a 3738A Broadband test set in conjunction with two 3742-EW Millimeter Wave heads, a 37X97D VNA with Option 12, and two synthesizers.

Test set configurations are established with the following codes:

- S-parameter test set—**SELSP**
- Millimeter Wave test set—**SELMM**
- Broadband test set—**SELBB**
- Normal internal test set mode of operation—**SELINT**, or by issuing the master reset code **RST0**

NOTE

All other resets maintain the currently programmed test set mode.

Millimeter Wave and Broadband operations are, by definition, multiple source control modes of operation. The band and equation information is taken care of automatically by the VNA and require no user intervention. You may, however, change the Millimeter Wave Band start and stop frequencies and equations if desired. Broadband operation permits changing only the stop frequency.

Notice that there is only one band (even for Broadband operation). This band is separate from the normal internal test set mode of operation. Therefore, it is selected and controlled via the new codes **BDMM**, **CLBMM** and **SVBMM**. As both Millimeter Wave and Broadband are already active multiple source control modes, **SVBMM** both saves and activates the new band equations and frequencies. The normal multiple source codes **ECW**, **ESW**, **MS0**, **MS1**, **MSD** and **BD1** through **BD5** are not permitted.

The codes which control the test set configurations are listed in Table 9-8, below.

Table 9-8. *Millimeter Wave and Broadband Commands (1 of 2)*

Command	Description
BDMM	Define Millimeter Wave band equations
BSP	Enter band stop frequency
BSP?	Output band stop frequency
BST	Enter band start frequency
BST?	Output band start frequency
CLBMM	Clear the new Millimeter Wave band definitions
E12	Set Millimeter Wave band to E band (WR-12)
E12E	Set Millimeter Wave band to E band (WR-12)
F08	Set Millimeter Wave Band to F Band (WR-8)
MMBX?	Output Millimeter Wave band selection
P1MMA	Set Port 1 Millimeter Wave Head to Amplified (3742)
P1MMN	Set Port 1 Millimeter Wave Head to None
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)
P1MMX?	Output Port 1 Millimeter Wave Head type
P2MMA	Set Port 2 Millimeter Wave Head to Amplified (3742)
P2MMN	Set Port 2 Millimeter Wave Head to none
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)
P2MMX?	Output Port 2 Millimeter Wave Head type
Q22	Set Millimeter Wave Band to Q Band (WR-22)
SELBB	Select Broadband test set operation
SELINT	Select Internal (normal) test set operation
SELMM	Select Millimeter Wave test set operation

Table 9-8. *Millimeter Wave and Broadband Commands (2 of 2)*

Command	Description
SELSP	Select S-parameter test set operation
SELXX?	Output the test set selection MMWave/Internal
SVBMM	Save and activate the new Millimeter Wave band definitions
V15	Set Millimeter Wave Band to V Band (WR-15)
W10	Set Millimeter Wave Band to W Band (WR-10)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)

9-10 OPTICAL APPLICATION

The model 37000 VNAs provide de-embedding of electro-optical (E/O) and opto-electrical (O/E) devices to permit opto-electric S21 measurements. The commands are listed in Table 9-9 on the following page. When using these commands, three things are assumed:

- The path is always from port 1 to port 2. An optical modulator is connected to port 1 and a photo diode is connected to port 2
- An RF calibration at the desired electrical reference planes is available. Only the following RF calibration types are acceptable:
  - Trans-Frequency Response Forward
  - Trans-Frequency Response Both Directions
  - 1-Path 2-Port Forward
  - 12-Term
- An S2P file defining the response of the opto-electric device to be de-embedded is available. You may create this file from data supplied by the manufacturer or in certain instances the VNA can create this file

S21 Measurements

An E/O measurement of an optical modulator is performed by connecting the modulator output to the input of a photo diode of known characteristics. The required S2P file defines the S21 characteristics of the photo diode. When the RF calibration and S2P file are recalled, the RF calibration terms are modified to de-embed the photo diode response before they are stored in memory. Therefore, the S21 characteristics of the optical modulator can be measured and displayed.

An O/E measurement of a photo diode is performed by connecting the output of an optical modulator of known characteristics to the input of the photo diode. The required S2P file defines the S21 characteristics of the optical modulator. When the RF calibration and S2P files are recalled, the RF calibration terms are modified to de-embed the optical modulator response before they are stored on memory. Therefore, the S21 characteristics of the photo diode can be measured and displayed.

Performing the De-embedding

When the RF calibratin and S2P files reside on the hard drive or floppy disk of the VNA, use the **LDODF** mnemonic command in the following format:

```
LDODF “RF cal filename”, “S2P filename”
```

The mnemonic command **LDODF** is sent followed by a space and two strings separated by a comma. The first string is the name of the RF calibration file and the second is the name of the S2P file. For example:

```
LDODF “c:\opical.cal”, “c:\response.s2p”
```

When the RF calibration data and S2P data reside in the PC controlling the VNA, use the **IDOF** mnemonic command in the following format:

```
IDOF [arbitrary block of RF cal data],
[arbitrary block of S2P data]
```

Creating an S2P File

In an E/O measurement, the S21 characteristics of an optical modulator are measured and displayed. In an O/E measurement, the S21 characteristics of a photo diode are measured and displayed. This data can be saved to the VNA hard drive or floppy disk using the **SAVE** mnemonic or output to the GPIB using the **OS2P** mnemonic.

Examples:
The following command saves the S2P format data to a file on the hard disk:

```
SAVE ‘c:\modulate.s2p’
```

The following command saves the S2P format data to a file on the floppy disk:

```
SAVE ‘a:\photod.s2p’
```

The following command outputs S2P format data to the GPIB in arbitrary block:

```
OS2P
```

NOTE
You can also capture and view the S2P data using the CAPVNA program.

Table 9-9. *Optical De-embedding Commands*

Mnemonic	Description
IODF	Used to enter optical de-embedding files from the GPIB and calibrate
LDODF	Used to load the optical de-embedding files from the hard disk and calibrate

9-11 MERGE CAL FILES APPLICATION

The Merge Cal Files application allows the user to combine two calibrations that were performed on the VNA, but having differing frequency ranges. This is of particular importance when a wide band RF calibration cannot be performed because wide band calibration components, such as loads and shorts, are not available. Such a case exists when using Anritsu's 37X97C wideband VNAs. Here, the preferred calibration method would be to do a standard method (SOLT) coaxial calibration in the 0.04 to 65 GHz bands, a triple offset short (SSST) coaxial calibration in the 65 to 110 GHz band, then combine the calibrations to yield a wideband 0.04 to 110 GHz calibration that can be saved and recalled.

The resultant calibration file setup will be the first calibration file setup except that the frequency points and RF correction values of the second calibration file will be intermingled with the frequency points and RF correction values of the first. The start and stop frequencies will be adjusted to reflect the lowest and highest frequencies in the intermingling. If there are frequency points in common, then the correction values of the first file will be used and that frequency and data point in the second file will be discarded.

Both RF calibration files must be the same type, that is, Full 12 Term, 1 Path 2 Port Forward, 1 Path 2 Port Reverse, etc., and the total number of frequency points of the first and second files added together cannot exceed 1601.

Merging Calibrations

When the RF calibration files reside on the VNA hard drive and/or floppy disk, use the mnemonic command LDMCF in the following format:

LDMCF “First RF Cal filename”, “Second RF Cal filename”

For example:
LDMCF “c:\merge1.cal”, “a:\merge2.cal”

When the RF calibration files reside in the PC controlling the VNA, use the IMCF command in the following format:

IMCF [Arbitrary block of the first RF Cal data], [Arbitrary block of the second RF Cal data]

In most cases, it doesn't matter which calibration file is chosen as the first calibration file; however, if the VNA is a 37397C used in a Broadband setup that crosses the 65 GHz switchpoint, it is advised that the first calibration data be from the lower frequency band and the second calibration data be from the higher frequency band. Additionally, if the higher frequency band starts at 65.0 GHz, the lower frequency band must end at 65.0 GHz.

This will force the merged calibration to contain the 65 GHz frequency point from the lower band. Failure to follow these guidelines may result in a spike showing up in the measured data at 65 GHz.

Merge Cal Files Commands

The Merge Cal Files commands are shown in Table 9-10.

Table 9-10. *Merge Cal Files Commands*

Command	Description
IMCF	Enter merge calibration files from GPIB and combine
LDMCF	Load merge calibration files from disk and combine

9-12 EMBEDDING/ DE-EMBEDDING APPLICATION

The Embedding/De-embedding Application is a simple realization of the embedding/de-embedding technique. It can only embed/de-embed one network at a time, as shown in Figure 9-2: The commands used with this function are shown in Table 9-11.

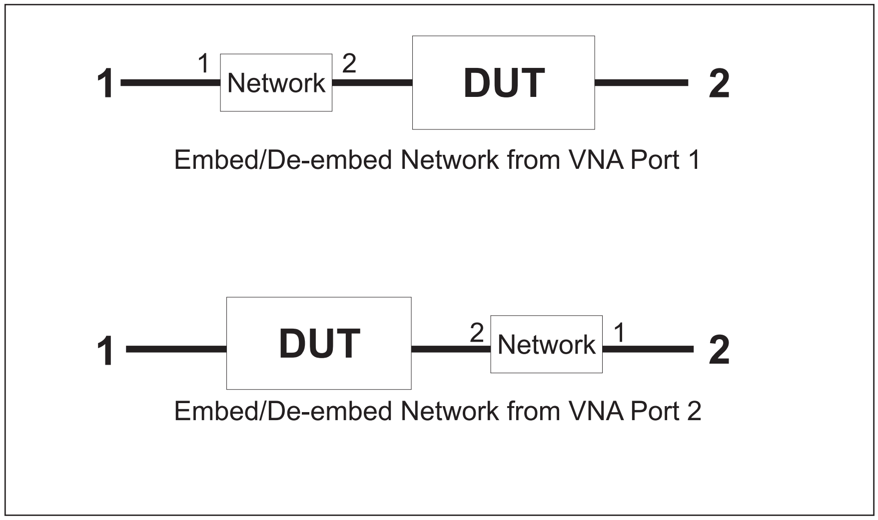

Figure 9-2. *Embed/De-embed Modeling*

Notice the orientation of the network to be embedded/de-embedded. The network Port 1 is connected to the VNA port from which it is to be embedded/de-embedded.

To perform the embedding/de-embedding, the user must supply front panel and calibration data and S2P data for the network. These can be supplied as files on the 37XXXD hard drive or floppy drive, or they can come from the GPIB/Ethernet connection as <Arbitrary Block> data.

Embedding and de-embedding is accomplished by modifying the calibration coefficients of the RF calibration from the first file or block of data. When the embedding/de-embedding is finished, the active RF calibration is different from that which was supplied. To save the result of the embedding/de-embedding, one can save the front panel and cal data to a new file on the hard drive or floppy drive, or extract it to the controller with the **OCF** command.

Here are two examples:

```
EDEE; EDEPORT1; LDEDEF  "C:\T12BBC.CAL", "C:\NETW.S2P"
```

EDEE; EDEPORT1 means that the application will perform an embedding at VNA Port 1. Notice that the Front Panel and cal data filename is first, followed by the S2P filename. The filenames are in Quotation marks (optionally they could be in tick ' marks). After embedding, the setup will be that of the cal data. If the range of the S2P file extends outside of the cal data range, that is OK. If the range of the S2P data is less than the cal data or only partially overlaps the cal data, then the application uses the closest S2P data point to calculate the embedding/deembedding, and displays the warning message **EXTENDING S2P RANGE TO FIT CAL**. If there are data points in the S2P data that do not line up with the cal data points, the S2P data is interpolated.

The next example:

EDED; EDEPORT2; IEDEF [arbitrary block of cal data], [arbitrary block of S2P data]

This tells the VNA that the network will be de-embedded from VNA Port 2, and that the cal data and the S2P data are provided in the arbitrary blocks. As with **LDEDEF**, the final setup is that of the cal data and the S2P data may be interpolated. The warning message **EXTENDING S2P RANGE TO FIT CAL** may also be displayed if appropriate.

Refer to the orientation of the network to be embedded/de-embedded in Figure 9-2. If the data in the S2P file or arbitrary block was taken with the network oriented the opposite way, the user may use the mnemonic **EDESWAP**. Then the S2P S11 and S22 data (and also the S12 and S21 data) will be swapped during the calculation. The mnemonic **EDENORM** can be used to switch back to normal orientation.

Table 9-11. *Embedding/De-embedding Commands*

Command	Description
EDED	Select De-embedding as embedding/de-embedding method
EDEE	Select Embedding as embedding/de-embedding method
EDEED?	Output embedding/de-embedding method selection
EDENORM	Normal port orientation of embedding/de-embedding network
EDEPORT1	Apply the embedding/de-embedding network to Port 1
EDEPORT2	Apply the embedding/de-embedding network to Port 2
EDEPORT?	Output port receiving the embedding/de-embedding network
EDESWAP	Swap port orientation of embedding/de-embedding network
EDESWAP?	Output port orientation of embedding/de-embedding network swapped/normal
IEDEF	Enter embedding/de-embedding files from GPIB and embed/de-embed
LDEDEF	Load Embedding/De-embedding files from disk and embed/de-embed

9-13 NxN SOLUTION

The NXN Solution solves for the S21 value of DUTs, when they cannot be measured directly. Some examples include:

- The DUTs could be frequency translation devices such as mixers, where the output frequency is not in the range of the VNA.
- The DUTs could be physically long, such as a cable connecting a transmitter and its antenna inside of an airplane wing.

This measurement can be made by having three similar DUT's and connecting them together such that t hree measurements can be made. Refer to Figure 9-3.

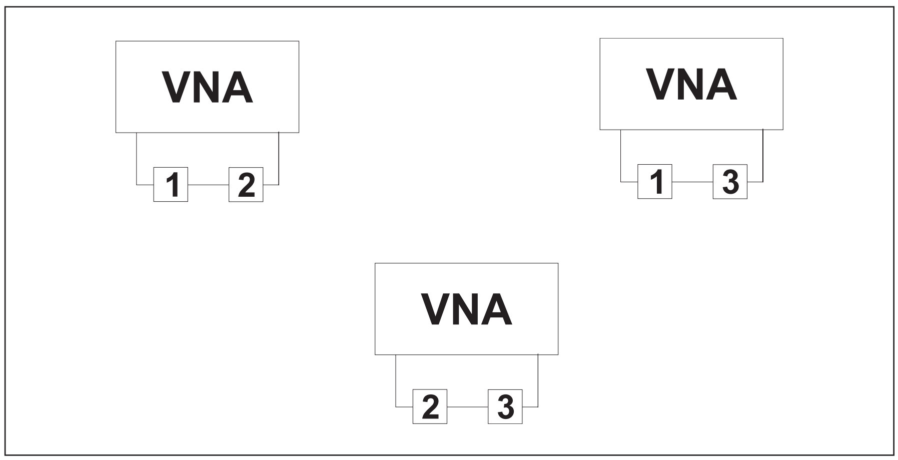

Figure 9-3. NxN Solutions Measurement Setup.

NOTE

Because DUT 2 is used in both positions, the constraint is that it has to be a frequency conversion device and it must be reversible (that is, equal upconversion and downconversion behaviors). No such constraint applies if the DUTs are not frequency converting.

There are three similar calculations. One for each DUT. To perform a particular calculation requires the user to supply a block of S2P data for each DUT combination (1-2, 1-3 and 2-3). To assist in the phase calculation, the user must supply the electrical length of each DUT. The manual method can only perform these calculations from data supplied as files residing the the VNA hard or floppy drives.

Over the GPIB or Ethernet, the user can supply filenames in string format (section (10-3) or provide the S2P data directly in arbitrary block format (section 10-3). Likewise, the target of the result can be an S2P file on one of the VNA drives or a block of S2P data sent back over the GPIB or Ethernet to the controller.

The set of GPIB commands that supply filenames for the S2P data of the DUT pairs and writes the solution to another file whose name is supplied are:

LDNXNSV1 ‘ DUT1 target filename’, ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

LDNXNSV2 ‘ DUT2 target filename’, ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

LDNXNSV3 ‘ DUT3 target filename’, ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

The set of GPIB commands which supply filenames for the S2P data of the DUT pairs and sends the solution to the GPIB or Ethernet in arbitrary block format are:

LDNXNO1 ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

LDNXNO2 ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

LDNXNO3 ‘1-2 filename’, ‘1-3 filename’, ‘2-3 filename’

The set of GPIB commands which receive the S2P data of the DUT pairs in the form of arbitrary blocks and saves the solution to a file are:

INXNSV1 ‘ DUT1 target filename’

INXNSV2 ‘ DUT2 target filename’

INXNSV3 ‘ DUT3 target filename’

The set of GPIB commands which receive the S2P data of the DUT pairs in the form of arbitrary blocks and sends the solution to the GPIB or Ethernet in arbitrary block format are:

INXNO1

INXNO2

INXNO3

The GPIB commands to set and query the electrical lengths of the three DUT's are:

`NXNL1 value1`

`NXNL2 value2`

`NXNL3 value3`

`NXNL1?`

`NXNL2?`

`NXNL3?`

The frequency range of the solution is the intersection of the three DUT pair frequency sets. That is: Where the

- Start frequency is the highest of the start frequencies of the frequency sets
- Stop frequency is the lowest of the stop frequencies of the frequency sets.
- If the frequencies do not coincide, circular interpolation is used.

If the sum of the number of points of the three S2P files exceeds 4900 or the resultant number of points exceeds 1601, the calculation will abort and the message '**`TOO MANY FREQUENCY POINTS`**' prints. If the resultant frequency list is empty, the calculation will abort and the message '**`NO COMMON S2P FILE FREQUENCIES`**' prints.

The commands to impliment this function are shown in Table 9-12 (next page).

Table 9-12. *NxN Solutions Commands*

Command	Description
INXNO1	Enter NxN data and send device1 data to GPIB
INXNO2	Enter NxN data and send device2 data to GPIB
INXNO3	Enter NxN data and send device3 data to GPIB
INXNSV1	Enter NxN data and save device1 data to disk
INXNSV2	Enter NxN data and save device2 data to disk
INXNSV3	Enter NxN data and save device3 data to disk
LDNXNO1	Load NxN files from disk and send device1 data to GPIB
LDNXNO2	Load NxN files from disk and send device2 data to GPIB
LDNXNO3	Load NxN files from disk and send device3 data to GPIB
LDNXNSV1	Load NxN data from disk and save device1 data to disk
LDNXNSV2	Load NxN data from disk and save device2 data to disk
LDNXNSV3	Load NxN data from disk and save device3 data to disk
NXNL1	Enter length for NxN device 1
NXNL1?	Output length for NxN device 1
NXNL2	Enter length for NxN device 2
NXNL2?	Output length for NxN device 2
NXNL3	Enter length for NxN device 3
NXNL3?	Output length for NxN device 3

Part 3
Programming Reference

This part consists of three chapters that provide programming reference information for the 37XXXD VNA.

Chapter 10 – *provides a list of all GPIB commands for the 37XXXD. The listing for each command (mnemonic) includes relevant details about the command.*

Chapter 11 – *provides general (non-command specific) tabular information for the 37XXXD. Much of this information is presented in Chapters 4 through 10, but is provided in this chapter for easy access.*

Chapter 12 – *provides a list of all Error Messages related to remote- only (GPIB) operation of the 37XXXD.*

Chapter 10
Command Dictionary

APR Sets the group delay aperture on the active channel. **DISPLAY CONTROL (Ch 4)**

Command mnemonic

Command function

Command Syntax String

Allowable values for the command argument(s), if any. The mnemonic shown in boldface type is the default units suffix

Indicates the Command's "Functional Group" and chapter where located.

Syntax: `APR val1 unit(s)`

Value: 0.0 – 20.0

unit(s) XX1, XX3, XM3

Remarks: Programming hints, how to use the command, and/or expanded description of command.

Data I/O: Description of data input or output due to this command. See section 10-3 and Chapter 7, section 7-2 for details.

Status Reporting: Status Reporting bit(s) or functions unique to this command.

Front Panel Key: Lists the front panel hard key and menu option(s) used to implement the function, if appropriate. The hard key begins the string in which the menu-option path appears in grey (red in Acrobat file). Individual menu options are separated using a reverse slash in the manner of computer DOS commands. Example:

Option Menu**\DIAGNOSTICS\INSTALLED OPTIONS**

Additional Description Fields as required

Related Commands: Commands that impact or relate to this command.

Figure 10-1. *Typographic Conventions for the Command Listings*

Chapter 10
Command Dictionary

10-1 INTRODUCTION

This chapter provides a listing of GPIB programming commands (mnemonics) used with the Model 37XXXD Vector Network Analyzer.

10-2 TYPOGRAPHIC CONVENTIONS

The typographic conventions, abbreviations, and syntax legend used throughout this chapter to define the GPIB commands are described in Figure 10-1 (opposite page).

10-3 DATA I/O FORMATS

The data input and output formats and templates, referred to throughout this chapter, are delimited with the less-than and greater-than characters (< >). These characters are not part of the data; they are only used in this text to distinguish the data elements they represent. See Chapter 7, Remote Only Operations, "Data Transfer" for complete details.

37XXXD data formats are summarized below:

<NR1>
This notation represents ASCII integer values. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR1> notation:

1
0
-29,179

<NR2>
This notation represents ASCII floating point values in decimal point format. A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR2> notation:

1.0
-0.00015
12.743,-180.07

<NR3>
This notation represents ASCII floating point values in exponential format (scientific notation). A comma (,) is used to separate multiple values sent in a single command's input or output string.

Examples of values that can be represented by <NR3> notation:

1.0E9
7.056E3
9.0E2,3.42E2

<NRf>
This notation is used to signify that data can be in either <NR1>, <NR2>, or <NR3> format as described above.

Examples of values that can be represented by <NRf> notation:

1.0E9
10.005
83,4.5E2,234.9901

<String>
This notation represents a string of 7-bit ASCII characters (including nonprintable characters) that is delimited (surrounded) with either single quotes (‘ ‘) or double quotes (” ”). The string can include text formatting characters such as linefeed, space, or carriage return.

Note that if a double quote character must be sent as part of the string, then it must be followed by an additional double quote. Alternatively, the string can be sent using single quotes (See ”cal_file” example below.)

Examples of data represented by <String> notation:

”1/15/98”
”Save” ”cal_file” ”now.”
‘Save” ”cal_file” ”now.’

<Arbitrary ASCII>
This notation represents undelimited 7-bit ASCII text. The end of the text must be terminated with the 0A character (decimal 10) and concurrent setting (^) of the GPIB End of Transmission State (EOI). This requirement makes it necessary for <Arbitrary ASCII> text to be transmitted only at the end of a program or response message, i.e. at the end of a multiple input or output statement.

Example of data represented by <Arbitrary ASCII> notation:

Anritsu,37247D,123456,1.0<0A^EOI>

The example shows a sample response from the *IDN?, 488.2 common query. In the example, the instrument identifies itself as a Anritsu 37247D, with serial number 123456, and software version 1.0 installed. Note that decimal 10 (0A character) must be sent with the EOI to signal end of transmission.

<Arbitrary Block>
This notation represents data that is transmitted as 8-bit data bytes (00-FF hex, 0-255 decimal, notation is <DAB>). This is useful for transmitting large blocks of formatted ASCII or binary data or unformatted binary data. The data stream is immediately preceded by a variable length ASCII header that is encoded with the number of data bytes to be sent. The header always starts with the pound (#) character. Figure 10-2 below describes the header and the transmitted data messages.

`#nm1..mn<DAB>1..<DAB>m`

Where:

# = The pound sign character. Required for binary data transfer.
n = Number of digits to follow ($m_1..m_n$) that make up the number m.
$m_1..m_n$ = Taken together, this makes up the number m which is the number of data bytes to follow that constitute the requested data.
<DAB> = An 8-bit binary data byte. This is the data (or information) being sent.

NOTE

If n = 0, then m is omitted, and transmission end is signaled by sending the linefeed character (0A, or decimal 10) and concurrent setting (^) of the GPIB End Of Transmission State (EOI) immediately following the last <DAB>.

Figure 10-2. *<Arbitrary Block> Data Format*

10-4 FUNCTIONAL GROUPS

Throughout this chapter, the distinctive, white on black text, in the upper corner of each command's description area, is the functional group to which the command belongs (see Figure 10-1, page 10-2). The 37XXXD GPIB Function Groups are described in Chapters 4 through 9; they provide descriptive details and tabular data that apply to the group as a whole.

10-5 RELEVANT TABLES

Data referenced in many places within this chapter is located in Chapter 11, "Instrument Data."

10-6 COMMANDS

The remaining pages in this chapter provide an alphabetical listing of the commands (mnemonics) used to program the Model 37XXXD Vector Network Analyzer.

***CLS** Clear status bytes and structures **IEEE 488.2 (Ch 7)**

Syntax: `*CLS`

Status Reporting: Clears the Standard Event Status Register, the Extended Event Status Register, and the Limits Status Register. Also clears the Operation Complete Command and Query states by setting them to idle state, i.e. no operations pending. Also clears the GPIB error message buffers (see OGE, OGL).

***DDT** Enter the 488.2 Define Device Trigger command string **IEEE 488.2 (Ch 7)**

Syntax: `*DDT Value`
Value: Valid 37XXXD GPIB command sequence in <Aritrary Block> format (paragraph 10-3).

Remarks: The maximum size for the command sequence is 255 bytes.

Related Commands: *TRG

***DDT?** Output the 488.2 Define Device Trigger command string **IEEE 488.2 (Ch 7)**

Syntax: `*DDT?`

Data I/O: The query response is sent using the <Arbitrary Block> format (section 10-3).

***ESE** Enter the 488.2 Standard Event Status Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*ESE Value`
Value: 0-255

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

***ESE?** Output the 488.2 Standard Event Status Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*ESE?`

Remarks: Returns the decimal value of the bit pattern of the Standard Event Status Enable Register. The value is 0-255.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

***ESR?** Output the 488.2 Standard Event Status Register value **IEEE 488.2 (Ch 7)**

Syntax: `*ESR?`

Remarks: Returns the decimal value of the bit pattern of the Standard Event Status Register and clears it. The value is 0-255.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

***IDN?** Output the 488.2 instrument identification string **IEEE 488.2 (Ch 7)**

Syntax: `*IDN?`

Remarks: This query returns the 37XXXD identification string. The string consists of four comma separated fields as follows: Anritsu, Model, Serial #, Software Revision.

The actual model number, serial number, and software revision of the 37XXXD queried will be passed. The maximum length of the string is 72 characters.

Data I/O: Outputs the 488.2 instrument identification string using an <Arbitrary ASCII> format (section 10-3).

Related Commands: OID, *OPT?

***IST?** Output the value of the ist message **IEEE 488.2 (Ch 7)**

Syntax: `*IST?`

Remarks: The *ist* is the status bit sent by the 37XXXD in response to a parallel poll. The *IST? query outputs the value of the *ist* without having to perform a parallel poll. The output value is 1 if *ist* is TRUE, 0 if *ist* is FALSE.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: *PRE, *PRE?

***OPC** Initiate the 488.2 Operation Complete sequence **IEEE 488.2 (Ch 7)**

Syntax: `*OPC`

Status Reporting: Sets the Operation Complete bit 0 in the Standard Event Status Register after all pending operations are complete.

Related Commands: *OPC?

***OPC?** Initiate the 488.2 Operation Complete Query sequence **IEEE 488.2 (Ch 7)**

Syntax: `*OPC?`

Remarks: Ouputs an ASCII "1" after all pending operations are complete.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: *OPC

***OPT?** Output the 488.2 options installed string **SERVICE LOG (Ch 8)**

Syntax: `*OPT?`

Remarks: This query returns the installed, reportable 37XXXD options identification string. The string consists of comma separated fields containing the option numbers or a 0 if none are installed. The maximum length of the string is 255 characters.

Data I/O: Outputs an <Arbitrary ASCII> format (section 10-3)

Front Panel Key: Option Menu\DIAGNOSTICS\INSTALLED OPTIONS

Related Commands: OID, *IDN?

***PRE** Enter the 488.2 Parallel Poll Register Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*PRE Value`

Value: 0 to 65535

Remarks: Sets the bits of the Parallel Poll Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

***PRE?** Output the 488.2 Parallel Poll Register Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*PRE?`

Remarks: Returns the decimal value of the bit pattern of the Parallel Poll Enable Register.

Data I/O: Output the 488.2 Parallel Poll Register Enable mask using ASCII <NR1> format (section 10-3).

Related Commands: *IST?

***RST** Instrument reset **IEEE 488.2 (Ch 7)**

Syntax: `*RST`

Remarks: Resets the 37XXXD to default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. This command does not affect the Output Queue, any Status or Parallel Poll Registers, or the 37XXXD GPIB address setting.

Related Commands: RST, RST0, RST1

***SRE** Enter the 488.2 Service Request Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*SRE Value`

Value: 0 to 255

Remarks: Sets the bits of the Service Request Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0. Note that the Master Summary Status (MSS) bit 6 (decimal 64) will be ignored since it represents the summary of all enabled status bits (bits 0-5, 7).

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

***SRE?** Output the 488.2 Service Request Enable mask **IEEE 488.2 (Ch 7)**

Syntax: `*SRE?`

Remarks: Returns the decimal value of the bit pattern of the Service Request Enable Register. The value will be 0 to 63, or 128 to 191, with the MSS bit 6 (decimal 64) zeroed out (See *SRE).

Data I/O: Outputs the 488.2 Service Request Enable mask using ASCII <NR1> format (section 10-3).

***STB?** Output the 488.2 Status Byte value **IEEE 488.2 (Ch 7)**

Syntax: `*STB?`

Remarks: Returns the decimal value of the bit pattern of the Status Byte and the Master Summary Status bit 6. The value will be 0 to 255.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

***TRG** Initiate a Group Execute Trigger sequence **IEEE 488.2 (Ch 7)**

Syntax: `*TRG`

Remarks: The previously defined trigger action using the *DDT command will be placed in the GPIB input buffer, parsed, and executed. This is the instrument specific equivalent of the 488.1 GET, Group Execute Trigger message.

Related Commands: *DDT, *DDT?

***TST?** Perform self test and output status **IEEE 488.2 (Ch 7)**

Syntax: *TST?

Remarks: Causes the 37XXXD to perform an extensive, fully automated internal circuits self test. Detailed error messages indicating self test failures, if any, are placed in the service log in the order they occur. The query returns a 1 if any part of the self test failed, or a 0 when passed. NOTE: When commands TST or *TST? are sent to the 37XXXD, the VNA output power is momentarily set to the model-dependent Rated Power level during the self test. Ensure that any equipment connected to Port 1 or Port 2 will not be damaged by this power level.

Data I/O: Returns a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Option Menu\DIAGNOSTICS\START SELF TEST

Related Commands: ONE, OEL, OSL, PSL, TST

***WAI** Wait to continue **IEEE 488.2 (Ch 7)**

Syntax: *WAI

Remarks: Suspends the execution of any further commands or queries until all pending operations are completed. Note that this command is required by the 488.2 Standard but has no effect on 37XXXD operation. The 37XXXD executes all commands sequentially, i.e. it will always wait for commands and queries to finish executing prior to processing new commands.

Related Commands: *OPC, *OPC?

A12 Simulate 12-term calibration **CALIBRATION (Ch 5)**

Syntax: A12

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC12, ICL, CON. Also see C12, OC1-OC12, OCL

A8R Simulate 1-path 2-port calibration reverse path **CALIBRATION (Ch 5)**

Syntax: `A8R`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC5, CON. Also see C8R, OC1-OC5

A8T Simulate 1-path 2-port calibration forward path **CALIBRATION (Ch 5)**

Syntax: `A8T`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC5, CON. Also see C8R, OC1-OC5

ABORTCAL Abort calibration in progress and keep existing calibration data **AUTOCAL (Ch 5)**

Syntax: `ABORTCAL`

ABT Simulate trans freq response calibration forward and reverse **CALIBRATION (Ch 5)**

Syntax: `ABT`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC2, CON. Also see CBT, OC1-OC2

ACAA Set AutoCal standard to assurance **AUTOCAL (Ch 5)**

Syntax: `ACAA`

Related Commands: ACLOAD, ACOPEN, ACSHORT, ACTHRU, ACSTD?

ACADPL Enter AutoCal adapter length **AUTOCAL (Ch 5)**

Syntax: `ACADPL Value`
Value: Electrical length of the adapter in time (0.0 - 9.999999e-7).
Units: S, US, NS, PS

Data I/O: Value is input in ASCII <NRf> format (section 10-3).

Related Commands: ACADPL?

ACADPL? Output AutoCal adapter length **AUTOCAL (Ch 5)**

Syntax: `ACADPL?`

Data I/O: Outputs value in ASCII <NR3 > format (section 10-3).

Related Commands: ACADPL

ACADR Set AutoCal type to adapter removal **AUTOCAL (Ch 5)**

Syntax: `ACADR`

Related Commands: ACS11, ACS22, ACSF2P, ACX?

ACAL1R2 Set adapter removal port configuration to ADAPT & L=1 and R=2 **AUTOCAL (Ch 5)**

Syntax: `ACAL1R2`

Front Panel Key: Begin Cal\ **AUTOCAL\CHANGE AUTOCAL SETUP\ADAPTER REMOVAL\PORT CONFIG etc.**

Related Commands: ACAR1L2, ACARP?, ACL1AR2, ACR1AL2

ACAR1L2 Set adapter removal port configuration to ADAPT & R=1 and L=2 **AUTOCAL (Ch 5)**

Syntax: ACAR1L2

Front Panel Key: Begin Cal\ **AUTOCAL \ CHANGE AUTOCAL SETUP \ ADAPTER REMOVAL \ PORT CONFIG etc.**

Related Commands: ACAL1R2, ACARP?, ACL1AR2, ACR1AL2

ACARP? Output AutoCal adapter removal port configuration **AUTOCAL (Ch 5)**

Syntax: ACARP?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “5” for ADAP L1_R2, ”6” for L1 ADAPT_R2, “7” for ADAP R1_L2, ”8” for R1 ADAPT_L2.

Front Panel Key: Begin Cal\ **AUTOCAL \ CHANGE AUTOCAL SETUP \ ADAPTER REMOVAL \ PORT CONFIG etc.**

ACDEF Select default AutoCal isolation averaging factor **AUTOCAL (Ch 5)**

Syntax: ACDEF

Front Panel Key: Begin Cal\ **AUTOCAL \ CHANGE AUTOCAL SETUP \ ADAPTER REMOVAL \ DEFAULT**

Related Commands: ACIAF, ACIAF?, ACIAX?, ACOMIT

ACF2P? Output AutoCal full 2 port configuration **AUTOCAL (Ch 5)**

Syntax: ACF2P?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “3” for PORTS L1_R2, ”4” for PORTS R1_L2.

Front Panel Key: Begin Cal\ **AUTOCAL \ AUTOCAL TYPE**

Related Commands: ACL1R2, ACR1L2

ACF2TC Set AutoCal 2 port thru type to calibrator **AUTOCAL (Ch 5)**

Syntax: ACF2TC

Front Panel Key: Begin Cal\AUTOCAL\CHANGE AUTOCAL SETUP\FULL 2 PORT\THRU TYPE CALIBRATOR

Related Commands: ACF2TT, ACF2TX?

ACF2TT Set AutoCal 2 port thru type to true thru **AUTOCAL (Ch 5)**

Syntax: ACF2TT

Front Panel Key: Begin Cal\AUTOCAL\CHANGE AUTOCAL SETUP\FULL 2 PORT\THRU TYPE TRUE

Related Commands: ACF2TC, ACF2TX?

ACF2TX? Output AutoCal 2 port thru type selection **AUTOCAL (Ch 5)**

Syntax: ACF2TX?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “1” for ACAL THRU, ”2” for ACAL TRUE THRU.

Front Panel Key: Begin Cal\AUTOCAL\CHANGE AUTOCAL SETUP\FULL 2 PORT\THRU TYPE

Related Commands: ACF2TC, ACF2TT

ACHFD Save AutoCal characterization data to floppy disk **AUTOCAL (Ch 5)**

Syntax: ACHFD

Front Panel Key: Utility Menu\AUTOCAL UTILITIES\SAVE TO FLOPPY DISK

Related Commands: ACHHD

ACHHD Save AutoCal characterization data to hard disk **AUTOCAL (Ch 5)**

Syntax: ACHHD

Related Commands: ACHFD

ACIAF Enter user AutoCal isolation averaging factor **AUTOCAL (Ch 5)**

Syntax: `ACIAF Value`
Value: The averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal**AUTOCAL SETUP\FULL 2 PORT\AVERAGING FACTOR**

Related Commands: ACIAF?, ACDEF, ACOMIT

ACIAF? Output user AutoCal isolation averaging factor **AUTOCAL (Ch 5)**

Syntax: `ACIAF?`

Data I/O: Outputs value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Begin Cal**AUTOCAL SETUP\ISOLATION**

Related Commands: ACIAF, ACDEF, ACOMIT

ACIAX? Output AutoCal isolation averaging factor omit/default/user selection **AUTOCAL (Ch 5)**

Syntax: `ACIAX?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “0” for Omit Isolation Averaging, ”1” for Isolation Averaging Default value, and “2” for Isolation Averaging Factor.

Front Panel Key: Begin Cal**AUTOCAL SETUP\ISOLATION**

Related Commands: ACDEF, ACIAF, ACIAF?

ACISO Enter AutoCal isolation averaging number **AUTOCAL (Ch 5)**

Syntax: `ACISO Value`
Value: The Autocal isolation averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal**AUTOCAL\CHANGE AUTOCAL SETUP\ISOLATION**

Related Commands: ACISO?

ACISO? Output AutoCal isolation averaging number **AUTOCAL (Ch 5)**

Syntax: `ACISO?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Begin Cal**\AUTOCAL\CHANGE AUTOCAL SETUP\ISOLATION**

Related Commands: ACISO?

ACL1AR2 Set adapter removal port configuration to L=1 and ADAPT & R=2 **AUTOCAL (Ch 5)**

Syntax: `ACL1AR2`

Front Panel Key: Begin Cal**\AUTOCAL\CHANGE AUTOCAL SETUP\ADAPTER REMOVAL\PORT CONFIG etc.**

Related Commands: ACAL1R2, ACAR1L2, ACARP?, ACR1AL2

ACL1R2 Set AutoCal full 2 port configuration to L=1 and R=2 **AUTOCAL (Ch 5)**

Syntax: `ACL1R2`

Front Panel Key: Begin Cal**\AUTOCAL\CHANGE AUTOCAL SETUP\S22 1 PORT (or S11 1 PORT (or (FULL 2 PORT)\PORT 1 CONNECTION LEFT/RIGHT (or PORT CONFIG L=1, R=2; R=1, L=2** or Utility Menu**\AUTOCAL UTILITIES\AUTOCAL CHARACTERIZATION\PORT CONFIG L=1, R=2; R=1, L=2**

Related Commands: ACF2P?, ACR1L2

ACLO Enter AutoCal load averaging number **AUTOCAL (Ch 5)**

Syntax: `ACLO Value`
Value: The averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal**\AUTOCAL\CHANGE AUTOCAL SETUP\LOAD**

Related Commands: ACLO?

ACLO? Output AutoCal load averaging number **AUTOCAL (Ch 5)**

Syntax: `ACLO?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Begin Cal\AUTOCAL\CHANGE AUTOCAL SETUP\LOAD

Related Commands: ACLO

ACLOAD Set AutoCal standard to load **AUTOCAL (Ch 5)**

Syntax: `ACLOAD`

Related Commands: ACAA, ACOPEN, ACSHORT, ACSTD?, ACTHRU

ACOMIT Omit using AutoCal isolation averaging factor **AUTOCAL (Ch 5)**

Syntax: `ACOMIT`

Front Panel Key: Begin Cal\AUTOCAL SETUP\ISOLATION

Related Commands: ACDEF, ACIAF, ACIAF?, ACIAX

ACOPEN Set AutoCal standard to open **AUTOCAL (Ch 5)**

Syntax: `ACOPEN`

Related Commands: ACAA, ACLOAD, ACSHORT, ACSTD?, ACTHRU

ACP1? Output AutoCal S11 port configuration **AUTOCAL (Ch 5)**

Syntax: `ACP1?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: "1" for Port 1 left, and "2" for Port 1 right.

Related Commands: ACP1L, ACP1R, ACPL, ACPR

ACP1L Set AutoCal S11 port configuration to left **AUTOCAL (Ch 5)**

Syntax: `ACP1L`

Related Commands: ACP1R, ACP1?, ACPL, ACPR

ACP1R Set AutoCal S11 port configuration to right **AUTOCAL (Ch 5)**

Syntax: `ACP1R`

Related Commands: ACP1L, ACP1?, ACPL, ACPR

ACP2? Output AutoCal S22 port configuration **AUTOCAL (Ch 5)**

Syntax: `ACP2?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “3” for Ports L1 R2, and ”2” for Ports R1 L2.

Related Commands: ACP2L, ACP2R

ACP2L Set AutoCal S22 port configuration to left **AUTOCAL (Ch 5)**

Syntax: `ACP2L`

Related Commands: ACP2?, ACP2R

ACP2R Set AutoCal S22 port configuration to right **AUTOCAL (Ch 5)**

Syntax: `ACP2R`

Related Commands: ACP2?, ACP2L

ACPL Set AutoCal S11 port configuration to left **AUTOCAL (Ch 5)**

Syntax: `ACPL`

Related Commands: ACP1L, ACP1R, ACP1?, ACPR

ACPR Set AutoCal S11 port configuration to right **AUTOCAL (Ch 5)**

Syntax: `ACPR`

Related Commands: ACP1L, ACP1R, ACP1?, ACPL

ACR1AL2 Set adapter removal port configuration to R=1 and ADAPT & L=2 **AUTOCAL (Ch 5)**

Syntax: `ACR1AL2`

Front Panel Key: Begin Cal\ **AUTOCAL\ CHANGE AUTOCAL SETUP\ ADAPTER REMOVAL\ PORT CONFIG etc.**

Related Commands: ACL1AR2, ACAL1R2, ACAR1L2

ACR1L2 Set AutoCal full 2 port configuration to R=1 and L=2 **AUTOCAL (Ch 5)**

Syntax: `ACR1L2`

Front Panel Key: Begin Cal\ **AUTOCAL\ CHANGE AUTOCAL SETUP\ S22 1 PORT (or S11 1 PORT (or (FULL 2 PORT)\ PORT 1 CONNECTION LEFT/RIGHT (or PORT CONFIG L=1, R=2; R=1, L=2** or Utility Menu\ **AUTOCAL UTILITIES\ AUTOCAL CHARACTERIZATION\ PORT CONFIG L=1, R=2; R=1, L=2**

Related Commands: ACF2P?, ACL1R2

ACRFL Enter AutoCal reflection averaging number **AUTOCAL (Ch 5)**

Syntax: `ACRFL Value`
Value: The averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\ **AUTOCAL\ CHANGE AUTOCAL SETUP\ REFLECTION**

Related Commands: ACRFL?

ACRFL? Output AutoCal reflection averaging number **AUTOCAL (Ch 5)**

Syntax: `ACRFL?`

Data I/O: The value is output in ASCII <NR1> format (section 10-3).

Front Panel Key: Begin Cal\ **AUTOCAL\ CHANGE AUTOCAL SETUP\ REFLECTION**

Related Commands: ACRFL

ACS11 Set AutoCal type to S11 **AUTOCAL (Ch 5)**

Syntax: ACS11

Front Panel Key: Begin Cal**AUTOCAL\CHANGE AUTOCAL SETUP\S11 1 PORT**

Related Commands: ACADR, ACS22, ACSF2P, ACX?

ACS22 Set AutoCal type to S22 **AUTOCAL (Ch 5)**

Syntax: ACS22

Front Panel Key: Begin Cal**AUTOCAL\CHANGE AUTOCAL SETUP\S22 1 PORT**

Related Commands: ACS11, ACSFP2, ACX?

ACSF2P Set AutoCal type to full 2 port **AUTOCAL (Ch 5)**

Syntax: ACSF2P

Front Panel Key: Begin Cal**AUTOCAL\AUTOCAL TYPE**

Related Commands: ACS11, ACS22, ACX?

ACSHORT Set AutoCal standard to short **AUTOCAL (Ch 5)**

Syntax: ACSHORT

Related Commands: ACAA, ACLOAD, ACOPEN, ACSTD?, ACTHRU

ACSTD? Output AutoCal standard **AUTOCAL (Ch 5)**

Syntax: ACSTD?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “1” for Open, ”2” for Short, “3” for Load, ”4” for Thru, and “5” for Assurance.

Related Commands: ACAA, ACLOAD, ACOPEN, ACSHORT, ACTHRU

ACSW Enter AutoCal switch averaging number **AUTOCAL (Ch 5)**

Syntax: `ACSW Value`
Value: The averaging number between 1 and 16

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\ **AUTOCAL\CHANGE AUTOCAL SETUP\SWITCH AVERAGING**

Related Commands: ACSW?

ACSW? Output AutoCal switch averaging number **AUTOCAL (Ch 5)**

Syntax: `ACSW?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3).

Front Panel Key: Begin Cal\ **AUTOCAL\CHANGE AUTOCAL SETUP\SWITCH AVERAGING**

Related Commands: ACSW

ACTHRU Set AutoCal standard to thru **AUTOCAL (Ch 5)**

Syntax: `ACTHRU`

Front Panel Key: Begin Cal\ **AUTOCAL\THRU TYPE**

Related Commands: ACAA, ACLOAD, ACOPEN, ACSHORT, ACSTD?

ACTU Enter AutoCal thru averaging number **AUTOCAL (Ch 5)**

Syntax: `ACTU Value`
Value: The averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\ **AUTOCAL \CHANGE AUTOCAL SETUP\NUMBER OF AVGS T HR U**

Related Commands: ACTU?, ACTUAVG, ACTUAVG?

ACTU? Output AutoCal thru averaging number **AUTOCAL (Ch 5)**

Syntax: ACTU?

Data I/O: The value is input in ASCII <NR1> format (section 10-3).

Front Panel Key: Begin Cal**\AUTOCAL \CHANGE AUTOCAL SETUP\NUMBER OF AVGS T HR U (Value)**

Related Commands: ACTU, ACTUAVG, ACTUAVG?

ACTUAVG Enter AutoCal thru update averaging number **AUTOCAL (Ch 5)**

Syntax: ACTUAVG Value
Value: The averaging number between 1 and 4096

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal**\AUTOCAL\NUMBER OF AVGS**

Related Commands: ACTU, ACTU?, ACTUAVG?

ACTUAVG? Output AutoCal thru update averaging number **AUTOCAL (Ch 5)**

Syntax: ACTUAVG?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3).

Front Panel Key: Begin Cal**\AUTOCAL\NUMBER OF AVGS**

Related Commands: ACTU, ACTU?, ACTUAVG

ACTULS Apply last thru update cal setup **AUTOCAL (Ch 5)**

Syntax: ACTULS

ACX? Output AutoCal type **AUTOCAL (Ch 5)**

Syntax: `ACX?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “1” for S11 1 Port, ”2” for S22 1 Port, “3” for Full 2 Port, ”4” for Adapter Removal.

Front Panel Key: Begin Cal\AUTOCAL\THRU TYPE

Related Commands: ACADR, ACS11, ACS22, ACSF2P

ADD Select addition as trace math for active channel **DISPLAY (Ch 4)**

Syntax: `ADD`

Remarks: Store trace data to memory. Issue this command then normalize the trace to display the complex addition result of measured data and memory data.

Front Panel Key: Trace Memory\SELECT TRACE MATH\ADD(+)

Related Commands: CH1-CH4, STD, DNM

ADDFC Enter frequency counter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDFC Value Unit(s)`
Value: 1-30
Units: XX1

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Utility Menu\GPIB ADDRESSES\FREQUENCY COUNTER

Related Commands: ADDFC?,ADDPLT,ADDPM,SRC1ADD,SRC2ADD

ADDFC? Output frequency counter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDFC?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu\GPIB ADDRESSES\FREQUENCY COUNTER

Related Commands: ADDFC,ADDPLT?,ADDPM?,SRC1ADD?,SRC2ADD?

ADDHW? Output instrument NI hardware address **ADDRESSING (Ch 8)**

Syntax: ADDHW?

Data I/O: Outputs data the using an <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Utility Menu**\NETWORK SETUP\ETHERNET ADDRESS**

Related Commands: ADDIP?, DEFGT?, SUBMSK?

ADDIP Enter instrument network IP address **ADDRESSING (Ch 8)**

Syntax: ADDIP Value
Value: DOT format string, i.e. “172.26.208.133”

Data I/O: Enter the IP address in <String> data format (section 10-3) .

Front Panel Key: Utility Menu**\NETWORK SETUP\IP ADDRESS**

Related Commands: ADDIP?,DEFGT, SUBMSK

ADDIP? Output instrument network IP address **ADDRESSING (Ch 8)**

Syntax: ADDIP?

Data I/O: Outputs data the using an <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Utility Menu**\NETWORK SETUP\IP ADDRESS**

Related Commands: ADDIP,ADDHW?,DEFGT?,SUBMSK?

ADDPLT Enter plotter GPIB address **ADDRESSING (Ch 8)**

Syntax: ADDPLT Value Unit(s)
Value: 1-30
Units: XX1

Data I/O: The value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Utility Menu**\GPIB ADDRESSES\PLOTTER**

Related Commands: ADDPLT?,ADDFC,ADDPM,SRC1ADD,SRC2ADD

ADDPLT? Output plotter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPLT?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu**GPIB ADDRESSES\\PLOTTER**

Related Commands: ADDPLT,ADDFC?,ADDPM?,SRC1ADD?,SRC2ADD?

ADDPM Enter power meter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPM Value Unit(s)`
Value: 1-30
Units: XX1

Data I/O: The value is input in ASCII<NRf> format (section 10-3).

Front Panel Key: Utility Menu**GPIB ADDRESSES\\POWER METER**

Related Commands: ADDPM?,ADDFC,ADDPLT,SRC1ADD,SRC2ADD

ADDPM? Output power meter GPIB address **ADDRESSING (Ch 8)**

Syntax: `ADDPM?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu**GPIB ADDRESSES\\POWER METER**

Related Commands: ADDPM,ADDFC?,ADDPLT?,SRC1ADD?,SRC2ADD?

ADPL Enter electrical length for adapter removal **ADAPTER REMOVAL (Ch 9)**

Syntax: `ADPL Value Unit(s)`
Value: A number in ASCII <NRF> format (paragraph 10-3)
Units: Units of time: S, MS, US, PS

Front Panel Key: Appl**ADAPTER REMOVAL\\ELECTRICAL LENGTH OF THE ADAPTER**

ADPL? Output electrical length for adapter removal **ADAPTER REMOVAL (Ch 9)**

Syntax: `ADPL?`

Data I/O: Outputs electrical length for adapter removal using ASCII <NRF> format (section 10-3).

Front Panel Key: Appl\ **ADAPTER REMOVAL\ELECTRICAL LENGTH OF THE ADAPTER**

ADRIVE Select the floppy drive as the default drive **DISK FUNCTION (Ch 8)**

Syntax: `ADRIVE`

Remarks: All disk operations which do not specify a drive will be performed on the floppy drive.

Related Commands: CDRIVE, CD, CWD?

AFT Simulate transmission frequency response calibration forward path **CALIBRATION (Ch 5)**

Syntax: `AFT`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1, CON. Also see CFT, OC1

AH0 Turn automatic DUT protection off **MEASUREMENT (Ch 4)**

Syntax: `AH0`

Related Commands: AH1, AHX?

AH1 Turn automatic DUT protection on **MEASUREMENT (Ch 4)**

Syntax: `AH1`

Related Commands: AH0, AHX?

AHX? Output automatic DUT protection on/off status **MEASUREMENT (Ch 4)**

Syntax: `AHX?`

Data I/O: Outputs automatic DUT protection on/off status using ASCII <NR1> format (section 10-3) as follows: “0” for Automatic DUT Protection is off or ”1” for Automatic DUT Protection is on.

Related Commands: AH0, AH1

ALC Perform ALC loop internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: `ALC`

Remarks: For service use only.

AMKR Select active marker on all channels marker mode **MARKERS (Ch 6)**

Syntax: `AMKR`

Related Commands: FMKR, NMKR, SMKR, XMKR?

ANNCOL Enter the color number for annotation and menu text **SYSTEM STATE (Ch 8)**

Syntax: `ANNCOL Value`
Value: 0 to 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\ANNOTATION AND MENU TEXT**

Related Commands: DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, ANNCOL?

ANNCOL? Output the color number for annotation and menu text **SYSTEM STATE (Ch 8)**

Syntax: ANNCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\ANNOTATION AND MENU TEXT**

Related Commands: DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, ANNCOL

AOF Turn averaging off **ENHANCEMENT (Ch 4)**

Syntax: AOF

Remarks: Restarts the sweep. Does not change the currently set number.

Related Commands: AVG, WFS

AOF? Output averaging on/off status **ENHANCEMENT (Ch 4)**

Syntax: AOF?

Data I/O: Outputs a “1” if ON, ”0” if OFF in ASCII <NR1> format (section 10-3).

Related Commands: AOF, AVG

AON Turn averaging on **ENHANCEMENT (Ch 4)**

Syntax: AON

Remarks: Restarts the sweep, but does not change the averaging value that is currently set.

Related Commands: AVG, AOF, WFS

APR Enter group delay aperture setting on active channel **DISPLAY (Ch 4)**

Syntax: `APR Value Unit(s)`
Value: 0.0 to 20.0
Units: XX1, XX3, XM3

Front Panel Key: Set Scale\ **APERTURE X.X PERCENT OF SWEEP**

Related Commands: CH1-CH4, DLA, APR?

APR? Output group delay aperture setting on active channel **DISPLAY (Ch 4)**

Syntax: `APR?`

Data I/O: Outputs value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Set Scale\ **APERTURE X.X PERCENT OF SWEEP**

Related Commands: CH1-CH4, DLA, APR

ARB Simulate reflection only calibration both ports **CALIBRATION (Ch 5)**

Syntax: `ARB`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC6, CON. Also see CRB, OC1-OC6.

ARF Simulate reflection only calibration port 1 **CALIBRATION (Ch 5)**

Syntax: `ARF`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC6, CON. Also see CRB, OC1-OC6.

ARR Simulate reflection only calibration port 2 **CALIBRATION (Ch 5)**

Syntax: `ARR`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1-IC3, CON. Also see CRR, OC1-OC3

ART Simulate trans freq response calibration reverse path **CALIBRATION (Ch 5)**

Syntax: `ART`

Remarks: This command sets the error correction type you wish to simulate; it does not perform a calibration. After issuing this command, input the calibration data arrays you wish to apply to the measured data then issue the CON command to turn on correction.

Related Commands: IC1, CON. Also see CRT, OC1

ASC Autoscale the active channel display **DISPLAY (Ch 4)**

Syntax: `ASC`

Remarks: For best results, wait for a full sweep before issuing command.

Related Commands: CH1-CH4, WFS

ASP Enter polar stop sweep position angle **DISPLAY (Ch 4)**

Syntax: `ASP Value Unit(s)`
Value: -360.00 to 360.00
Units: DEG

Front Panel Key: Set Scale**\SELECT POLAR CHART MODE\STOP ANGLE**

Related Commands: CH1-CH4, PCP, PCS, AST

ASP? Output polar stop sweep position angle **DISPLAY (Ch 4)**

Syntax: `ASP?`

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

Front Panel Key: Set Scale\ **SELECT POLAR CHART MODE\STOP ANGLE**

AST Enter polar start sweep position angle **DISPLAY (Ch 4)**

Syntax: `AST Value Unit(s)`
Value: -360.00 to 360.00
Units: DEG

Front Panel Key: Set Scale\ **SELECT POLAR CHART MODE\START ANGLE**

Related Commands: CH1-CH4, PCP, PCS, ASP

AST? Output polar start sweep position angle **DISPLAY (Ch 4)**

Syntax: `AST?`

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

Front Panel Key: Set Scale\ **SELECT POLAR CHART MODE\START ANGLE**

ATTN Attach next segment and make the active segment **LIMITS (Ch 6)**

Syntax: `ATTN`

Front Panel Key: Limits\ **SEGMENTED LIMITS\DEFINE LOWER (or DEFINE UPPER)\ATTACH NEXT**

Related Commands: CH1-CH4, L01-L10, U01-U10, DIS, BEGN

AVG Enter averaging count and turn on **ENHANCEMENT (Ch 4)**

Syntax: `AVG Value Unit(s)`
Value: 1 to 4095
Units: XX1, XX3, XM3

Remarks: Restarts the sweep.

Front Panel Key: Avg/Smooth Menu\ **AVERAGING**

Related Commands: AOF

AVG? Output averaging count **ENHANCEMENT (Ch 4)**

Syntax: `AVG?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Avg/Smooth Menu\ **AVERAGING**

Related Commands: AOF, AVGCNT?

AVGCNT? Output the current sweep-by-sweep average sweep count **ENHANCEMENT (Ch 4)**

Syntax: `AVGCNT?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3).

Related Commands: AVG, AVG?, AOF, RSTAVG, SWAVG?

BBL Select broadband load for calibration **CALIBRATION (Ch 5)**

Syntax: `BBL`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ LOAD TYPE\ BROADBAND FIXED LOAD**

Related Commands: SLD

BBZ Enter broadband load impedance for calibration **CALIBRATION (Ch 5)**

Syntax: `BBZ Value Unit(s)`
Value: 1.0 to 9999.99
Units: XX1, OHM

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LOAD TYPE\BROADBAND FIXED LOAD

BBZL Enter broadband load inductance for calibration **CALIBRATION (Ch 5)**

Syntax: `BBZL Value Unit(s)`
Value: Inductance value in ASCII <NRF> format (paragraph 10-3).
Units: XX1

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LOAD TYPE\BROADBAND FIXED LOAD\INDUCTANCE

BC0 Turn CRT display off (disabled) **SYSTEM STATE (Ch 8)**

Syntax: `BC0`

Related Commands: BC1, BCX?

BC1 Turn CRT display on (disabled) **SYSTEM STATE (Ch 8)**

Syntax: `BC1`

Related Commands: BC0, BCX?

BCKCOL Enter the color number for background **SYSTEM STATE (Ch 8)**

Syntax: `BCKCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu\COLOR CONFIGURATION\BACKGROUND

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, BCKCOL?

BCKCOL? Output the color number for background **SYSTEM STATE (Ch 8)**

Syntax: BCKCOL?

Data I/O: Outputs the color palette number in ASCII <NR1> format.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\BACKGROUND (Color)**

Related Commands: ANNCOL, DATCOL?, GRTCOL?, LAYCOL, MKRCOL?, MNUCOL?, TRCCOL?, BCKCOL

BCX? Output CRT display on/off status **SYSTEM STATE (Ch 8)**

Syntax: BCX?

Data I/O: Outputs a "1" if ON, "0" if off in ASCII <NR1> format (section 10-3).

Related Commands: BC0, BC1

BD1 Select band 1 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD1

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE\BAND**

Related Commands: SVB, CLB

BD2 Select band 2 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD2

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE\BAND**

Related Commands: SVB, CLB

BD3 Select band 3 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD3

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Front Panel Key: Option Menu\MILLIMETER WAVE BAND DEFINITION\DEFINE\BAND

Related Commands: SVB, CLB

BD4 Select band 4 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD4

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Front Panel Key: Option Menu\MILLIMETER WAVE BAND DEFINITION\DEFINE\BAND

Related Commands: SVB, CLB

BD5 Select band 5 for definition **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: BD5

Remarks: Only commands in Multiple Source group may be issued between BDX and SVB command pairs.

Front Panel Key: Option Menu\MILLIMETER WAVE BAND DEFINITION\DEFINE\BAND

Related Commands: SVB, CLB

BDMM Define Millimeter Wave band equations **MILLIMETER WAVE (Ch 9)**

Syntax: BDMM

Remarks: Send this prior to redefining the equations for Millimeter Wave.

Front Panel Key: Option Menu\TEST SET CONFIG\BROADBAND TEST SET MODULES

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, CLBMM, SVBMM

BEEP0 Disable the instrument beeper on GPIB errors **SYSTEM STATE (Ch 8)**

Syntax: `BEEP0`

Related Commands: BEEP1, BEEPX?

BEEP1 Enable the instrument beeper on GPIB errors **SYSTEM STATE (Ch 8)**

Syntax: `BEEP1`

Related Commands: BEEP0, BEEPX?

BEEPX? Output GPIB beep on error enable/disable status **SYSTEM STATE (Ch 8)**

Syntax: `BEEPX?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “0” for beep disabled or ”1” for beep enabled.

Related Commands: BEEP0, BEEP1

BEG Begin taking calibration data **CALIBRATION (Ch 5)**

Syntax: `BEG`

Remarks: After calibration parameters are configured (see CALIBRATION group), use this command to start measuring calibration standards (data-collection process). The prompt to connect the first standard will be displayed. After prompt's action is carried out, issue commands to take calibration data for that standard and then go to next calibration step.

Status Reporting: Extended Event Status Register bit 0 will be set when all calibration standards have been measured and the entire calibration process is complete.

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\START CAL**

Related Commands: TC1, TC2, TCD, NCS, RPC, KEC

BEGAC Start AutoCal **AUTOCAL (Ch 5)**

Syntax: BEGAC

Front Panel Key: Begin Cal\ **AUTOCAL\ START AUTOCAL**

Related Commands: BEGCH, BEGTU

BEGCH Start AutoCal characterization **AUTOCAL (Ch 5)**

Syntax: BEGCH

Related Commands: BEGAC, BEGTU

BEGN Begin next segment and make it the active segment **LIMITS (Ch 6)**

Syntax: BEGN

Front Panel Key: Limits\ **SEGMENTED LIMITS\ DEFINE LOWER (or DEFINE UPPER)\ BEGIN NEXT**

Related Commands: ATTN

BEGTU Start AutoCal thru update **AUTOCAL (Ch 5)**

Syntax: BEGTU

Front Panel Key: Begin Cal\ **AUTOCAL\ START THRU UPDATE**

Related Commands: BEGAC, BEGCH

BH0 Turn bias off while in hold **MEASUREMENT (Ch 4)**

Syntax: BH0

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\ BIAS HOLD CONDITIONS—BIAS OFF**

Related Commands: BH1, BHX?, HLD

BH1 Turn bias on while in hold **MEASUREMENT (Ch 4)**

Syntax: `BH1`

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\BIAS HOLD CONDITIONS—BIAS ON**

Related Commands: BH0, BHX?, HLD

BHX? Output bias on/off during hold status **MEASUREMENT (Ch 4)**

Syntax: `BHX?`

Data I/O: Output bias on/off during hold status using ASCII <NR1> format (section 10-3): "1" for ON or "0" for OFF.

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\BIAS HOLD CONDITIONS—BIAS (Status)**

Related Commands: BH0, BH1

BMPB Select Black on White as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPB`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE.

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\FORMAT OF PRINTER OUTPUT\BLACK ON WHITE BACKGROUND**

Related Commands: BMPC, BMPT, OBMP, SAVE

BMPC Select Color on White as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPC`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE.

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\FORMAT OF PRINTER OUTPUT\COLOR ON WHITE BACKGROUND**

Related Commands: BMPB, BMPT, OBMP, SAVE

BMPT Select true color as bitmap type **HARD COPY (Ch 8)**

Syntax: `BMPT`

Remarks: Defines the bitmap response type to the mnemonic OBMP or SAVE.

Front Panel Key: Hard Copy Menu**\PRINT OPTIONS\FORMAT OF PRINTER OUTPUT\TRUE COLOR**

Related Commands: BMPB, BMPC, OBMP, SAVE

BPF Enter break point frequency for 3 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `BPF Value Unit(s)`
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Front Panel Key: Begin Cal**\NEXT CAL STEP\INCLUDE ISOLATION\NORMAL (1601 DATA POINTS)\NEXT CAL STEP\LRL/LRM PARAMETERS\TWO BANDS\BREAKPOINT**

BRILL Activate color configuration Brilliant **SYSTEM STATE (Ch 8)**

Syntax: `BRILL`

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\COLOR SCHEMES\BRILLIANT COLORS**

Related Commands: CLASS, INVER, NEWCO, SHARP, SOFTCO, STOCO, RSTCOL

BSP Enter band stop frequency **MILLIMETER WAVE (Ch 9)**

Syntax: `BSP Value Unit(s)`
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Except for band 1, only band stop frequencies can be set. Band start frequencies are automatically set to the previous band's end frequency.

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE BANDS\BAND STOP FREQ**

Related Commands: BST, BSP?

BSP? Output band stop frequency **MILLIMETER WAVE (Ch 9)**

Syntax: `BSP?`

Data I/O: Outputs band stop frequency using ASCII <NR3> format (section 10-3).

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE BANDS\BAND STOP FREQ (Status)**

Related Commands: BST, BSP

BST Enter band start frequency **MILLIMETER WAVE (Ch 9)**

Syntax: `BST Value Unit(s)`
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Only band 1 start frequency can be set. Bands 2-5 automatically start at the end of the previous band.

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE BANDS\BAND START FREQ**

Related Commands: BSP

BST? Output band start frequency **MILLIMETER WAVE (Ch 9)**

Syntax: `BST?`

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

Front Panel Key: Option Menu**\MILLIMETER WAVE BAND DEFINITION\DEFINE BANDS\BAND START FREQ (Status)**

BWL3 Set bandwidth loss value to 3 dB **MARKERS (Ch 6)**

Syntax: `BWL3`

Front Panel Key: Readout Marker**\MARKER READOUT FUNCTIONS\FILTER PARAMETERS\FILTER SETUP\BANDWIDTH LOSS VALUE**

Related Commands: FMKR, BWLS, BWLS?

BWLS Enter bandwidth loss value **MARKERS (Ch 6)**

Syntax: `BWLS Value Unit(s)`

Value: Depends on graph type; refer to Table 11-2 at the end of this chapter

Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Front Panel Key: Readout Marker**\MARKER READOUT FUNCTIONS\FILTER PARAMETERS\FILTER SETUP\BANDWIDTH LOSS VALUE**

Related Commands: FMKR, BWL3, BWLS?

BWLS? Output bandwidth loss value **MARKERS (Ch 6)**

Syntax: `BWLS?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker**\MARKER READOUT FUNCTIONS\FILTER PARAMETERS\FILTER SETUP\BANDWIDTH LOSS VALUE (Status)**

Related Commands: BWL3, BWLS

C12 Select 12 term calibration **CALIBRATION (Ch 5)**

Syntax: `C12`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12 TERM**

C8R Select 1-path 2-port calibration reverse path **CALIBRATION (Ch 5)**

Syntax: `C8R`

Front Panel Key: Begin Cal**\NEXT CAL STEP\1 PATH 2 PORT\REVERSE PATH (S22, S12)**

C8T Select 1-path 2-port calibration forward path **CALIBRATION (Ch 5)**

Syntax: `C8T`

Front Panel Key: Begin Cal**\NEXT CAL STEP\1 PATH 2 PORT\FORWARD PATH (S11, S21)**

CALR Perform receiver cal for gain compression testing **GAIN COMPRESSION (Ch 9)**

Syntax: CALR

Remarks: A receiver calibration is one of the required steps in both swept frequency and swept power gain compression testing.

Front Panel Key: Appl**SWEPT POWER GAIN COMPRESSION\\MORE\\GAIN COMPRESSION**

Related Commands: SFGCA, SPGCA, NRMS, UNDOGC

CAS Clear active segmented limit vertical/horizontal definitions **LIMITS (Ch 6)**

Syntax: CAS

Front Panel Key: Limits**SEGMENTED LIMITS\\DEFINE LOWER (or DEFINE UPPER)\\CLEAR SEGMENT**

CBT Select trans freq response calibration forward and reverse **CALIBRATION (Ch 5)**

Syntax: CBT

Front Panel Key: Begin Cal**NEXT CAL STEP\\TRANSMISSION FREQUENCY RESPONSE\\BOTH PATHS (S21, S12)**

CC0 Enter capacitance coefficient 0 for open **CALIBRATION (Ch 5)**

Syntax: CC0 Value Unit(s)
Value: -9999.99 to 9999.99
Units: XX1

Front Panel Key: Begin Cal**NEXT CAL STEP\\FULL 12-TERM\\INCLUDE ISOLATION\\NORMAL\\NEXT CAL STEP\\PORT 1 CONN (or PORT 2 CONN)\\USER DEFINED\\TERM1-C0**

Related Commands: P1C, P2C

CC1 Enter capacitance coefficient 1 for open **CALIBRATION (Ch 5)**

Syntax: `CC1 Value Unit(s)`
Value: -9999.99 to 9999.99
Units: XX1

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\USER DEFINED\TERM2-C1**

Related Commands: P1C, P2C

CC2 Enter capacitance coefficient 2 for open **CALIBRATION (Ch 5)**

Syntax: `CC2 Value Unit(s)`
Value: -9999.99 to 9999.99
Units: XX1

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\USER DEFINED\TERM3-C2**

Related Commands: P1C, P2C

CC3 Enter capacitance coefficient 3 for open **CALIBRATION (Ch 5)**

Syntax: `CC3 Value Unit(s)`
Value: -9999.99 to 9999.99
Units: XX1

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\USER DEFINED\TERM4-C3**

Related Commands: P1C, P2C

CCD Collect corrected data in an internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `CCD`

Remarks: Sets up an internal buffer to collect Corrected Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CRD, CFD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CD Change default directory **DISK FUNCTION (Ch 8)**

Syntax: `CD Value`

Value: Value 1 is in <String> data format (paragraph 10-3) that contains the path specification to the subdirectory in question

Related Commands: ADRIVE, CDRIVE, CWD?

CDRIVE Select the hard disk as the default drive **DISK FUNCTION (Ch 8)**

Syntax: `CDRIVE`

Remarks: All disk operations which do not specify a drive will be performed on the hard drive.

Related Commands: ADRIVE, CD, CWD?

CF1 Select female 1.0 mm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CF1`

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN\W1-CONN (F)**

Related Commands: DF1, P1C, P2C

CF2 Select female 2.4mm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CF2`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\2.4mm (F)**

Related Commands: P1C, P2C

CF3 Select female GPC-3.5 connector for current port **CALIBRATION (Ch 5)**

Syntax: CF3

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\GPC-3.5 (F)**

Related Commands: P1C, P2C

CF716 Select female 7/16 connector for current port **CALIBRATION (Ch 5)**

Syntax: CF716

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN\MORE\7/16 (F)**

Related Commands: DF716, P1C, P2C

CFC Select female TNC connector for current port **CALIBRATION (Ch 5)**

Syntax: CFC

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TNC (F)**

Related Commands: P1C, P2C

CFD Collect final data in an internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: CFD

Remarks: Sets up an internal buffer to collect Final Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CRD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CFK Select female K connector for current port **CALIBRATION (Ch 5)**

Syntax: `CFK`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\K-CONN (F)**

Related Commands: P1C, P2C

CFN Select female Type N connector for current port **CALIBRATION (Ch 5)**

Syntax: `CFN`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TYPE N (F)**

Related Commands: P1C, P2C

CFN75 Select Female type N 75-ohm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CFN75`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TYPE N (F) 75**

Related Commands: P1C, P2C

CFS Select female SMA connector for current port **CALIBRATION (Ch 5)**

Syntax: `CFS`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (F)**

Related Commands: P1C, P2C

CFSP Select Special Female connector for current port **CALIBRATION (Ch 5)**

Syntax: CFSP

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SPECIAL (F)**

Related Commands: P1C, P2C

CFSPA Select Band A special female connector for current port **CALIBRATION (Ch 5)**

Syntax: CFSPA

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN or PORT 2 CONN\SPECIAL A (F)**

Related Commands: DOASF, P1C, P2C

CFSPB Select Band B special female connector for current port **CALIBRATION (Ch 5)**

Syntax: CFSPB

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN or PORT 2 CONN\SPECIAL B (F)**

Related Commands: DOBSF, P1C, P2C

CFSPC Select Band C special female connector for current port **CALIBRATION (Ch 5)**

Syntax: CFSPC

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN or PORT 2 CONN\SPECIAL C (F)**

Related Commands: DOCSF, P1C, P2C

CFT Select trans freq response calibration forward path **CALIBRATION (Ch 5)**

Syntax: CFT

Front Panel Key: Begin Cal\NEXT CAL STEP\TRANSMISSION FREQUENCY RESPONSE\FORWARD PATH (S21)

CFV Select female V connector for current port **CALIBRATION (Ch 5)**

Syntax: CFV

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\V-CONN (F)

Related Commands: P1C, P2C

CH1 Make channel 1 the active channel **CHANNELS (Ch 4)**

Syntax: CH1

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Front Panel Key: Ch 1

Related Commands: CHX?, WFS

CH2 Make channel 2 the active channel **CHANNELS (Ch 4)**

Syntax: CH2

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Front Panel Key: Ch 2

Related Commands: CHX?, WFS

CH3 Make channel 3 the active channel **CHANNELS (Ch 4)**

Syntax: `CH3`

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad), however, will be maintained.

Front Panel Key: Ch 3

Related Commands: CHX?, WFS

CH4 Make channel 4 the active channel **CHANNELS (Ch 4)**

Syntax: `CH4`

Remarks: If channel to be activated is not currently displayed, the sweep will be restarted with the requested active channel displayed. The channel display mode (single, dual, dual overlaid, or quad) however, will be maintained.

Front Panel Key: Ch 4

Related Commands: CHX?, WFS

CHX? Output active channel number **CHANNELS (Ch 4)**

Syntax: `CHX?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

CL0 Enter inductive coefficient 0 for short **CALIBRATION (Ch 5)**

Syntax: `CL0 Value Unit(s)`
Value: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E02 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (section 10-3).

CL1 Enter inductive coefficient 1 for short **CALIBRATION (Ch 5)**

Syntax: `CL1 Value Unit(s)`
Value: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-24 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (section 10-3).

CL2 Enter inductive coefficient 2 for short **CALIBRATION (Ch 5)**

Syntax: `CL2 Value Unit(s)`
Value: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-33 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (section 10-3).

CL3 Enter inductive coefficient 3 for short **CALIBRATION (Ch 5)**

Syntax: `CL3 Value Unit(s)`
Value: Coefficient number
Units: XX1

Remarks: The coefficient is that number which when multiplied by 1.0*E-42 yields the inductance value.

Data I/O: Enter the coefficient in ASCII <NRF> format (section 10-3).

CLASS Activate color configuration Classic **SYSTEM STATE (Ch 8)**

Syntax: `CLASS`

Front Panel Key: Utility Menu\COLOR CONFIGURATION\COLOR SCHEMES\CLASSIC COLORS

Related Commands: BRILL, INVER, NEWCO, SHARP, SOFTCO, STOCO, RSTCOL

CLB Clear all multiple source band definitions **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `CLB`

Front Panel Key: Option Menu\ **MILLIMETER WAVE BAND DEFINITION\DEFINE\CLEAR ALL DEFINITIONS**

CLBMM Clear the new Millimeter Wave band definitions **MILLIMETER WAVE (Ch 9)**

Syntax: `CLBMM`

Remarks: Sets the Millimeter Wave band definitions to the default values.

Front Panel Key: Option Menu\ **MILLIMETER WAVE BAND DEFINITION\DEFINE\CLEAR ALL DEFINITIONS**

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, BDMM, SVBMM

CM Suffix sets distance data type and scales by 1E-2 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `CM`

Related Commands: CMT

CM1 Select male 1.0 mm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CM1`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN\W1-CONN (M)**

Related Commands: DM1, P1C, P2C

CM2 Select male 2.4mm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CM2`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\2.4mm (M)**

Related Commands: P1C, P2C

CM3 Select male GPC-3.5 connector for current port **CALIBRATION (Ch 5)**

Syntax: `CM3`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\GPC-3.5 (M)**

Related Commands: P1C, P2C

CM716 Select male 7/16 connector for current port **CALIBRATION (Ch 5)**

Syntax: `CM716`

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\PORT 1 CONN\MORE\7/16 (M)**

Related Commands: DM716, P1C, P2C

CMC Select male TNC connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMC`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TNC (M)**

Related Commands: P1C, P2C

CMK Select male K connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMK`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\K-CONN (M)**

Related Commands: P1C, P2C

CMN Select male N connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMN`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TYPE N (M)

Related Commands: P1C, P2C

CMN75 Select Male type N 75-Ohm connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMN75`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\TYPE N (M) 75

Related Commands: P1C, P2C

CMS Select male SMA connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMS`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (M)

Related Commands: P1C, P2C

CMSP Select Special Male connector for current port **CALIBRATION (Ch 5)**

Syntax: `CMSP`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SPECIAL (M)

Related Commands: P1C, P2C

CMSPA Select Band A special male connector for current port **CALIBRATION (Ch 5)**

Syntax: CMSPA

Front Panel Key: Begin Cal**NEXT CAL STEP\\ENTER (to select CAL TYPES and SETUPS)\\NEXT CAL STEP\\PORT 1 CONN or PORT 2 CONN\\SPECIAL A (M)**

Related Commands: DOASM, P1C, P2C

CMSPB Select Band B special male connector for current port **CALIBRATION (Ch 5)**

Syntax: CMSPB

Front Panel Key: Begin Cal**NEXT CAL STEP\\ENTER (to select CAL TYPES and SETUPS)\\NEXT CAL STEP\\PORT 1 CONN or PORT 2 CONN\\SPECIAL B (M)**

Related Commands: DOBSM, P1C, P2C

CMSPC Select Band C special male connector for current port **CALIBRATION (Ch 5)**

Syntax: CMSPC

Front Panel Key: Begin Cal**NEXT CAL STEP\\ENTER (to select CAL TYPES and SETUPS)\\NEXT CAL STEP\\PORT 1 CONN or PORT 2 CONN\\SPECIAL C (M)**

Related Commands: DOCSM, P1C, P2C

CMT Suffix sets distance data type and scales by 1E-2 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: CMT

Related Commands: CM

CMV Select male V connector for current port **CALIBRATION (Ch 5)**

Syntax: CMV

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ PORT 1 CONN (or PORT 2 CONN)\ V-CONN (M)**

Related Commands: P1C, P2C

CMX? Output calibration method **CALIBRATION (Ch 5)**

Syntax: CMX?

Data I/O: Output calibration method using ASCII <NR1> format (section 10-3). Outputs as follows: “1” for Standard OSL, ”2” for Offset-Short or “3” for LRL/LRM.

Front Panel Key: Begin Cal\ **CAL METHOD**

CND Select user specified connector for current port **CALIBRATION (Ch 5)**

Syntax: CND

Remarks: Enter specifications of the standard devices to be used during the calibration.

Related Commands: P1C, P2C, CC0-CC3, COO, COS

CNG Select GPC-7 connector for current port **CALIBRATION (Ch 5)**

Syntax: CNG

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ PORT 1 CONN (or PORT 2 CONN)\ GPC-7**

Related Commands: P1C, P2C

CNTR Enter center frequency **MEASUREMENT (Ch 4)**

Syntax: `CNTR Value Unit(s)`

Value: Can be any frequency from the lower frequency limit to the higher frequency limit of the 37XXXD.

Units: HZ, KHZ, MHZ, GHZ

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ SET CENTER/SPAN\ CENTER** or Setup Menu\ **SET CENTER/SPAN\ CENTER**

Related Commands: CNTR?, SPAN, SPAN?, SRT, SRT?, STP, STP?

CNTR? Output center frequency **MEASUREMENT (Ch 4)**

Syntax: `CNTR?`

Data I/O: Output center frequency using ASCII <NR3> format (paragrah 11-3).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ SET CENTER/SPAN\ CENTER** or Setup Menu\ **SET CENTER/SPAN\ CENTER (Frequency)**

Related Commands: CNTR, SPAN, SPAN?, SRT, SRT?, STP, STP?

COF Turn error correction off **CALIBRATION (Ch 5)**

Syntax: `COF`

Remarks: Restarts the sweep.

Front Panel Key: Apply Cal\ **APPLY CALIBRATION OFF**

Related Commands: CON, CON?

CON Turn error correction on **CALIBRATION (Ch 5)**

Syntax: `CON`

Remarks: Restarts the sweep.

Front Panel Key: Apply Cal\ **APPLY CALIBRATION ON**

Related Commands: COF, CON?

CON? Output error correction on/off status **CALIBRATION (Ch 5)**

Syntax: `CON?`

Data I/O: Output error correction on/off status using ASCII <NR1> format (section 10-3): "1" for ON or "0" for OFF.

Front Panel Key: Apply Cal**\APPLY CALIBRATION**

Related Commands: CON, COF

COO Enter offset for open for user specified connector (Standard Calibration) **CALIBRATION (Ch 5)**

Syntax: `COO Value Unit(s)`
Value: -999.9999 to 999.9999 (meters)
Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 OPEN (or PORT 2 OPEN)\PORT 1 CONN (or PORT 2 CONN)\USER DEFINED\ENTER THE OFFSET LENGTH**

COPY Copy a files contents to another file **DISK FUNCTION (Ch 8)**

Syntax: `COPY Value 1, Value 2`
Value: Value 1 is in <String> data format (paragraph 10-3) that specifies the path and filename for the source file. Value 2 is in <string> data format that specifies the path and filename of the target file

Front Panel Key: Hard Copy Menu**\DISK OPERATIONS\TABULAR DATA FROM HARD DISK TO PRINTER (or TABULAR DATA FROM FLOPPY DISK TO PRINTER\FILE (1 thru 8)**

Related Commands: DEL

COS Enter offset for short for user specified connector **CALIBRATION (Ch 5)**

Syntax: COS Value Unit(s)

Value: -999.999 to 999.999(meters)

Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 SHORT (or PORT 2 SHORT)\PORT 1 CONN (or PORT 2 CONN)\USER DEFINED\ENTER THE OFFSET LENGTH**

CRB Select reflection only calibration both ports **CALIBRATION (Ch 5)**

Syntax: CRB

Front Panel Key: Begin Cal**\NEXT CAL STEP\REFLECTION ONLY\BOTH PORTS (S11, S22)**

CRD Collect raw data in an internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: CRD

Remarks: Sets up an internal buffer to collect Raw Data.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CXD?, DCCTN, DCCTN?, DCHLD, DCMRK, DCOFF

CRF Select reflection only calibration port 1 **CALIBRATION (Ch 5)**

Syntax: CRF

Front Panel Key: Begin Cal**\NEXT CAL STEP\REFLECTION ONLY\PORT 1 ONLY (S11)**

Related Commands: CRR

CRR Select reflection only calibration port 2 **CALIBRATION (Ch 5)**

Syntax: CRR

Front Panel Key: Begin Cal**NEXT CAL STEP\\REFLECTION ONLY\\PORT 2 ONLY (S22)**

Related Commands: CRF

CRT Select trans freq response calibration reverse path **CALIBRATION (Ch 5)**

Syntax: CRT

Front Panel Key: Begin Cal**NEXT CAL STEP\\TRANSMISSION FREQUENCY RESPONSE\\REVERSE PATH (S12)**

CSB Clear status bytes and structures (same as *CLS) **STATUS REPORTING (Ch 7)**

Syntax: CSB

Related Commands: *CLS

CSF? Output cal start frequency **CALIBRATION (Ch 5)**

Syntax: CSF?

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

CSL Clear service log **SERVICE LOG (Ch 8)**

Syntax: CSL

Remarks: This command will erase permanently any error messages in the service log. Typically for service use only.

Related Commands: OEL, OSL, SSL, PSL, ONE

CTF? Output cal stop frequency **CALIBRATION (Ch 5)**

Syntax: CTF?

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

CTN Continue sweeping from current point **MEASUREMENT (Ch 4)**

Syntax: `CTN`

Remarks: Takes the instrument out of hold mode and continues sweeping from the current frequency.

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\ CONTINUE**

Related Commands: HLD, TRS

CWC Select CW frequency calibration data points **CALIBRATION (Ch 5)**

Syntax: `CWC`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ C.W. (1 POINT)**

Related Commands: CWF, NOC, TDC, DFC

CWD? Output current working directory string **DISK FUNCTION (Ch 8)**

Syntax: `CWD?`

Data I/O: Outputs a string in <Arbitrary ASCII> format which contains the complete path including the drive letter.

Related Commands: ADRIVE, CDRIVE, CD

CWDEC Subtract 1 from the current CW index **MEASUREMENT (Ch 4)**

Syntax: `CWDEC`

Related Commands: CWINC, CWN2I

CWF Enter CW frequency and turn CW on **MEASUREMENT (Ch 4)**

Syntax: `CWF Value Unit(s)`
Value: CW frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Restarts the sweep.

Front Panel Key: Begin Cal\ **AUTOCAL\NEXT CAL STEP\FULL 12 TERM\INCLUDE ISOLATION\C.W. (1 POINT)\C.W. FREQ** or Setup Menu\ **C.W. MODE ON**

Related Commands: WFS, SWP, SRT, STP

CWF2I? Output index for frequency given **MEASUREMENT (Ch 4)**

Syntax: `CWF2I?`

Remarks: Outs a number in ASCII <NRf> format (paragraph 10-3) for the frequency in question.

Data I/O: The index of the closest frequency in the current frequency table is output in ASCII <NR1> format (section 10-3).

Related Commands: CWI2F?

CWF? Output CW frequency **MEASUREMENT (Ch 4)**

Syntax: `CWF?`

Data I/O: Outputs value in ASCII <NR3> format (section 10-3).

CWI Enter index for CW frequency and turn CW on **MEASUREMENT (Ch 4)**

Syntax: `CWI Value`
Value: 0 to the number of points in sweep -1

Data I/O: Value is input in ASCII <NRf> format (section 10-3).

CWI2F? Output frequency for index given **MEASUREMENT (Ch 4)**

Syntax: `CWI2F?`

Remarks: Outputs 0 to the number of points in sweep -1

Data I/O: Val1 is input in ASCII <NRf> format and frequency is output in ASCII <NR3> format (section 10-3).

Related Commands: CWF2I?

CWI? Output current index number **MEASUREMENT (Ch 4)**

Syntax: `CWI?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

CWINC Add 1 to the current CW index **MEASUREMENT (Ch 4)**

Syntax: `CWINC`

Related Commands: CWDEC, CWN2I

CWN2I Add N to the current CW index **MEASUREMENT (Ch 4)**

Syntax: `CWN2I Value`
Value: (+/-) the number of points in sweep -1

Data I/O: Value is input in ASCII <NRf> format (section 10-3).

CWON Turn CW on at current CW frequency **MEASUREMENT (Ch 4)**

Syntax: `CWON`

Remarks: Restarts the sweep.

Front Panel Key: Setup Menu\ **C.W. MODE ON**

Related Commands: CWF

CWON? Output CW on/off status **MEASUREMENT (Ch 4)**

Syntax: `CWON?`

Data I/O: Outputs CW on/off status using ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Setup Menu\ **C.W. MODE**

CWP Enter number of points drawn in CW **MEASUREMENT (Ch 4)**

Syntax: `CWP Value Unit(s)`
Value: 1 to 1601
Units: XX1

Remarks: This is a CW “sweep” mode where the data trace represents consecutive measurements at the same CW frequency. Restarts the sweep.

Front Panel Key: Setup Menu\ **POINTS DRAWN IN CW**

Related Commands: WFS, DD0, DD1, CWF, SWP

CWP? Output number of points drawn in CW **MEASUREMENT (Ch 4)**

Syntax: `CWP?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Setup Menu\ **POINTS DRAWN IN CW**

CWSRT Set CW frequency to the start frequency **MEASUREMENT (Ch 4)**

Syntax: `CWSRT`

CWSTP Set CW frequency to the stop frequency **MEASUREMENT (Ch 4)**

Syntax: `CWSTP`

CXD? Output internal buffer data collection mode **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `CXD?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: "0" for No Collection Mode, "1" for Raw Data Collection, "2" for Corrected Data Collection, or "3" for Final Data Collection.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CRD, DCOFF

CXX? Output calibration type **CALIBRATION (Ch 5)**

Syntax: `CXX?`

Data I/O: Outputs calibration type using ASCII <NR1> format (section 10-3), as follows: "0" for None, "1" for 12 Term, "2" for 8 Term FWD, "3" for 8 Term REV, "4" for Transmission FWD, "5" for Transmission REV, "6" for Transmission FWD & REV, "7" for Reflection FWD, "8" for Reflection REV, or "9" for Reflection FWD & REV).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\TRANSMISSION FREQUENCY RESPONSE\SELECT TRANSMISSION FREQ RESPONSE CALIBRATION TYPE (or SELECT REFLECTION ONLY CALIBRATION TYPE)**

D13 Display channels 1 & 3 **CHANNELS (Ch 4)**

Syntax: `D13`

Remarks: Restarts the sweep.

Front Panel Key: Channels Menu\ **DUAL CHANNELS 1&3**

Related Commands: WFS, T13

D14 Display all four channels **CHANNELS (Ch 4)**

Syntax: `D14`

Remarks: Restarts the sweep.

Front Panel Key: Channels Menu\ **ALL FOUR CHANNELS**

Related Commands: WFS

D24 Select dual channel display with channels 2 & 4 **CHANNELS (Ch 4)**

Syntax: `D24`

Remarks: Restarts the sweep.

Front Panel Key: Channels Menu\ **DUAL CHANNELS 2&4**

Related Commands: WFS, T24

DA1 Select a1 = Ra as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DA1`

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\DENOMINATOR a1)**

Related Commands: DA2, DB1, DB2, DE1, DEN?

DA2 Select a2 = Rb as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DA2`

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\DENOMINATOR a2)**

Related Commands: DA1, DB1, DB2, DE1, DEN?

DAT Display data only on active channel **DISPLAY (Ch 4)**

Syntax: `DAT`

Front Panel Key: Trace Memory\ **VIEW DATA**

Related Commands: DNM

DAT? Output trace memory display mode **DISPLAY (Ch 4)**

Syntax: `DAT?`

Data I/O: Output trace memory display mode using ASCII <NR1> format (section 10-3), as follows: “1” for Data ”2” for Memory, “3” for Data & Memory, or ”4” for Data With Memory Mathematically Combined.

Front Panel Key: Trace Memory\ **VIEW DATA (Status)**

Related Commands: MTH?

DATCOL Enter the color number for data **SYSTEM STATE (Ch 8)**

Syntax: `DATCOL Value`
Value: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\ DATA**

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, DATCOL?

DATCOL? Output the color number for data **SYSTEM STATE (Ch 8)**

Syntax: `DATCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format.

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\ DATA (Color)**

Related Commands: ANNCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, DATCOL

DATE Enter the system date **SYSTEM STATE (Ch 8)**

Syntax: `DATE Value 1, Value 2, Value 3`

Value: Value 1, Value 2 and Value 3 are in ASCII <NRF> format (paragraph 10-3)

Remarks: val1 is the month (1 - 12), val2 is the day (1 - 31) and val3 is the year (0 - 99). Notice the comma separators. This modifies the system date stored on the processor board.

Front Panel Key: Utility Menu **\ SET DATE/TIME \ DAY/MONTH/YEAR**

Related Commands: DATE?, TIME, TIME?

DATE? Output the system date **SYSTEM STATE (Ch 8)**

Syntax: `DATE?`

Data I/O: The date is output using ASCII <NR1> format (section 10-3). It uses three numbers separated by commas. The first is the month (1 - 12), the second is the day (1 - 31), and the third is the year (0 - 99).

Front Panel Key: Utility Menu **\ SET DATE/TIME \ DAY/MONTH/YEAR (Current)**

Related Commands: DATE, TIME, TIME?

DB Suffix sets power data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `DB`

Related Commands: DBL, DBM

DB1 Select b1 = Ta as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DB1`

Front Panel Key: S Params **\ PRESS <1> TO REDEFINE SELECTED PARAMETER \ PHASE LOCK (or USER LABEL \ DENOMINATOR b1)**

Related Commands: DA1, DA2, DB2, DE1, DEN?

DB2 Select b2 = Tb as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DB2`

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\DENOMINATOR db2)**

Related Commands: DA1, DA2, DB1, DE1, DEN?

DBL Suffix sets power data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `DBL`

Related Commands: DB, DBM

DBM Suffix sets power data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `DBM`

Related Commands: DB, DBL

DBP Select distance bandpass mode for active channel **DIAGNOSTICS (Ch 8)**

Syntax: `DBP`

DC1 Display channel 1 and 2 operating parameters **SYSTEM STATE (Ch 8)**

Syntax: `DC1`

Front Panel Key: Utility Menu\ **DISPLAY INSTRUMENT STATE PARAMS\CHANNEL 1&2**

DC3 Display channel 3 and 4 operating parameters **SYSTEM STATE (Ch 8)**

Syntax: `DC3`

Front Panel Key: Utility Menu\ **DISPLAY INSTRUMENT STATE PARAMS\CHANNEL 3&4**

DCA Select automatic DC term calculation for lowpass **DIAGNOSTICS (Ch 8)**

Syntax: DCA

Front Panel Key: Domain\ **SET RANGE\MORTE\SET D.C. TERM\AUTO EXTRAPOLATE**

DCCTN Resume internal buffer data collection **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCCTN

Remarks: Used to commence data collection after a collection mode is set or to resume data collection after being paused with DCHLD.

Related Commands: CCD, CFD, CRD, DCCTN?, DCHLD

DCCTN? Output internal buffer data collection resume/suspend status **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCCTN?

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for Data Collection is Suspended, ”1” for Data Collection is Active.

Related Commands: DCCTN, DCHLD

DCHLD Suspend internal buffer data collection **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: DCHLD

Remarks: Internal buffer data collection will be temporarily suspended to allow parameter changes to be performed.

Related Commands: DCCTN, DCCTN?

DCMRK Inserts the mark value into the internal buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCMRK Value Unit(s)`
Value: Mark value
Units: Optionally, any of the terminator mnemonics currently supported

Remarks: The value of the number will be inserted as the real portion of the number inserted in the buffer. The imaginary part of the number will be zero. This is to allow the user to mark a spot in the buffer for synchronization and separation.

Data I/O: Enter as an ASCII <NRf> number (section 10-3).

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: DCCTN, DCHLD

DCO Select open for DC term for lowpass **DIAGNOSTICS (Ch 8)**

Syntax: `DCO`

Front Panel Key: Domain**\SET RANGE\MORTE\SET D.C. TERM\OPEN**

DCOFF Turn internal buffer data collection mode off **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCOFF`

Remarks: The internal buffer and all data will be deleted.

Related Commands: CCD, CFD, CRD, CXD?

DCP Display calibration parameters 1st page **SYSTEM STATE (Ch 8)**

Syntax: `DCP`

Front Panel Key: Utility Menu**\DISPLAY INSTRUMENT STATE PARAMS\CALIBRATION**

DCP1 Display calibration parameters 1st page **SYSTEM STATE (Ch 8)**

Syntax: `DCP1`

DCP2 Display calibration parameters 2nd page **SYSTEM STATE (Ch 8)**

Syntax: `DCP2`

DCPCUR? Outputs the current point count in the collect buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCPCUR?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: DCPMAX?, CRD, CCD, CFD, OCS

DCPMAX? Outputs the maximum number of points that can be collected in the collect buffer **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: `DCPMAX?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: DCPCUR?, CRD, CCD, CFD, OCS

DCS Select short for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: `DCS`

Front Panel Key: Domain **\SET RANGE\MORTE\SET D.C. TERM\SHORT**

DCV Enter value for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: `DCV Value Unit(s)`
Value: -999.999 to 999.999
Units: XX1, XX3, XM3

Front Panel Key: Domain **\SET RANGE\MORTE\SET D.C. TERM\OTHER**

Related Commands: DCV

DCV? Output lowpass DC term value **TIME DOMAIN (Ch 9)**

Syntax: `DCV?`

Data I/O: Outputs the value in ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ MORTE\ SET D.C. TERM\ OTHER**

Related Commands: DCV

DCX? Output lowpass DC term selection **TIME DOMAIN (Ch 9)**

Syntax: `DCX?`

Data I/O: Outputs lowpass DC term selection using ASCII <NR3> format, as follows: “0” fcor Value, ”1” for Auto, “2” for Line Impedence, ”3” for Open, or “4” for Short.

Front Panel Key: Domain\ **SET RANGE\ MORTE\ SET D.C. TERM\ REFLECTION COEFFICIENT**

Related Commands: DCA, DCO, DCS, DCV, DCZ

DCZ Select line impedance for DC term for lowpass **TIME DOMAIN (Ch 9)**

Syntax: `DCZ`

Front Panel Key: Domain\ **SET RANGE\ MORTE\ SET D.C. TERM\ LINE IMPEDANCE**

DD0 Turn data drawing off **SYSTEM STATE (Ch 8)**

Syntax: `DD0`

Front Panel Key: Utility Menu\ **DATA DRAWING OFF**

DD1 Turn data drawing on **SYSTEM STATE (Ch 8)**

Syntax: `DD1`

Front Panel Key: Utility Menu\ **DATA DRAWING ON**

DD1? Output data drawing on/off status **SYSTEM STATE (Ch 8)**

Syntax: DD1?

Data I/O: Outputs data drawing on/off status using ASCII <NR1> format (section 10-3), as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Utility Menu\ **DATA DRAWING**

DDX? Output active channel domain parameter frequency distance or time **TIME DOMAIN (Ch 9)**

Syntax: DDX?

Data I/O: Outputs selection value in ASCII <NR3> format, as follows: “0” for Frequency, ”1” for Time, or “2” for Distance.

Related Commands: TDDIST, TDTIME, TDDIST?

DE1 Select unity as denominator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: DE1

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\DENOMINATOR UNITY)**

Related Commands: DA1, DA2, DB1, DB2, DEN?

DEFGT Enter instrument default gateway IP address **ADDRESSING (Ch 8)**

Syntax: DEFGT Value
Value: DOT format string i.e. “172.26.208.1”

Remarks: Entering an invalid Default Gateway Address may cause the instrument to hang up when booting up.

Data I/O: Enter the IP address in <String> data format (section 10-3) .

Front Panel Key: Utility Menu\ **NETWORK SETUP\DEFAULT GATEWAY**

Related Commands: ADDIP,DEFGT?,SUBMSK

DEFGT? Output instrument default gateway IP address **ADDRESSING (Ch 8)**

Syntax: `DEFGT?`

Data I/O: Outputs data the using an <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Utility Menu\NETWORK SETUP\DEFAULT GATEWAY

Related Commands: ADDHW?,ADDIP?,DEFGT,SUBMSK?

DEG Suffix sets phase data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `DEG`

DEL Delete a file from disk **DISK FUNCTION (Ch 8)**

Syntax: `DEL Value`
Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and filename of the file to be deleted.

Related Commands: COPY

DEN? Output denominator selection for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `DEN?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows: “1” for Unity, ”2” for a1, “3” for a2, ”4” for b1, or “5” for b2.

Related Commands: DA1, DA2, DB1, DB2, DE1

DF1 Display 1.0 mm female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DF1`

Front Panel Key: Utility Menu\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OPEN & SHORT INFORMATION\W1-CONN (F)

Related Commands: CF1, P1C, P2C

DF2 Display 2.4mm female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DF2`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\2.4 mm (F)**

DF3 Display GPC-3.5 female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DF3`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\GPC-3.5 (F)**

DF716 Display 7/16 female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DF716`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL OPEN & SHORT INFORMATION\7/16 (F)**

Related Commands: CF716, P1C, P2C

DFC Select discrete frequency calibration data points **CALIBRATION (Ch 5)**

Syntax: `DFC`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)**

Related Commands: CWC, TDC, NOC, IFV, Discrete frequency list commands in MEASUREMENT group: DFQ, DFD, FRS, FRI, FRP, FIL, FRC.DFD, FRS, FRI, FRP, FIL, FRC.

DFD Done specifying discrete frequency ranges **CALIBRATION (Ch 5)**

Syntax: `DFD`

Remarks: Requires at least two points to have been entered. See MEASUREMENT/DISCRETE FREQUENCY LIST description.

DFK Display K female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFK`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\K-CONN (F)**

DFN Display N female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFN`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\TYPE N (F)**

DFN75 Display N Female 75-Ohm connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFN75`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\TYPE N (F) 75**

DFP Display Front panel instrument state **SYSTEM STATE (Ch 8)**

Syntax: `DFP`

Front Panel Key: Utility Menu**\DISPLAY INSTRUMENT STATE PARAMS\OP-ERATING**

DFQ Enter single discrete frequency **CALIBRATION (Ch 5)**

Syntax: `DFQ Value Unit(s)`
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: The frequency must be within start sweep freqency and stop sweep frequency.

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\INDIVIDUAL FREQ INSERT**

DFS Display SMA female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFS`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\SMA (F)**

DFSP Display Special Female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFSP`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\SPECIAL (F)**

DFT Display TNC female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFT`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\TNC (F)**

DFV Display V female connector information **SYSTEM STATE (Ch 8)**

Syntax: `DFV`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\V-CONN (F)**

DG7 Display GPC-7 Male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DG7`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\GPC-7**

DGS Display GPIB status information **SYSTEM STATE (Ch 8)**

Syntax: `DGS`

Front Panel Key: Utility Menu**\DISPLAY INSTRUMENT STATE PARAMS\SYSTEM**

DGT Display 1st CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT`

Remarks: For service use only (same as DGT1).

DGT1 Display 1st CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT1`

Remarks: For service use only.

DGT2 Display 2nd CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT2`

Remarks: For service use only.

DGT3 Display 3rd CRT test pattern **PERIPHERAL TESTS (Ch 8)**

Syntax: `DGT3`

Remarks: For service use only.

DIA Select air as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIA`

Remarks: Value is set to air dielectric value (1.000649). Value Impacts time domain distance calculations and reference plane position settings.

Front Panel Key: Ref Plane\ **SET DIELECTRIC\AIR**

DIE Enter a dielectric value **DISPLAY (Ch 4)**

Syntax: `DIE Value Unit(s)`
Value: 1 to 999.999
Units: XX1, XX3, XM3

Remarks: Impacts time domain distance calculations and reference plane position settings.

Front Panel Key: Ref Plane\ **SET DIELECTRIC\OTHER**

DIM Select microporous teflon as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIM`

Remarks: Value set to microporous teflon dielectric value (1.69). Value impacts time domain distance calculations and reference plane position settings.

Front Panel Key: Ref Plane\ **SET DIELECTRIC\ MICROPOROUS TEFLON**

DIP Select polyethylene as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIP`

Remarks: Value set to polyethylene dielectric value (2.26). Value impacts time domain distance calculations and reference plane position settings.

Front Panel Key: Ref Plane\ **SET DIELECTRIC\ POLYETHYLENE**

DIR Output a directory listing to the GPIB **DISK FUNCTION (Ch 8)**

Syntax: `DIR Value`
Value: Value 1 is in <String> data format (paragraph 10-3) that specifies the path to the directory in question and may contain a filename filter with wildcards.

Data I/O: Outputs data in an <Arbitrary Block> format (section 10-3) containing a heavily formatted ASCII listing similar to one obtained from a DOS-based machine.

Front Panel Key: Utility Menu\ **GENERAL DISK UTILITIES\ FLOPPY DISK UTILITIES (or HARD DISK UTILITIES)\ DISPLAY DIRECTORY**

Related Commands: ADRIVE, CDRIVE, CD, CWD?, FMT1

DIS Display active segmented limit **LIMITS (Ch 6)**

Syntax: `DIS`

Remarks: Displays the active segmented limit. Requires SLA or SLL, as appropriate.

DIS? Output active segmented limit on/off status **LIMITS (Ch 6)**

Syntax: `DIS?`

Data I/O: Output active segmented limit on/off status using <NR1> format (section 10-3), as follows: “0” for OFF or ”1” for ON.

DISKRD Output disk file data to the GPIB **DISK FUNCTION (Ch 8)**

Syntax: `DISKRD Value`
Value: Value 1 is in <String> data format (paragraph 10-3) that specifies the path and filename of the data to be output.

Data I/O: Outputs an <Arbitrary Block> (section 10-3) containing the contents of the file.

Related Commands: DISKWR

DISKWR Write GPIB data to a disk file **DISK FUNCTION (Ch 8)**

Syntax: `DISKWR Value 1, Value 2`
Value: Value 1 is in <String> data format (paragraph 10-3) that specifies the path and filename of the file to receive data. Value 2 is in <Arbitrary Block> format (paragraph 10-3) that contains the data to be output.

Related Commands: DISKRD

DIT Select Teflon as active dielectric **DISPLAY (Ch 4)**

Syntax: `DIT`

Remarks: Impacts time domain distance calculations and reference plane position settings.

Front Panel Key: Ref Plane**\SET DIELECTRIC\TEFLON**

DIV Select division as trace math for active channel **DISPLAY (Ch 4)**

Syntax: `DIV`

Remarks: Selects division as trace math for the active channel.

Front Panel Key: Trace Memory\ **SELECT TRACE MATH\ DIVIDE(/)**

Related Commands: DNM, CH1-CH4

DIX? Output dielectric constant **DISPLAY (Ch 4)**

Syntax: `DIX?`

Data I/O: Outputs an ASCII value in <NR3 > format (section 10-3).

DLA Select group delay display for active channel **DISPLAY (Ch 4)**

Syntax: `DLA`

Front Panel Key: Graph Type\ **GROUP DELAY**

Related Commands: CH1-CH4, IMG, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

DLP Select distance lowpass mode for active channel **DIAGNOSTICS (Ch 8)**

Syntax: `DLP`

DM1 Display 1.0 mm male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DM1`

Front Panel Key: Utility Menu\ **CAL COMPONENT UTILITIES\ DISPLAY COAXIAL OPEN & SHORT INFORMATION\ W1-CONN (M)**

Related Commands: CM1, P1C, P2C

DM2 Display 2.4mm male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DM2`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL INFORMATION\2.4 mm (M)**

DM3 Display GPC-3.5 male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DM3`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL INFORMATION\GPC-3.5 (M)**

DM716 Display 7/16 male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DM716`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OPEN & SHORT INFORMATION\7/16 (M)**

Related Commands: CM716, P1C, P2C

DMK Display K male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DMK`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL INFORMATION\K-CONN (M)**

DMN Display N male connector information **SYSTEM STATE (Ch 8)**

Syntax: `DMN`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL INFORMATION\TYPE N (M)**

DMN75 Display N Male 75-Ohm connector information **SYSTEM STATE (Ch 8)**

Syntax: `DMN75`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY COAXIAL INFORMATION\TYPE N (M) 75**

DMS Display SMA male connector information **SYSTEM STATE (Ch 8)**

Syntax: DMS

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\SMA (F)**

DMSP Display Special Male connector information **SYSTEM STATE (Ch 8)**

Syntax: DMSP

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\SPECIAL (M)**

DMT Display TNC male connector information **SYSTEM STATE (Ch 8)**

Syntax: DMT

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\TNC (M)**

DMV Display V male connector information **SYSTEM STATE (Ch 8)**

Syntax: DMV

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\DISPLAY CO-AXIAL INFORMATION\V-CONN (M)**

DNM Display data normalized to trace memory on active channel **DISPLAY (Ch 4)**

Syntax: DNM

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Front Panel Key: Trace Memory**\VIEW DATA (X) MEMORY**

Related Commands: DIV, MUL, ADD, MIN, CH1-CH4, STD, WFS

DOASF Display band A special female connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOASF`

Front Panel Key: Utility Menu\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL A (F)

Related Commands: CFSPA, P1C, P2C

DOASM Display band A special male connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOASM`

Front Panel Key: Utility Menu\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL A (M)

Related Commands: CMSPA, P1C, P2C

DOBSF Display band B special female connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOBSF`

Front Panel Key: Utility Menu\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL B (F)

Related Commands: CFSPB, P1C, P2C

DOBSM Display band B special male connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOBSM`

Front Panel Key: Utility Menu\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL B (M)

Related Commands: CMSPB, P1C, P2C

DOCSF Display band C special female connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOCSF`

Front Panel Key: Utility Menu **\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL C (F)**

Related Commands: CFSPC, P1C, P2C

DOCSM Display band C special male connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOCSM`

Front Panel Key: Utility Menu **\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\SPECIAL C (M)**

Related Commands: CMSPC, P1C, P2C

DOF1 Display 1.0 mm female connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOF1`

Front Panel Key: Utility Menu **\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\W1-CONN (F)**

Related Commands: P1C, P2C

DOM1 Display 1.0 mm male connector offset-short information **SYSTEM STATE (Ch 8)**

Syntax: `DOM1`

Front Panel Key: Utility Menu **\CAL COMPONENT UTILITIES\DISPLAY COAXIAL OFFSET SHORT INFORMATION\W1-CONN (M)**

Related Commands: P1C, P2C

DPI Select distance phasor impulse mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `DPI`

Related Commands: CH1-CH4

DPN Enter pen number for data **HARD COPY (Ch 8)**

Syntax: `DPN Value Unit(s)`
Value: 1 to 8
Units: XX1

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ DATA PEN**

DPN? Output pen number for data **HARD COPY (Ch 8)**

Syntax: `DPN?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ DATA PEN**

Related Commands: DPN, GPN?, HPN?, MPN?, TPN?

DPR0 Visible data only OFD format **DATA TRANSFER (Ch 7)**

Syntax: `DPR0`

Remarks: See DPR1 for details.

DPR1 Data pair always OFD format **DATA TRANSFER (Ch 7)**

Syntax: DPR1

Remarks: This is a data formatting command for the OFD/IFD and OM1-OM6 commands that allows for sending complex data pairs (i.e., mag/phase or real/ imaginary) while using single graph displays (i.e. log mag or real), as if the related dual graph type was selected.

The data element not currently measured on the single display will be zeroed out. For example: if the log mag graph type is selected for the active channel and “DPR1; OFD” is issued, the data will be sent out in the same format as if the log mag/phase graph type was active(dB, degrees).

The only difference is the phase value will be zeroed out (dB, 0). Similarly, if “DPR1;OFD” is issued while a phase display is selected for the active channel, the data will be output as if the log mag/phase display was selected, except that the magnitude value will be zeroed out (0, degrees). See Table 7-7 for data output format information for all display types.

This command is useful in developing a standard data transfer routine in your application program, but it will impact throughput speed (for single displays only).

Related Commands: DPR0, OFD, IFD, OM1-OM12

DPRX? Output data pair mode visible only or pair always **MEASUREMENT DATA (Ch 7)**

Syntax: DPRX?

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0: for Visible Only or ”1” for Data Pair Always.

Related Commands: DPR0, DPR1

DR1 Select Marker 1 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR1

Front Panel Key: Marker Menu**\SELECT REF MARKER\MARKER 1 or S Params\PRESS <1> TO REDEFINE SELECTED PARAMETER\RATIO**

DR2 Select Marker 2 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR2

Front Panel Key: Marker Menu\ **SELECT REF MARKER\MARKER 2**

DR3 Select Marker 3 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR3

Front Panel Key: Marker Menu\ **SELECT REF MARKER\MARKER 3**

DR4 Select Marker 4 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR4

Front Panel Key: Marker Menu\ **SELECT REF MARKER\MARKER 4**

DR5 Select Marker 5 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR5

Front Panel Key: Marker Menu\ **SELECT REF MARKER\MARKER 5**

DR6 Select Marker 6 as Delta Reference Marker **MARKERS (Ch 6)**

Syntax: DR6

Front Panel Key: Marker Menu\ **SELECT REF MARKER\MARKER 6**

DRF Turn delta reference mode on **MARKERS (Ch 6)**

Syntax: DRF

Front Panel Key: Marker Menu\ **SET MARKERS\ REF MODE ON**

Related Commands: DR1-DR12

DRL Diagnostic read latch **DIAGNOSTICS (Ch 8)**

Syntax: DRL

Remarks: For service use only.

DRO Turn delta reference mode off **MARKERS (Ch 6)**

Syntax: DRO

Front Panel Key: Marker Menu\ **SET MARKERS\ REF MODE OFF**

DRO? Output delta reference mode on/off status **MARKERS (Ch 6)**

Syntax: DRO?

Data I/O: Outputs delta reference mode on/off status using ASCII <NR1 > format (section 10-3), as follows: "1" for ON or "0" for OFF.

Front Panel Key: Marker Menu\ **SET MARKERS\ REF MODE**

DRX? Output delta reference marker number **MARKERS (Ch 6)**

Syntax: DRX?

Data I/O: Output delta reference marker number using ASCII value in <NR1> format (section 10-3).

Front Panel Key: Marker Menu\ **SELECT REF MARKER**

DSF0 Disable filter shape factor calculation **MARKERS (Ch 6)**

Syntax: DSF0

Front Panel Key: Readout Marker\ **FILTER SETUP\ READOUTS SHAPE FACTOR OFF**

Related Commands: DSF1, DSFX?

DSF1 Enable filter shape factor calculation **MARKERS (Ch 6)**

Syntax: DSF1

Front Panel Key: Readout Marker\ **FILTER SETUP\ READOUTS SHAPE FACTOR ON**

Related Commands: DSF0, DSFX?

DSFX? Output filter shape factor calculation enable/disable status **MARKERS (Ch 6)**

Syntax: DSFX?

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Readout Marker\ **FILTER SETUP\ READOUTS SHAPE FACTOR**

Related Commands: DSF0, DSF1

DSP Select single channel display **CHANNELS (Ch 4)**

Syntax: DSP

Front Panel Key: Channels Menu\ **SINGLE CHANNEL**

Related Commands: CH1-CH4

DSP? Output channel display mode **CHANNELS (Ch 4)**

Syntax: DSP?

Data I/O: Outputs channel display mode using ASCII <NR1> format (section 10-3), as follows: “1” for Single, ”13” for Dual 1&3, “24” for Dual 2&4, ”4” for Quad, “130” for Dual Overaly 1&3, ”240” for Dual Overlay 2&4.

Front Panel Key: Channels Menu\ **SINGLE CHANNEL**

Related Commands: CH1-CH4

DSPS21 Select Gain Compression bottom graph displays S21 **GAIN COMPRESSION (Ch 9)**

Syntax: DSPS21

Front Panel Key: Setup Menu\ **SWEPT POWER GAIN COMPRESSION\ MORE\ S21 OPTIONS\ DISPLAY S21**

Related Commands: DSP21?, NRMS21

DSPS21? Output Gain Compression bottom graph selection Normalized/S2 **GAIN COMPRESSION (Ch 9)**

Syntax: `DSPS21?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows:. “0” for sweep, ”1” for CW. See the command’s function group.

Front Panel Key: Setup Menu**\SWEPT FREQUENCY GAIN COMPRESSION\NORMALIZE S21\NORMALIZE S21** or Setup Menu**\SWEPT POWER GAIN COMPRESSION\MORE\S21 OPTIONS\NORMALIZE S21 (or DISPLAY S21)**

Related Commands: DSP21, NRMS21

DSQ0 Disable filter Q calculation **MARKERS (Ch 6)**

Syntax: `DSQ0`

Front Panel Key: Readout Marker**\FILTER SETUP\READOUTS Q OFF**

Related Commands: DSQ1, DSQX?

DSQ1 Enable filter Q calculation **MARKERS (Ch 6)**

Syntax: `DSQ1`

Front Panel Key: Readout Marker**\FILTER SETUP\READOUTS Q ON**

Related Commands: DSQ0, DSQX?

DSQX? Output filter Q calculation enable/disable status **MARKERS (Ch 6)**

Syntax: `DSQX?`

Data I/O: Outputs filter Q calculation enable/disable status using ASCII <NR1> format (section 10-3), as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Readout Marker**\FILTER SETUP\READOUTS Q**

Related Commands: DSQ0, DSQ1

DTM Display measurement data and trace memory on active channel **DISPLAY (Ch 4)**

Syntax: `DTM`

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Front Panel Key: Trace Memory**VIEW DATA AND MEMORY**

Related Commands: STD

DVM Enter DVM channel number **DIAGNOSTICS (Ch 8)**

Syntax: `DVM Value`
Value: 0-128

Remarks: For service use only.

DWG Display waveguide parameters **SYSTEM STATE (Ch 8)**

Syntax: `DWG`

Front Panel Key: Utility Menu**CAL COMPONENT UTILITIES\\DISPLAY WAVEGUIDE INFORMATION**

DWL Diagnostic write latch **DIAGNOSTICS (Ch 8)**

Syntax: `DWL`

Remarks: For service use only.

E12 Set Millimeter Wave band to E band (WR-12) **MILLIMETER WAVE (Ch 9)**

Syntax: `E12`

E12E Set Millimeter Wave band to E band (WR-12) **MILLIMETER WAVE (Ch 9)**

Syntax: `E12E`

EANAIN Measure External Analog In on active channel **MEASUREMENT (Ch 4)**

Syntax: EANAIN

Remarks: This code displays the voltage at the external input BNC on the rear panel on the active channel. To display properly, the user should select the Real Display format.

Related Commands: S11, S21, S12, S22

ECW Select CW operation for component being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: ECW

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY C.W. ON**

ED1 Edit source 1 equation **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: ED1

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION TO EDIT SOURCE 1**

ED2 Edit source 2 equation **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: ED2

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION TO EDIT SOURCE 2**

EDED Select De-embedding as embedding/de-embedding method **EMBED/DE-EMBED (Ch 9)**

Syntax: EDED

Front Panel Key: Appl\ **EMBED/DE-EMBED\ METHOD EMBED/DE-EMBED**

Related Commands: EDEE.EDEED?

EDEE Select Embedding as embedding/de-embedding method **EMBED/DE-EMBED (Ch 9)**

Syntax: EDEE

Front Panel Key: Appl\ **EMBED/DE-EMBED\ METHOD EMBED/DE-EMBED**

Related Commands: EDED,EDEED?

EDEED? Output embedding/de-embedding method selection **EMBED/DE-EMBED (Ch 9)**

Syntax: EDEED?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3). Value = 1 for the Embeding Method. Value = 2 for the Deembedding Method.

Front Panel Key: Appl\ **EMBED/DE-EMBED\ METHOD EMBED/DE-EMBED**

Related Commands: EDED, EDEE

EDENORM Normal port orientation of embedding/de-embedding network **EMBED/DE-EMBED (Ch 9)**

Syntax: EDENORM

Front Panel Key: Appl\ **EMBED/DE-EMBED\ SWAP PORT OF S2P DATA OFF**

Related Commands: EDESWAP,EDESWAP?

EDEPORT1 Apply the embedding/de-embedding network to Port 1 **EMBED/DE-EMBED (Ch 9)**

Syntax: EDEPORT1

Front Panel Key: Appl\ **EMBED/DE-EMBED\PORT1**

Related Commands: EDEPORT2,EDEPORT?

EDEPORT2 Apply the embedding/de-embedding network to Port 2 **EMBED/DE-EMBED (Ch 9)**

Syntax: EDEPORT2

Front Panel Key: Appl\ **EMBED/DE-EMBED\PORT2**

Related Commands: EDEPORT1,EDEPORT?

EDEPORT? Output port receiving the embedding/de-embedding network **EMBED/DE-EMBED (Ch 9)**

Syntax: EDEPORT?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).Value = 1 for Port 1. Value = 2 for Port 2.

Front Panel Key: Appl\ **EMBED/DE-EMBED\PORT1/PORT2**

Related Commands: EDEPORT1,EDEPORT2

EDESWAP Swap port orientation of embedding/de-embedding network **EMBED/DE-EMBED (Ch 9)**

Syntax: EDESWAP

Front Panel Key: Appl\ **EMBED/DE-EMBED\SWAP PORTS OF S2P DATA ON**

Related Commands: EDENORM,EDESWAP?

EDESWAP? Output port orientation of embedding/de-embedding network swapped/normal **EMBED/DE-EMBED (Ch 9)**

Syntax: `EDESWAP?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3). Value = 1 for a swapped orientation S2P network. Value = 0 for a normal orientation S2P Network.

Front Panel Key: Appl\ **EMBED/DE-EMBED\SWAP PORTS OF S2P DATA**

Related Commands: EDENORM,EDESWAP

EDG End diagnostics mode **DIAGNOSTICS (Ch 8)**

Syntax: `EDG`

Remarks: For service use only.

EDR Edit receiver equation **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDR`

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu\ **MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION TO EDIT RECEIVER**

EDV Enter divisor value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDV Value Unit(s)`
Value: 099 to 0, 1 to 199
Units: XX1, XX3, XM3

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu\ **MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY DIVISOR**

EDV? Output divisor value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EDV?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3). See Chapter 10, section 10-3.

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY DIVISOR**

EKT Select external keyboard testing **PERIPHERAL TESTS (Ch 8)**

Syntax: `EKT`

Remarks: For service use only.

EML Enter multiplier value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EML Value Unit(s)`
Value: 099 to 0, 1 to 199
Units: XX1, XX3, XM3

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY MULTIPLIER**

EML? Output multiplier value for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EML?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3). See Chapter 10, section 10-3.

Front Panel Key: Options Menu **\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY MULTIPLIER**

EOS Enter offset frequency for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EOS Value Unit(s)`
Value: -999.9999 GHz to 999.9999 GHz
Units: HZ, KHZ, MHZ, GHZ

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu\ **MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\OFFSET FREQUENCY**

EOS? Output offset frequency for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EOS?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3). See Chapter 10, section 10-3.

Front Panel Key: Options Menu\ **MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\OFFSET FREQUENCY**

ESW Select sweep operation for component being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `ESW`

Remarks: See Chapter 10, paragraph 10-3.

Front Panel Key: Options Menu\ **MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY SWEEP ON**

EX1RF0 Turn external source 1 rf off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EX1RF0`

Related Commands: EX1RF1, EX2RF0, EX2RF1

EX1RF1 Turn external source 1 rf on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EX1RF1`

Related Commands: EX1RF0, EX2RF0, EX2RF1

EX2RF0 Turn external source 2 rf off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: EX2RF0

Related Commands: EX1RF0, EX1RF1, EX2RF1

EX2RF1 Turn external source 2 rf on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: EX2RF1

Related Commands: EX1RF0, EX1RF1, EX2RF0

EXD Display external A/D input **DIAGNOSTICS (Ch 8)**

Syntax: EXD

Remarks: For service use only.

EXISTD? Output directory existence information **DISK FUNCTION (Ch 8)**

Syntax: EXISTD?

Remarks: Value 1 is in <String> data format (paragraph 10-3) that specifies the path and directory name of the directory in question.

Data I/O: Outputs directory existence information using ASCII <NR1> format (section 10-3), as follows: "0" for directory does not exist, "1" for directory exists.

Related Commands: EXISTF?

EXISTF? Output file existence information **DISK FUNCTION (Ch 8)**

Syntax: EXISTF?

Remarks: Value 1 is in <String> data format (paragraph 10-3) that specifies the path and filename of the file in question.

Data I/O: Outputs file existence information using ASCII <NR1> format (section 10-3), as follows: "0" for file does not exist, "1" for file exists.

Related Commands: EXISTD?

EXW? Output multiple source sweep flag for equation being edited **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `EXW?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows:. “0” for sweep, ”1” for CW. See the command's function group.

Front Panel Key: Options Menu\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE DEFINE\EQUATION SUMMARY

F08 Set Millimeter Wave Band to F Band (WR-8) **MILLIMETER WAVE (Ch 9)**

Syntax: `F08`

Related Commands: E12,E12E,Q22,V15,W10,W10E

FCW0 Turn fast CW measurement mode off **FAST CW (Ch 7)**

Syntax: `FCW0`

Remarks: The instrument will return to the normal measurement and display mode.

Related Commands: FCW1, FCWX?

FCW1 Turn fast CW measurement mode on **FAST CW (Ch 7)**

Syntax: `FCW1`

Remarks: The instrument display is not updated. Raw data from the active channel is made available to the GPIB bus or collected in an internal buffer.

Data I/O: If internal buffer data collection is not active, the raw data measurement is output as an <Arbitrary Block> (section 10-3). The format is always FMC. The most current data measurement is returned.

Block Size: The data consists of a pair of 4-byte floating point numbers (real and imaginary) for a total of 8 bytes.

Related Commands: FCW0, FCWX?, TEX, TIB

FCW2 Turn Fast CW mode 2 on **FAST CW (Ch 7)**

Syntax: FCW2

Remarks: The instrument display is not updated. Raw data from the measurement task is made available to the GPIB bus or collected in an internal buffer.

Data I/O: If internal buffer data collection is not active, the raw data measurement is output as an <Arbitrary Block>.

Block Size: The data consists of 3 complex measurements. Each measurement consists of a pair of 4-byte floating point numbers (real and imaginary). This gives a total of 24 bytes.

Related Commands: FCW0, FCW1, FCWX?, TEX, TIB

FCWX? Output fast CW measurement mode on/off status **FAST CW (Ch 7)**

Syntax: FCWX?

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for OFF, ”1” for ON.

Related Commands: FCW0, FCW1

FDE0 Disable Output Data End Message **DATA TRANSFER (Ch 7)**

Syntax: FDE0

Related Commands: FDE1, FDEX?

FDE1 Enable Output Data End Message **DATA TRANSFER (Ch 7)**

Syntax: FDE1

Related Commands: FDE0, FDEX?

FDEX? Output Output Data End Message enable/disable status **DATA TRANSFER (Ch 7)**

Syntax: FDEX?

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Related Commands: FDE0, FDE1

FDH0 Select variable length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: `FDH0`

Remarks: This is the default mode.

Related Commands: FDH1, FDH2, FDHX?

FDH1 Select fixed length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: `FDH1`

Remarks: The block size portion of the arbitrary block header will be padded with leading zeros as necessary to cause the overall length to be 11. For example, the fixed length header shown below would precede a data block containings 123 bytes: #9000000123.

Related Commands: FDH0, FDH2, FDHX?

FDH2 Select zero length arbitrary block headers **TRANSMISSION METHODS (Ch 7)**

Syntax: `FDH2`

Remarks: Reverts to the FDH1 mode after completion of the current program message.

Related Commands: FDH0, FDH1, FDHX?

FDHX? Output arbitrary block header length selection **TRANSMISSION METHODS (Ch 7)**

Syntax: `FDHX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for variable length arbitrary block headers, ”1” for fixed length arbitrary block headers, “2” for no arbitrary block headers.

Related Commands: FDH0, FDH1, FDH2

FFD Send form feed to printer and stop print/plot **HARD COPY (Ch 8)**

Syntax: `FFD`

FGT Select frequency with time gate for active channel **TIME DOMAIN (Ch 9)**

Syntax: `FGT`

Remarks: Selects frequency with time gate mode for active channel.

Front Panel Key: Domain**FREQUENCY WITH TIME\\GATE**

Related Commands: CH1-CH4, OPC

FHI Set data points to 1601 **MEASUREMENT (Ch 4)**

Syntax: `FHI`

Front Panel Key: Data Points**1601 POINTS MAX**

Related Commands: WFS, OPC, NP1601, FME, FLO

FIL Fill defined discrete frequency range **MEASUREMENT (Ch 4)**

Syntax: `FIL`

Remarks: See the command' s function group.

Front Panel Key: Begin Cal**NEXT CAL STEP\\FULL 12-TERM\\INCLUDE ISOLATION\\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\\FILL RANGE**

FLC Source frequency linearity internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: `FLC`

Remarks: For service use only.

FLO Set data points to 101 **MEASUREMENT (Ch 4)**

Syntax: `FLO`

Front Panel Key: Data Points**101 POINTS MAX**

Related Commands: WFS, OPC, NP101, FME, FHI

FLTBW? Output filter bandwidth **MARKERS (Ch 6)**

Syntax: `FLTBW?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker**BANDWIDTH**

Related Commands: BWL3, BWLS,

FLTC? Output filter center frequency **MARKERS (Ch 6)**

Syntax: `FLTC?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker**CENTER FREQ**

Related Commands: BWL3, BWLS

FLTL? Output filter loss at reference value **MARKERS (Ch 6)**

Syntax: `FLTL?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker**LOSS AT REF**

Related Commands: MSR0, MSRD, MSRM

FLTQ? Output filter Q **MARKERS (Ch 6)**

Syntax: `FLTQ?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker**Q**

Related Commands: DSQ0, DSQ1

FLTS? Output filter shape factor **MARKERS (Ch 6)**

Syntax: `FLTS?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Readout Marker\ **SHAPE FACTOR**

Related Commands: DSF0, DSF1

FMA Select ASCII data transfer format **DATA TRANSFER (Ch 7)**

Syntax: `FMA`

Remarks: Selects ASCII <NR3> as appropiate for succeeding data transfer commands. The ASCII format will stay in effect until either the FMB or FMC (binary format) commands are issued. This command will have no effect on data transfer commands that cannot be output in ASCII format. See the specific command's description to determine formats supported.

Related Commands: FMB, FMC

FMB Select IEEE754 64 bit data transfer format **DATA TRANSFER (Ch 7)**

Syntax: `FMB`

Remarks: Selects IEEE-754 64-bit (double precision, 8 bytes) binary data transfer format for succeeding data transfer commands. The 64-bit format will stay in effect until either the FMA (ASCII) or FMC (32-bit binary) commands are issued.

This command will have no effect on data transfer commands that cannot be output in 64-bit format. See the specific command's description to determine formats supported.

Related Commands: FMA, FMC, LSB, MSB

FMC Select IEEE754 32 bit data transfer format **DATA TRANSFER (Ch 7)**

Syntax: `FMC`

Remarks: Selects IEEE-754 32-bit (single precision, 4 bytes) binary data transfer format for succeeding data transfer commands. The 32-bit format will stay in effect until either the FMA (ASCII) or FMB (64-bit binary) commands are issued.

This command will have no effect on data transfer commands that cannot be output in 32-bit format. See the specific command's description to determine formats supported.

Related Commands: FMA, FMB, LSB, MSB

FME Set data points to 401 **MEASUREMENT (Ch 4)**

Syntax: `FME`

Front Panel Key: Data Points**\401 POINTS MAX**

Related Commands: WFS, OPC, NP401, FHI, FLO

FMKR Select filter parameters marker mode **MARKERS (Ch 6)**

Syntax: `FMKR`

Related Commands: AMKR, NMKR, SMKR, XMKR?

FMT0 Select normal ascii data element delimiting **TRANSMISSION METHODS (Ch 7)**

Syntax: `FMT0`

Remarks: When data values are output with the FMA mode, each value is separated with a comma. This is also true for listing type outputs such as for the service log or disk directory. This is the default mode.

Related Commands: FMT1, FMTX?, FMA

FMT1 Select enhanced ascii data element delimiting **TRANSMISSION METHODS (Ch 7)**

Syntax: `FMT1`

Remarks: When data values are output with the FMA mode, each data pair is separated with a line feed. Each element within the pair is separated with a comma. If there is no data pair, each element is separated with a line feed. Each line in the service log listing or the disk directory listing is separated with a line feed.

Related Commands: FMT0, FMTX?, FMA

FMTX? Output ascii data element delimiting mode **TRANSMISSION METHODS (Ch 7)**

Syntax: `FMTX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for normal delimiting, ”1” for enhanced delimiting.

Related Commands: FMT0, FMT1, FMA

FMX? Output data output mode FMA FMB or FMC **DATA TRANSFER (Ch 7)**

Syntax: `FMX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for FMA, ”1” for FMB, “2” for FMC.

Related Commands: FMA, FMB, FMC

FOF Blank frequency information **SYSTEM STATE (Ch 8)**

Syntax: `FOF`

Remarks: Blanks any frequency information from the screen and any hard copy output. This command is useful for security reasons since the instrument cannot display frequency data again without the FON command being issued or a reset is invoked.

Front Panel Key: Utility Menu**BLANK FREQUENCY INFORMATION**

Related Commands: FON

FON Display frequency information **SYSTEM STATE (Ch 8)**

Syntax: `FON`

Remarks: See FOF for more information.

Front Panel Key: Utility Menu**BLANK FREQUENCY INFORMATION**

Related Commands: FOF

FOX? Output frequency information on/off status **SYSTEM STATE (Ch 8)**

Syntax: `FOX?`

Data I/O: Outputs its value in ASCII <NR1 > format (section 10-3), as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Utility Menu**BLANK FREQUENCY INFORMATION**

FP0 Turn flat power correction off **MEASUREMENT (Ch 4)**

Syntax: `FP0`

FP1 Turn flat power correction on **MEASUREMENT (Ch 4)**

Syntax: `FP1`

FPT Select front panel keypad testing **PERIPHERAL TESTS (Ch 8)**

Syntax: `FPT`

Remarks: For service use only.

FPX? Output flat power correction on/off status **DIAGNOSTICS (Ch 8)**

Syntax: `FPX?`

Remarks: For service use only.

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3), as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Appl**SWEPT FREQUENCY GAIN COMPRESSION\\FLATNESS CORRECTION**

FQD Select frequency domain for active channel **TIME DOMAIN (Ch 9)**

Syntax: FQD

Related Commands: WFS, OPC

FRC Clear all defined discrete frequency ranges **MEASUREMENT (Ch 4)**

Syntax: FRC

Remarks: See command's function group.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\CLEAR ALL**

FRI Enter Discrete Fill increment frequency **MEASUREMENT (Ch 4)**

Syntax: FRI Value Unit(s)
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Val1 must be within 37XXXD start- and stop-sweep frequencies. See the command's function group.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\INCREMENT**

FRP Enter Discrete Fill number of points **MEASUREMENT (Ch 4)**

Syntax: FRP Value Unit(s)
Value: 1 to current number of points; 1601 max
Units: XX1, XX3, XM3

Remarks: See command's function group.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\NUMBER OF PTS**

FRS Enter Discrete Fill start frequency **MEASUREMENT (Ch 4)**

Syntax: `FRS Value Unit(s)`
Value: Frequency
Units: HZ, KHZ, MHZ, GHZ

Remarks: Val1 must be within 37XXXD start- and stop-sweep frequencies. See the command's function group.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)\ START FREQ**

GCMP Enter gain compression point search value **GAIN COMPRESSION (Ch 9)**

Syntax: `GCMP Value Unit(s)`
Value: Number
Units: DB

Remarks: To search for the 1 dB gain compression point, enter a search value of 1 dB.

Data I/O: Enter the search value in ASCII <NRF> format (section 10-3).

Front Panel Key: Appl\ **SWEPT FREQUENCY GAIN COMPRESSION\ GAIN COMPRESSION POINT**

Related Commands: SPGCA, GCMP?

GCMP? Output gain compression point search value **GAIN COMPRESSION (Ch 9)**

Syntax: `GCMP?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Appl\ **SWEPT FREQUENCY GAIN COMPRESSION\ GAIN COMPRESSION POINT**

Related Commands: SPGCA, GCMP

GCT Enter gate center value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GCT Value Unit(s)`

Value: -999.999 to 999.999 ms

Units: time = S, MS, USC, PS, PSC, NS, NSC; distance = M, MTR, MM, MMT, CM, CMT

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\ CENTER**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GCT? Output gate center value **TIME DOMAIN (Ch 9)**

Syntax: `GCT?`

Data I/O: Outputs value in ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ CENTER**

Related Commands: GCT

GDS Gate symbols displayed on active channel **TIME DOMAIN (Ch 9)**

Syntax: `GDS`

Front Panel Key: Domain\ **GATE DISPLAY**

GHZ Suffix sets frequency data type and scales by 1E9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `GHZ`

GLS Select low sidelobe gate shape **TIME DOMAIN (Ch 9)**

Syntax: GLS

GMS Select minimum sidelobe gate shape **TIME DOMAIN (Ch 9)**

Syntax: GMS

GNM Select nominal gate shape **TIME DOMAIN (Ch 9)**

Syntax: GNM

Front Panel Key: Domain\ **SET GATE\GATE SHAPE\NOMINAL**

GOF Turn off gating on active channel **TIME DOMAIN (Ch 9)**

Syntax: GOF

Front Panel Key: Domain\ **GATE OFF**

Related Commands: GOF?

GOF? Output gating mode on active channel **TIME DOMAIN (Ch 9)**

Syntax: GOF?

Data I/O: Outputs its value using ASCII <NR1> format, as follows: “0” for OFF, ”1” for ON, “2” for display gate symbols.

Front Panel Key: Domain\ **GATE**

Related Commands: GOF

GON Turn on gating on active channel **TIME DOMAIN (Ch 9)**

Syntax: GON

Front Panel Key: Domain\ **GATE ON**

GPN Enter pen number for graticule **HARD COPY (Ch 8)**

Syntax: `GPN Value Unit(s)`
Value: 1 to 8
Units: XX1

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PEN COLORS\GRATICULE PEN**

GPN? Output pen number for graticule **HARD COPY (Ch 8)**

Syntax: `GPN?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PEN COLORS\GRATICULE PEN**

Related Commands: GPN, DPN?, HPN?, MPN?, TPN?

GRF? Output graph type for active channel **DISPLAY (Ch 4)**

Syntax: `GRF?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows: “1” for log mag, ”2” for phase, “3” for log mag & phase, ”4” for Smith-impedance, “5” for SWR, 6 for group delay, ”7” for Smith-admittance, “8” for lin polar, ”9” for log polar, “0” for lin mag, ”11” for lin mag & phase, “12” for real, ”13” for imaginary, “14” for real & imaginary, ”15” for power out.

GRT Select Rectangular gate shape **TIME DOMAIN (Ch 9)**

Syntax: `GRT`

Front Panel Key: Domain**\SET GATE\GATE SHAPE\MINIMUM**

GRTCOL Enter the color number for the graticule **SYSTEM STATE (Ch 8)**

Syntax: `GRTCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\GRATICULE**

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, GRTCOL?

GRTCOL? Output the color number for the graticule **SYSTEM STATE (Ch 8)**

Syntax: `GRTCOL?`

Data I/O: Outputs the color palette numbers in ASCII <NR1> format.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\GRATICULE (Color)**

Related Commands: ANNCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, GRTCOL

GSN Enter gate span value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GSN Value Unit(s)`
Value: 0.0000 to 999.999 ms
Units: time = S, MS, USC, PS, PSC, NS, NSC; distance = M, MTR, MM, MMT, CM, CMT

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain**\SET RANGE\SPAN**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GSN? Output gate span value **TIME DOMAIN (Ch 9)**

Syntax: `GSN?`

Data I/O: Outputs its value using ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\SPAN**

Related Commands: GSN

GSP Enter gate stop value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GSP Value Unit(s)`
Value: -99.9999 to +999.9999 ms
Units: S, MS, USC, PS, PSC, NS, NSC

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\STOP**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, GSP?

GSP? Output gate stop value **TIME DOMAIN (Ch 9)**

Syntax: `GSP?`

Data I/O: Outputs value using ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\STOP**

Related Commands: GSP

GST Enter gate start value distance or time **TIME DOMAIN (Ch 9)**

Syntax: `GST Value Unit(s)`
Value: -99.9999 to +999.9999 ms
Units: S, MS, USC, PS, PSC, NS, NSC

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\ START**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?

GST? Output gate start value **TIME DOMAIN (Ch 9)**

Syntax: `GST?`

Data I/O: Outputs value using ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ START**

Related Commands: GST

GSX? Output gate shape **TIME DOMAIN (Ch 9)**

Syntax: `GSX?`

Data I/O: Outputs its value using ASCII <NR1> format, as follows: “1” for rectangular, ”2” for nominal, “3” for low sidelobe, ”4” for minimum sidelobe.

Related Commands: GLS, GMS, GNM, GRT, GSX?

HC0 Disable internal IF calibration **MEASUREMENT (Ch 4)**

Syntax: `HC0`

Remarks: Prevents VNA from periodically and automatically performing the internal calibration, to allow for synchronization between the 37XXXD and a physical activity such as antenna rotation. Turn on IF Cal as soon as measurement is complete to retain maximum measurement accuracy.

Front Panel Key: Options Menu**\TRIGGERS\AUTOMATIC I.F. CAL OFF**

Related Commands: HC1, HCX?, HCT

HC1 Enable internal IF calibration and trigger an IF calibration **MEASUREMENT (Ch 4)**

Syntax: `HC1`

Front Panel Key: Options Menu**\TRIGGERS\AUTOMATIC I.F. CAL ON**

Related Commands: HC0, HCX?, HCT

HCT Trigger an IF calibration **MEASUREMENT (Ch 4)**

Syntax: `HCT`

Front Panel Key: Options Menu**\TRIGGERS\TRIGGERS I.F. CAL**

Related Commands: HC0, HC1

HCX? Output internal IF calibration enable/disable status **MEASUREMENT (Ch 4)**

Syntax: `HCX?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows: “0” for disabled or ”1” for enabled.

Front Panel Key: Options Menu**\TRIGGERS\AUTOMATIC I.F. CAL**

HD0 Turn off tabular data headers and page formatting **HARD COPY (Ch 8)**

Syntax: `HD0`

Remarks: Turns off the tabular data headers and page formatting from tabular data printing or disk saves.

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\TABULAR DATA\HEADER AND PAGE BREAKS OFF**

Related Commands: HD1

HD1 Turn on tabular data headers and page formatting **HARD COPY (Ch 8)**

Syntax: `HD1`

Remarks: Turns on the tabular data headers and page formatting from tabular data printing or disk saves.

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\TABULAR DATA\HEADER AND PAGE BREAKS ON**

Related Commands: HD0

HID Hide active segmented limit **LIMITS (Ch 6)**

Syntax: `HID`

Related Commands: DIS, CH1-CH4

HIST0 Turns off GPIB history writing to disk **HARD COPY (Ch 8)**

Syntax: `HIST0`

Remarks: GPIB history is saved in files c:\hist\hist??.dat and consists of all commands received and data output.

Related Commands: HIST1,HISTX?

HIST1 Turns on GPIB history writing to disk **HARD COPY (Ch 8)**

Syntax: `HIST1`

Remarks: GPIB history is saved in files c:\hist\hist??.dat and concists of a record of all commands received and data output.

Related Commands: HIST0,HISTX?

HISTX? Outputs the history writes to hard disk enable/disable status **HARD COPY (Ch 8)**

Syntax: `HISTX?`

Data I/O: Outputs status using ASCII <NR1> format (section 10-3) as follows: “0” means writing is disabled, ”1” means writing is enabled.

Related Commands: HIST0, HIST1

HLD Put sweep into hold mode **MEASUREMENT (Ch 4)**

Syntax: `HLD`

Front Panel Key: Setup Menu**\HOLD BUTTON FUNCTION\HOLD (or SINGLE SWEEP AND HOLD)**

Related Commands: CTN, BH0, BH1, RH0, RH1

HLD? Output the sweep hold status **MEASUREMENT (Ch 4)**

Syntax: `HLD?`

Data I/O: Outputs its value using ASCII <NR1> format, as follows: “0” for not in hold or ”1” for in hold.

Front Panel Key: Setup Menu**\HOLD BUTTON FUNCTION\HOLD/CONTINUE (Status)**

Related Commands: CTN, HLD, HLDX?

HLDX? Output hold mode (continue, restart, or single sweep) **MEASUREMENT (Ch 4)**

Syntax: `HLDX?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “1” for HOLD_CONTINUE, ”2” for HOLD_RESTART, “3” for SNGL_SWP_HOLD.

Related Commands: CTN, HLD

HPN Enter pen number for header **HARD COPY (Ch 8)**

Syntax: `HPN Value Unit(s)`
Value: 1 to 8
Units: XX1

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ HEADER PEN**

Related Commands: HPN?, DPN?, GPN?, MPN?, TPN?

HPN? Output pen number for header **HARD COPY (Ch 8)**

Syntax: `HPN?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ HEADERS PEN**

Related Commands: HPN, DPN?, GPN?, MPN?, TPN?

HZ Suffix sets frequency data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `HZ`

IACCHAR Input AutoCal characterization data from the GPIB **AUTOCAL (Ch 5)**

Syntax: `IACCHAR Value`
Value: Characterization data in binary format.

Data I/O: Inputs an <Arbitrary Block> (section 10-3).

Related Commands: OACCHAR

IARF Enter adapter removal data from GPIB and calibrate **ADAPTER REMOVAL (Ch 9)**

Syntax: `IARF Value 1, Value 2`

Value: Value 1 is in <Arbitrary Block> format (paragraph 10-3) containing the XX front panel and calibration data. Value 2 is in <Arbitrary Block> format containing the YY front panel calibration data.

Related Commands: OCD, DISKWR, LDARF

IC1 Enter calibration coefficient 1 **DATA TRANSFER (Ch 7)**

Syntax: `IC1 Value`

Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC10 Enter calibration coefficient 10 **DATA TRANSFER (Ch 7)**

Syntax: `IC10 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC11 Enter calibration coefficient 11 **DATA TRANSFER (Ch 7)**

Syntax: `IC11 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC12 Enter calibration coefficient 12 **DATA TRANSFER (Ch 7)**

Syntax: `IC12 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC2 Input Calibration Coefficient 2 **CALIBRATION (Ch 5)**

Syntax: `IC2 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 12), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC3 Enter calibration coefficient 3 **CALIBRATION (Ch 5)**

Syntax: `IC3 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC4 Enter calibration coefficient 4 **CALIBRATION (Ch 5)**

Syntax: `IC4 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC5 Enter calibration coefficient 5 **CALIBRATION (Ch 5)**

Syntax: `IC5 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC6 Enter calibration coefficient 6 **CALIBRATION (Ch 5)**

Syntax: `IC6 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC7 Enter calibration coefficient 7 **CALIBRATION (Ch 5)**

Syntax: `IC7 Value`

Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC8 Enter calibration coefficient 8 **CALIBRATION (Ch 5)**

Syntax: `IC8 Value`

Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

IC9 Enter calibration coefficient 9 **CALIBRATION (Ch 5)**

Syntax: `IC9 Value`
Value: <Arbitrary Block>

Remarks: Allows entry of the user defined error correction coeffienct selected (1 - 24), see Table 10-1 at the end of this chapter. Prior to entering error terms, set the desired calibration type simulation with the matching Axx series calibration command (see Calibration Group). After inputting the error coefficients, turn on error correction with the CON command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: IFMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

ICA Enter calibration coefficient 10 **CALIBRATION (Ch 5)**

Syntax: `ICA Value Unit(s)`
Value: A, B, or C
Units: <Arbitrary Block>

Remarks: ICA, ICB, and ICC are equivalents of IC10, IC11, and IC12 comands respectively.

ICB Enter calibration coefficient 11 **CALIBRATION (Ch 5)**

Syntax: `ICB Value Unit(s)`
Value: Same as ICA
Units: Same as ICA

Remarks: Same as ICA.

ICC Enter calibration coefficient 12 **CALIBRATION (Ch 5)**

Syntax: `ICC Value Unit(s)`
Value: Same as ICA
Units: Same as ICA

Remarks: Same as ICA.

ICD Enter corrected data for active channel parameter **CALIBRATION (Ch 5)**

Syntax: `ICD Value`

Value: <Arbitrary Block>

Remarks: Data correction is for normalization and electrical length and, if applicable, time domain. Place the 37XXXD in hold (HLD) then issue the ICD command.

Data I/O: Inputs a floating point array whose size is equal to twice the number of points in the current sweep (real and imaginary data pairs for each point). The ICD command inputs an <Arbitrary Block> (section 10-3).

Related Commands: FMA, FMB, FMC, LSB, MSB, IFD, OCD, ONP, HLD, WFS, CH1, CH4

ICF Enter front panel setup and calibration data **CALIBRATION (Ch 5)**

Syntax: `ICF Value`

Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OCF command. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OCF, IFP

ICL Enter all applicable calibration coefficients for cal type **CALIBRATION (Ch 5)**

Syntax: `ICL Value`

Value: <Arbitrary Block>

Remarks: Enter all error correction coefficients applicable to the current calibration type; see Table 10-1 at the end of this chapter. Prior to entering error terms, set the calibration type simulation with the corresponding Axx series calibration command (see Calibration Group). After inputting the error coefficients, apply error coeficients to measurement data with the CON command.

Data I/O: An array of floating point values whose size is equal to the currently set number of data points. The ICL command inputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: FMA, FMB, FMC, OCL, IC1-IC12, CON

IEDEF Enter embedding/de-embedding files from GPIB and embed/de-embed **EMBED/DE-EMBED (Ch 9)**

Syntax: `IEDEF Value 1, Value 2`
Value: See Data I/O

Data I/O: Enter the data as two <Arbitrary Block> format (section 10-3) data blocks. The first contains the Front Panel and Cal Data. The second contains the S2P data.

Front Panel Key: Appl\ **EMBED/DE-EMBED\ APPLY NETWORK S2P FILE DATA TO CAL FILE DATA**

Related Commands: LDEDEF

IEM Enter extended status byte mask **STATUS BYTE (Ch 8)**

Syntax: `IEM Value`
Value: 0 - 32767

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0.

Related Commands: OEM, OEB

IF1 Select 10 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF1`

Front Panel Key: Video IF BW\ **MINIMUM (10 Hz)**

IF2 Select 100 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF2`

Front Panel Key: Video IF BW\ **REDUCED (100 Hz)**

IF3 Select 1 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF3`

Front Panel Key: Video IF BW\ **NORMAL (1 kHz)**

IF4 Select 10 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IF4`

Front Panel Key: Video IF BW**MAXIMUM (10 kHz)**

IFA Select 30 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFA`

Remarks: Same as IF4.

IFB Select 1st IF bandpass testing **DIAGNOSTICS (Ch 8)**

Syntax: `IFB`

Remarks: For service use only.

IFD Enter final data for active channel parameter **CALIBRATION (Ch 5)**

Syntax: `IFD Value`
Value: <Arbitrary Block>

Remarks: Place the 37XXXD in hold (HLD); then issue the IFD command. Data must match the current graph type as shown in Table 10-2 at the end of this chapter.

Data I/O: Inputs a floating point array whose size is equal to the number of points in the current sweep (the arrary size is doubled for dual graph displays, i.e. log mag/phase). The IFD command inputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: ICD, OFD, FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, HLD, ONP, CH1-CH4

IFM Select 10 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFM`

Remarks: Same as IF1.

Front Panel Key: Video IF BW**MINIMUM (10 Hz)**

IFN Select 1 KHz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFN`

Remarks: Same as IF3.

Front Panel Key: Video IF BW**NORMAL (1 kHz)**

IFP Enter current front panel setup **MEASUREMENT (Ch 4)**

Syntax: `IFP Value`
Value: <Arbitrary Block>

Remarks: The VNA will validate then change to the new setup.

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OFP command. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OFP, ICF

IFPC Enter flat power coefficients **DATA TRANSFER (Ch 7)**

Syntax: `IFPC Value`
Value: The flat power coefficients

Data I/O: Inputs an <Arbitrary Block> (section 10-3).

Related Commands: FMA, FMB, FMC, MSB, LSB, IFV, OFPC, OFV

IFR Select 100 Hz IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFR`

Remarks: Same as IF2.

Front Panel Key: Video IF BW**REDUCED (100 Hz)**

IFV Enter frequency values **MEASUREMENT (Ch 4)**

Syntax: `IFV Value`
Value: <Arbitrary Block>

Remarks: Inputs a list of frequencies for use as current sweep or for calibration setup. NOTE: IFV will reset (delete) existing calibration sweep and data.

Data I/O: An array of from 2 to 1601 floating point values containing frequencies within the 37XXXD range. The IFV command inputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Related Commands: FMA, FMB, FMC, LSB, MSB, DFC, ONP, WFS

IFX? Output IF bandwidth **ENHANCEMENT (Ch 4)**

Syntax: `IFX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3) as follows: “1” for 10 Hz, ”2” for 100 Hz, “3” for 1 kHz, or ”4” for 10 kHz.

Front Panel Key: Video IF BW**\value**

IHDW Enter hardware cal data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `IHDW Value`
Value: Value 1 is the hardware calibration data previously output using the command OHDW

Data I/O: The data is expected in <Arbitrary Block> format (section 10-3). Notice that it is not necessary to specify the type of hardware cal data as this information is contained within the data itself.

Related Commands: OHDW, DISKWR, RECALL

IKIT Enter calkit data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `IKIT Value 1, Value 2`

Value: Value 1 is in <String> data format (paragraph 10-3) containing a three-letter string that indicates the type of calibration kit (see Table (8-8). Value 2 is in <Arbitrary Block> format containing the actual calibration kit data.

Remarks: Calibration kit data files can be found on the data floppy disks that come with the calibration kits. The type string is the 3 character extention of the data file.

Related Commands: LKT, DISKWR, RECALL

ILM Enter limits status byte mask **STATUS BYTE (Ch 7)**

Syntax: `ILM Value`

Value: 0-255

Remarks: Sets the bits of the Standard Event Status Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0 NOTE: The Limits Testing feature must be turned on (LT1) for the 37XXXD to report a limits pass/fail status.

Related Commands: OLM, OLB, LT1

IMCF Enter merge calibration files from GPIB and combine **MERGE CAL FILES (Ch 9)**

Syntax: `IMCF Value 1, Value 2`

Value: Value 1 is in <Arbitrary Block> format (paragraph 10-3) containing the lower frequency front panel and calibration data to merge. Value 2 is in <Arbitrary Block> format containing the higher frequency front panel calibration data to merge.

Remarks: The total number of points after merging cannot exceed 160

Data I/O: Input data in an <Arbitrary Block> (section 10-3).

Front Panel Key: Appl**MERGE CAL FILES**

Related Commands: LDMCF

IMG Select imaginary display for active channel **DISPLAY (Ch 4)**

Syntax: `IMG`

Front Panel Key: Graph Type\ **IMAGINARY**

Related Commands: DLA, CH1-CH4, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

IMU Suffix sets imaginary data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `IMU`

IND Input Normalization data **MISCELLANEOUS (Ch 7)**

Syntax: `IND Value`
Value: <Arbitrary Block>

Data I/O: Inputs is an <Arbitrary Block> (section 10-3).

Related Commands: OND

INRM Enter normalization data from GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `INRM Value`
Value: Value 1 is the normalization data encapsulated in an <Arbitrary Block> format (paragraph 10-3)

Remarks: The normalization data is that which was gotten previously by reading a normalization data file (*.NRM) or by using the command ONRM.

Related Commands: ONRM, DISKWR, RECALL

INT Initialize (format) floppy disk **DISK FUNCTION (Ch 8)**

Syntax: `INT`

Remarks: Initializes (formats) floppy disk in floppy drive to IBM/DOS 1.44 MB format. Command can take up to five minutes to complete format. NOTE: All data on floppy disk will be erased immediately upon execution of this command.

Front Panel Key: Utility Menu\GENERAL DISK UTILITIES\FLOPPY DISK UTILITIES\FORMAT FLOPPY DISK

Related Commands: *OPC, *OPC?

INVER Activate color configuration Inverse **SYSTEM STATE (Ch 8)**

Syntax: `INVER`

Front Panel Key: Utility Menu\COLOR CONFIGURATION\COLOR SCHEMES\INVERSE COLORS

Related Commands: BRILL, CLASS, NEWCO, SHARP, SOFTCO, STOCO, RSTCOL

INXNO1 Enter NxN data and send device1 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `INXNO1 Value 1, Value 2, Value 3`
Value: See Data I/O

Data I/O: Enter the data as three <Arbitrary Block> format (section 10-3) data blocks. The first contains the S2P data for the device1-2 combination. The second contains the S2P data for the device 1-3 combination. The third contains the S2P data for the device 2-3 combination. The S2P data for device 1 is output in an <Arbitrary Block> format (section 10-3).

Front Panel Key: Appl\NXN SOLUTION\SOLVE DEVICE 1

Related Commands: INXNO2,INXNO3,LDNXNSV1,LDNXNSV2,LDNXNSV3

INXNO2 Enter NxN data and send device2 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `INXNO2 Value 1, Value 2, Value 3`

Value: See Data I/O

Data I/O: Enter the data as three <Arbitrary Block> format (section 10-3) data blocks. The first contains the S2P data for the device 1-2 combination. The second contains the S2P data for the device 1-3 combination. The third contains the S2P data for the device 2-3 combination. The S2P data for device 2 is output in an <Arbitrary Block> format (section 10-3).

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 2**

Related Commands: INXNO1,INXNO3,LDNXNSV1,LDNXNSV2,LDNXNSV3

INXNO3 Enter NxN data and send device3 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `INXNO3 Value 1, Value 2, Value 3`

Value: See Data I/O

Data I/O: Enter the data as three <Arbitrary Block> format (section 10-3) data blocks. The first contains the S2P data for the device 1-2 combination. The second contains the S2P data for the device 1-3 combination. The third contains the S2P data for the device 2-3 combination. The S2P data for device 3 is output in an <Arbitrary Block> format (section 10-3).

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 3**

Related Commands: INXNO1,INXNO2,LDNXNSV1,LDNXNSV2,LDNXNSV3

INXNSV1 Enter NxN data and save device1 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `INXNSV1 Value 1, Value 2, Value 3, Value 4`
Value: See Data I/O

Data I/O: Enter the data as a filename in <String> data format (section 10-3) followed by three data blocks in <Arbitrary Block> format (section 10-3). The file receives the device 1 S2P data. The first block contains the device 1-2 S2P data. The second block contains the device 1-3 S2P data. The third block contains the device 2-3 S2P data. The file resides on the VNA Hard drive or Floppy drive.

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 1**

Related Commands: INXNSV2,INXNSV3,LDNXNO1,LDNXNO2,LDNXNO3

INXNSV2 Enter NxN data and save device2 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `INXNSV2 Value 1, Value 2, Value 3, Value 4`
Value: See Data I/O

Data I/O: Enter the data as a filename in <String> data format (section 10-3) followed by three data blocks in <Arbitrary Block> format (section 10-3). The file receives the device 2 S2P data. The first block contains the device 1-2 S2P data. The second block contains the device 1-3 S2P data. The third block contains the device 2-3 S2P data. The file resides on the VNA Hard drive or Floppy drive.

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 2**

Related Commands: INXNSV1,INXNSV3,LDNXNO1,LDNXNO2,LDNXNO3

INXNSV3 Enter NxN data and save device3 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `INXNSV3 Value 1, Value 2, Value 3, Value 4`

Value: See Data I/O

Data I/O: Enter the data as a filename in <String> data format (section 10-3) followed by three data blocks in <Arbitrary Block> format (section 10-3). The file receives the device 3 S2P data. The first block contains the device 1-2 S2P data. The second block contains the device 1-3 S2P data. The third block contains the device 2-3 S2P data. The file resides on the VNA Hard drive or Floppy drive.

Front Panel Key: Appl\ **NXN SOLUTION\SOLVE DEVICE 3**

Related Commands: INXNSV1,INXNSV2,LDNXNO1,LDNXNO2,LDNXNO3

IODF Enter the optical file data from GPIB and calibrate **OPTICAL APPLICATION (Ch 9)**

Syntax: `IODF Value 1, Value 2`

Value: Value 1 is the front panel and cal file data and Value 2 is the S2P format characterization data. See the optical application description for details (paragraph 9-10).

Data I/O: Each of the blocks, val1 and val2 is in <Arbitrary Block> format (section 10-3). Notice the comma separator.

Related Commands: OCD, OS2P, DISKWR, LDODF

IPM Enter the 488.2 Service Request Enable mask **STATUS BYTE (Ch 7)**

Syntax: `IPM Value`

Value: 0-55

Remarks: Behaves exactly the same as the *SRE, 488.2 common command. It sets the bits of the Service Request Enable Register to the binary weighted bit pattern of the decimal value entered. The register is cleared by sending a value of 0. Note that the Master Summary Status (MSS) bit 6 (decimal 64) will be ignored since it represents the summary of all enabled status bits (bits 0-5, 7). This command is the same as *SRE.

IPSC Enter power sweep linearity calibration coefficients **GAIN COMPRESSION (Ch 9)**

Syntax: `IPSC Value`
Value: <Arbitrary Block>

Data I/O: Inputs an <Arbitrary Block> (section 10-3).

Related Commands: OPSC, PSCNFREQ?, PSCNPWR?, PSCSTEP?

IS1 Enter front panel setup 1 **MEASUREMENT (Ch 4)**

Syntax: `IS1 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS10 Enter front panel setup 10 **MEASUREMENT (Ch 4)**

Syntax: `IS10 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS2 Enter front panel setup 2 **MEASUREMENT (Ch 4)**

Syntax: `IS2 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS3 Enter front panel setup 3 **MEASUREMENT (Ch 4)**

Syntax: `IS3 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS4 Enter front panel setup 4 **MEASUREMENT (Ch 4)**

Syntax: `IS4 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS5 Enter front panel setup 5 **MEASUREMENT (Ch 4)**

Syntax: `IS5 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS6 Enter front panel setup 6 **MEASUREMENT (Ch 4)**

Syntax: `IS6 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS7 Enter front panel setup 7 **MEASUREMENT (Ch 4)**

Syntax: `IS7 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS8 Enter front panel setup 8 **MEASUREMENT (Ch 4)**

Syntax: `IS8 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

IS9 Enter front panel setup 9 **MEASUREMENT (Ch 4)**

Syntax: `IS9 Value`
Value: <Arbitrary Block>

Data I/O: <Arbitrary Block> formatted data (section 10-3) previously output using the OS1-OS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Related Commands: OS1-S10

ISC Enter scale and select inverted compressed Smith Chart display **DISPLAY (Ch 4)**

Syntax: `ISC Value Unit(s)`
Value: 3
Units: DBL, XX1

Front Panel Key: Graph Type\ **SMITH CHART (ADMITTANCE)**

Related Commands: DLA, CH1-CH4, IMG, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISE Enter scale and select inverted expanded Smith Chart display **DISPLAY (Ch 4)**

Syntax: ISE Value Unit(s)
Value: 10, 20, 30
Units: DBL, XX1

Front Panel Key: Graph Type\SMITH CHART (ADMITTANCE)

Related Commands: DLA, CH1-CH4, IMG, ISC, ISM, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISF Exclude isolation **CALIBRATION (Ch 5)**

Syntax: ISF

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12 TERM\EXCLUDE ISOLATION

Related Commands: ISN, C12, C8T, C8R

ISM Select normal inverted Smith Chart for active channel **DISPLAY (Ch 4)**

Syntax: ISM

Front Panel Key: Graph Type\SMITH CHART (ADMITTANCE)

Related Commands: DLA, CH1-CH4, ISC, ISE, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

ISN Include isolation **CALIBRATION (Ch 5)**

Syntax: ISN

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12 TERM\INCLUDE ISOLATION

KEC Keep existing calibration data **CALIBRATION (Ch 5)**

Syntax: KEC

Front Panel Key: Begin Cal\KEEP EXISTING CALIBRATION

KHZ Suffix sets frequency data type and scales by 1E3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: KHZ

L1C Perform LO1 internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: L1C

Remarks: For service use only.

L2C Perform LO2 internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: L2C

Remarks: For service use only.

LA1 Select a1 = Ra as phase lock for parameter being defined **MEASUREMENT (Ch 4)**

Syntax: LA1

Related Commands: LA2,LAX?

LA2 Select a2 = Rb as phase lock for parameter being defined **MEASUREMENT (Ch 4)**

Syntax: LA2

Related Commands: LA1,LAX?

LAND Select landscape mode for output plot **HARD COPY (Ch 8)**

Syntax: LAND

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PLOT ORIENTATION LANDSCAPE**

Related Commands: PORT

LAX? Output phase lock selection for parameter being defined **MEASUREMENT (Ch 4)**

Syntax: `LAX?`

Data I/O: Outputs data using ASCII <NR1> format (section 10-3): “1” for A1 or ”2” for A2.

Related Commands: LA1,LA2

LAYCOL Enter the color number for overlay data **SYSTEM STATE (Ch 8)**

Syntax: `LAYCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\OVERLAY DATA**

Related Commands: ANNCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL, LAYCOL?

LAYCOL? Output the color number for overlay data **SYSTEM STATE (Ch 8)**

Syntax: `LAYCOL?`

Data I/O: Outputs the color palette number using ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\OVERLAY DATA (Color)**

Related Commands: DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL?, LAYCOL

LB0 Turn limits testing beep on failure off **LIMITS (Ch 6)**

Syntax: `LB0`

Front Panel Key: Limits**\TEST LIMITS\BEEP FOR TEST FAILURE OFF**

Related Commands: LB0, LT0, LBX?

LB1 Turn limits testing beep on failure on **LIMITS (Ch 6)**

Syntax: `LB1`

Remarks: Issues an audible beep if a set limit is exceeded.

Front Panel Key: Limits**TEST LIMITS\\BEEP FOR TEST FAILURE ON**

Related Commands: LB0, LT0, LBX?

LBX? Output limits testing beeper enable status **LIMITS (Ch 6)**

Syntax: `LBX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3) as follows: “0” for disabled or ”1” for enabled.

Front Panel Key: Limits**TEST LIMITS\\BEEP FOR TEST FAILURE**

LCM Select LRL calibration method **CALIBRATION (Ch 5)**

Syntax: `LCM`

Front Panel Key: Begin Cal**CHANGE CAL METHOD AND LINE TYPE\\LRL/LRM**

Related Commands: SCM, OCM

LDARF Load adapter removal files from disk and calibrate **DISK FUNCTION (Ch 8)**

Syntax: `LDARF Value 1, Value 2`

Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and filename of the XX front panel and cal file to load. Value 2 is in <string> data format specifying the path and filename of the YY front panel and calibration file to load

LDEDEF Load Embedding/De-embedding files from disk and embed/de-embed **EMBED/DE-EMBED (Ch 9)**

Syntax: `LDEDEF Value 1, Value 2`

Value: See Data I/O

Data I/O: Enter the data as two file names in <String> data format (section 10-3) .The first file contains the Front Panel and Cal Dats. The second file contains the S2P data. These files must reside on the VNA Hard drive or Floppy drive.

Front Panel Key: Appl**\EMBED/DE-EMBED\APPLY NETWORK S2P FILE DATA TO CAL FILE DATA**

Related Commands: IEDEF

LDMCF Load merge calibration files from disk and combine **MERGE CAL FILES (Ch 9)**

Syntax: `LDMCF`

Value: Value 1 is in <String> format (paragraph 10-3) specifying the filename of the lower frequency front panel and calibration data to merge. Value 2 is in <String> format specifying the filename of the higher frequency front panel calibration data to merge

Remarks: The total number of points after merging cannot exceed 1601. The instrument settings from the first cal data is taken as the merged instrument settings.

Data I/O: Enter the calibration file name in <String> data format (section 10-3) specifying the path and filename of the calibration file to load.

Front Panel Key: Appl**\MERGE CAL FILES**

Related Commands: IMCF

LDNXNO1 Load NxN files from disk and send device1 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNO1 Value 1, Value 2, Value 3`

Value: See Data I/O

Data I/O: Enter the data as three file names in <String> data format (section 10-3). The first file contains the device 1-2 S2P data. The second file contains the device 1-3 S2P data. The third file contains the device 2-3 S2P data. The device 1 S2P data is output using the <Arbitrary Block> format (section 10-3)

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 1**

Related Commands: LDNXNO2,LDNXNO3,INXNSV1,INXNSV2,INXNSV3

LDNXNO2 Load NxN files from disk and send device2 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNO2 Value 1, Value 2, Value 3`

Data I/O: Enter the data as three file names in <String> data format (section 10-3). The first file contains the device 1-2 S2P data. The second file contains the device 1-3 S2P data. The third file contains the device 2-3 S2P data. The device 2 S2P data is output using <Arbitrary Block> format (section 10-3)

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 2**

Related Commands: LDNXNO1,LDNXNO3,NXNSV1,INXNSV2,INXNSV3

LDNXNO3 Load NxN files from disk and send device3 data to GPIB **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNO3 Value 1, Value 2, Value 3`

Data I/O: Enter the data as three file names in <String> data format (section 10-3). The first file contains the device 1-2 S2P data. The second file contains the device 1-3 S2P data. The third file contains the device 2-3 S2P data. The device 3 S2P data is output using <Arbitrary Block> format (section 10-3)

Front Panel Key: Appl**\NXN SOLUTION\SOLVE DEVICE 3**

Related Commands: LDNXNO1,LDNXNO2,NXNSV1,INXNSV2,INXNSV3

LDNXNSV1 Load NxN data from disk and save device1 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNSV1 Value 1, Value 2, Value 3, Value 4`

Data I/O: Enter the data as four file names in <String> data format (section 10-3). The first file receives the device 1 S2P data. The second file contains the device 1-2 S2P data. The third file contains the device 1-3 S2P data. The fourth file contains the device 2-3 S2P data. All files reside on or are written to the VNA Hard drive or floppy drive.

Front Panel Key: Appl**NXN SOLUTION\\SOLVE DEVICE 1**

Related Commands: LDNXNSV2,LDNXNSV3,INXNSV1,INXNSV2,INXNSV3

LDNXNSV2 Load NxN data from disk and save device2 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNSV2 Value 1, Value 2, Value 3, Value 4`

Data I/O: Enter the data as four file names in <String> data format (section 10-3). The first file receives the device 2 S2P data. The second file contains the device 1-2 S2P data. The third file contains the device 1-3 S2P data. The fourth file contains the device 2-3 S2P data. All files reside on or are written to the VNA Hard drive or floppy drive.

Front Panel Key: Appl**NXN SOLUTION\\SOLVE DEVICE 2**

Related Commands: LDNXNSV1,LDNXNSV3,INXNSV1,INXNSV2,INXNSV3

LDNXNSV3 Load NxN data from disk and save device3 data to disk **NXN SOLUTION (Ch 9)**

Syntax: `LDNXNSV3 Value 1, Value 2, Value 3, Value 4`

Data I/O: Enter the data as four file names in <String> data format (section 10-3). The first file receives the device 3 S2P data. The second file contains the device 1-2 S2P data. The third file contains the device 1-3 S2P data. The fourth file contains the device 2-3 S2P data. All files reside on or are written to the VNA Hard drive or floppy drive.

Front Panel Key: Appl**NXN SOLUTION\\SOLVE DEVICE 3**

Related Commands: LDNXNSV1,LDNXNSV2,INXNSV1,INXNSV2,INXNSV3

LDODF Load optical data files from disk and calibrate **OPTICAL APPLICATION (Ch 9)**

Syntax: `LDODF Value 1, Value 2`
Value: See Data I/O

Data I/O: Value 1 is in <String> data format (section 10-3) specifying the path and filename of the front panel and calibration file to load. Value 2 is in <string> data format specifying the path and filename of the S2P format data file to load.

Related Commands: OCD, OS2P, DISKWR, IODF

LDT0 Disable printing date/time **HARD COPY (Ch 8)**

Syntax: `LDT0`

Front Panel Key: Hard Copy Menu**\SETUP HEADERS\DATE OFF**

Related Commands: LDT1

LDT1 Enable printing date/time **HARD COPY (Ch 8)**

Syntax: `LDT1`

Front Panel Key: Hard Copy Menu**\SETUP HEADERS\DATE ON**

Related Commands: LDT0

LFD Enter limit frequency readout delta value **LIMITS (Ch 6)**

Syntax: `LFD Value Unit(s)`
Value: Depends on graph type
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Remarks: Enter the value to offset Limit 2 from the currently set value of Limit 1. Both limits must be on to use this command. The values and suffixes are as appropriate for the graph type displayed.

Front Panel Key: Limits**\READOUT LIMIT\LIMIT DIFFERENCE**

Related Commands: LFP, CH1-CH4, LFD?

LFD2 Enter limit frequency readout delta value for bottom graph **LIMITS (Ch 6)**

Syntax: `LFD2 Value Unit(s)`
Value: Depends on graph type
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Remarks: Enter the value to offset Limit 2 from the currently set value of Limit 1. Both limits must be on to use this command. The values and suffixes are as appropriate for the graph type displayed.

Front Panel Key: Limits\ **READOUT LIMIT\LIMIT DIFFERENCE**

Related Commands: LFP, CH1-CH4, LFD2?

LFD2? Output limit frequency readout delta value for bottom graph **LIMITS (Ch 6)**

Syntax: `LFD2?`

Data I/O: Outputs its value in ASCII <NR3> format (section 10-3).

Front Panel Key: Limits\ **READOUT LIMIT\LIMIT DIFFERENCE**

Related Commands: LFD2

LFD? Output limit frequency readout delta value **LIMITS (Ch 6)**

Syntax: `LFD?`

Data I/O: Outputs its value in ASCII <NR3> format (section 10-3).

Front Panel Key: Limits\ **READOUT LIMIT\LIMIT DIFFERENCE**

Related Commands: LFD

LFP Select limit frequency readout for phase displays **LIMITS (Ch 6)**

Syntax: `LFP`

Remarks: Phase displays, which appears on a dual graph type like log magnitude and phase, are set using this command.

Related Commands: LFD, CH1-CH4

LFR — Select limit frequency readout for active channel — **LIMITS (Ch 6)**

Syntax: `LFR`

Related Commands: LFD, LFP

LID — Enter string for DUT identity — **MISCELLANEOUS (Ch 7)**

Syntax: `LID Value`
Value: String of up to 15 valid characters.

Front Panel Key: Hard Copy Menu**SETUP HEADERS\DEVICE ID ON**

Related Commands: LDT, LMS, LNM. LID?

LID? — Output string for DUT identity — **MISCELLANEOUS (Ch 7)**

Syntax: `LID?`

Data I/O: Outputs its string in <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Hard Copy Menu**SETUP HEADERS\DEVICE ID**

Related Commands: LID

LIN — Select linear magnitude display for active channel — **DISPLAY (Ch 4)**

Syntax: `LIN`

Front Panel Key: Graph Type**LINEAR MAG**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

LKS0 — Disable lock search mode — **DIAGNOSTICS (Ch 8)**

Syntax: `LKS0`

Remarks: For service use only.

LKS1 Enable lock search mode **DIAGNOSTICS (Ch 8)**

Syntax: `LKS1`

Remarks: For service use only.

LKT Load calibration kit information from floppy disk **DISK FUNCTION (Ch 8)**

Syntax: `LKT`

Front Panel Key: Utility Menu**\CAL COMPONENT UTILITIES\INSTALL KIT INFORMATION FROM FLOPPY DISK**

LL1 Enter length of line 1 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL1 Value Unit(s)`
Value: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT, LL2

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\NEXT CAL STEP\CHARACTERIZE CAL DEVICES DEVICE 1 LINE 1**

LL2 Enter length of line 2 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL2 Value Unit(s)`
Value: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\NEXT CAL STEP\CHARACTERIZE CAL DEVICES DEVICE 2 LINE**

LL3 Enter length of line 3 for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LL3 Value Unit(s)`
Value: 0 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\NEXT CAL STEP\CHARACTERIZE CAL DEVICES DEVICE 3 LINE**

LLM? Output limit line display mode single or segmented **LIMITS (Ch 6)**

Syntax: `LLM?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3) as follows: “0” for single or ”1” for segmented.

LLO Enter lower limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO Value Unit(s)`

Value: Depends on graph type (see DISPLAY group)

Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Limits\ **READOUT LIMIT\LOWER LIMIT**

Related Commands: LUP, CH1-CH4

LLO2 Enter lower limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO2 Value Unit(s)`

Value: Depends on graph type (see DISPLAY group)

Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Limits\ **READOUT LIMIT\LOWER LIMIT**

Related Commands: LFD2, LOL20, LOL21, LUP2, UPL20, UPL21

LLO2? Output lower limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO2?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\ **READOUT LIMIT\LOWER LIMIT**

Related Commands: LLO2

LLO? Output lower limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LLO?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\ **READOUT LIMIT\ LOWER LIMIT**

LLZ Enter line impedance for LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LLZ Value Unit(s)`
Value: 0.001 to 1x10E+3
Units: XX1 XX3, XM3, OHM

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ REFERENCE IMPEDANCE**

LM2 Select a match for the second device during a LRM type calibration **CALIBRATION (Ch 5)**

Syntax: `LM2`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ LRL/LRM PARAMETERS\ NEXT CAL STEP\ CHARACTERIZE CAL DEVICES DEVICE 2 MATCH**

LM3 Select a match for the third device during a LRM type calibration **CALIBRATION (Ch 5)**

Syntax: `LM3`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ LRL/LRM PARAMETERS\ NEXT CAL STEP\ CHARACTERIZE CAL DEVICES DEVICE 3 MATCH**

LMS Enter string for DUT model/serial number **HARD COPY (Ch 8)**

Syntax: `LMS Value`
Value: String of up to 15 valid characters.

Front Panel Key: Hard Copy Menu\ \ **SETUP HEADERS\ MODEL ON**

Related Commands: LMS

LMS? Output string for DUT model/serial number **HARD COPY (Ch 8)**

Syntax: LMS?

Data I/O: Outputs string in <Arbitrary ASCII> format.

Front Panel Key: Hard Copy Menu\\SETUP HEADERS\MODEL ON

Related Commands: LMS

LMZ Enter match impedance for LRM calibration **CALIBRATION (Ch 5)**

Syntax: LMZ Value Unit(s)
Value: 0.001 to 1x10E+3
Units: Ohms

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\MATCH IMPEDANCE

Related Commands: LMZ?

LMZ? Output match impedance for LRM calibration **CALIBRATION (Ch 5)**

Syntax: LMZ?

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Begin Cal\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\MATCH IMPEDANCE

Related Commands: LMZ

LMZL Enter match inductance for LRM calibration **CALIBRATION (Ch 5)**

Syntax: LMZL Value Unit(s)
Value: -9999.9999 - 9999.9999
Units: PicoHenries

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\MATCH INDUCTANCE

Related Commands: LMZL?

LMZL? Output match inductance for LRM calibration **CALIBRATION (Ch 5)**

Syntax: `LMZL?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Begin Cal**\NEXT CAL STEP\ENTER (to select CAL TYPES and SETUPS)\NEXT CAL STEP\MATCH INDUCTANCE**

Related Commands: LMZL

LNM Enter string for operator name **HARD COPY (Ch 8)**

Syntax: `LNM Value`
Value: String of up to 15 characters long

Front Panel Key: Hard Copy Menu**\\SETUP HEADERS\OPERATOR ON**

Related Commands: LID, LMS

LNM? Output string for operator name **HARD COPY (Ch 8)**

Syntax: `LNM?`

Data I/O: Outputs its string in <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Hard Copy Menu**\\SETUP HEADERS\OPERATOR**

Related Commands: LNM

LO11 Select LO1 phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO11`

Remarks: For service use only.

LO12 Select LO1 D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO12`

Remarks: For service use only.

LO21 Select LO2 main phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO21`

Remarks: For service use only.

LO22 Select LO2 offset phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO22`

Remarks: For service use only.

LO23 Select LO2 DDS phase lock voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO23`

Remarks: For service use only.

LO24 Select LO2 main D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO24`

Remarks: For service use only.

LO25 Select LO2 offset D/A voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: `LO25`

Remarks: For service use only.

LOC Enter string for operator comment **HARD COPY (Ch 8)**

Syntax: `LOC Value`
Value: String up to 79 characters long

Front Panel Key: Hard Copy Menu**SETUP HEADERS\COMMENT ON**

Related Commands: LID, LNM, LMS

LOC? Output string for operator comment **HARD COPY (Ch 8)**

Syntax: LOC?

Data I/O: Outputs string in <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Hard Copy Menu\ **\SETUP HEADERS\COMMENT**

Related Commands: LOC

LOF Limits display off **LIMITS (Ch 6)**

Syntax: LOF

Front Panel Key: Limits**\TEST LIMITS\LIMIT TESTING OFF**

Related Commands: LON

LOGO0 Turn hard copy logo off **HARD COPY (Ch 8)**

Syntax: LOGO0

Remarks: After mnemonic is issued, printer and plotter will not form the logo portion of the printout or plot.

Front Panel Key: Hard Copy Menu\ **\SETUP HEADERS\SETUP LOGO\LOGO OFF**

Related Commands: LOGO1, LOGOX?

LOGO1 Turn hard copy logo on **HARD COPY (Ch 8)**

Syntax: LOGO1

Remarks: After mnemonic is issued, printer an plotter will form a logo when printing or plotting.

Front Panel Key: Hard Copy Menu\ **\SETUP HEADERS\SETUP LOGO\LOGO ON**

Related Commands: LOGO0, LOGOX?

LOGO? Output hard copy logo selection standard/user defined **HARD COPY (Ch 8)**

Syntax: LOGO?

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for standard Anritsu logo or ”1” for user defined logo.

Related Commands: LOGOS, LOGOU

LOGOS Select standard hard copy logo **HARD COPY (Ch 8)**

Syntax: LOGOS

Front Panel Key: Hard Copy Menu**\\SETUP HEADERS\SETUP LOGO\LOGO TYPE STANDARD**

Related Commands: LOGOU, LOGO?

LOGOU Select user defined hard copy logo **HARD COPY (Ch 8)**

Syntax: LOGOU

Remarks: For the user-defined logo to function, the following files must be present in the C:\UTIL subdirectory: LOGO.EPS for epson type printers LOGO.HP for HP type printers and LOGO.PLT for plotters. If the required file is not found, the standard Anritsu logo will be used.

Front Panel Key: Hard Copy Menu**\\SETUP HEADERS\SETUP LOGO\LOGO TYPE USER LOGO**

Related Commands: LOGOS, LOGO?

LOGOX? Output hard copy logo on/off status **HARD COPY (Ch 8)**

Syntax: LOGOX?

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

Front Panel Key: Hard Copy Menu**\\SETUP HEADERS\SETUP LOGO\LOGO TYPE**

Related Commands: LOGO0, LOGO1

LOL0 Turn lower limit off **LIMITS (Ch 6)**

Syntax: LOL0

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT OFF**

Related Commands: LON, LOF, LOL1, LLO

LOL1 Turn lower limit on at current value **LIMITS (Ch 6)**

Syntax: LOL1

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT ON**

Related Commands: LON, LOF, LOL0, LLO

LOL20 Turn lower limit off for bottom graph **LIMITS (Ch 6)**

Syntax: LOL20

Related Commands: LON, LOF, LOL21, LLO2

LOL21 Turn lower limit on at current value for bottom graph **LIMITS (Ch 6)**

Syntax: LOL21

Related Commands: LON, LOF, LOL20, LLO2

LOL2X? Output lower limit on/off status for bottom graph **LIMITS (Ch 6)**

Syntax: LOL2X?

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

Related Commands: LOL20, LOL21

LOLX? Output lower limit on/off status **LIMITS (Ch 6)**

Syntax: `LOLX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF, ”1” for ON.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

LON Limits display on **LIMITS (Ch 6)**

Syntax: `LON`

Front Panel Key: Limits\ **TEST LIMITS\ LIMIT TESTING ON**

LON? Output limits display on/off status **LIMITS (Ch 6)**

Syntax: `LON?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

Front Panel Key: Limits\ **TEST LIMITS\ LIMIT TESTING ON**

LPF1? Output limit test failure status on channel 1 **LIMITS (Ch 6)**

Syntax: `LPF1?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

LPF2? Output limit test failure status on channel 2 **LIMITS (Ch 6)**

Syntax: `LPF2?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

LPF3? Output limit test failure status on channel 3 **LIMITS (Ch 6)**

Syntax: `LPF3?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

LPF4? Output limit test failure status on channel 4 **LIMITS (Ch 6)**

Syntax: `LPF4?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

LPF? Output limit test failure status all channels **LIMITS (Ch 6)**

Syntax: `LPF?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for logo off or ”1” for logo on.

LPH Select linear magnitude and phase display for active channel **DISPLAY (Ch 4)**

Syntax: `LPH`

Front Panel Key: Graph Type**LINEAR MAG AND PHASE**

Related Commands: CH1-CH4

LPI Select lowpass impulse response for active channel **TIME DOMAIN (Ch 9)**

Syntax: `LPI`

Remarks: Requires a calibration that used a harmonically related set of data points - time domain calibration.

Front Panel Key: Domain**SET RANGE****RESPONSE IMPULSE**

Related Commands: TDC, CH1-CH4

LPS Select lowpass step response for active channel **TIME DOMAIN (Ch 9)**

Syntax: `LPS`

Remarks: Requires a calibration that used a harmonically related set of data points - time domain calibration.

Front Panel Key: Domain**SET RANGE****RESPONSE STEP**

Related Commands: TDC, CH1-CH4

LPSX? Output lowpass response for active channel impulse or step **TIME DOMAIN (Ch 9)**

Syntax: `LPSX?`

Data I/O: Outputs its number using ASCII <NR1> format (section 10-3) as follows: “0” for impulse or ”1” for step.

Front Panel Key: Domain**\SET RANGE\RESPONSE**

LR2 Specify 2 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LR2`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\NUMBER OF BANDS USED ONE BAND**

LR3 Specify 3 line LRL calibration **CALIBRATION (Ch 5)**

Syntax: `LR3`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\NUMBER OF BANDS USED TWO BANDS**

LS1 Set lower segmented limit 100 as the active segment **LIMITS (Ch 6)**

Syntax: `LS1`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits**\SINGLE LIMITS\LOWER LIMIT**

Related Commands: US1-US10, CH1-CH4, LSX?

LS10 Select lower segmented limit 10 as the active segment **LIMITS (Ch 6)**

Syntax: `LS10`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits**\SINGLE LIMITS\LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS2 Select lower segmented limit 2 as the active segment **LIMITS (Ch 6)**

Syntax: `LS2`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS3 Select lower segmented limit 3 as the active segment **LIMITS (Ch 6)**

Syntax: `LS3`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS4 Select lower segmented limit 4 as the active segment **LIMITS (Ch 6)**

Syntax: `LS4`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS5 Select lower segmented limit 5 as the active segment **LIMITS (Ch 6)**

Syntax: `LS5`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS6 Select lower segmented limit 6 as the active segment **LIMITS (Ch 6)**

Syntax: `LS6`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS7 Select lower segmented limit 7 as the active segment **LIMITS (Ch 6)**

Syntax: `LS7`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS8 Select lower segmented limit 8 as the active segment **LIMITS (Ch 6)**

Syntax: `LS8`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LS9 Select lower segmented limit 9 as the active segment **LIMITS (Ch 6)**

Syntax: `LS9`

Remarks: All succeeding limit segment commands will apply to LSx.

Front Panel Key: Limits\ **SINGLE LIMITS\ LOWER LIMIT**

Related Commands: US-US10, CH1-CH4, LSX?

LSB Select least significant byte first binary transfer **DATA TRANSFER (Ch 7)**

Syntax: `LSB`

Remarks: This is convenient for transferring data into or out of IBM/Intel based computers.

Related Commands: MSB, FMB, FMC

LSEG Select segmented limit line display mode **LIMITS (Ch 6)**

Syntax: `LSEG`

Remarks: Any segmented limit line command selects this mode automatically.

Related Commands: LSNG

LSNG Select single limit line display mode **LIMITS (Ch 6)**

Syntax: `LSNG`

Remarks: Any single limit line command selects this mode automatically.

Related Commands: LSEG

LSX? Output active segmented limit **LIMITS (Ch 6)**

Syntax: `LSX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3). “1Ä10” for lower limit 1A10 or ”100010” for upper limit 1Ä10.

Front Panel Key: Limits\SINGLE LIMITS\LOWER LIMIT

LT0 Turn limits testing off **LIMITS (Ch 6)**

Syntax: `LT0`

LT1 Turn limits testing on **LIMITS (Ch 6)**

Syntax: `LT1`

Status Reporting: A limit test failure will set bits (0A3 for Channels 1A4, respectively) in the Limits Event Status Register.

LT1? Output limits testing enable status **LIMITS (Ch 6)**

Syntax: `LT1?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3). “0” for OFF or ”1” for ON.

LTC Select coaxial transmission line for calibration **CALIBRATION (Ch 5)**

Syntax: `LTC`

Remarks: Selects a coaxial transmission line for the calibration.

Front Panel Key: Begin Cal**CHANGE CAL METHOD AND LINE TYPE\TRANSMISSION LINE TYPE COAXIAL**

LTRD Output response data from the dedicated GPIB bus **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `LTRD Value 1, Value 2`
Value: Value 1 is the gpib address of the device to read from.Value 2 is the number of bytes to read in ASCII <NRf> format (paragraph 10-3).

Data I/O: val1 and val2 in ASCII <NRf> format and Outputs an <Arbitrary Block> (section 10-3).

Related Commands: LTWRT

LTST Display the limits testing menu **LIMITS (Ch 6)**

Syntax: `LTST`

Related Commands: LT0, LT1

LTU Select microstrip transmission line for calibration **CALIBRATION (Ch 5)**

Syntax: `LTU`

Front Panel Key: Begin Cal\CHANGE CAL METHOD AND LINE TYPE\TRANSMISSION LINE TYPE MICROSTRIP

LTW Select waveguide transmission line for calibration **CALIBRATION (Ch 5)**

Syntax: `LTW`

Remarks: Can only use an offset short or CRL/LRM calibration method with waveguide calibration.

Front Panel Key: Begin Cal\CHANGE CAL METHOD AND LINE TYPE\TRANSMISSION LINE TYPE WAVEGUIDE

LTWRT Send program data to the dedicated GPIB bus **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `LTWRT Value 1, Value 2`

Value: Value 1 is the GPIB address of the device to write the data to. Value 2 is the data to write.

Data I/O: Val1 is in ASCII <NRf> format and val2 is in <Arbitrary block> format (section 10-3).

Related Commands: LTRD

LTX? Output line type **CALIBRATION (Ch 5)**

Syntax: `LTX?`

Data I/O: Outputs its value in ASCII <NR1> format (section 10-3) as follows: “1” for coax, ”2” for waveguide or “3” for microstrip.

Front Panel Key: Begin Cal\TRANSMISSION LINE TYPE

LUP Enter upper limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LUP Value Unit(s)`

Value: Depends on graph type; see Table 11-2 at the end of this chapter.

Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Remarks: The values and suffixes are as appropriate for the graph type displayed. That is, DEG, dB, REU, etc.

Front Panel Key: Limits**READOUT LIMIT\\UPPER LIMIT**

Related Commands: LON, LOF, UPL0, UPL1

LUP2 Enter upper limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LUP2 Value Unit(s)`

Value: Depends on graph type; see Table 11-2 at the end of this chapter.

Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Remarks: The values and suffixes are as appropriate for the graph type displayed. That is, DEG, dB, REU, etc.

Front Panel Key: Limits**READOUT LIMIT\\UPPER LIMIT**

Related Commands: LON, LOF, UPL20, UPL21

LUP2? Output upper limit value for bottom graph on active channel **LIMITS (Ch 6)**

Syntax: `LUP2?`

Data I/O: Outputs its value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits**READOUT LIMIT\\UPPER LIMIT**

Related Commands: LUP2

LUP? Output upper limit value for top graph on active channel **LIMITS (Ch 6)**

Syntax: `LUP?`

Data I/O: Outputs its value using ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits**READOUT LIMIT\\UPPER LIMIT**

LVH Select high as limits testing TTL level **LIMITS (Ch 6)**

Syntax: `LVH`

Front Panel Key: Limits**\TEST LIMITS\LIMIT TEST TTL FAIL CONDITION\TTL HIGH**

Related Commands: LVL, LVX?

LVL Select low as limits testing TTL level **LIMITS (Ch 6)**

Syntax: `LVL`

Front Panel Key: Limits**\TEST LIMITS\LIMIT TEST TTL FAIL CONDITION\TTL LOW**

Related Commands: LVH, LVX?

LVX? Output limits testing ttl level status **LIMITS (Ch 6)**

Syntax: `LVX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for low or ”1” for high.

Front Panel Key: Limits**\TEST LIMITS\LIMIT TEST TTL FAIL CONDITION**

M Suffix sets distance data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `M`

Related Commands: MTR

M1C Set CW mode at marker 1 frequency **MARKERS (Ch 6)**

Syntax: `M1C`

Remarks: Marker 1 must be set.

Front Panel Key: Setup Menu**\MARKER SWEEP\C.W. FREQ MARKER 1**

Related Commands: MK1-MK12

M1E Set sweep/zoom end to marker 1 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M1E`

Remarks: Marker 1 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ STOP TIME MARKER 1**

Related Commands: MK1-MK12

M1S Set sweep/zoom start to marker 1 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M1S`

Remarks: Marker 1 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ START TIME MARKER 1**

Related Commands: MK1-MK12

M2C Set CW mode at marker 2 frequency **MARKERS (Ch 6)**

Syntax: `M2C`

Remarks: Marker 2 must be set.

Front Panel Key: Setup Menu\ **MARKER SWEEP\ C.W. FREQ MARKER 2**

Related Commands: MK1-MK12

M2E Set sweep/zoom end to marker 2 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M2E`

Remarks: Marker 2 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ STOP TIME MARKER 2**

Related Commands: MK1-MK12

M2S Set sweep/zoom start to marker 2 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M2S`

Remarks: Marker 2 must be set.

Front Panel Key: Domain\SET RANGE\MARKER RANGE\START TIME MARKER 2

Related Commands: MK1-MK12

M3C Set CW mode at marker 3 frequency **MARKERS (Ch 6)**

Syntax: `M3C`

Remarks: Marker 3 must be set.

Front Panel Key: Setup Menu\MARKER SWEEP\C.W. FREQ MARKER 3

Related Commands: MK1-MK12

M3E Set sweep/zoom end to marker 3 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M3E`

Remarks: Marker 3 must be set.

Front Panel Key: Domain\SET RANGE\MARKER RANGE\STOP TIME MARKER 3

Related Commands: MK1-MK12

M3S Set sweep/zoom start to marker 3 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M3S`

Remarks: Marker 3 must be set.

Front Panel Key: Domain\SET RANGE\MARKER RANGE\START TIME MARKER 3

Related Commands: MK1-MK12

M4C Set CW mode at marker 4 frequency **MARKERS (Ch 6)**

Syntax: M4C

Remarks: Marker 4 must be set.

Front Panel Key: Setup Menu **\MARKER SWEEP\C.W. FREQ MARKER 4**

Related Commands: MK1-MK12

M4E Set sweep/zoom end to marker 4 frequency distance or time **MARKERS (Ch 6)**

Syntax: M4E

Remarks: Marker 4 must be set.

Front Panel Key: Domain **\SET RANGE\MARKER RANGE\STOP TIME MARKER 4**

Related Commands: MK1-MK12

M4S Set sweep/zoom start to marker 4 frequency distance or time **MARKERS (Ch 6)**

Syntax: M4S

Remarks: Marker 4 must be set.

Front Panel Key: Domain **\SET RANGE\MARKER RANGE\START TIME MARKER 4**

Related Commands: MK1-MK12

M5C Set CW mode at marker 5 frequency **MARKERS (Ch 6)**

Syntax: M5C

Remarks: Marker 5 must be set.

Front Panel Key: Setup Menu **\MARKER SWEEP\C.W. FREQ MARKER 5**

Related Commands: MK1-MK12

M5E Set sweep/zoom end to marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M5E`

Remarks: Marker 5 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ STOP TIME MARKER 5**

Related Commands: MK1-MK12

M5S Set sweep/zoom start to marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M5S`

Remarks: Marker 5 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ START TIME MARKER 5**

Related Commands: MK1-MK12

M6C Set CW mode at marker 6 frequency **MARKERS (Ch 6)**

Syntax: `M6C`

Remarks: Marker 6 must be set.

Front Panel Key: Setup Menu\ **MARKER SWEEP\ C.W. FREQ MARKER 6**

Related Commands: MK1-MK12

M6E Set sweep/zoom end to marker 6 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M6E`

Remarks: Marker 6 must be set.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ STOP TIME MARKER 6**

Related Commands: MK1-MK12

M6S Set sweep/zoom start to marker 6 frequency distance or time **MARKERS (Ch 6)**

Syntax: `M6S`

Remarks: Marker 6 must be set.

Front Panel Key: Domain **\SET RANGE\MARKER RANGE\START TIME MARKER 6**

Related Commands: MK1-MK12

MAG Select log magnitude display for active channel **DISPLAY (Ch 4)**

Syntax: `MAG`

Front Panel Key: Graph Type **\LOG MAGNITUDE**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

MAT Select matched reflective devices during cal **CALIBRATION (Ch 5)**

Syntax: `MAT`

Front Panel Key: Begin Cal **\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\REFLECTION PAIRING\MATCHED (OPEN-OPEN/SHORT-SHORT)**

Related Commands: MIX

MD Create a new disk directory **DISK FUNCTION (Ch 8)**

Syntax: `MD Value`
Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and directory name to create.

Remarks: The path must already exist.

Related Commands: ADRIVE, CDRIVE, CD, MD

MEASDLY Set Measurement Delay time **ENHANCEMENT (Ch 4)**

Syntax: `MEASDLY Value`
Value: 0.001 to 99.9999

Remarks: Minimum resolution is 0.0001 seconds

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Option Menu**\TRIGGERS\MEASUREMENT DELAY**

Related Commands: MEASDLY0, MEASDLY1, MEASDLY?, MEASDLYX?

MEASDLY0 Disable Measurement Delay **ENHANCEMENT (Ch 4)**

Syntax: `MEASDLY0`

Front Panel Key: Option Menu**\TRIGGERS\MEASUREMENT DELAY OFF**

Related Commands: MEASDLY, MEASDLY1, MEASDLY?, MEASDLYX?

MEASDLY1 Enable Measurement Delay **ENHANCEMENT (Ch 4)**

Syntax: `MEASDLY1`

Front Panel Key: Option Menu**\TRIGGERS\MEASUREMENT DELAY ON**

Related Commands: MEASDLY, MEASDLY0, MEASDLY?, MEASDLYX?

MEASDLY? Output Measurement Delay time **ENHANCEMENT (Ch 4)**

Syntax: `MEASDLY?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Option Menu**\TRIGGERS\MEASUREMENT DELAY**

Related Commands: MEASDLY, MEASDLY0, MEASDLY1, MEASDLYX?

MEASDLYX? Output Measurement Delay on/off status **ENHANCEMENT (Ch 4)**

Syntax: `MEASDLYX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Option Menu **\TRIGGERS\MEASUREMENT DELAY**

Related Commands: MEASDLY, MEASDLY0, MEASDLY1, MEASDLY?

MEM Display trace memory on active channel **DISPLAY (Ch 4)**

Syntax: `MEM`

Remarks: Store data from selected channel to memory (STD command), before using this command to view a trace with trace memory active.

Front Panel Key: Trace Memory **\VIEW MEMORY**

Related Commands: STD, CH1-CH4

MFGCT Start multiple frequency swept power gain compression test **GAIN COMPRESSION (Ch 9)**

Syntax: `MFGCT`

Remarks: Begins the automated sequence which collects and displays the multiple frequency swept power gain compression data.

Related Commands: SPGCA, SPGCT

MHZ Suffix sets frequency data type and scales by 1E6 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MHZ`

MIN Select subtraction as trace math for active channel **DISPLAY (Ch 4)**

Syntax: `MIN`

Front Panel Key: Trace Memory **\SELECT TRACE MATH\SUBSTRACT(-)**

Related Commands: MUL, ADD, DIV, CH1-CH4, MTH?

MIX Select mixed reflective devices during calibration **CALIBRATION (Ch 5)**

Syntax: `MIX`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\REFLECTION PAIRING\MIXED (OPEN-SHORT-SHORT/OPEN)**

Related Commands: MAT

MK1 Enter marker 1 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK1 Value Unit(s)`

Value: Limited to current frequency, time, or distance sweep/zoomrange

Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu\ **SET MARKER\MARKER 1 ON**

Related Commands: MR1-MR12

MK1? Output marker 1 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK1?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu\ **SET MARKER\MARKER**

Related Commands: OM1-OM12

MK2 Enter marker 2 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK2 Value Unit(s)`
Value: Limited to current frequency, time, or distance sweep/zoomrange
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu **\SET MARKER\MARKER 2 ON**

Related Commands: MR1-MR12

MK2? Output marker 2 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK2?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu **\SET MARKER\MARKER 2**

Related Commands: OM1-OM12

MK3 Enter marker 3 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK3 Value Unit(s)`
Value: Limited to current frequency, time, or distance sweep/zoomrange
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu **\SET MARKER\MARKER 3 ON**

Related Commands: MR1-MR12

MK3? Output marker 3 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK3?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu **\SET MARKER\MARKER 3**

Related Commands: OM1-OM12

MK4 Enter marker 4 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK4 Value Unit(s)`
Value: Limited to current frequency, time, or distance sweep/zoomrange
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu **\SET MARKER\MARKER 4 ON**

Related Commands: MR1-MR12

MK4? Output marker 4 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK4?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu **\SET MARKER\MARKER 4**

Related Commands: OM1-OM12

MK5 Enter marker 5 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK5 Value Unit(s)`
Value: Limited to current frequency, time, or distance sweep/zoomrange
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu **\SET MARKER\MARKER 5 ON**

Related Commands: MR1-MR12

MK5? Output marker 5 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK5?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu **\SET MARKER\MARKER 5**

Related Commands: OM1-OM12

MK6 Enter marker 6 frequency distance or time and turn on **MARKERS (Ch 6)**

Syntax: `MK6 Value Unit(s)`
Value: Limited to current frequency, time, or distance sweep/zoomrange
Units: time = S, MS, USC, PS, PSC, NS, NSC
distance = M, MTR, MM, MMT, CM, CMT
frequency = HZ, KHZ, MHZ, GHZ

Front Panel Key: Marker Menu **\SET MARKER\MARKER 6 ON**

Related Commands: MR1-MR12

MK6? Output marker 6 frequency distance or time **MARKERS (Ch 6)**

Syntax: `MK6?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3). The value is in time, distance , or frequency units depending on current sweep domain.

Front Panel Key: Marker Menu**\SET MARKER\MARKER 6**

Related Commands: OM1-OM12

MKRC Select interpolated marker functionality **MARKERS (Ch 6)**

Syntax: `MKRC`

Front Panel Key: Marker Menu**\MARKER READOUT FUNCTIONS\MARKER MODE CONTINUOUS**

Related Commands: MKRD, MKRX?

MKRCOL Enter the color number for the markers **SYSTEM STATE (Ch 8)**

Syntax: `MKRCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MARKERS AND LIMITS**

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MNUCOL, TRCCOL, MKRCOL?

MKRCOL? Output the color number for the markers **SYSTEM STATE (Ch 8)**

Syntax: `MKRCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MARKERS AND LIMITS (Color)**

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MNUCOL?, TRCCOL?, MKRCOL

MKRD Select discrete marker functionality **MARKERS (Ch 6)**

Syntax: `MKRD`

Front Panel Key: Marker Menu\ **MARKER READOUT FUNCTIONS\MARKER MODE DISCRETE**

Related Commands: MKRC, MKRX?

MKRX? Output interpolated/discrete marker functionality **MARKERS (Ch 6)**

Syntax: `MKRX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for Discrete or ”1” for Interpolated.

Front Panel Key: Marker Menu\ **MARKER READOUT FUNCTIONS\MARKER MODE**

Related Commands: MKRC, MKRD

MKSL Marker search left **MARKERS (Ch 6)**

Syntax: `MKSL Value Unit(s)`
Value: Depends on graph type
Units: Depends on graph type

Remarks: If the optional val1 unit(s) argument is not supplied, the search marker (marker 2) is moved from its current position to the next most previous occurrence of the search value (see mnemonic SRCH). If the val1 unit(s) argument is supplied, the search value is updated to the argument value prior to moving the search marker.

Status Reporting: If the search fails to find the search value, the search failure bit (bit 4) in the Limits Event Status Register will be set. An Execution Error will also be reported.

Front Panel Key: Readout Marker\ **SEARCH LEFT**

Related Commands: MKSR, SMKR, SRCH, SRCH?

MKSR Marker search right **MARKERS (Ch 6)**

Syntax: `MKSR Value Unit(s)`
Value: Depends on graph type
Units: Depends on graph type

Remarks: If the optional val1 unit(s) argument is not supplied, the search marker (marker 2) is moved from its current position to the next occurance of the search value (see mnemonic SRCH). If the val1 unit(s) argument is supplied, the search value is updated to the argument value prior to moving the search marker.

Status Reporting: If the search fails to find the search value, the search failure bit (bit 4) in the Limits Event Status Register will be set. An Execution Error will also be reported.

Front Panel Key: Readout Marker\ **SEARCH RICHT**

Related Commands: MKSL, SMKR, SRCH, SRCH?

MKT0 Turn marker tracking off **MARKERS (Ch 6)**

Syntax: `MKT0`

Front Panel Key: Readout Marker\ **TRACKING OFF**

Related Commands: MKT1, MKTX?

MKT1 Turn marker tracking on **MARKERS (Ch 6)**

Syntax: `MKT1`

Front Panel Key: Readout Marker\ **TRACKING ON**

Related Commands: MKT0, MKTX?

MKTX? Output marker tracking on/off status **MARKERS (Ch 6)**

Syntax: `MKTX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Readout Marker\ **TRACKING**

Related Commands: MKT0, MKT1

MM Suffix sets distance data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MM`

MMBX? Output Millimeter Wave band selection **MILLIMETER WAVE (Ch 9)**

Syntax: `MMBX?`

Data I/O: Returns a value in ASCII <NR1> format (section 10-3) as follows: (0=Q22,1=V15,2=E12,3=E12E,4=W10,5=W10E, 6=F08).

MMN Move active marker to minimum trace value **MARKERS (Ch 6)**

Syntax: `MMN`

Front Panel Key: Marker Menu**\CH1-S11\MARKER TO MIN**

Related Commands: MMX, CH1-CH4

MMT Suffix sets distance data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MMT`

Related Commands: MM

MMX Move active marker to maximum trace value **MARKERS (Ch 6)**

Syntax: `MMX`

Front Panel Key: Marker Menu**\CH1-S11\MARKER TO MAX**

Related Commands: MMN, CH1-CH4

MNUCOL Enter the color number for the menu headers **SYSTEM STATE (Ch 8)**

Syntax: `MNUCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 (end of chapter).

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MENU HEADERS (TITLES & INFO)**

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, TRCCOL, MNUCOL?

MNUCOL? Output the color number for the menu headers **SYSTEM STATE (Ch 8)**

Syntax: `MNUCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format (section 10-3).

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MENU HEADERS (TITLES & INFO) (Color)**

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, TRCCOL?, MNUCOL?

MO1 Turn off marker 1 **MARKERS (Ch 6)**

Syntax: `MO1`

Front Panel Key: Marker Menu**\SET MARKER\MARKER 1 OFF**

MO2 Turn off marker 2 **MARKERS (Ch 6)**

Syntax: `MO2`

Front Panel Key: Marker Menu**\SET MARKER\MARKER 2 OFF**

MO3 Turn off marker 3 **MARKERS (Ch 6)**

Syntax: `MO3`

Front Panel Key: V\SET MARKER\MARKER 3 OFF

MO4 Turn off marker 4 **MARKERS (Ch 6)**

Syntax: `MO4`

Front Panel Key: Marker Menu\ **SET MARKER\ MARKER 4 OFF**

MO5 Turn off marker 5 **MARKERS (Ch 6)**

Syntax: `MO5`

Front Panel Key: Marker Menu\ **SET MARKER\ MARKER 5 OFF**

MO6 Turn off marker 6 **MARKERS (Ch 6)**

Syntax: `MO6`

Front Panel Key: Marker Menu\ **SET MARKER\ MARKER 6 OFF**

MOF Turn marker display off **MARKERS (Ch 6)**

Syntax: `MOF`

Front Panel Key: Marker Menu\ **DISPLAY MARKERS OFF**

MON Turn marker display on **MARKERS (Ch 6)**

Syntax: `MON`

Front Panel Key: Marker Menu\ **DISPLAY MARKERS ON**

MON? Output marker display on/off status **MARKERS (Ch 6)**

Syntax: `MON?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **DISPLAY MARKERS**

MOSET Enter constant offset log magnitude for active channel **DISPLAY (Ch 4)**

Syntax: `MOSET Unit(s)`
Units: DB, DBL, DBM, XX1, XX3, XM3

MOSET? Output constant offset log magnitude for active channel **DISPLAY (Ch 4)**

Syntax: `MOSET?`

MPH Select log magnitude and phase display for active channel **DISPLAY (Ch 4)**

Syntax: `MPH`

Front Panel Key: Graph Type\ **LOG MAGNITUDE AND PHASE**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, PCP, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

MPN Enter pen number for markers and limits **HARD COPY (Ch 8)**

Syntax: `MPN Value Unit(s)`
Value: 1 to 8
Units: XX1

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ MARKERS AND LIMITS PEN**

MPN? Output pen number for markers and limits **HARD COPY (Ch 8)**

Syntax: `MPN?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PEN COLORS\ MARKERS AND LIMITS PEN**

Related Commands: MPN, DPN?, GPN?, HPN?, TPN?

MR1 Turn marker 1 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR1`

Front Panel Key: Marker Menu\ **MARKER 1 ON**

MR1? Output marker 1 on/off status **MARKERS (Ch 6)**

Syntax: `MR1?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 1**

Related Commands: MR102, MO102

MR2 Turn marker 2 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR2`

Front Panel Key: Marker Menu\ **MARKER 2 ON**

MR2? Output marker 2 on/off status **MARKERS (Ch 6)**

Syntax: `MR2?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 2**

Related Commands: MR102, MO102

MR3 Turn marker 3 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR3`

Front Panel Key: Marker Menu\ **MARKER 3 ON**

MR3? Output marker 3 on/off status **MARKERS (Ch 6)**

Syntax: `MR3?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 3**

Related Commands: MR102, MO102

MR4 Turn marker 4 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR4`

Front Panel Key: Marker Menu\ **MARKER 4 ON**

MR4? Output marker 4 on/off status **MARKERS (Ch 6)**

Syntax: `MR4?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 4**

Related Commands: MR102, MO102

MR5 Turn marker 5 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR5`

Front Panel Key: Marker Menu\ **MARKER 5 ON**

MR5? Output marker 5 on/off status **MARKERS (Ch 6)**

Syntax: `MR5?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 5**

Related Commands: MR102, MO102

MR6 Turn marker 6 on and make it the active marker **MARKERS (Ch 6)**

Syntax: `MR6`

Front Panel Key: Marker Menu\ **MARKER 6 ON**

MR6? Output marker 6 on/off status **MARKERS (Ch 6)**

Syntax: `MR6?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Marker Menu\ **MARKER 6**

Related Commands: MR102, MO102

MRM Display the Marker Readout menu **MARKERS (Ch 6)**

Syntax: `MRM`

Related Commands: LFP, LFR, LTST

MRR Restore original marker range **TIME DOMAIN (Ch 9)**

Syntax: `MRR`

Remarks: Valid only in the Time Domain mode.

Front Panel Key: Domain\ **SET RANGE\ MARKER RANGE\ RESTORE ORIGINAL RANGE**

MRX? Output active marker number **MARKERS (Ch 6)**

Syntax: `MRX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for No marker, ”1” thru “6” for the marker number.

Related Commands: MR102

MS Suffix sets time data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `MS`

MS0 Turn multiple source mode off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MS0`

Front Panel Key: Options Menu\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE OFF

Related Commands: MS1, MSD

MS1 Turn multiple source mode on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MS1`

Front Panel Key: Options Menu\MILLIMETER WAVE BAND DEFINITION\MULTIPLE SOURCE MODE ON

Related Commands: MS0, MSD

MSB Select most significant byte first binary transfer **DATA TRANSFER (Ch 7)**

Syntax: `MSB`

Remarks: Default format for byte ordering — not suitable for IBM/Intel based computers.

Related Commands: LSB

MSD Select multiple source define mode **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `MSD`

Related Commands: MS0, MS1

MSFH Enter high loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFH Value Unit(s)`
Value: Depends on graph type; refer to Table 11-2 at the end of this chapter.
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Front Panel Key: Readout Marker\SHAPE FACTOR HIGH

Related Commands: MSFL, MSFH?, FLTS?, DSF0, DSF1

MSFH? Output high loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFH?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Readout Marker\ **SHAPE FACTOR HIGH**

Related Commands: MSFH

MSFL Enter low loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFL Value Unit(s)`
Value: Depends on graph type; refer to Table 11-2 at the end of this chapter.
Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Front Panel Key: Readout Marker\ **SHAPE FACTOR LOW**

Related Commands: MSFH, MSFL?, FLTS?, DSF0, DSF1

MSFL? Output low loss value for shape factor calculation **MARKERS (Ch 6)**

Syntax: `MSFL?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Readout Marker\ **SHAPE FACTOR LOW**

Related Commands: MSFL

MSR0 Select 0 as reference for marker search and bandwidth calculation **MARKERS (Ch 6)**

Syntax: `MSR0`

Front Panel Key: Readout Marker\ **REFERENCE 0 Db**

Related Commands: MSRD, MSRM, MSRX?

MSRD Select delta reference marker as reference for marker search and bandwidth calculation **MARKERS (Ch 6)**

Syntax: MSRD

Related Commands: MSR0, MSRM, MSRX?

MSRM Select maximum as reference for marker search and bandwidth calculation **MARKERS (Ch 6)**

Syntax: MSRM

Related Commands: MSR0, MSRD, MSRX?

MSRX? Output reference selection for marker search and bandwidth calculation **MARKERS (Ch 6)**

Syntax: MSRX?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for Zero dB, ”1” for Delta Ref Mrkr,”2” for Maximum value.

Front Panel Key: Readout Marker\ **REFERENCE 0 Db**

Related Commands: MSR0, MSRD, MSRM

MSX? Output multiple source mode on/off/define **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: MSX?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows:.”0” for OFF, “1” for ON, ”2” for DEFINE.

MTH? Output trace math math type **DISPLAY (Ch 4)**

Syntax: MTH?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for add, ”2” for substract, “3” for multiply, ”4” for divide.

Related Commands: ADD, DIV, MUL, MIN, DAT?

MTR Suffix sets distance data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: MTR

Related Commands: M

MUL Select multiplication as trace math for active channel **DISPLAY (Ch 4)**

Syntax: MUL

Front Panel Key: Trace Memory\ **SELECT TRACE MATH\MULTIPLY(*)**

Related Commands: DIV, ADD, MIN, MTH?, CH1-CH4

MV Suffix sets voltage data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: MV

NA1 Select a1 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NA1

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\NUMERATOR a1)**

Related Commands: NA2, NB1, NB2, NU1, NUM?

NA2 Select a2 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NA2

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\NUMERATOR a2)**

Related Commands: NA1, NB1, NB2, NU1, NUM?

NB1 Select b1 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NB1`

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\NUMERATOR b1)**

Related Commands: NA1, NA2, NB2, NU1, NUM?

NB2 Select b2 as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `NB2`

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\NUMERATOR b2)**

Related Commands: NA1, NA2, NB1, NU1, NUM?

NCS Go to next calibration step **CALIBRATION (Ch 5)**

Syntax: `NCS`

Related Commands: OPC, TCD, TC1, TC2

NEWCO Activate color configuration New **SYSTEM STATE (Ch 8)**

Syntax: `NEWCO`

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\COLOR SCHEMES\NEW COLORS**

Related Commands: BRILL, CLASS, INVER, SHARP, SOFTCO, STOCO, RSTCOL

NMKR Select normal markers on active channel marker mode **MARKERS (Ch 6)**

Syntax: `NMKR`

Related Commands: AMKR, FMKR, SMKR, XMKR?

NOC Select normal calibration data points **CALIBRATION (Ch 5)**

Syntax: `NOC`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL (1601 POINTS MAXIMUM)

Related Commands: SRT, STP, TOC, DFC, CWC

NOFST Enter nominal offset value for external gain **GAIN COMPRESSION (Ch 9)**

Syntax: `NOFST Value`

Value: The nominal offset value in ASCII <NRF> format (paragraph 10-3).

Units: DB

Remarks: This is the gain in the external path between port 1 and the AUT.

Front Panel Key: Appl\SWEPT FREQUENCY GAIN COMPRESSION\NOMINAL OFFSET

Related Commands: SFGCA, SPGCA, NOFST?

NOFST? Output nominal offset value for external gain **GAIN COMPRESSION (Ch 9)**

Syntax: `NOFST?`

Data I/O: The value is output in ASCII <NR3> format (section 10-3).

Front Panel Key: Appl\SWEPT FREQUENCY GAIN COMPRESSION\NOMINAL OFFSET

Related Commands: SFGCA, SPGCA, NOFST

NP101 Set data points to 101 **MEASUREMENT (Ch 4)**

Syntax: `NP101`

Remarks: Restarts the sweep.

Front Panel Key: Data Points\1601 POINTS MAX or Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\START FREQUENCY\MAXIMUM NUMBER OF DATA POINT(S)

Related Commands: NPx series, WFS, *OPC, *OPC?, FLO

NP1601 Set data points to 1601 **MEASUREMENT (Ch 4)**

Syntax: `NP1601`

Remarks: Restarts the sweep.

Front Panel Key: Data Points\ **1601 POINTS MAX** or Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ MAXIMUM NUMBER OF DATA POINT(S)**

Related Commands: NPx series, WFS, *OPC, *OPC?, FHI, ONP

NP201 Set data points to 201 **MEASUREMENT (Ch 4)**

Syntax: `NP201`

Remarks: Restarts the sweep.

Front Panel Key: Data Points\ **1601 POINTS MAX** or Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ MAXIMUM NUMBER OF DATA POINT(S)**

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NP401 Set data points to 401 **MEASUREMENT (Ch 4)**

Syntax: `NP401`

Remarks: Restarts the sweep.

Front Panel Key: Data Points\ **1601 POINTS MAX** or Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ MAXIMUM NUMBER OF DATA POINT(S)**

Related Commands: NPx series, WFS, *OPC, *OPC?, FME, ONP

NP51 Set data points to 51 **MEASUREMENT (Ch 4)**

Syntax: NP51

Remarks: Restarts the sweep.

Front Panel Key: Data Points\ **1601 POINTS MAX** or Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ MAXIMUM NUMBER OF DATA POINT(S)**

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NP801 Set data points to 801 **MEASUREMENT (Ch 4)**

Syntax: NP801

Remarks: Restarts the sweep.

Front Panel Key: Data Points\ **1601 POINTS MAX** or Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ MAXIMUM NUMBER OF DATA POINT(S)**

Related Commands: NPx series, WFS, *OPC, *OPC?, ONP

NRD Display non-ratioed parameters on 4 channels **DIAGNOSTICS (Ch 8)**

Syntax: NRD

Remarks: For service use only.

NRMS Normalize S21 for gain compression testing **GAIN COMPRESSION (Ch 9)**

Syntax: NRMS

Remarks: An S21 normalization is one of the required steps in both swept frequency and swept power gain compression testing.

Front Panel Key: Setup Menu\ **SWEPT POWER GAIN COMPRESSION\ MORE\ S21 OPTIONS\ WAIT FOR ONE COMPLETE SWEEP BEFORE STORING**

Related Commands: SFGCA, SPGCA, CALR, UNDOGC

NRMS21 Select Gain Compression bottom graph displays Normalized S21 **GAIN COMPRESSION (Ch 9)**

Syntax: NRMS21

Front Panel Key: Setup Menu**SWEPT FREQUENCY GAIN COMPRESSION\NORMALIZE S21\NORMALIZE S21** or Setup Menu**SWEPT POWER GAIN COMPRESSION\MORE\S21 OPTIONS\NORMALIZE S21**

Related Commands: DSP21, DSP21?

NS Suffix sets time data type and scales by 1E-9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: NS

Related Commands: NSC

NSC Suffix sets time data type and scales by 1E-9 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: NSC

Related Commands: NS

NU1 Select unity as numerator for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NU1

Front Panel Key: S Params**PRESS <1> TO REDEFINE SELECTED PARAMETER\PHASE LOCK (or USER LABEL\NUMERATOR UNITY)**

Related Commands: NA1, NA2, NB1, NB2, NUM?

NUM? Output numerator selection for parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: NUM?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3) as follows: “1” for unity, ”2” for a1, “3” for a2, ”4” for b1, “5” for b2.

Related Commands: NA1, NA2, NB1, NB2, NU1

NXNL1 Enter length for NxN device 1 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL1 Value`
Value: -999.999 to 999.9999
Units: MM, CM. M

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Appl**\NxN SOLUTION\DEVICE 1 LENGTH**

Related Commands: NXNL1?,NXNL2,NXNL3

NXNL1? Output length for NxN device 1 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL1?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Appl**\NxN SOLUTION\DEVICE 1 LENGTH**

Related Commands: NXNL1,NXNL2?,NXNL3?

NXNL2 Enter length for NxN device 2 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL2 Value`
Value: -999.9999 to 999.9999
Units: MM, CM, M

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Appl**\NxN SOLUTION\DEVICE 2 LENGTH**

Related Commands: NXNL1,NXNL2?,NXML3

NXNL2? Output length for NxN device 2 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL2?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).T

Front Panel Key: Appl**\NxN SOLUTION\DEVICE 2 LENGTH**

Related Commands: NXNL1?,NXNL2,NXNL3?

NXNL3 Enter length for NxN device 3 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL3 Value`
Value: -999.9999 to 999.9999
Units: MM, CM, M

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Appl\ **NxN SOLUTION\DEVICE 3 LENGTH**

Related Commands: NXNL1,NXNL2,NXNL3?

NXNL3? Output length for NxN device 3 **NXN SOLUTION (Ch 9)**

Syntax: `NXNL3?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Appl\ **NxN SOLUTION\DEVICE 3 LENGTH**

Related Commands: NXNL1?,NXNL2?,NXNL3

O3CM Select Triple Offset Short calibration method **CALIBRATION (Ch 5)**

Syntax: `O3CM`

Front Panel Key: Begin Cal\ **CHANGE CAL METHOD AND LINE TYPE\SSST (TRIPLE OFFSET SHORT)**

O4FD Output final data for all 4 channels to the GPIB **DATA TRANSFER (Ch 7)**

Syntax: `O4FD`

Remarks: Data units depend on the graph type currently set (see Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to eight times the number of points in the current sweep. O4FD always outputs two pieces of data for each data format even if some of the data may not be displayed and will thus be invalid. In most cases, this undisplayed data will be zeroed out.

The O4FD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1 to CH4, WFS, O4SC, O4SR

O4SC Output corrected data for all four S-parameters **DATA TRANSFER (Ch 7)**

Syntax: `O4SC`

Remarks: Data correction is valid for normalization and electrical length and, if applicable, time domain. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to eight times the number of points in the current sweep (contains real and imaginary data pairs for each point). The O4SC command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, ORD, OFD, ONP, WFS, O4SR, O4FD

O4SR Output raw data for all four S-parameters **DATA TRANSFER (Ch 7)**

Syntax: `O4SR`

Remarks: Outputs the raw data (real and imaginary) pairs before any correction is applied. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to eight times the number of points in the current sweep (contains real and imaginary data pairs for each point). The O4SR command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: O4SC, O4FD, OFD, OCD, ONP, FMA, FMB, FMC, LSB, MSB

OACCHAR Output AutoCal characterization data to the GPIB **AUTOCAL (Ch 5)**

Syntax: OACCHAR

Data I/O: Outputs an <Arbitrary Block> (section 10-3).

Related Commands: IACCHAR

OACSER Output auto-cal box serial number **AUTOCAL (Ch 5)**

Syntax: OACSER

Data I/O: Outputs the Autocal serial number in arbitrary ASCII format (section 10-3).

OACTYPE Output auto-cal box type **AUTOCAL (Ch 5)**

Syntax: OACTYPE

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3), as follows: “6” for ELECTRONIC, ”9” for MECHANICAL.

OAM1 Output channel 1 active marker value **DATA TRANSFER (Ch 7)**

Syntax: OAM1

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Readout Marker\ **CH1-S11**

Related Commands: OM1 thru OM6, OAM2, OAM3, OAM4

OAM2 Output channel 2 active marker value **DATA TRANSFER (Ch 7)**

Syntax: `OAM2`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Readout Marker **\CH2-S21**

Related Commands: OM1 thru OM6, OAM1, OAM3, OAM4

OAM3 Output channel 3 active marker value **DATA TRANSFER (Ch 7)**

Syntax: `OAM3`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Readout Marker **\CH3-S12**

Related Commands: OM1 thru OM6, OAM1, OAM2, OAM4

OAM4 Output channel 4 active marker value **DATA TRANSFER (Ch 7)**

Syntax: `OAM4`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3> formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Readout Marker **\CH4-S22**

Related Commands: OM1 thru OM6, OAM1, OAM2, OAM3

OBMP Output the display as a bitmap **HARD COPY (Ch 8)**

Syntax: `OBMP`

Data I/O: Bit map is output with an <Arbitrary Block> format (section 10-3).

Block Size: 38470 bytes for a black on white bitmap, 307455 bytes for a color on white or true color bitmap

Related Commands: BMPB,BMPC, BMPT, SAVE

OC1 Output calibration coefficients 1 **DATA TRANSFER (Ch 7)**

Syntax: `OC1`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC10 Output calibration coefficients 10 **DATA TRANSFER (Ch 7)**

Syntax: `OC10`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC11 Output calibration coefficients 11 **DATA TRANSFER (Ch 7)**

Syntax: `OC11`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC12 Output calibration coefficients 12 **DATA TRANSFER (Ch 7)**

Syntax: `OC12`

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC2 Output calibration coefficients 2 **DATA TRANSFER (Ch 7)**

Syntax: OC2

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC3 Output calibration coefficients 3 **DATA TRANSFER (Ch 7)**

Syntax: OC3

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC4 Output calibration coefficients 4 **DATA TRANSFER (Ch 7)**

Syntax: OC4

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC5 Output calibration coefficients 5 **DATA TRANSFER (Ch 7)**

Syntax: OC5

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC6 Output calibration coefficients 6 **DATA TRANSFER (Ch 7)**

Syntax: OC6

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC7 Output calibration coefficients 7 **DATA TRANSFER (Ch 7)**

Syntax: OC7

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC8 Output calibration coefficients 8 **DATA TRANSFER (Ch 7)**

Syntax: OC8

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OC9 Output calibration coefficients 9 **DATA TRANSFER (Ch 7)**

Syntax: OC9

Remarks: Outputs error correction coefficient selected (1 - 24), see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to twice the currently set number of data points. The OCx commands output an (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selected).

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OCA-OCC, OCL, FMA, FMB, FMC, LSB, MSB, ONP

OCA Output calibration coefficient A **DATA TRANSFER (Ch 7)**

Syntax: OCA

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCB Output calibration coefficient B **DATA TRANSFER (Ch 7)**

Syntax: OCB

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCC Output calibration coefficient C **DATA TRANSFER (Ch 7)**

Syntax: OCC

Remarks: The OCA, OCB, and OCC are equivalents of OC10, OC11, and OC12 respectively.

Block Size: 12 + (2 * NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE 4 FMC MODE

OCD Output corrected data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: OCD

Remarks: Data correction is valid for normalization and electrical length and, if applicable, time domain. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to twice the number of points in the current sweep (contains real and imaginary data pairs for each point). The OCD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, ORD, OFD, ONP, WFS, CH1-CH4

OCF Output front panel setup and calibration data **DATA TRANSFER (Ch 7)**

Syntax: `OCF`

Data I/O: <Arbitrary Block> formatted data (section 10-3). This same data can later be input using the ICF command. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 21690 bytes (NO CALIBRATION) 188371 bytes (CALIBRATION APPLIED)

Related Commands: OFP, ICF

OCL Output all applicable calibration coefficients for cal type **DATA TRANSFER (Ch 7)**

Syntax: `OCL`

Remarks: Outputs all error correction coefficients applicable to the current calibration type; see Table 10-1 at the end of this chapter.

Data I/O: An array of floating point values whose size is equal to the currently set number of data points. The OCL command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (2 * NUMBER OF POINTS) * (NUMBER OF CAL TERMS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: OC1-OC12, OCA, OCB, OCC, ICL, ONCP, ONP

OCM Select offset short calibration method **CALIBRATION (Ch 5)**

Syntax: `OCM`

Front Panel Key: Begin Cal\ **CHANGE CAL METHOD AND LINE TYPE\SSLT (DOUBLE OFFSET SHORT WITH LOAD)**

Related Commands: LCM, SCM

OCS Output internal buffer collected data **INT. BUFFER DATA COLL. (Ch 7)**

Syntax: OCS

Remarks: The entire contents of the internal buffer are output and the buffer reset. The output format is always FMC.

Data I/O: The data is output as an <Arbitrary Block> (pragraph 11-3).

Block Size: The size of the block depends of the number of data points collected. SIZE = 8 * number of points.

Status Reporting: Sets the Collection Buffer Full bit (CBF) in the Extended Event Status Register when the collection buffer becomes full.

Related Commands: CCD, CFD, CRD, DCCTN, DCCTN?, DCHLD, DCMRK

ODAT Output hard copy tabular data to GPIB **HARD COPY (Ch 8)**

Syntax: ODAT

Remarks: Tabular data is the same as the data saved in a tabular data file (*.DAT).

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: Size varies depending on the display type and number of data points. A 4 channel display at 401 data points produces 62,479 bytes. 4 channel 1601 points produces 239,780 bytes. 1 channel 401 points produces 22,530 bytes.

Related Commands: SAVE, DISKRD, OHGL, OS2P, OTXT

ODR Output directory listing of the floppy drive **DATA TRANSFER (Ch 7)**

Syntax: ODR

Data I/O: Outputs <Arbitrary Block> formatted list (section 10-3) of comma separated filenames and sizes.

Block Size: 50 + 80 * (NUMBER OF FILES)

ODRH Output directory listing of the hard drive **DATA TRANSFER (Ch 7)**

Syntax: ODRH

Data I/O: Outputs <Arbitrary Block> formatted list (section 10-3) of comma separated filenames and sizes.

Block Size: 50 + 80 * (NUMBER OF FILES)

ODV Output distance values for time domain **DATA TRANSFER (Ch 7)**

Syntax: ODV

Remarks: The converted distance values depend on the dielectric type set (see DISPLAY group, Dielectric commands).

Data I/O: An array of floating point values whose size is the currently set number of data points. The ODV command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, ONP, OTV, OFV

OEB Output extended status byte **STATUS REPORTING (Ch 7)**

Syntax: OEB

Remarks: Returns the decimal value of the binary bit pattern of the Extended Event Status Register. The value will be from 0 to 32767.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3.)

Related Commands: IEM, OEM

OEL Output error list **DATA TRANSFER (Ch 7)**

Syntax: `OEL`

Data I/O: Outputs formatted list of error messages separated with commas.

Block Size: 50 + 50 * (NUMBER OF ERRORS)

Related Commands: ONE, OGE, OGL

OEM Output extended status byte mask **STATUS REPORTING (Ch 7)**

Syntax: `OEM`

Remarks: Returns the decimal value of the bit pattern of the Extended Event Status Enable Register. The value will be from 0 to 32767.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: IEM

OFD Output final data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: `OFD`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is, log mag/phase).

The OFD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFD1 Output final data for channel 1 parameter **DATA TRANSFER (Ch 7)**

Syntax: `OFD1`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is, log mag/phase).

The OFD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFD2 Output final data for channel 2 parameter **DATA TRANSFER (Ch 7)**

Syntax: `OFD2`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is, log mag/phase).

The OFD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFD3 Output final data for channel 3 parameter **DATA TRANSFER (Ch 7)**

Syntax: OFD3

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is, log mag/phase).

The OFD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFD4 Output final data for channel 4 parameter **DATA TRANSFER (Ch 7)**

Syntax: OFD4

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter).

Data I/O: Outputs a floating point array whose size is equal to the number of points in the current sweep (the array is doubled for dual graph displays, that is, log mag/phase).

The OFD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: FMA, FMB, FMC, LSB, MSB, DPR0, DPR1, ONP, OCD, ORD, CH1-CH4, WFS

OFF Enter offset value for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF Value Unit(s)`
Value: Depends on graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE VALUE**

Related Commands: SCL, ASC, CH1-CH4

OFF2 Enter offset value for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF2 Value Unit(s)`
Value: Depends on graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE VALUE**

Related Commands: SCL2, REF2

OFF2? Output offset value for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF2?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE VALUE**

Related Commands: OFF2

OFF? Output offset value for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `OFF?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE VALUE**

OFP Output current front panel setup **DATA TRANSFER (Ch 7)**

Syntax: `OFP`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for input later using the IFP command. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: OCF, IFP

OFPC Output flat power coefficients **DATA TRANSFER (Ch 7)**

Syntax: `OFPC`

Data I/O: Outputs an <Arbitrary Block> (section 10-3).

Related Commands: FMA, FMB, FMC, MSB, LSB, IFPC, OFV, IFV

OFV Output frequency values **DATA TRANSFER (Ch 7)**

Syntax: `OFV`

Remarks: An array of floating point values whose size is the currently set number of data points. The OFV command outputs an <Arbitrary Block> (paragraph 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: ONP, FMA, FMB, FMC, LSB, MSB

OGCFD Output gain compression final data to GPIB **MEASUREMENT DATA (Ch 7)**

Syntax: `OGCFD`

Remarks: The data consists of two elements per swept power gain compression frequency point. The first element is the input power which produces the target gain compression value, and the second element is the output power corresponding to that input power. The format of the output data depends on the FMA, FMB or FMC mode programmed.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size depends on the number of frequency points and the FMA, FMB or FMC mode. For 10 frequency points, FMA produced 386 bytes, FMB produces 167 bytes and FMC produces 86 bytes. For 5 frequency points, FMA produces 196 bytes, FMB produces 86 bytes and FMC produces 46 bytes.

Related Commands: SPGCA, MFGCT

OGCFV Output gain compression frequency values to GPIB **MEASUREMENT DATA (Ch 7)**

Syntax: `OGCFV`

Remarks: This mnemonic outputs the frequency values for the swept power gain compression application.

Data I/O: The data is formatted depending on the FMA, FMB, FMC, LSB, MSB formats and encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size depends on the number of data points and the FMA, FMB, FMC format. For ten frequency points, FMA produces 195 bytes, FMB produces 85 bytes, FMC produces 45 bytes. For five frequency points, FMA produces 99 bytes, FMB produces 45 bytes and FMC produces 25 bytes.

Related Commands: SPGCA, IFV, ONDF

OGCTXT Output text format gain compression data to GPIB **HARD COPY (Ch 8)**

Syntax: OGCTXT

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size depends on the number of frequency points. 10 frequency points produces 711 bytes. 5 frequency points produces 430 bytes.

Related Commands: SPGCA, MFGCT, SAVEGC

OGE Output extended description of current GPIB error **DATA TRANSFER (Ch 7)**

Syntax: OGE

Remarks: See error handling information in Chapter 7 for interpretation of the output string.

Data I/O: Outputs string in <Arbitrary ASCII> format.

Block Size: 210 bytes, maximum

Related Commands: ONE, OEL

OGL Output extended description of previous GPIB error **DATA TRANSFER (Ch 7)**

Syntax: OGL

Remarks: See error handling information in Chapter 7 for interpretation of the output string.

Data I/O: Outputs string in <Arbitrary ASCII> format.

Block Size: 210 bytes, maximum

Related Commands: ONE, OEL.

OHDR Output hard copy header information to GPIB **HARD COPY (Ch 8)**

Syntax: `OHDR`

Data I/O: Outputs data in <Arbitrary Block> format (section 10-3).

Block Size: A maximum of approximately 1500 bytes

OHDW Output hardware cal data to GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `OHDW Value`
Value: Three characters in <String> data format (paragraph 10-3) that is made from the three characters of the filename extension associated with the hardware calibration type (see Table 8-8).

Data I/O: The data is output in <Arbitrary Block> format (section 10-3).

Block Size: The “ALL” data is 1191 bytes, the “ALC” data is 297 bytes, the “FRE” data is 436 bytes, the “LO1” data is 351 bytes, the ”LO2” data is 351 bytes and the “SLT” data is 293 bytes.

Related Commands: IHDW, SAVE, DISKRD

OHGL Output HPGL format data to GPIB **HARD COPY (Ch 8)**

Syntax: `OHGL`

Remarks: This is the same data which gets written to the plotter on a plot.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size varies depending on the display and number of data points. A four-channel display with 401 points produces 40,314 bytes. A four-channel 1601 point display produces 110,314 bytes. A single channel 401 point display produces 12,659 bytes.

Related Commands: SAVE, DISKRD, ODAT, OS2P, OTXT

OHM Suffix sets impedance data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `OHM`

OID Output instrument identification string **DATA TRANSFER (Ch 7)**

Syntax: OID

Remarks: Outputs the VNA operation string containing the following fields separated by commas: Model, Low Frequency in GHz, High Frequency in GHz, Low Power in dB, Reset Power in dB, Software Revision. The actual information for the 37XXXD queried will be returned in each field. The power values indicate the ALC range. Use the PIP? query to output absolute power setting at Port 1.

NOTE: System power in excess of reset level is available, but not guaranteed to remain level. Excessive system power setting will cause error 5110: RF PWR UNLEVELED and/or error 52XX: RF OVERLOAD to be reported. To determine maximum available power, consult Source Control Specifications in Operation Manual.

Data I/O: Outputs an <Arbitrary ASCII > format (section 10-3).

Block Size: 50 bytes, maximum

Related Commands: *IDN?, *OPT?, PIP?

OLB Output limits status byte **STATUS REPORTING (Ch 7)**

Syntax: OLB

Remarks: Returns the decimal value of the bit pattern of the Limits Status Register. The value will be 0 - 255.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: ILB

OLM Output limits status byte mask **DATA TRANSFER (Ch 7)**

Syntax: OLM

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Related Commands: ILM

OM1 Output marker 1 value **DATA TRANSFER (Ch 7)**

Syntax: `OM1`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 1 ON**

Related Commands: CH1-CH4, DPR0, DPR1

OM2 Output marker 2 value **DATA TRANSFER (Ch 7)**

Syntax: `OM2`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 2 ON**

Related Commands: CH1-CH4, DPR0, DPR1

OM3 Output marker 3 value **DATA TRANSFER (Ch 7)**

Syntax: `OM3`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 3 ON**

Related Commands: CH1-CH4, DPR0, DPR1

OM4 Output marker 4 value **DATA TRANSFER (Ch 7)**

Syntax: `OM4`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 4 ON**

Related Commands: CH1-CH4, DPR0, DPR1

OM5 Output marker 5 value **DATA TRANSFER (Ch 7)**

Syntax: `OM5`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 5 ON**

Related Commands: CH1-CH4, DPR0, DPR1

OM6 Output marker 6 value **DATA TRANSFER (Ch 7)**

Syntax: `OM6`

Remarks: Data units depend on the graph type currently set. (See Table 10-2 at the end of this chapter.)

Data I/O: Outputs ASCII <NR3 > formatted data (see section 10-3). The data output consists of one or two elements, whose values will be determined by the graph display type selected.

Front Panel Key: Marker Menu\ **MARKER 6 ON**

Related Commands: CH1-CH4, DPR0, DPR1

ONCP Output number of points for current calibration — **DATA TRANSFER (Ch 7)**

Syntax: ONCP

Data I/O: Outputs the number of points in ASCII <NR1> format (section 10-3).

Related Commands: ONP

ONCT Output number of cal terms for current calibration — **CALIBRATION (Ch 5)**

Syntax: ONCT

Remarks: Outputs the value in ASCII <NR1> format (paragraph 10-3). See Table 10-1 at the end of this chapter.

OND Output Normalization data — **DATA TRANSFER (Ch 7)**

Syntax: OND

Data I/O: Outputs an <Arbitrary Block> (section 10-3).

Related Commands: IND

ONDF Output number of discrete frequencies — **MEASUREMENT (Ch 4)**

Syntax: ONDF

Data I/O: Outputs number in ASCII <NR1> format (section 10-3).

Related Commands: IFV, DFC

ONE Output number of lines in the error list — **DATA TRANSFER (Ch 7)**

Syntax: ONE

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Related Commands: OEL, OGE, OGL

ONP Output number of points currently being measured **MEASUREMENT DATA (Ch 7)**

Syntax: `ONP`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ SET CENTER/SPAN/DATA POINTS** Data Points\ **1601 POINTS MAX**

ONPV Output the number of power sweep power values **MEASUREMENT DATA (Ch 7)**

Syntax: `ONPV`

Data I/O: Outputs number in ASCII <NR1> format (section 10-3).

Related Commands: PSTRT, PSTOP, PSTEP, OPSV

ONRM Output stored normalization data to GPIB **MISCELLANEOUS (Ch 7)**

Syntax: `ONRM`

Remarks: If normalization data has been stored, it will be output.

Data I/O: The data will be encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: 12832 bytes

Related Commands: INRM, SAVE, DISKRD

OPB Output the 488.2 Status Byte value (same as *STB?) **IEEE 488.2 (Ch 7)**

Syntax: `OPB`

Remarks: This is the equivalent command to *STB?, 488.2 Status Byte query. Returns the decimal value of the bit pattern of the Status Byte and the Master Summary Status bit 6. The value will be 0 to 255.

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: *STB?

OPSC Output power sweep linearity calibration coefficients **GAIN COMPRESSION (Ch 9)**

Syntax: `OPSC`

Data I/O: Outputs an <Arbitrary Block> (section 10-3).

Related Commands: IPSC, PSCNFREQ?, PSCNPWR?, PSCSTEP?

OPSV Output power sweep power values **MEASUREMENT DATA (Ch 7)**

Syntax: `OPSV`

Remarks: This mnemonic outputs the power values for power sweep.

Data I/O: The data is formatted depending on the FMA, FMB, FMC, LSB, MSB formats and encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size depends on the number of data points and the FMA, FMB, FMC format. For 21 power points, FMA produces 404 bytes, FMB produces 174 bytes, FMC produces 89 bytes. For 11 power points, FMA produces 214 bytes, FMB produces 93 bytes and FMC produces 49 bytes.

Related Commands: PSTRT, PSTOP, PSTEP, ONPV

ORD Output raw data for active channel parameter **DATA TRANSFER (Ch 7)**

Syntax: `ORD`

Remarks: Outputs the raw data (real and imaginary) pairs before any correction is applied. Wait for full sweep to be updated (WFS) prior to outputting data.

Data I/O: Outputs a floating point array whose size is equal to twice the number of points in the current sweep (contains real and imaginary data pairs for each point). The ORD command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: See Section 11-7

Related Commands: CH1-CH4, OFD, OCD, ONP, FMA, FMB, FMC, LSB, MSB

OS1 Output front panel setup number 1 **DATA TRANSFER (Ch 7)**

Syntax: `OS1`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS10 Output front panel setup number 10 **DATA TRANSFER (Ch 7)**

Syntax: `OS10`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS11C Output corrected S11 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS11C`

Remarks: If S11 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S11 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, OCD, OS11R, FMA, FMB, FMC

OS11R Output raw S11 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS11R`

Remarks: If S11 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S11 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, ORD, OS11C, FMA, FMB, FMC

OS12C Output corrected S12 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS12C`

Remarks: If S12 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S12 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, OCD, OS12R, FMA, FMB, FMC

OS12R Output raw S12 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS12R`

Remarks: If S12 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S12 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, ORD, OS12C, FMA, FMB, FMC

OS2 Output front panel setup number 2 **DATA TRANSFER (Ch 7)**

Syntax: `OS2`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS21C Output corrected S21 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS21C`

Remarks: If S21 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S21 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, OCD, OS21R, FMA, FMB, FMC

OS21R Output raw S21 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS21R`

Remarks: If S21 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S21 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, ORD, OS21C, FMA, FMB, FMC

OS22C Output corrected S22 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS22C`

Remarks: If S22 data is being taken with the current channel selection and display type, then the data will be output. If correction is turned on then the data will be corrected data otherwise it will be the raw data. This is identical to OCD when S22 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, OCD, OS22R, FMA, FMB, FMC

OS22R Output raw S22 data **MEASUREMENT DATA (Ch 7)**

Syntax: `OS22R`

Remarks: If S22 data is being taken with the current channel selection and display type, then the raw data will be output. This is identical to ORD when S22 is displayed on the active channel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3). The data itself is a complex pair for each data point which is additiionally formatted by the FMA, FMB and FMC modes.

Block Size: See Section 11-7

Related Commands: CHx, ORD, OS22C, FMA, FMB, FMC

OS2P Output S2P format data to GPIB **HARD COPY (Ch 8)**

Syntax: `OS2P`

Remarks: The S2P output format is provided to interface with application programs requiring that kind of data.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size varies depending on the number of data points. 51 points produces 5,406 bytes, 401 points produces 41,107 bytes, 1601 points produces 163,508 bytes.

Related Commands: SAVE, DISKRD, ODAT, OHGL, OTXT

OS3 Output front panel setup number 3 **DATA TRANSFER (Ch 7)**

Syntax: `OS3`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS4 Output front panel setup number 4 **DATA TRANSFER (Ch 7)**

Syntax: OS4

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS5 Output front panel setup number 5 **DATA TRANSFER (Ch 7)**

Syntax: OS5

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS6 Output front panel setup number 6 **DATA TRANSFER (Ch 7)**

Syntax: OS6

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS7 Output front panel setup number 7 **DATA TRANSFER (Ch 7)**

Syntax: OS7

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS8 Output front panel setup number 8 **DATA TRANSFER (Ch 7)**

Syntax: `OS8`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OS9 Output front panel setup number 9 **DATA TRANSFER (Ch 7)**

Syntax: `OS9`

Data I/O: <Arbitrary Block> formatted data (section 10-3) for later input using the IS1-IS10 commands. The data is in internal system binary format and must not be edited or altered in any way.

Block Size: 8711 bytes

Related Commands: ISxx, OFP, OCF

OSL Output service log **DATA TRANSFER (Ch 7)**

Syntax: `OSL`

Remarks: This command is useful when troubleshooting system failure or GPIB programming type problems. It is also useful for capturing and archiving error information for errors that occur during Remote Only operation.

Data I/O: Outputs formatted data that consists of service data and all error messages, with details about each error.

Block Size: 450 + 100 * (NUMBER OF ERRORS)

Related Commands: OEL, PSL, SAVLOG, SAVLOGH, CSL, ONE, OGE, OGL

OTV Output time values for time domain **MEASUREMENT DATA (Ch 7)**

Syntax: OTV

Data I/O: An array of floating point values whose size is the currently set number of data points. The OTV command outputs an <Arbitrary Block> (section 10-3) containing either ASCII or binary formatted data depending on currently selected format (see format selector commands FMA, FMB, FMC).

Block Size: 12 + (NUMBER OF POINTS) *18 FMA MODE *8 FMB MODE *4 FMC MODE

Related Commands: FMA, FMB, FMC, LSB, MSB, ODV, OFV, ONP

OTXT Output text format data to GPIB **HARD COPY (Ch 8)**

Syntax: OTXT

Remarks: Outputs data similar to tabular except data fields are separated with a tab character (ASCII value of 9) for easier loading and display in Microsoft Excel.

Data I/O: The data is encapsulated in an <Arbitrary Block> format (section 10-3).

Block Size: The block size varies depending on the display and number of data points. A 4 channel display with 401 points produces 39,465 bytes. A 4 channel 1601 point display produces 154,905bytes. A single channel 401 point display produces 13,625 bytes.

Related Commands: SAVE, DISKRD, ODAT, OHGL, OS2P

P1C Select port 1 for connector specification **CALIBRATION (Ch 5)**

Syntax: P1C

Remarks: Specifies port 1 as the port to which subsequent connector related commands will apply.

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (M)**

Related Commands: P2C

P1C? Output port 1 connector type **CALIBRATION (Ch 5)**

Syntax: `P1C?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for SMA male, ”2” for SMA female, “3” for K male, ”4” for K female, “5” for Type N male, ”6” for Type N female, “7” for GPC 3.5 male, ”8” for GPC 3.5 female, “9” for GPC 7, ”10” for other & user specified, “11” for V male, ”12” for V female, “13” for TNC male, ”14” for TNC female, “15” for 2.4 mm male, ”16” for 2.4 mm female.

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (M)**

P1MMA Set Port 1 Millimeter Wave Head to Amplified (3742) **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMA`

Front Panel Key: Option Menu**\TEST SET CONFIG\PORT 1 (2) MODULE**

Related Commands: P1MMN, P1MMR, P1MMT, P1MMX?

P1MMN Set Port 1 Millimeter Wave Head to None **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMN`

Front Panel Key: Option Menu**\TEST SET CONFIG\PORT 1 (2) MODULE**

Related Commands: P1MMR, P1MMT,P1MMX?

P1MMR Set Port 1 Millimeter Wave Head to Receiver (3741) **MILLIMETER WAVE (Ch 9)**

Syntax: `P1MMR`

Front Panel Key: Option Menu**\TEST SET CONFIG\PORT 1 (2) MODULE**

Related Commands: P1MMN, P1MMT,P1MMX?

P1MMT Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740) **MILLIMETER WAVE (Ch 9)**

Syntax: P1MMT

Front Panel Key: Option Menu\ **TEST SET CONFIG\ PORT 1 (2) MODULE**

Related Commands: P1MMN, P1MMR,P1MMX?

P1MMX? Output Port 1 Millimeter Wave Head type **MILLIMETER WAVE (Ch 9)**

Syntax: P1MMX?

Data I/O: Returns a value in ASCII <NR1> format (section 10-3) as follows: 0=none, 1=3740 (Transmit/Receive), 2=3741 (Receive), 3=3742 (Amplified).

Front Panel Key: Option Menu\ **TEST SET CONFIG\ PORT 1 (2) MODULE**

Related Commands: P1MMN,P1MMR, P1MMT, P1MMA

P1P? Output approximate power level at port 1 **CALIBRATION (Ch 5)**

Syntax: P1P?

Remarks: Absolute power setting in dB. Includes flat test port power correction, when applied.

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Setup Menu\ **TEST SIGNALS\ PORT 1 POWER**

Related Commands: PWR?, SA1?, FP0, FP1

P2ALC Perform Port 2 ALC loop internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: P2ALC

P2C Select port 2 for connector specification **CALIBRATION (Ch 5)**

Syntax: P2C

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (M)

Related Commands: P1C

P2C? Output port 2 connector type **CALIBRATION (Ch 5)**

Syntax: P2C?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for SMA male, ”2” for SMA female, “3” for K male, ”4” for K female, “5” for Type N male, ”6” for Type N female, “7” for GPC 3.5 male, ”8” for GPC 3.5 female, “9” for GPC 7, ”10” for other & user specified, “11” for V male, ”12” for V female, “13” for TNC male, ”14” for TNC female, “15” for 2.4 mm male, ”16” for 2.4 mm female.

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\PORT 1 CONN (or PORT 2 CONN)\SMA (M)

P2MMA Set Port 2 Millimeter Wave Head to Amplified (3742) **MILLIMETER WAVE (Ch 9)**

Syntax: P2MMA

Related Commands: P2MMN, P2MMR, P2MMT, P2MMX?

P2MMN Set Port 2 Millimeter Wave Head to none **MILLIMETER WAVE (Ch 9)**

Syntax: P2MMN

Related Commands: P2MMR, P2MMT,P2MMX?

P2MMR Set Port 2 Millimeter Wave Head to Receiver (3741) **MILLIMETER WAVE (Ch 9)**

Syntax: P2MMR

Related Commands: P2MMN,P2MMT,P2MMX?

P2MMT Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740) **MILLIMETER WAVE (Ch 9)**

Syntax: P2MMT

Related Commands: P2MMN,P2MMR,P2MMX?

P2MMX? Output Port 2 Millimeter Wave Head type **MILLIMETER WAVE (Ch 9)**

Syntax: P2MMX?

Data I/O: Returns a value in ASCII <NR1> format (section 10-3) as follows: 0=none, 1=3740 (Transmit/Receive), 2=3741 (Receive), 3=3742 (Amplified).

Related Commands: P2MMN,P2MMR, P2MMT, P2MMA

PBL Select 1/4 size plot bottom left corner **HARD COPY (Ch 8)**

Syntax: PBL

Remarks: Selects a quarter-size plot, which appears in the bottom left corner of the screen.

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PLOT SIZE\LOWER LEFT**

Related Commands: PBR, PFL

PBR Select 1/4 size plot bottom right corner **HARD COPY (Ch 8)**

Syntax: PBR

Remarks: Selects a quarter-size plot, which appears in the bottom right corner of the screen.

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PLOT SIZE\LOWER RIGHT**

Related Commands: PBL, PFL

PCP Select measurement phase polar chart mode **DISPLAY (Ch 4)**

Syntax: PCP

Front Panel Key: Set Scale\ **SELECT POLAR CHART MODE\ MAGNITUDE, PHASE**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCS, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PCS Select sweep position polar chart mode **DISPLAY (Ch 4)**

Syntax: PCS

Front Panel Key: Set Scale\ **SELECT POLAR CHART MODE\ MAGNITUDE, SWP POSITION**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCX?, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PCX? Output polar chart mode **DISPLAY (Ch 4)**

Syntax: PCX?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for phase or ”2” for position.

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHA, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PDR Print directory listing of the floppy drive **DISK FUNCTION (Ch 8)**

Syntax: PDR

Remarks: A copy of the directory listing of the floppy drive is sent to the printer.

Related Commands: ODR, ODRH, PDRH

PDRH Print directory listing of the hard drive **DISK FUNCTION (Ch 8)**

Syntax: `PDRH`

Remarks: A copy of the directory listing of the hard drive is sent to the printer.

Related Commands: ODR, ODRH, PDR

PEL Print the error list **SERVICE LOG (Ch 8)**

Syntax: `PEL`

Remarks: A formatted list of the error messages in the service log is sent to the printer.

Related Commands: OFL, OSL, PSL

PFL Select full-size plot **HARD COPY (Ch 8)**

Syntax: `PFL`

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PLOT SIZE\FULL SIZE**

Related Commands: PBL, PFR

PFS Print full screen image **HARD COPY (Ch 8)**

Syntax: `PFS`

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\FULL PLOT**

Related Commands: PGR

PFSC Configure for printing entire screen graphic image **HARD COPY (Ch 8)**

Syntax: `PFSC`

Remarks: Heretofore configuration could only be set by mnemonic PFS.

Related Commands: PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PGR Print graph area screen image **HARD COPY (Ch 8)**

Syntax: PGR

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\FORMAT OF PRINTER OUTPUT\GRAPH ONLY**

Related Commands: PFS

PGRC Configure for printing data area graphic image **HARD COPY (Ch 8)**

Syntax: PGRC

Remarks: Heretofore configuration could only be set by mnemonic PGR.

Related Commands: PFSC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PGT Plot graticule **DISK FUNCTION (Ch 8)**

Syntax: PGT

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\GRATICULE ON**

PGTC Configure for plotting graticule **HARD COPY (Ch 8)**

Syntax: PGTC

Remarks: Heretofore configuration could only be set by mnemonic PGT.

Related Commands: PFSC, PGRC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PHA Select phase display for active channel **DISPLAY (Ch 4)**

Syntax: PHA

Front Panel Key: Graph Type\ **PHASE**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PLG, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PHO Enter phase offset for display channel **DISPLAY (Ch 4)**

Syntax: `PHO Value Unit(s)`
Value: -180 to +180
Units: DEG

Front Panel Key: Set Scale**PHASE SHIFT**

PHO? Output phase offset for display channel **DISPLAY (Ch 4)**

Syntax: `PHO?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Set Scale**PHASE SHIFT**

PLD Plot data area only **HARD COPY (Ch 8)**

Syntax: `PLD`

Front Panel Key: Hard Copy Menu**PLOT OPTIONS\\HEADER ON**

PLDC Configure for plotting data area **HARD COPY (Ch 8)**

Syntax: `PLDC`

Remarks: Heretofore configuration could only be set by mnemonic PLD.

Related Commands: PFSC,PGRC,PGTC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PLG Select log polar display for active channel **DISPLAY (Ch 4)**

Syntax: `PLG`

Front Panel Key: Graph Type**LOG POLAR**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLR, POW, REL, RIM, SMC, SME, SMI, SWR

PLH Plot header **HARD COPY (Ch 8)**

Syntax: `PLH`

Front Panel Key: Hard Copy Menu**PLOT OPTIONS\\HEADER ON**

PLHC Configure for plotting header **HARD COPY (Ch 8)**

Syntax: `PLHC`

Remarks: Heretofore configuration could only be set by mnemonic PLH.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PLM Plot markers and limits **HARD COPY (Ch 8)**

Syntax: `PLM`

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\LIMITS ON**

PLMC Configure for plotting markers and limits **HARD COPY (Ch 8)**

Syntax: `PLMC`

Remarks: Heretofore configuration could only be set by mnemonic PLM.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLHC,PLSC,PLTC,PMKC,PMNC,PMTC,PTBC

PLO? Output plot mode portrait or landscape **HARD COPY (Ch 8)**

Syntax: `PLO?`

Data I/O: Outputs value in ASCII <NR1> format, as follows: “0” for portrait, ”1” for landscape.

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ORIENTATION**

Related Commands: PORT, LAND

PLR Select linear polar display for active channel **DISPLAY (Ch 4)**

Syntax: `PLR`

Front Panel Key: Graph Type\ **LINEAR POLAR**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, REL, RIM, SMC, SME, SMI, SWR

PLS Plot entire screen **HARD COPY (Ch 8)**

Syntax: `PLS`

Related Commands: CH1-CH4

PLSC Configure for plotting entire screen **HARD COPY (Ch 8)**

Syntax: `PLSC`

Remarks: Heretofore configuration could only be set by mnemonic PLS.

Related Commands: PFSC, PGRC,PGTC,PLDC,PLHC,PLMC,PLTC,PMKC,PMNC,PMTC,PTBC

PLT Plot data traces only **HARD COPY (Ch 8)**

Syntax: `PLT`

Front Panel Key: Hard Copy Menu **\PLOT OPTIONS\PLOT TRACES AND MARKERS ON**

PLTC Configure for plotting data traces **HARD COPY (Ch 8)**

Syntax: `PLTC`

Remarks: Heretofore configuration could only be set by mnemonic PLT.

Related Commands: PFSC, PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PMKC,PMNC,PMTC,PTBC

PMK Print tabular data for Markers **HARD COPY (Ch 8)**

Syntax: `PMK`

Front Panel Key: Hard Copy Menu **\PRINT OPTIONS\TABULAR DATA\MARKER DATA ON**

Related Commands: CH1-CH4

PMKC Configure for printing tabular data for markers **HARD COPY (Ch 8)**

Syntax: PMKC

Remarks: Heretofore configuration could only be set by mnemonic PMK.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMNC,PMTC,PTBC

PMN Plot menu **HARD COPY (Ch 8)**

Syntax: PMN

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\MENU ON**

PMNC Configure for plotting menu **HARD COPY (Ch 8)**

Syntax: PMNC

Remarks: Heretofore configuration could only be set by mnemonic PMN.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMTC,PTBC

PMT Print tabular data for traces and markers **HARD COPY (Ch 8)**

Syntax: PMT

Front Panel Key: Hard Copy Menu\ **PRINT OPTIONS\TABULAR DATA\MARKER DATA ON**

Related Commands: CH1-CH4

PMTC Configure for printing tabular data for traces and markers **HARD COPY (Ch 8)**

Syntax: PMTC

Remarks: Heretofore configuration could only be set by mnemonic PMT.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PTBC

PORT Select portrait mode for output plot **HARD COPY (Ch 8)**

Syntax: PORT

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\ PLOT ORIENTATION PORTRAIT**

Related Commands: LAND, PLO?

POSET Enter constant offset phase for active channel **DISPLAY (Ch 4)**

Syntax: POSET

POSET? Output constant offset phase for active channel **DISPLAY (Ch 4)**

Syntax: POSET?

POW Select power out display for active channel **DISPLAY (Ch 4)**

Syntax: POW

Front Panel Key: Graph Type\ **POWER OUT**

Related Commands: DLA, IMG, ISC, ISE, ISM, IMG, LIN, MAG, MPH, PCP, PCS, PCX?, PHA, PLG, PLR, REL, RIM, SMC, SME, SMI, SWR

PRT? Perform printer test and output status **PERIPHERAL TESTS (Ch 8)**

Syntax: PRT?

Remarks: For service use only. Requires a special test fixture.

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for No failure or ”1” for Failed.

PS Suffix sets time data type and scales by 1E02 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: PS

PSC Suffix sets time data type and scales by 1E02 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: PSC

PSCNFRQ? Output the power sweep linearity cal number of frequency poi **GAIN COMPRESSION (Ch 9)**

Syntax: `PSCNFRQ?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3).

Related Commands: IPSC, OPSC, PSCNPWR?, PSCSTEP?

PSCNPWR? Output the power sweep linearity cal number of power points **GAIN COMPRESSION (Ch 9)**

Syntax: `PSCNPWR?`

Data I/O: Outputs its value using ASCII <NR1> format (section 10-3).

Related Commands: IPSC, OPSC, PSCNFREQ?, PSCSTEP?

PSCSTEP? Output the power sweep linearity cal power step size **GAIN COMPRESSION (Ch 9)**

Syntax: `PSCSTEP?`

Data I/O: Outputs its value using ASCII <NR3> format (section 10-3).

Related Commands: IPSC, OPSC, PSCNFREQ?, PSCNPWR?

PSL Print the service log **DIAGNOSTICS (Ch 8)**

Syntax: `PSL`

PSP Enter number of power sweeps for flat power correction (obsolete) **CALIBRATION (Ch 5)**

Syntax: `PSP Value Unit(s)`
Value: 1 - 5
Units: XX1

Remarks: OBSOLETE CODE

Related Commands: PSP?

PSP? Output number of power sweeps for flat power correction (obsolete) **CALIBRATION (Ch 5)**

Syntax: `PSP?`

Remarks: OBSOLETE CODE

Data I/O: Outputs the value in ASCII <NR1> format.

Related Commands: PSP

PSPWR Enter power sweep off power level **GAIN COMPRESSION (Ch 9)**

Syntax: `PSPWR Value`
Value: (-20 to 0)

Remarks: This code only makes sense withing the swept power gain compression application and is the level to which the power is set when power sweep is turned off.

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Setup Menu\ **POWER SWEEP OFF\ POWER LEVEL**

Related Commands: PSPWR?, PSWP0, PSWP1, PSWPX?

PSPWR? Output power sweep off power level **GAIN COMPRESSION (Ch 9)**

Syntax: `PSPWR?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Setup Menu\ **POWER SWEEP OFF\ POWER LEVEL**

Related Commands: PSPWR, PSWP0, PSWP1, PSWPX?

PST Stop print/plot **HARD COPY (Ch 8)**

Syntax: `PST`

PSTEP Enter power sweep step size **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTEP Value`
Value: The power step value in ASCII <NRF> format (paragraph 10-3).
Units: DB

Front Panel Key: Setup Menu\ **STEPSIZE**

Related Commands: PSTRT, PSTOP

PSTEP? Output power sweep step size **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTEP?`

Data I/O: The value is output in ASCII <NR3> format (section 10-3).

Front Panel Key: Setup Menu\ **STEPSIZE**

Related Commands: PSTRT, PSTOP, PSTEP

PSTOP Enter power sweep stop power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTOP Value Unit(s)`
Value: The stop power in ASCII <NRF> format (paragraph 10-3).
Units: DB

Front Panel Key: Setup Menu\ **P STOP**

Related Commands: PSTRT, PSTEP

PSTOP? Output power sweep stop power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTOP?`

Data I/O: The value is output in ASCII <NR3> format (section 10-3).

Front Panel Key: Setup Menu\ **P STOP**

Related Commands: PSTRT, PSTOP, PSTEP

PSTRT Enter power sweep start power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTRT Value Unit(s)`
Value: The start power in ASCII <NRF> format (paragraph 10-3).
Units: DB

Front Panel Key: Setup Menu **\P START**

Related Commands: PSTOP, PSTEP

PSTRT? Output power sweep start power **GAIN COMPRESSION (Ch 9)**

Syntax: `PSTRT?`

Data I/O: The value is output in ASCII <NR3> format (section 10-3).

Front Panel Key: Setup Menu **\P START**

Related Commands: PSTRT, PSTOP, PSTEP

PSWC Perform power sweep linearity calibration **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWC`

Remarks: Command will start the calibration. The frequency list and power sweep power values must have already been entered.

Front Panel Key: Appl **\SWEPTPOWER GAIN COMPRESSION\MORE\CALIBRATE FOR LINEARITY\START LINEAR POWER CALIBRATION**

Related Commands: SPGCA, PSTRT, PSTOP, PSTEP, IFV

PSWC0 Turn power sweep linearity calibration off **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWC0`

Remarks: The power sweep linearity calibration coefficients will not be applied to the power.

Front Panel Key: Appl **\SWEPTPOWER GAIN COMPRESSION\MORE\LINEARITY CORRECTION OFF**

Related Commands: PSWC1, PSWCX?

PSWC1 Turn power sweep linearity calibration on **GAIN COMPRESSION (Ch 9)**

Syntax: PSWC1

Remarks: The power sweep linearity calibration coefficients will be applied to the power output.

Front Panel Key: Appl\ **SWEPTPOWER GAIN COMPRESSION\MORE\LINEARITY CORRECTION ON**

Related Commands: PSWC0, PSWCX?

PSWCX? Output power sweep linearity calibration on/off status **GAIN COMPRESSION (Ch 9)**

Syntax: PSWCX?

Data I/O: The value will be ouput in ASCII <NR1> format (section 10-3) as follows: “0” for calibration off or ”1” for calibration on.

Front Panel Key: Appl\ **SWEPTPOWER GAIN COMPRESSION\MORE\LINEARITY CORRECTION**

Related Commands: PSWC0, PSWC1

PSWP0 Turn power sweep off **GAIN COMPRESSION (Ch 9)**

Syntax: PSWP0

Remarks: Turns power sweep off at the current CWF frequency.

Front Panel Key: Setup Menu\ **POWER SWEEP OFF**

Related Commands: CWF, PSWP1, PSWPX?

PSWP1 Turn power sweep on **GAIN COMPRESSION (Ch 9)**

Syntax: PSWP1

Remarks: Turns power sweep on at the current CWF frequency.

Front Panel Key: Setup Menu\ **POWER SWEEP ON**

Related Commands: CWF, PSWP0, PSWPX?

PSWPX? Output power sweep on/off status **GAIN COMPRESSION (Ch 9)**

Syntax: `PSWPX?`

Data I/O: The value will be output in ASCII <NR1> format (section 10-3) as follows: “0” for power sweep is off or ”1” for power sweep is on.

Front Panel Key: Setup Menu **\POWER SWEEP**

Related Commands: PSWP0, PSWP1

PT0 Set tabular printout points skipped to 0 **HARD COPY (Ch 8)**

Syntax: `PT0`

Front Panel Key: Hard Copy Menu **\PRINT OPTIONS\TABULAR DATA\PRINT DENSITY**

PT1 Set tabular printout points skipped to 1 **HARD COPY (Ch 8)**

Syntax: `PT1`

Front Panel Key: Hard Copy Menu **\PRINT OPTIONS\TABULAR DATA\PRINT DENSITY**

PT2 Set tabular printout points skipped to 2 **HARD COPY (Ch 8)**

Syntax: `PT2`

Front Panel Key: Hard Copy Menu **\PRINT OPTIONS\TABULAR DATA\PRINT DENSITY**

PT3 Set tabular printout points skipped to 3 **HARD COPY (Ch 8)**

Syntax: `PT3`

Front Panel Key: Hard Copy Menu **\PRINT OPTIONS\TABULAR DATA\PRINT DENSITY**

PT4 Set tabular printout points skipped to 4 **HARD COPY (Ch 8)**

Syntax: `PT4`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PT5 Set tabular printout points skipped to 5 **HARD COPY (Ch 8)**

Syntax: `PT5`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PT6 Set tabular printout points skipped to 6 **HARD COPY (Ch 8)**

Syntax: `PT6`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PT7 Set tabular printout points skipped to 7 **HARD COPY (Ch 8)**

Syntax: `PT7`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PT8 Set tabular printout points skipped to 8 **HARD COPY (Ch 8)**

Syntax: `PT8`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PT9 Set tabular printout points skipped to 9 **HARD COPY (Ch 8)**

Syntax: `PT9`

Front Panel Key: Hard Copy Menu **\ PRINT OPTIONS \ TABULAR DATA \ PRINT DENSITY**

PTAVG Set averaging type to point-by-point averaging **ENHANCEMENT (Ch 4)**

Syntax: PTAVG

Front Panel Key: Avg Smooth Menu**\POINT-BY-POINT**

Related Commands: SWAVG, SWAVG?

PTB Print tabular data for Traces **HARD COPY (Ch 8)**

Syntax: PTB

Front Panel Key: Hard Copy Menu**\PRINT OPTIONS\TABULAR DATA\SWEEP DATA ON**

Related Commands: PT0-PT9

PTBC Configure for printing tabular data for traces **HARD COPY (Ch 8)**

Syntax: PTBC

Remarks: Heretofore configuration could only be set by mnemonic PTB.

Related Commands: PFSC,PGRC,PGTC,PLDC,PLHC,PLMC,PLSC,PLTC,PMKC,PMNC,PMTC

PTL Select 1/4 size plot top left corner **HARD COPY (Ch 8)**

Syntax: PTL

Front Panel Key: Hard Copy Menu**\PLOT OPTIONS\PLOT SIZE\UPPER LEFT**

Related Commands: PTR, PBR, PBL, PFL

PTP Enter the target power for flat power correction **MEASUREMENT (Ch 4)**

Syntax: `PTP Value Unit(s)`
Value: The power level in ASCII <NRF> format (paragraph 10-3).
Units: DBM

Remarks: The calibration will be performed using this as the power level to be achieved.

Front Panel Key: Setup Menu **\TEST SIGNALS\CALIBRATE FOR FLATNESS\POWER TARGET**

Related Commands: PTP?, SFC, FP0, FP1

PTP? Output the target power for flat power correction **MEASUREMENT (Ch 4)**

Syntax: `PTP?`

Data I/O: The target value will be output in ASCII <NR3> format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\CALIBRATE FOR FLATNESS\POWER TARGET**

Related Commands: PTP, SFC, FP0, FP1

PTR Select 1/4 size plot top right corner **HARD COPY (Ch 8)**

Syntax: `PTR`

Front Panel Key: Hard Copy Menu **\PLOT OPTIONS\PLOT SIZE\UPPER RIGHT**

Related Commands: PTL, PBR, PBL, PFL

PTS Enter number of points to be skipped during flat power correction **CALIBRATION (Ch 5)**

Syntax: `PTS Value Unit(s)`
Value: 1 to 65
Units: XX1

Front Panel Key: Setup Menu **\TEST SIGNALS\CALIBRATE FOR FLATNESS\XXX POINTS MEASURE 1 PWR POINT EVERY XX POINTS**

PTS? Output number of points to be skipped during flat power correction **CALIBRATION (Ch 5)**

Syntax: `PTS?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\CALIBRATE FOR FLAT-NESS\XXX POINTS MEASURE 1 PWR POINT EVERY XX POINTS**

PW1 Enter external source 1 power level **MEASUREMENT (Ch 4)**

Syntax: `PW1 Value`
Value: Depends on power range of source 1.

Remarks: Sets the power level of external source number 1.

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\SOURCE 1 POWER**

Related Commands: PW1?,PW2, PW2?

PW1? Output external source 1 power level **MEASUREMENT (Ch 4)**

Syntax: `PW1?`

Remarks: Outputs the power level setting of external source number 1.

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\SOURCE 1 POWER**

Related Commands: PW1,PW2, PW2?

PW2 Enter external source power level **MEASUREMENT (Ch 4)**

Syntax: `PW2 Value Unit(s)`
Value: Depends on power range of source 2.
Units: DBM, XX1, XX3, XM3

Front Panel Key: Setup Menu **\TEST SIGNALS\SOURCE 2 POWER**

PW2? Output external source power level **MEASUREMENT (Ch 4)**

Syntax: `PW2?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\SOURCE 2 POWER**

PWR Enter internal source power level **MEASUREMENT (Ch 4)**

Syntax: `PWR Value Unit(s)`
Value: Depends on the 37XXXD power range.
Units: DB, XX1, XX3, XM3

Front Panel Key: Setup Menu **\TEST SIGNALS\POWER CONTROL**

Related Commands: OID, P1P?, PWR?

PWR? Output internal source power level **MEASUREMENT (Ch 4)**

Syntax: `PWR?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Setup Menu **\TEST SIGNALS\POWER CONTROL**

Related Commands: OID, PIP?

Q22 Set Millimeter Wave Band to Q Band (WR-22) **MILLIMETER WAVE (Ch 9)**

Syntax: `Q22`

RAD Suffix sets phase data type and scales by 180/pi **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `RAD`

RC1 Recall front panel setup number 1 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC1`

Front Panel Key: Save/Recall Menu **\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 1**

RC10 Recall front panel setup number 10 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC10`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 10**

RC2 Recall front panel setup number 2 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC2`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 2**

RC3 Recall front panel setup number 3 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC3`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 3**

RC4 Recall front panel setup number 4 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC4`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 4**

RC5 Recall front panel setup number 5 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC5`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 5**

RC6 Recall front panel setup number 6 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC6`

Front Panel Key: Save/Recall Menu**\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 6**

RC7 Recall front panel setup number 7 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC7`

Front Panel Key: Save/Recall Menu **\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 7**

RC8 Recall front panel setup number 8 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC8`

Front Panel Key: Save/Recall Menu **\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 8**

RC9 Recall front panel setup number 9 from memory **SAVE/RECALL (Ch 8)**

Syntax: `RC9`

Front Panel Key: Save/Recall Menu **\RECALL\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 9**

RD Remove a disk directory **DISK FUNCTION (Ch 8)**

Syntax: `RD Value`
Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and directory name to remove.

Remarks: The directory to remove must be empty.

Related Commands: MD

RDA Select automatic reference delay calculation **DISPLAY (Ch 4)**

Syntax: `RDA`

Remarks: Calculation impacted by dielectric setting.

Front Panel Key: Ref Plane **\AUTO**

Related Commands: CH1-CH4, RDD, RDT, DIx commands in DISPLAY Group.

RDD Enter reference delay in distance for active channel **DISPLAY (Ch 4)**

Syntax: `RDD Value Unit(s)`
Value: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Remarks: Calculation impacted by dielectric setting.

Front Panel Key: Ref Plane\ **DISTANCE**

Related Commands: CH1-CH4, RDA, RDT, DIx commands in DISPLAY Group.

RDD? Output reference delay in distance for active channel **DISPLAY (Ch 4)**

Syntax: `RDD?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Ref Plane\ **DISTANCE**

RDT Enter reference delay in time for active channel **DISPLAY (Ch 4)**

Syntax: `RDT Value Unit(s)`
Value: -999.999 to +999.999
Units: SEC, MS, US, NS, PS

Status Reporting: CH1-CH4, RDD, RDA

Front Panel Key: Ref Plane\ **TIME**

RDT? Output reference delay in time for active channel **DISPLAY (Ch 4)**

Syntax: `RDT?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Ref Plane\ **TIME**

RECALL Recall a data file from disk to a task **DISK FUNCTION (Ch 8)**

Syntax: `RECALL Value`

Value: Value 1 is in <String> data format (paragraph 10-3) contaning the path and filename of the file to recall.

Remarks: Not all files are recallable. One can recall files with the following name/extentions: (front panel and calibration data files) *.CAL, (normalization data files) *.NRM, (tabular data files) *.DAT, (service log files) *.LOG, (error list files) *.ELG, (hardware calibration files) HW_CAL.*, (calibration kit data files) KIT_INFO.*. Recalled tabular data, service log and error list files go to the printer for printing. The others are stored internally.

Front Panel Key: Utility Menu\ **AUTOCAL UTILITIES\RECALL FROM HARD (or FLOPPY) DISK**

Related Commands: SAVE

REF Enter reference line for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `REF Value Unit(s)`

Value: 0-8

Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Status Reporting: CH1-CH4, OFF, SCL

Front Panel Key: Set Scale\ **LOG MAG REFERENCE LINE**

REF2 Enter reference line for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `REF2 Value Unit(s)`

Value: 0-8

Units: Depends on graph type; see Table 11-2 at the end of this chapter.

Front Panel Key: Set Scale\ **LOG MAG REFERENCE LINE**

Related Commands: CH1-CH4, OFF2, SCL2

REF2? Output reference line for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: REF2?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE LINE**

Related Commands: REF2

REF? Output reference line for top graph of active channel **DISPLAY (Ch 4)**

Syntax: REF?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Set Scale\ **LOG MAG REFERENCE LINE**

REL Select real display for active channel **DISPLAY (Ch 4)**

Syntax: REL

Front Panel Key: Graph Type\ **REAL**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, RIM, SMC, SME, SMI, SWR

REU Suffix sets real data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: REU

RGZ Select reflective device greater than Z0 **CALIBRATION (Ch 5)**

Syntax: RGZ

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ OPEN (GREATER THAN Zo)**

Related Commands: RLZ

RH0 Select RF off in hold mode **MEASUREMENT (Ch 4)**

Syntax: `RH0`

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\BIAS HOLD CONDITIONS—RF OFF**

Related Commands: HLD, RHI, BH0

RH1 Select RF on in hold **MEASUREMENT (Ch 4)**

Syntax: `RH1`

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\BIAS HOLD CONDITIONS—RF ON**

Related Commands: HLD, RH0, BH0

RHX? Output RF on/off during hold status **MEASUREMENT (Ch 4)**

Syntax: `RHX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Setup Menu\ **HOLD BUTTON FUNCTION\BIAS HOLD CONDITIONS—RF (Status)**

RIM Select real and imaginary display for active channel **DISPLAY (Ch 4)**

Syntax: `RIM`

Front Panel Key: Graph Type\ **REAL AND IMAGINARY**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI, SWR

RLZ Select reflective device less than Z0 **CALIBRATION (Ch 5)**

Syntax: `RLZ`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\SHORT (LESS THAN Zo)**

Related Commands: RGZ

RM1 Select reference plane at line 1 midpoint **CALIBRATION (Ch 5)**

Syntax: `RM1`

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\LOCATION OF REFERENCE PLANES MIDDLE OF LINE 1**

Related Commands: RRP

ROL Enter reflective device offset length **CALIBRATION (Ch 5)**

Syntax: `ROL Value Unit(s)`
Value: 00.000 to +10.000
Units: MMT, CMT, MTR, MM, CM, M

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\OFFSET LENGTH OF TRM REFLECTION**

RPC Repeat previous calibration **CALIBRATION (Ch 5)**

Syntax: `RPC`

Remarks: Performs exactly the same as the BEG command EXCEPT it uses existing calibration setup. This command is useful after recalling a saved calibration.

Front Panel Key: Begin Cal\ **REPEAT PREVIOUS CAL**

Related Commands: BEG, KEC, TC1, TC2, NCS

RPO Enter rear panel dc voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `RPO Value Unit(s)`
Value: 00.000 to +10.000
Units: VLT

RPO? Output rear panel dc voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `RPO?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

RRP Select reference plane at reflection plane **CALIBRATION (Ch 5)**

Syntax: `RRP`

Remarks: Selects reference plane to be at the reflection plane for the LRL calibration.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LRL/LRM PARAMETERS\LOCATION OF REFERENCE PLANES END OF LINE 1 (REF)**

Related Commands: RRP

RST Instrument reset (same as *RST) **SYSTEM STATE (Ch 8)**

Syntax: `RST`

Remarks: Resets the 37XXXD to default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. This command does not affect the Output Queue, Status or Parallel Poll Registers, or the VNA GPIB address setting.

Related Commands: *RST, RST0, RST1

RST0 Reset instrument front panel memories and reserved parameters **SYSTEM STATE (Ch 8)**

Syntax: `RST0`

Remarks: Resets the VNA settings to their default values. Default state settings are listed in Chapter 12. Additionally, front panel stored setups are cleared and the reserved parameters are set to their default values. This command does not effect the Output Queue, Status, Parallel Poll Registers, or the GPIB address. Reserved parameters are those parameters which are initialized at factory turn-on. They are also initialized after a battery-backed RAM failure occurs.

Related Commands: *RST, RST, RST1

RST1 Reset instrument and front panel memories **SYSTEM STATE (Ch 8)**

Syntax: `RST1`

Remarks: Resets the VNA to the default state with all user programmable parameters set to their default values. Default state settings are listed in Chapter 12. Additionally, front panel stored setups are cleared. This command does not effect the Output Queue, Status, Parallel Poll Registers, or the GPIB address.

Related Commands: *RST, RST, RST0

RSTAVG Reset the sweep-by-sweep averaging sweep count **ENHANCEMENT (Ch 4)**

Syntax: `RSTAVG`

Remarks: Sets the sweep count back to 1 and the sweep_by_sweep averaged display to its unaveraged appearance

Front Panel Key: Avg Smooth Menu\ **RESET AVG COUNT**

Related Commands: AVGCNT?, AVG, AVG?, AOF, PTAVG, SWAVG, SWAVG?

RSTCOL Reset color configuration to default **SYSTEM STATE (Ch 8)**

Syntax: `RSTCOL`

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\ RESET COLORS**

RSTGC Reset gain compression parameters to default **GAIN COMPRESSION (Ch 9)**

Syntax: RSTGC

Remarks: This is not an instrument reset.

Front Panel Key: Utility Menu\COLOR CONFIGURATION\RESET COLORS

RT0 Turn retrace rf off **MEASUREMENT (Ch 4)**

Syntax: RT0

Front Panel Key: Option Menu\RF OFF DURING RETRACE

Related Commands: RT1, RTX?

RT1 Turn retrace rf on **MEASUREMENT (Ch 4)**

Syntax: RT1

Front Panel Key: Option Menu\RF ON DURING RETRACE

Related Commands: RT0, RTX?

RTL Return to local **SYSTEM STATE (Ch 8)**

Syntax: RTL

Remarks: This command performs the same function as the RETURN TO LOCAL key. It has no effect if the VNA is in the local lockout mode.

RTX? Output retrace rf on/off status **MEASUREMENT (Ch 4)**

Syntax: RTX?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: "1" for TRUE or "0" for FALSE.

Front Panel Key: Option Menu\RF ON/OFF DURING RETRACE

RV0 Turn rear panel output voltage off **REAR PANEL OUTPUT (Ch 9)**

Syntax: RV0

Front Panel Key: Options Menu**\REAR PANEL OUTPUT\OUTPUT OFF**

RV1 Turn rear panel output voltage on **REAR PANEL OUTPUT (Ch 9)**

Syntax: RV1

Front Panel Key: Options Menu**\REAR PANEL OUTPUT\OUTPUT ON**

RV1? Output rear panel output voltage on/off status **REAR PANEL OUTPUT (Ch 9)**

Syntax: RV1?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Options Menu**\REAR PANEL OUTPUT\OUTPUT**

RVD Set rear panel output mode to dc value **REAR PANEL OUTPUT (Ch 9)**

Syntax: RVD

Related Commands: RVH, RVV, RVL, RVX?

RVH Set rear panel output mode to horizontal **REAR PANEL OUTPUT (Ch 9)**

Syntax: RVH

Front Panel Key: Options Menu**\REAR PANEL OUTPUT\SELECT MODE\HORIZONTAL**

Related Commands: RVD, RVV, RVL, RVX?

RVL Set rear panel output mode to lock direction **REAR PANEL OUTPUT (Ch 9)**

Syntax: RVL

Related Commands: RVH, RVV, RVD, RVX?

RVV Set rear panel output mode to vertical **REAR PANEL OUTPUT (Ch 9)**

Syntax: RVV

Front Panel Key: Options Menu\ **REAR PANEL OUTPUT\ SELECT MODE\ VERTICAL**

Related Commands: RVH, RVD, RVL, RVX?

RVX? Output rear panel output mode **REAR PANEL OUTPUT (Ch 9)**

Syntax: RVX?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for horizontal, ”2” for vertical, “3” for lock dir, and ”4” for dc output.

Front Panel Key: Options Menu\ **REAR PANEL OUTPUT\ SELECT MODE\ VERTICLE/HORIZONTAL**

S Suffix sets time data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: S

S11 Measure S11 on active channel **MEASUREMENT (Ch 4)**

Syntax: S11

Remarks: Measures the forward reflection parameter, S11, on the active channel. Forward reflection is the value of the signal leaving port 1 vs the value of the signal being reflected back into port 1. Any channel that is displaying the user parameter USR2 will now display S11.

Front Panel Key: S Params\ **S21, FWD REFL**

Related Commands: S12, S21, S22, CH1-CH4

S12 Measure S12 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S12`

Remarks: Measures the reverse transmission parameter, S12, on the active channel. Reverse transmission is the value of the signal leaving port 2 vs the value of the signal being received at port 1. Any channel that is displaying the user parameter USR3 will now display S12.

Front Panel Key: S Params\ **S21, REV TRANS**

Related Commands: S11, S21, S22, CH1-CH4

S21 Measure S21 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S21`

Remarks: Measures the forward transmission parameter, S21, on the active channel. Forward transmission is the value of the signal leaving port 1 vs the value of the signal being received at port 2. Any channel that is displaying the user parameter USR1 will now display S21.

Front Panel Key: S Params\ **S21, FWD TRANS**

Related Commands: S11, S12, S22, CH1-CH4

S22 Measure S22 on active channel **MEASUREMENT (Ch 4)**

Syntax: `S22`

Remarks: Measures the reverse reflection parameter, S22, on the active channel. Reverse reflection is the value of the signal leaving port 2 vs the value of the signal being reflected back into port 2. Any channel that is displaying the user parameter USR4 will now display S22.

Front Panel Key: S Params\ **S21, REV REFL**

Related Commands: S11, S12, S21, CH1-CH4

SA1 Enter port 1 source attenuator value **MEASUREMENT (Ch 4)**

Syntax: `SA1 Value Unit(s)`
Value: 0 to 70 dB, in 10 dB steps
Units: DB, DBL, DBM, XX1, XX3, XM3

Remarks: Attenuates the signal output from Port 1.

Front Panel Key: Setup Menu\ **TEST SIGNALS\PORT 1 ATTN**

Related Commands: PWR, P1P?, TA2

SA1? Output port 1 source attenuator value **MEASUREMENT (Ch 4)**

Syntax: `SA1?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Front Panel Key: Setup Menu\ **TEST SIGNALS\PORT 1 ATTN**

SA1MAX? Output port 1 source attenuator max value **MEASUREMENT (Ch 4)**

Syntax: `SA1MAX?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: SA1?, TA2MAX?

SAMP2 Use 2 samplers for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP2`

Remarks: This configuration provides greater dynamic range but only allows 1 parameter measurements.

Front Panel Key: Avg/Smooth Menu\ **SAMPLERS USED PER SWEEP**

Related Commands: SAMP?,SAMP3

SAMP3 Use 3 samplers for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP3`

Remarks: This configuration is the normal sampler configuration. Since 3 samplers are used, can measure 2 parameters simultaneously however the dynamic range may be degraded do to interaction between samplers.

Front Panel Key: Avg/Smooth Menu\ **SAMPLERS USED PER SWEEP**

Related Commands: SAMP?,SAMP2

SAMP? Output the number of samplers used for measurements **MEASUREMENT (Ch 4)**

Syntax: `SAMP?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3) as follows: “2” means low noise 2 sampler measurement and ”3” means normal 3 sampler measurement.

Front Panel Key: Avg/Smooth Menu\ **SAMPLERS USED PER SWEEP**

Related Commands: SAMP2,SAMP3

SAVE Save a data file to disk **DISK FUNCTION (Ch 8)**

Syntax: `SAVE Value`

Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and filename of the file to which the data is to be saved. The file name extension defines the type of data to be saved.

Remarks: The following are the types of data and associated file names which can be saved: front panel and calibration data (*.CAL), normalization data (*.NRM), tabular data (*.DAT). S2P format data (*.S2P), text format data (*.TXT), hpgl plot data (*.HGL), black and white windows bit map of screen (*.BMB), color windows bit map of screen (*.BMC), service log data (*.LOG), error list data (*.ELG), hardware calibration files (HW_CAL.*).

Front Panel Key: Hard Copy Menu\ **DISK FILE OPTIONS\ FORMAT TEXT** or Utility Menu\ **AUTOCAL UTILITIES\ SAVE TO HARD DISK (or SAVE TO FLOPPY DISK)**

Related Commands: RECALL

SAVEGC Save text format gain compression data to disk **DISK FUNCTION (Ch 8)**

Syntax: `SAVEGC Value`

Value: Value 1 is in <String> data format (paragraph 10-3) specifying the path and filename of the file to which the gain compression data is stored. The extention should be '.TXT' for consistency.

Remarks: The data items are separated with tabs (ASCII value 9) in order to be compatible with Microsoft Excel.

Related Commands: SAVE, SPGCA, MFGCT, OGCTXT

SBD Enter substrate dielectric for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `SBD Value Unit(s)`

Value: 1.0 to 9999.99

Units: XX1, XX3, XM3

Status Reporting: SBT

Front Panel Key: Begin Cal**NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\USER DEFINED\SUBSTRATE DIELECTRIC**

SBT Enter substrate thickness for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `SBT Value Unit(s)`

Value: 0.001 mm to 1.0 m

Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: SBD

Front Panel Key: Begin Cal**NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\USER DEFINED\THICKNESS OF SUBSTRATE**

SCL Enter Scale Resolution for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `SCL Value Unit(s)`

Value: Depends on graph type: Mag Resolution: 0.001-50, Phase Resolution: 0.01-90, Polar Resolution: E-9-999.99, Mag Resolution: 200 max, Smith/Inverted Smith: -30, 10, 20, 30

Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Front Panel Key: Set Scale**LOG MAG RESOLUTION**

Related Commands: OFF, REF, ISE, ISC, SME, SMC

SCL2 Enter Scale Resolution for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `SCL2 Value Unit(s)`

Value: Depends on graph type: Mag Resolution: 0.001-50, Phase Resolution: 0.01-90, Polar Resolution: E-9-999.99, Mag Resolution: 200 max, Smith/Inverted Smith: -30, 10, 20, 30

Units: Depends on graph type; refer to Table 11-2 at the end of this chapter.

Front Panel Key: Set Scale**LOG MAG RESOLUTION**

Related Commands: OFF2, REF2

SCL2? Output Scale Resolution for bottom graph of active channel **DISPLAY (Ch 4)**

Syntax: `SCL2?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Set Scale**LOG MAG RESOLUTION**

Related Commands: SCL2

SCL? Output Scale Resolution for top graph of active channel **DISPLAY (Ch 4)**

Syntax: `SCL?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Set Scale**LOG MAG RESOLUTION**

SCM Select standard calibration method **CALIBRATION (Ch 5)**

Syntax: SCM

Front Panel Key: Begin Cal\CHANGE CAL METHOD AND LINE TYPE\STANDARD (NOT USED FOR WAVEGUIDE)

Related Commands: LCM, OCM

SDG Start diagnostics mode **DIAGNOSTICS (Ch 8)**

Syntax: SDG

Remarks: For service use only.

SDR Select standard receiver mode **DIAGNOSTICS (Ch 8)**

Syntax: SDR

Remarks: For service use only.

Front Panel Key: Option Menu\RECEIVER MODE\STANDARD

SDR? Output receiver mode **RECEIVER MODE (Ch 9)**

Syntax: SDR?

Data I/O: The receiver mode is output in ASCII <NR1> format (section 10-3) as follows: “0” for standard, ”1” for source lock with GPIB control off, “2” for source lock with GPIB control on, ”3” for tracking with GPIB control off, “4” for tracking with GPIB control on, and ”5” for set on mode with GPIB off.

Front Panel Key: Option Menu\RECEIVER MODE\STANDARD

Related Commands: SDR, SL1, ST1, TK1

SELBB Select Broadband test set operation **MILLIMETER WAVE (Ch 9)**

Syntax: SELBB

Front Panel Key: Option Menu\TEST SET CONFIG\BROADBAND

SELINT Select Internal (normal) test set operation **MILLIMETER WAVE (Ch 9)**

Syntax: SELINT

Front Panel Key: Option Menu**\TEST SET CONFIG\INTERNAL**

Related Commands: SELMM, SELFP, SELBB, SELXX?

SELMM Select Millimeter Wave test set operation **MILLIMETER WAVE (Ch 9)**

Syntax: SELMM

Front Panel Key: Option Menu**\TEST SET CONFIG\MILLIMETER WAVE**

Related Commands: SELINT, SELSP, SELBB, SELXX?

SELSP Select S-parameter test set operation **MILLIMETER WAVE (Ch 9)**

Syntax: SELSP

Front Panel Key: Option Menu**\TEST SET CONFIG\S-PARAMETER**

Related Commands: SELXX?, SELINT, SELMM, SELBB

SELXX? Output the test set selection MMWave/Internal **MILLIMETER WAVE (Ch 9)**

Syntax: SELXX?

Data I/O: Returns a value in ASCII <NR1> format (section 10-3) as follows: “0” is internal, ”1” is millimeterwave, “2” is S-parameter, and ”3” is Broadband.

Front Panel Key: Option Menu**\TEST SET CONFIG**

Related Commands: SELINT, SELMM, SELSP, SELBB

SETUP Display setup menu **DISPLAY (Ch 4)**

Syntax: SETUP

SFC Perform flat test port calibration **CALIBRATION (Ch 5)**

Syntax: `SFC`

Front Panel Key: Setup Menu\TEST SIGNALS\CALIBRATE FOR FLATNESS\START FLAT POWER CALIBRATION

SFGCA Select swept frequency gain compression application **GAIN COMPRESSION (Ch 9)**

Syntax: `SFGCA`

Related Commands: SPGCA, UNDOGC

SFGCT Start swept frequency gain compression test **GAIN COMPRESSION (Ch 9)**

Syntax: `SFGCT`

Remarks: Begin testing gain compression over the current frequency range and at the current power level setting.

Related Commands: SFGCA

SH1 Set offset short 1 or 2 offset length for offset short calibration **CALIBRATION (Ch 5)**

Syntax: `SH1 Value Unit(s)`
Value: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: OCM, WSH1, WSH2

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\OFFSET LENGTH OF SHORTS\PORT 1 SHORTS SHORT 1

SH2 Set offset short 1 or 2 offset length for offset short calibration **CALIBRATION (Ch 5)**

Syntax: `SH2 Value Unit(s)`
Value: -999.999 to +999.999
Units: M, MTR, MM, MMT, CM, CMT

Status Reporting: OCM, WSH1, WSH2

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\OFFSET LENGTH OF SHORTS\PORT 1 SHORTS SHORT 2**

SHARP Activate color configuration Sharp **SYSTEM STATE (Ch 8)**

Syntax: `SHARP`

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\COLOR SCHEMES\SHARP COLORS**

Related Commands: BRILL, CLASS, INVER, NEWCO, SOFTCO, STOCO, RSTCO

SL1 Select source lock mode **RECEIVER MODE (Ch 9)**

Syntax: `SL1`

Remarks: For service use only.

Front Panel Key: Option Menu**\RECEIVER MODE\USER DEFINED\SOURCE LOCK**

SLC Clear all segmented limits definitions **LIMITS (Ch 6)**

Syntax: `SLC`

Front Panel Key: Limits**\SEGMENTED LIMITS\CLEAR ALL**

SLD Select sliding load for calibration **CALIBRATION (Ch 5)**

Syntax: `SLD`

Remarks: During calibration the data-taking process for the load includes six slide positions. If any calibration frequencies are below 2 GHz, you must also use a broadband load.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\LOAD TYPE\SLIDING LOAD**

Related Commands: BBL

SLH Enter segmented limits horizontal offset **LIMITS (Ch 6)**

Syntax: `SLH Value Unit(s)`
Value: Frequency, time, or distance in current sweep range .
Units: XM3, XX1, XX3

Front Panel Key: Limits\ **SEGMENTED LIMITS\SEGMENTED OFFSETS HORIZONTAL**

Related Commands: SLV

SLH? Output segmented limits horizontal offset **LIMITS (Ch 6)**

Syntax: `SLH?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\ **SEGMENTED LIMITS\SEGMENTED OFFSETS HORIZONTAL**

SLL0 Turn lower segmented limits display off **LIMITS (Ch 6)**

Syntax: `SLL0`

Front Panel Key: Limits\ **SEGMENTED LIMITS\LOWER LIMIT OFF**

Related Commands: LON, LOF, SLL1

SLL1 Turn lower segmented limits display on **LIMITS (Ch 6)**

Syntax: `SLL1`

Front Panel Key: Limits\ **SEGMENTED LIMITS\LOWER LIMIT ON**

Related Commands: LON, LOF, SLL0

SLLX? Output lower segmented limits display on/off status **LIMITS (Ch 6)**

Syntax: `SLLX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Limits\ **SEGMENTED LIMITS\LOWER LIMIT**

SLT Perform SLT internal calibration **DIAGNOSTICS (Ch 8)**

Syntax: `SLT`

Remarks: For service use only.

SLU0 Turn upper segmented limits display off **LIMITS (Ch 6)**

Syntax: `SLU0`

Front Panel Key: Limits\ **SEGMENTED LIMITS\UPPER LIMIT OFF**

Related Commands: LON, LOF, SLU1

SLU1 Turn upper segmented limits display on **LIMITS (Ch 6)**

Syntax: `SLU1`

Front Panel Key: Limits\ **SEGMENTED LIMITS\UPPER LIMIT ON**

Related Commands: LON, LOF, SLL, SLU0

SLUX? Output upper segmented limits display on/off status **LMITS (Ch 7)**

Syntax: `SLUX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Limits\SEGMENTED LIMITS\UPPER LIMIT

SLV Enter segmented limits vertical offset **LIMITS (Ch 6)**

Syntax: `SLV Value Unit(s)`
Value: Depends on graph type(see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Limits\SEGMENTED LIMITS\SEGMENTED OFFSETS VERTICAL

Related Commands: SLH

SLV? Output segmented limits vertical offset **LIMITS (Ch 6)**

Syntax: `SLV?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\SEGMENTED LIMITS\SEGMENTED OFFSETS VERTICAL

SMC Enter scale and select compressed Smith Chart display **DISPLAY (Ch 4)**

Syntax: `SMC`

Remarks: Selects the compressed Smith Chart for display on the active channel.

Front Panel Key: Graph Type\SMITH CHART (IMPEDANCE)

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMI, SME, SMI, SWR

SME Enter scale and select expanded Smith Chart display **DISPLAY (Ch 4)**

Syntax: `SME Value Unit(s)`
Value: 10, 20, 30
Units: DBL, XX1

Front Panel Key: Graph Type\ **SMITH CHART (IMPEDANCE)**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI, SWR

SMI Select normal Smith Chart for active channel **DISPLAY (Ch 4)**

Syntax: `SMI`

Front Panel Key: Graph Type\ **SMITH CHART (IMPEDANCE)**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, RIM, SMC, SME, SWR

SMKR Select marker search marker mode **MARKERS (Ch 6)**

Syntax: `SMKR`

Related Commands: AMKR, FMKR, NMKR, XMKR?

SOF Turn off smoothing **ENHANCEMENT (Ch 4)**

Syntax: `SOF`

Front Panel Key: Avg Smooth Menu\ **SMOOTHING X.X PERCENT OF SWEEP**

Related Commands: SON

SOF? Output smoothing on/off status **ENHANCEMENT (Ch 4)**

Syntax: `SOF?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Avg Smooth Menu\ **SMOOTHING X.X PERCENT OF SWEEP**

SOFTCO Activate color configuration Soft **SYSTEM STATE (Ch 8)**

Syntax: SOFTCO

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\COLOR SCHEMES\SOFT COLORS**

Related Commands: BRILL, CLASS, INVER, NEWCO, SHARP, STOCO, RSTCOL

SON Enter smoothing value and turn on **ENHANCEMENT (Ch 4)**

Syntax: SON Value Unit(s)
Value: 0 - 20
Units: XX1, XX3, XM3

Front Panel Key: Avg Smooth Menu\ **SMOOTHING X.X PERCENT OF SWEEP**

Related Commands: SOF

SON? Output smoothing value **ENHANCEMENT (Ch 4)**

Syntax: SON?

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Avg Smooth Menu\ **SMOOTHING X.X PERCENT OF SWEEP**

SPAMPMT Start swept power gain compression AM/PM test **GAIN COMPRESSION (Ch 9)**

Syntax: SPAMPMT

Remarks: Begins the automated sequence which finds the gaim compression target at one of the specified frequency points. Phase and magnitude vs input power are displayed.

Front Panel Key: Appl\ **SWEPT POWER GAIN COMPRESSION\MORE\AM/PM**

Related Commands: SFGCA, SPGCA, UNDOGC

SPAN Enter frequency span **MEASUREMENT (Ch 4)**

Syntax: `SPAN Value Unit(s)`
Value: Can be any frequency span up to the high frequency limit minus the low frequency limit of the 37XXXD.
Units: HZ, KHZ, MHZ, GHZ

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\SET CENTER/SPAN\SPAN** or Setup Menu\ **SET CENTER/SPAN\SPAN**

Related Commands: CNTR, CNTR?, SPAN?, SRT, SRT?, STP, STP?

SPAN? Output frequency span **MEASUREMENT (Ch 4)**

Syntax: `SPAN?`

Data I/O: Outputs a value in ASCII <NR3> format (section 10-3).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\SET CENTER/SPAN\SPAN** or Setup Menu\ **SET CENTER/SPAN\SPAN (Frequency)**

Related Commands: CNTR, CNTR?, SPAN, SRT, SRT?, STP, STP?

SPD Enter pen speed percentage **HARD COPY (Ch 8)**

Syntax: `SPD Value Unit(s)`
Value: 10 - 100
Units: XX1, XX3, XM3

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\PEN COLORS\PEN SPEED 100 PERCENT OF MAXIMUM**

SPGCA Select swept power gain compression application **GAIN COMPRESSION (Ch 9)**

Syntax: `SPGCA`

Related Commands: SFGCA, UNDOGC

SPGCT Start swept power gain compression test **GAIN COMPRESSION (Ch 9)**

Syntax: SPGCT

Remarks: Begins the automated sequence which finds the gain compression target at one of the specified frequency points.

Related Commands: SPGCA, MFGCT

SPH Enter active segmented limit horizontal stop position **LIMITS (Ch 6)**

Syntax: SPH Value Unit(s)
Value: Frequency, time, or distance in the current sweep range.
Units: XX1, XX3, XM3

Related Commands: LS01-LS010, US01-US10

SPH? Output active segmented limit horizontal stop position **LIMITS (Ch 6)**

Syntax: SPH?

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

SPLN Select normal source lock polarity **ENHANCEMENT (Ch 4)**

Syntax: SPLN

Related Commands: SPLR, SPLX?

SPLR Select reverse source lock polarity **ENHANCEMENT (Ch 4)**

Syntax: SPLR

Related Commands: SPLN, SPLX?

SPLX? Output source lock polarity normal/reverse status **ENHANCEMENT (Ch 4)**

Syntax: SPLX?

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: “1” for REVERSE, ”0” for NORMAL.

Related Commands: SPLN, SPLR

SPR0 Turn spur reduction off **ENHANCEMENT (Ch 4)**

Syntax: `SPR0`

Front Panel Key: Option Menu **\RECEIVER MODE\SPUR REDUCTION OFF**

Related Commands: SPR1, SPRX?

SPR1 Turn spur reduction on **ENHANCEMENT (Ch 4)**

Syntax: `SPR1`

Front Panel Key: Option Menu **\RECEIVER MODE\SPUR REDUCTION ON**

Related Commands: SPR0, SPRX?

SPRX? Output spur reduction on/off status **ENHANCEMENT (Ch 4)**

Syntax: `SPRX?`

Data I/O: Outputs a value using ASCII <NR1> format (section 10-3) as follows: "1" for ON, "0" for OFF.

Front Panel Key: Option Menu **\RECEIVER MODE\SPUR REDUCTION**

SPTS? Output number of smoothing points **SYSTEM STATE (Ch 8)**

Syntax: `SPTS?`

Remarks: Numerically equal to the smoothing value as a percent times the number of points in the sweep. Adjusted up to be an odd number.

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3).

Related Commands: SON, SON?

SPV Enter active segmented limit vertical stop position **LIMITS (Ch 6)**

Syntax: `SPV Value Unit(s)`
Value: Depends on graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Related Commands: LS01-LS010, US01-US10

SPV? Output active segmented limit vertical stop position **LIMITS (Ch 6)**

Syntax: SPV?

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

SRC1 Select source linearity voltage testing **DIAGNOSTICS (Ch 8)**

Syntax: SRC1

Remarks: For service use only.

SRC1? Output external source 1 existence information **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1?

Data I/O: Outputs value in ASCII <NR1> format (section 10.3) as follows: “0” means external source 1 does not exist, ”1” means external source 1 does exists.

Related Commands: SRC2?

SRC1AC Select source 1 as active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1AC

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 1 ACTIVE**

Related Commands: SRC1NA, SRC1AC?

SRC1AC? Output source 1 active/inactive status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1AC?

Data I/O: Outputs the status in ASCII <NR1> format (section 10-3) as follows: “0” for inactive or ”1” for active.

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 1 ACTIVE/INACTIVE**

Related Commands: SRC1AC, SRC1NA

SRC1ADD Enter external source 1 GPIB address **ADDRESSING (Ch 8)**

Syntax: SRC1ADD Value Unit(s)
Value: 1-30
Units: XX1

Data I/O: Data is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 1 GPIB ADDRESS** or Utility Menu\ **GPIB ADDRESSES\EXTERNAL SOURCE 1**

Related Commands: SRC1ADD?,ADDFC,ADDPM,ADDPLT,SRC2ADD

SRC1ADD? Output external source 1 GPIB address **ADDRESSING (Ch 8)**

Syntax: SRC1ADD?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 1 GPIB ADDRESS** or Utility Menu\ **GPIB ADDRESSES\EXTERNAL SOURCE 1**

Related Commands: SRC1ADD,ADDFC?,ADDPM?,ADDPLT?,SRC2ADD?

SRC1EX Select source 1 as external **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1EX

Related Commands: SRC1NT,SRC1EX?

SRC1EX? Output source 1 external/internal status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1EX?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3), "0" means the source is internal, "1" means the source is external.

Related Commands: SRC1EX,SRC1NT

SRC1G0 Turn source 1 GPIB control off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1G0

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 1 GPIB CONTROL OFF**

Related Commands: SRC1G1,SRC1GX?

SRC1G1 Turn source 1 GPIB control on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1G1

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 1 GPIB CONTROL ON**

Related Commands: SRC1G0,SRC1GX?

SRC1GX? Output source 1 GPIB control on/off status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1GX?

Data I/O: Outputs value in ASCII <NR1> format (section 10-3), “0” for OFF or ”1” for ON.

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 1 GPIB CONTROL**

Related Commands: SRC1G0,SRC1G1

SRC1MOD? Output external source 1 model/version string **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1MOD?

Data I/O: Outputs string in <Arbitrary ASCII> format (section 10-3).

Related Commands: SRC2MOD?

SRC1NA Select source 1 as not active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: SRC1NA

Related Commands: SRC1AC, SRC1AC?

SRC1NT Select source 1 as internal **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC1NT`

Related Commands: SRC1EX,SRC1EX?

SRC2 Select source power voltage testing **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2`

Remarks: For service use only.

SRC2? Output external source 2 existence information **MEASUREMENT (Ch 4)**

Syntax: `SRC2?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3) as follows: “0” means external source 2 does not exist, ”1” means external source 2 does exist.

Related Commands: SRC1?

SRC2AC Select source 2 as active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2AC`

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 2 ACTIVE**

Related Commands: SRC2NA, SRC2AC?

SRC2AC? Output source 2 active/inactive status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2AC?`

Data I/O: Outputs the status in ASCII <NR1> format (section 10-3) as follows: “0” for inactive or ”1” for active.

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 2 ACTIVE/INACTIVE**

Related Commands: SRC2AC, SRC2NA

SRC2ADD Enter external source 2 GPIB address **ADDRESSING (Ch 8)**

Syntax: `SRC2ADD Value Unit(s)`
Value: 1-30
Units: XX1

Data I/O: The value is input in ASCII (NRf> format (section 10-3).

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 2 GPIB ADDRESS** or Utility Menu\ **GPIB ADDRESSES\EXTERNAL SOURCE 2**

Related Commands: SRC2ADD?,ADDFC,ADDPLT,ADDPM,SRC1ADD

SRC2ADD? Output external source 2 GPIB address **ADDRESSING (Ch 8)**

Syntax: `SRC2ADD?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 2 GPIB ADDRESS** or Utility Menu\ **GPIB ADDRESSES\EXTERNAL SOURCE 2**

Related Commands: SRC2ADD,ADDFC?,ADDPLT?,ADDPM?,SRC1ADD?

SRC2G0 Turn source 2 GPIB control off **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2G0`

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 2 GPIB CONTROL OFF**

Related Commands: SRC2G1, SRC2GX?

SRC2G1 Turn source 2 GPIB control on **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2G1`

Front Panel Key: Option Menu\ **SOURCE CONFIG\SOURCE 2 GPIB CONTROL ON**

Related Commands: SRC2G0, SRC2GX?

SRC2GX? Output source 2 GPIB control on/off status **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2GX?`

Data I/O: Outputs the status in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Option Menu**\SOURCE CONFIG\SOURCE 2 GPIB CONTROL**

Related Commands: SRC2G0, SRC2G1

SRC2MOD? Output external Source 2 model/version string **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2MOD?`

Data I/O: Outputs string in <Arbitrary ASCII> format (section 10-3).

Related Commands: SRC1MOD?

SRC2NA Select source 2 as not active **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SRC2NA`

Related Commands: SRC2AC, SRC2AC?

SRCH Enter marker search value **MARKERS (Ch 6)**

Syntax: `SRCH Value Unit(s)`
Value: Depends on the graph type.
Units: Depend on graph type

Front Panel Key: Marker Menu**\MARKER READOUT FUNCTIONS\SEARCH**

Related Commands: MKSL, MKSR, SMKR, SRCH?

SRCH? Output marker search value **MARKERS (Ch 6)**

Syntax: `SRCH?`

Data I/O: Outputs the search value in ASCII <NR3> format (section 10-3).

Front Panel Key: Marker Menu**\MARKER READOUT FUNCTIONS\SEARCH**

Related Commands: MKSL, MKSR, SMKR, SRCH

SRT Enter start frequency **MEASUREMENT (Ch 4)**

Syntax: SRT Value Unit(s)

Value: Can be any frequency from low frequency limit of 37XXXD to current sweep stop frequency.

Units: HZ, KHZ, MHZ, GHZ

Remarks: If a calibration is in place, the lower limit is the calibration start frequency.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCY\ SET START** or Setup Menu\ **START\ SET START**

Related Commands: STP, CWF

SRT? Output start frequency **MEASUREMENT (Ch 4)**

Syntax: SRT?

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ START FREQUENCYl**or Setup Menu\ **START (Frequency)**

Related Commands: STP, CWF

ST1 Select set on mode **RECEIVER MODE (Ch 9)**

Syntax: ST1

Remarks: For service use only.

Front Panel Key: Option Menu\ **RECEIVER MODE\ USER DEFINED\ SET ON**

STD Store trace to memory on active channel **DISPLAY (Ch 4)**

Syntax: STD

Remarks: Stores the active channel's trace data in memory.

Front Panel Key: Trace Memory\ **STORE DATA TO MEMORY**

Related Commands: MEM, DNM, DTM, CH1-CH4

STH Enter active segmented limit horizontal start position **LIMITS (Ch 6)**

Syntax: `STH Value Unit(s)`
Value: Frequency, time, or distance
Units: XX1, XX3, XM3

Front Panel Key: Limits\ **SEGMENTED LIMITS\DEFINE UPPER\START POSITION HORIZONTAL**

Related Commands: STV, LS01-LS010, US01-US10

STH? Output active segmented limit horizontal start position **LIMITS (Ch 6)**

Syntax: `STH?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\ **SEGMENTED LIMITS\DEFINE UPPER\START POSITION HORIZONTAL**

STOCO Store the current color configuration as Reset **SYSTEM STATE (Ch 8)**

Syntax: `STOCO`

Front Panel Key: Utility Menu\ **COLOR CONFIGURATION\COLOR SCHEMES\STORE COLOR CONFIG AS RESET (DE-FAULT) COLORS**

Related Commands: BRILL, CLASS, INVER, NEWCO, SHARP, SOFTCO, RSTCOL

STP Enter stop frequency **MEASUREMENT (Ch 4)**

Syntax: `STP Value Unit(s)`
Value: Can be any frequency from current start-sweep frequency to maximum 37XXXD frequency.
Units: HZ, KHZ, MHZ, GHZ

Remarks: Upper frequency limit is reduced to the maximum calibrated frequency if a calibration is in place.

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\SET CENTER/SPAN/SET STOP**

Related Commands: SRT, CWF

STP? Output stop frequency **MEASUREMENT (Ch 4)**

Syntax: `STP?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\STOP FREQUENCYlor Setup Menu\STOP (Frequency)

STV Enter active segmented limit vertical start position **LIMITS (Ch 6)**

Syntax: `STV Value Unit(s)`
Value: Depends on the graph type (see DISPLAY group).
Units: Depends on graph type (see Table 11-2 at the end of this chapter).

Front Panel Key: Limits\SEGMENTED LIMITS\DEFINE UPPER\START POSITION VERTICAL

Related Commands: STH, LS01-LS010, US01-US10

STV? Output active segmented limit vertical start position **LIMITS (Ch 6)**

Syntax: `STV?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Limits\SEGMENTED LIMITS\DEFINE UPPER\START POSITION VERTICAL

SUBMSK Enter instrument Subnet Mask **ADDRESSING (Ch 8)**

Syntax: `SUBMSK Value`
Value: DOT format string i.e “255.255.252.0”

Data I/O: Enter the IP address in <String> data format (section 10-3) .

Front Panel Key: Utility Menu\NETWORK SETUP\SUBNET MASK

Related Commands: ADDIP,DEFGT,SUBMSK?

SUBMSK? Output instrument Subnet Mask **ADDRESSING (Ch 8)**

Syntax: SUBMSK?

Data I/O: Outputs data the using an <Arbitrary ASCII> format (section 10-3).

Front Panel Key: Utility Menu**\NETWORK SETUP\SUBNET MASK**

Related Commands: ADDHW?,ADDIP?,DEFGT?,SUBMSK

SV1 Save front panel setup number 1 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV1

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 1**

Related Commands: RC1-RC10

SV10 Save front panel setup number 10 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV10

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 10**

Related Commands: RC1-RC10

SV2 Save front panel setup number 2 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV2

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 2**

Related Commands: RC1-RC10

SV3 Save front panel setup number 3 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV3

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 3**

Related Commands: RC1-RC10

SV4 Save front panel setup number 4 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV4

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 4**

Related Commands: RC1-RC10

SV5 Save front panel setup number 5 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV5

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 5**

Related Commands: RC1-RC10

SV6 Save front panel setup number 6 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV6

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 6**

Related Commands: RC1-RC10

SV7 Save front panel setup number 7 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV7

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 7**

Related Commands: RC1-RC10

SV8 Save front panel setup number 8 to memory **SAVE/RECALL (Ch 8)**

Syntax: SV8

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 8**

Related Commands: RC1-RC10

SV9 Save front panel setup number 9 to memory **SAVE/RECALL (Ch 8)**

Syntax: `SV9`

Front Panel Key: Save/Recall Menu**\SAVE\FRONT PANEL SETUP IN INTERNAL MEMORY\MEMORY 9**

Related Commands: RC1-RC10

SVB Save current band definitions **MULTIPLE SOURCE CONTROL (Ch 9)**

Syntax: `SVB`

Remarks: See command's functional group.

Related Commands: BD-BD5, CLB

SVBMM Save and activate the new Millimeter Wave band definitions **MILLIMETER WAVE (Ch 9)**

Syntax: `SVBMM`

Remarks: Note that this does not require MSD to actuate the equations.

Related Commands: BSP, BST, ED1, ED2, EDR, EDV, EML, EOS, BDMM, CLBMM

SWAVG Set averaging type to sweep-by-sweep averaging **ENHANCEMENT (Ch 4)**

Syntax: `SWAVG`

Front Panel Key: Avg Smooth Menu**\SWEEP-BY-SWEEP**

Related Commands: SWAVG?, PTAVG

SWAVG? Output averaging type (sweep-by-sweep or point-by-point) **ENHANCEMENT (Ch 4)**

Syntax: `SWAVG?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: "0" for AVG_POINT_BY_POINT, "1" for

AVG_SWEEP_BY_SWEEP, "2" for

AVG_EXPON_BY_SWEEP.

Front Panel Key: Avg Smooth Menu\ **SWEEP-BY-SWEEP**

Related Commands: PTAVG, SWAVG

SWP Return to normal sweep mode **MEASUREMENT (Ch 4)**

Syntax: `SWP`

Remarks: Use this command to return to sweep mode from CW.

Front Panel Key: Setup Menu\ **C.W. MODE ON (OFF)**

Related Commands: CWF

SWP? Output sweep mode **MEASUREMENT (Ch 4)**

Syntax: `SWP?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for CW, ”2” for discrete fill, “3” for normal sweep, and ”4” for harmonic time domain.

Front Panel Key: Setup Menu\ **C.W. MODE (ON/OFF)**

SWPDIR? Output instantaneous sweep direction forward/reverse **MEASUREMENT (Ch 4)**

Syntax: `SWPDIR?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “1” for forward or ”2” for reverse.

Related Commands: HLD, CTN

SWR Select SWR display for active channel **DISPLAY (Ch 4)**

Syntax: `SWR`

Front Panel Key: Graph Type\ **SWR**

Related Commands: DLA, CH1-CH4, IMG, ISC, ISE, ISM, LIN, MAG, MPH, PCP, PCS, PHX?, PHA, PLG, POW, PLR, REL, SMC, SME, SMI

SXX? Output s parameter or user defined parameter of active channel **MEASUREMENT (Ch 4)**

Syntax: `SXX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “11” for S11, ”21” for S21, “22” for S22, and ”12” for S12.

T13 Select overlaid channel 1 and 3 display **CHANNELS (Ch 4)**

Syntax: `T13`

Remarks: Restarts the sweep.

Front Panel Key: Channels Menu**\OVERLAY DUAL CHANNELS 1&3**

Related Commands: WFS, D13

T24 Select overlaid channel 2 and 4 display **CHANNELS (Ch 4)**

Syntax: `T24`

Remarks: Restarts the sweep.

Front Panel Key: Channels Menu**\OVERLAY DUAL CHANNELS 2&4**

Related Commands: WFS, D24

TA2 Enter port 2 test attenuator value **MEASUREMENT (Ch 4)**

Syntax: `TA2 Value Unit(s)`
Value: 0 to 40 in 10 dB steps
Units: DBL, DBM, XX1, XX3, XM3

Remarks: Attenuates the signal coming into port 2 (Option 6).

Front Panel Key: Setup Menu**\TEST SIGNALS\PORT 2 ATTN**

TA2? Output port 2 test attenuator value **MEASUREMENT (Ch 4)**

Syntax: `TA2?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0”, ”10”, “20”, ”30”, “40”.

Front Panel Key: Setup Menu**\TEST SIGNALS\PORT 2 ATTN**

TA2MAX? Output port 2 test attenuator max value **MEASUREMENT (Ch 4)**

Syntax: `TA2MAX?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3).

Related Commands: SA1MAX?, TA2?

TACD Take AutoCal data **AUTOCAL (Ch 5)**

Syntax: `TACD`

Related Commands: BEGAC, BEGCH, BEGTU

TBP Select time bandpass mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TBP`

Remarks: Selects time bandpass mode for the active channel.

Front Panel Key: Domain**TIME BANDPASS MODE**

Related Commands: CH1-CH4

TC1 Take calibration data for port 1 **CALIBRATION (Ch 5)**

Syntax: `TC1`

Related Commands: TC2, NCS, TCD

TC2 Take calibration data for port 2 **CALIBRATION (Ch 5)**

Syntax: `TC2`

Related Commands: TC1, NCS, TCD

TCD Take calibration data on one or both ports as necessary **CALIBRATION (Ch 5)**

Syntax: `TCD`

Related Commands: NC1, NC2, NCS

TCM Select the TRM calibration method **CALIBRATION (Ch 5)**

Syntax: `TCM`

Front Panel Key: Begin Cal**CHANGE CAL METHOD AND LINE TYPE\\TRM**

Related Commands: LCM,OCM,SCM,CMX?

TDC Select time domain harmonic frequency calibration data points **CALIBRATION (Ch 5)**

Syntax: `TDC`

Remarks: Required for low pass time/distance domain measurements. The resulting frequency sweep will consist of harmonic multiples of the start frequency. The Stop frequency is the start frequency times the number of data points selected up to the maximum instrument frequency.

Front Panel Key: Begin Cal**NEXT CAL STEP\\FULL 12-TERM\\INCLUDE ISOLATION\\TIME DOMAIN (HARMONIC)**

Related Commands: NOC, DFC

TDDIST Set time domain parameter to distance for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDDIST`

Front Panel Key: Domain**DISPLAY DISTANCE**

Related Commands: TDDIST?

TDDIST? Output active channel time domain parameter distance or time **TIME DOMAIN (Ch 9)**

Syntax: `TDDIST?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3) as follows: “1” for time or ”2” for distance.

Front Panel Key: Domain**DISPLAY TIME/DISTANCE**

Related Commands: TDDIST, TDTIME

TDPI0 Turn phasor impulse response off for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDPI0`

Front Panel Key: Domain**SET RANGE\\PHASER IMPULSE OFF**

Related Commands: TDPI1

TDPI1 Turn phasor impulse response on for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDPI1`

Front Panel Key: Domain**SET RANGE\\PHASER IMPULSE ON**

Related Commands: TDPI0

TDPIX? Output phasor impulse on/off status for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDPIX?`

Data I/O: Outputs value in ASCII <NR1> format (section 10-3) as follows: “0” for off or ”1” for on.

Front Panel Key: Domain**SET RANGE\\PHASER IMPULSE**

Related Commands: TDPI0, TDPI1

TDTIME Set time domain parameter to time for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDTIME`

Front Panel Key: Domain**DISPLAY TIME**

Related Commands: TDDIST, TDDIST?

TDX? Output domain mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TDX?`

Data I/O: Ouputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for frequency, ”1” for frequency w/Gate, “2” for LP Impulse, ”3” for LP Step, “4” for BP, and ”5” for BP Phasor Impulse.

Front Panel Key: Domain**TIME BANDPASS MODE**

TEB Select external trigger and executes *DDT definition **TRIGGERS (Ch 7)**

Syntax: TEB

Remarks: The instrument otherwise behaves as if in the internal triggering mode.

Related Commands: TIB, TIN, TEX, TXX?

TEX Select external (rear panel) measurement triggering **MEASUREMENT (Ch 4)**

Syntax: TEX

Front Panel Key: Options Menu**TRIGGERS****EXTERNAL**

Related Commands: TIN

TIB Select GPIB measurement triggering **TRIGGERS (Ch 7)**

Syntax: TIB

Remarks: Receipt of a GPIB Group Execute Trigger causes the instrument to go to the next frequency and take a measurement. This is similar to the action taken when the trigger mode is external and an external trigger is received.

Status Reporting: Sets the missed trigger bit (MGT) in the Limits Event Status Register if a Group Execute Trigger is received before completion of the previous trigger action.

Related Commands: TIN, TEB, TEX, TXX?

TIME Enter the system time **SYSTEM STATE (Ch 8)**

Syntax: TIME Value 1, Value 2
Value: Value 1 and Value 2 are in ASCII <NRF> format (paragraph 10-3).

Remarks: Val1 is the hour (1 - 24) and val2 is the minute (0 - 59). Notice the comma separator. This modifies the system time stored on the processor board.

Front Panel Key: Utility Menu**SET DATE/TIME****MINUTE/HOUR**

Related Commands: DATE, DATE?, TIME?

TIME? Output the system time **SYSTEM STATE (Ch 8)**

Syntax: `TIME?`

Data I/O: The date is output as two ASCII <NR1> format (section 10-3) numbers separated by a comma. The first is the hour (1 - 24) and the second is the minute (0 - 59).

Front Panel Key: Utility Menu **\SET DATE/TIME\MINUTE/HOUR (Current)**

Related Commands: DATE, DATE?, TIME

TIN Select internal measurement triggering **MEASUREMENT (Ch 4)**

Syntax: `TIN`

Front Panel Key: Options Menu **\TRIGGERS\INTERNAL**

Related Commands: TEX

TK1 Select tracking mode **RECEIVER MODE (Ch 9)**

Syntax: `TK1`

Remarks: For service use only.

Front Panel Key: Option Menu **\RECEIVER MODE\USER DEFINED\TRACKING**

TLP Select time lowpass mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TLP`

Front Panel Key: Domain **\TIME LOWPASS MODE**

Related Commands: TDC, CH1-CH4

TLZ Enter through line impedance for calibration **CALIBRATION (Ch 5)**

Syntax: `TLZ Value Unit(s)`
Value: 1.0 to 9999.99
Units: XX1, XX3, XM3, OHM

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\THROUGHLINE PARAMETERS\THROUGHLINE IMPEDANCE**

TOL Enter through offset length for calibration **CALIBRATION (Ch 5)**

Syntax: `TOL Value Unit(s)`
Value: -999.9999 to +999.9999
Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\OFFSET LENGTH OF TRM REFLECTION**

TPI Select time phasor impulse mode for active channel **TIME DOMAIN (Ch 9)**

Syntax: `TPI`

Related Commands: CH1-CH4

TPN Enter pen number for trace overlay data **HARD COPY (Ch 8)**

Syntax: `TPN Value Unit(s)`
Value: 1 to 8
Units: XX1

Front Panel Key: Hard Copy Menu\ **PLOT OPTIONS\PEN COLORS\DATA TRACE OVERLAY PEN**

TPN? Output pen number for trace overlay data **HARD COPY (Ch 8)**

Syntax: `TPN?`

Data I/O: Outputs value in ASCII <NR1 > format (section 10-3).

Front Panel Key: Hard Copy Menu\Plot Options\Pen Colors\Overlay Data Pen
Hard Copy Menu**\PLOT OPTIONS\PEN COLORS\OVER-LAY DATA PEN**

Related Commands: TPN, DPN?, GPN?, HPN?, MPN?

TRCCOL Enter the color number for memory data **SYSTEM STATE (Ch 8)**

Syntax: `TRCCOL Value`
Value: 0 - 47

Remarks: Color palette numbers are listed in Table 10-3 at the end of this chapter.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MEMORY DATA**

Related Commands: ANNCOL, DATCOL, GRTCOL, LAYCOL, MKRCOL, MNUCOL, TRCCOL?

TRCCOL? Output the color number for memory data **SYSTEM STATE (Ch 8)**

Syntax: `TRCCOL?`

Data I/O: Outputs the color palette number in ASCII <NR1> format.

Front Panel Key: Utility Menu**\COLOR CONFIGURATION\MEMORY DATA (Color)**

Related Commands: ANNCOL?, DATCOL?, GRTCOL?, LAYCOL?, MKRCOL?, MNUCOL?, TRCCOL

TRS Trigger/restart sweep **MEASUREMENT (Ch 4)**

Syntax: TRS

Remarks: Restarts the sweep (continuous sweep mode) or triggers a single sweep (in hold mode).

Front Panel Key: Setup Menu **\HOLD BUTTON FUNCTION\SINGLE SWEEP AND HOLD (Restart)**

Related Commands: WFS, HLD, CTN

TST Perform self test and output status (same as *TST?) **IEEE 488.2 (Ch 7)**

Syntax: TST

Remarks: Causes the VNA to perform an extensive, fully automated internal circuits self test. Detailed error messages indicating self test failures, if any, are placed in the service log in the order they occur. The query returns a "1" if any part of the self test failed, or a "0" when passed.

NOTE: When commands TST or *TST? are sent to the 37XXXD, the VNA output power is momentarily set to the model-dependent Rated Power level during the self test. Ensure that any equipment connected to Port 1 or Port 2 will not be damaged by this power level.

Data I/O: Returns a value in ASCII format (section 10-3).

Front Panel Key: Option Menu **\DIAGNOSTICS\START SELF TEST**

Related Commands: ONE, OEL, OSL, PSL, *TST?

TXX? Output trigger source internal/external/get/extddt status **MEASUREMENT (Ch 4)**

Syntax: TXX?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: "1" for internal, "2" for external, "3" for GPIB.

Front Panel Key: Options Menu **\TRIGGERS\INTERNAL/EXTERNAL**

Related Commands: TIN, TEX

U10 Select 10 mil UTF calibration kit **CALIBRATION (Ch 5)**

Syntax: `U10`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\10 MIL KIT

Related Commands: U15, U25

U15 Select 15 mil UTF calibration kit **CALIBRATION (Ch 5)**

Syntax: `U15`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\15 MIL KIT

Related Commands: U10, U25

U25 Select 25 mil UTF calibration kit **CALIBRATION (Ch 5)**

Syntax: `U25`

Front Panel Key: Begin Cal\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\25 MIL KIT

Related Commands: U10, U15

UNDOGC Exit gain compression and undo changes **GAIN COMPRESSION (Ch 9)**

Syntax: `UNDOGC`

Remarks: Returns to the normal S-parameter measurement state.

Related Commands: SFGCA, SPGCA

UPL0 Turn upper limit off **LIMITS (Ch 6)**

Syntax: `UPL0`

Front Panel Key: Limits\SINGLE LIMITS\UPPER LIMIT OFF

Related Commands: UPL1, LUP, LON, LOF

UPL1 Turn upper limit on at current value **LIMITS (Ch 6)**

Syntax: `UPL1`

Front Panel Key: Limits**SINGLE LIMITS\\UPPER LIMIT ON**

Related Commands: UPL0, LUP, LON, LOF

UPL20 Turn upper limit off for bottom graph **LIMITS (Ch 6)**

Syntax: `UPL20`

Related Commands: UPL21, LUP2, LON, LOF

UPL21 Turn upper limit on at current value for bottom graph **LIMITS (Ch 6)**

Syntax: `UPL21`

Related Commands: UPL20, LUP2, LON, LOF

UPL2X? Output upper limit on/off status for bottom graph **LIMITS (Ch 6)**

Syntax: `UPL2X?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Related Commands: UPL20, UPL21

UPLX? Output upper limit on/off status **LIMITS (Ch 6)**

Syntax: `UPLX?`

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for OFF or ”1” for ON.

Front Panel Key: Limits**SINGLE LIMITS\\UPPER LIMIT**

US Suffix sets time data type and scales by 1E-6 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `US`

US1 Select upper segmented limit 1 as the active segment **LIMITS (Ch 6)**

Syntax: `US1`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits\ **SEGMENTED LIMITS\ DEFINE UPPER\ SEGMENT 1 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US10 Select upper segmented limit 10 as the active segment **LIMITS (Ch 6)**

Syntax: `US10`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits\ **SEGMENTED LIMITS\ DEFINE UPPER\ SEGMENT 10 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US2 Select upper segmented limit 2 as the active segment **LIMITS (Ch 6)**

Syntax: `US2`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits\ **SEGMENTED LIMITS\ DEFINE UPPER\ SEGMENT 2 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US3 Select upper segmented limit 3 as the active segment **LIMITS (Ch 6)**

Syntax: `US3`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits\ **SEGMENTED LIMITS\ DEFINE UPPER\ SEGMENT 3 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US4 Select upper segmented limit 4 as the active segment **LIMITS (Ch 6)**

Syntax: US4

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 4 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US5 Select upper segmented limit 5 as the active segment **LIMITS (Ch 6)**

Syntax: US5

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 5 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US6 Select upper segmented limit 6 as the active segment **LIMITS (Ch 6)**

Syntax: US6

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 6 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US7 Select upper segmented limit 7 as the active segment **LIMITS (Ch 6)**

Syntax: US7

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 7 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US8 Select upper segmented limit 8 as the active segment **LIMITS (Ch 6)**

Syntax: `US8`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 8 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

US9 Select upper segmented limit 9 as the active segment **LIMITS (Ch 6)**

Syntax: `US9`

Remarks: Makes USx the active segmented upper limit.

Front Panel Key: Limits**\SEGMENTED LIMITS\DEFINE UPPER\SEGMENT 9 ON**

Related Commands: CH1-CH4, LS1-LS10, LSx?

USC Suffix sets time data type and scales by 1E-6 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `USC`

USE Enter effective dielectric for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `USE Value Unit(s)`
Value: 1.0 to 9999.99
Units: XX1, ,X3, M3

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\USER DEFINED\EFFECTIVE DIELECTRIC**

Related Commands: USW, USZ

USL Enter label string for user parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USL Value`

Value: Value 1 is in <String> data format (paragraph 10-3) and is a maximum of five characters that displays on the screen.

Front Panel Key: S Params**\PRESS <1> TO REDEFINE SELECTED PARAMETER\USER LABEL**

Related Commands: USL?

USL? Output label string for user parameter being defined **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USL?`

Data I/O: String is output in <Arbitrary ASCII> format (section 10-3).

Block Size: 5 bytes maximum

Front Panel Key: S Params**\PRESS <1> TO REDEFINE SELECTED PARAMETER\USER LABEL**

Related Commands: USL

USR1 Measure user parameter 1 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR1`

Remarks: USR1 takes the place of S21. Any channel displaying S21 will now display USR1.

Front Panel Key: S Params**\PRESS <1> TO REDEFINE SELECTED PARAMETER\Sxx/USER 1**

Related Commands: USR2, USR3, USR4, S11, S21, S12, S22

USR2 Measure user parameter 2 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR2`

Remarks: USR2 takes the place of S11. Any channel displaying S11 will now display USR2.

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\Sxx/USER 2**

Related Commands: USR1, USR3, USR4, S11, S21, S12, S22

USR3 Measure user parameter 3 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR3`

Remarks: USR3 takes the place of S12. Any channel displaying S12 will now display USR3.

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\Sxx/USER 3**

Related Commands: USR1, USR2, USR4, S11, S21, S12, S22

USR4 Measure user parameter 4 on active channel **USER DEFINED PARAMETERS (Ch 9)**

Syntax: `USR4`

Remarks: USR4 takes the place of S22. Any channel displaying S22 will now display USR4.

Front Panel Key: S Params\ **PRESS <1> TO REDEFINE SELECTED PARAMETER\Sxx/USER 4**

Related Commands: USR1, USR2, USR3, S11, S21, S12, S22

USW Enter microstrip width for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `USW Value Unit(s)`
Value: 0.001 mm to 1.0 m
Units: M, MTR, MM, MMT, CM, CMT

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\USER DEFINED\WIDTH OF STRIP**

Related Commands: USE, USZ

USZ Enter microstrip impedance for microstrip calibration **CALIBRATION (Ch 5)**

Syntax: `USZ Value Unit(s)`
Value: 1.0 to 9999.99
Units: XX1, XX3, XM3, OHM

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\MICROSTRIP PARAMETERS\USER DEFINED\ZC**

Related Commands: USE, USW

V Suffix sets voltage data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `V`

V15 Set Millimeter Wave Band to V Band (WR-15) **MILLIMETER WAVE (Ch 9)**

Syntax: `V15`

VLT Suffix sets voltage data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `VLT`

VSP Enter rear panel stop voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VSP Value Unit(s)`
Value: 00.000 to +10.000 volts
Units: V, VLT

Front Panel Key: Options Menu\REAR PANEL OUTPUT\STOP LOCK

Related Commands: VST

VSP? Output rear panel stop voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VSP?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Options Menu\REAR PANEL OUTPUT\STOP LOCK

VST Enter rear panel start voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VST Value Unit(s)`
Value: 00.000 to +10.000 volts
Units: V, VLT

Front Panel Key: Options Menu\REAR PANEL OUTPUT\START LOCK

Related Commands: VSP

VST? Output rear panel start voltage value **REAR PANEL OUTPUT (Ch 9)**

Syntax: `VST?`

Data I/O: Outputs a value in ASCII <NR3 > format (section 10-3).

Front Panel Key: Options Menu\REAR PANEL OUTPUT\START LOCK

W10 Set Millimeter Wave Band to W Band (WR-10) **MILLIMETER WAVE (Ch 9)**

Syntax: `W10`

W10E Set Millimeter Wave Band to extended W Band (WR-10E) **MILLIMETER WAVE (Ch 9)**

Syntax: `W10E`

WCO Enter waveguide cutoff frequency for user defined kit **CALIBRATION (Ch 5)**

Syntax: `WCO Value Unit(s)`
Value: 0 to the current start frequency.
Units: HZ, KHZ, MHZ, GHZ

WFS Wait full sweep until all display data is valid **MEASUREMENT (Ch 4)**

Syntax: `WFS`

Remarks: This command is useful before autoscaling, normalizing, or finding the minimum/maximum values (with markers). It is required when outputting data from the 37XXXD to ensure that all data points in the sweep are valid. WFS is effective for dual sweeps containing forward and reverse parameters and also for insuring time domain processing is complete.

Status Reporting: Sets bit 4 in the Extended Event Status Register when complete.

Related Commands: TRS, HLD

WIDE Use entire display width for graphs **SYSTEM STATE (Ch 8)**

Syntax: `WIDE`

WKD Select user defined waveguide calibration kit **CALIBRATION (Ch 5)**

Syntax: `WKD`

Related Commands: WKI

WKI Select installed waveguide calibration kit **CALIBRATION (Ch 5)**

Syntax: `WKI`

Front Panel Key: Begin Cal**\NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\WAVEGUIDE PARAMETERS\USE INSTALLED WAVEGUIDE KIT**

Related Commands: WKD

WLS Select low sidelobe window shape **TIME DOMAIN (Ch 9)**

Syntax: `WLS`

Front Panel Key: Domain\ **SET GATE\ SET SHAPE\ LOW SIDELOBE**

Related Commands: WMS, WNM, WRT, CH1-CH4

WMS Select minimum sidelobe window shape **TIME DOMAIN (Ch 9)**

Syntax: `WMS`

Front Panel Key: Domain\ **SET GATE\ SET SHAPE\ MIN SIDELOBE**

Related Commands: WLS, WMS, WRT, CH1-CH4

WNM Select nominal window shape **TIME DOMAIN (Ch 9)**

Syntax: `WNM`

Front Panel Key: Domain\ **SET GATE\ SET SHAPE\ NOMIINAL**

Related Commands: WLS, WMS, WRT, CH1-CH4

WRT Select rectangular window shape **TIME DOMAIN (Ch 9)**

Syntax: `WRT`

Front Panel Key: Domain\ **SET GATE\ SET SHAPE\ RECTANGULAR**

Related Commands: WLS, WMS, WRT, CH1-CH4

WSH1 Enter waveguide short offset 1 for user defined kit **CALIBRATION (Ch 5)**

Syntax: `WSH1 Value Unit(s)`
Value: -999.999 to +999.999
Units: M, CM, MM

Front Panel Key: Begin Cal\ **NEXT CAL STEP\ FULL 12-TERM\ INCLUDE ISOLATION\ NORMAL\ NEXT CAL STEP\ WAVEGUIDE PARAMETERS\ USER DEFINED\ OFFSET LENGTH OF SHORT 1**

WSH2 Enter waveguide short offset 2 for user defined kit **CALIBRATION (Ch 5)**

Syntax: `WSH2 Value Unit(s)`
Value: -999.999 to +999.999
Units: M, CM, MM

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\WAVEGUIDE PARAMETERS\USER DEFINED\OFFSET LENGTH OF SHORT 2**

Related Commands: WSH1

WSH3 Enter waveguide short 3 offset for user defined kit **CALIBRATION (Ch 5)**

Syntax: `WSH3 Value Unit(s)`
Value: -999.999 to +999.999
Units: M, CM, MM

Data I/O: Value is input in ASCII <NRf> format (section 10-3).

Front Panel Key: Begin Cal\ **NEXT CAL STEP\FULL 12-TERM\INCLUDE ISOLATION\NORMAL\NEXT CAL STEP\WAVEGUIDE PARAMETERS\USER DEFINED\OFFSET LENGTH OF SHORT 3**

Related Commands: WSH3?, WGSHOFF3?

WSX? Output window shape **TIME DOMAIN (Ch 9)**

Syntax: `WSX?`

Remarks: Outputs a value in ASCII <NR1> format (paragraph 10-3) as follows: “1” for rectangular, ”2” for nominal, “3” low sidelobe, ”4” for minimum sidelobe.

XM3 Suffix sets unitless data type and scales by 1E-3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: `XM3`

XMKR? Output marker mode **MARKERS (Ch 6)**

Syntax: XMKR?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for Markers on active channel mode, ”1” for Active marker all channels mode, “2” for Filter parameter measurement Mode, ”3” for Marker search marker mode.

Related Commands: AMKR, FMKR, NMKR, SMKR

XSB? Output byte order for output data LSB or MSB **DATA TRANSFER (Ch 7)**

Syntax: XSB?

Data I/O: Outputs a value in ASCII <NR1> format (section 10-3) as follows: “0” for LSB or ”1” for MSB.

Related Commands: LSB, MSB

XX1 Suffix sets unitless data type **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: XX1

XX3 Suffix sets unitless data type and scales by 1E3 **DATA ENTRY SUFFIXES (Ch 4)**

Syntax: XX3

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZSP, ZCT, MRR

ZCT Enter zoom range center value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZCT Value Unit(s)`

Value: -999.999 to +999.999

Units: PSC, NSC, USC, PS, NS, MS, S, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\ CENTER**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZSP, ZST, MRR, ZCT?

ZCT? Output zoom range center value **TIME DOMAIN (Ch 9)**

Syntax: `ZCT?`

Data I/O: Outputs value in ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ CENTER**

Related Commands: ZCT

ZSN Enter zoom range span value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZSN Value Unit(s)`
Value: 0 to 999.999
Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 /SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\ SPAN**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZCT, ZSP, ZST, ZSN?

ZSN? Output zoom range span value **TIME DOMAIN (Ch 9)**

Syntax: `ZSN?`

Data I/O: Outputs value in ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ SPAN**

Related Commands: ZSN

ZSP Enter zoom range stop value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZSP Value Unit(s)`

Value: -999.999 to +999.999

Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain **\SET RANGE\STOP**

Related Commands: DIA, DIT, DIM, DIP, DIE, DIX?, TDDIST?, ZSN, ZCT, ZST, MRR, ZSP?

ZSP? Output zoom range stop value **TIME DOMAIN (Ch 9)**

Syntax: `ZSP?`

Data I/O: Outputs value in ASCII <NR3> format.

Front Panel Key: Domain **\SET RANGE\STOP**

Related Commands: ZSP

ZST Enter zoom range start value time or distance **TIME DOMAIN (Ch 9)**

Syntax: `ZST Value Unit(s)`

Value: -999.999 to +999.999

Units: PSC, NSC, S, US, USC, PS, NS, MS, MMT, CMT, MTR, MM, CM ,M

Remarks: The val1 limits listed above are for time only. To derive distance limits, use the equation:

distance=time limit x 299792458 x10 / SQROOT of dielectric constant

Use the query command DIX? to output the value for dielectric constant. If the time domain parameter is time, val1 is assumed to be a time value. If the time domain parameter is distance, val1 is assumed to be a distance value.

Use the query command TDDIST? to get the time domain parameter.

Front Panel Key: Domain\ **SET RANGE\ START**

ZST? Output zoom range start value **TIME DOMAIN (Ch 9)**

Syntax: `ZST?`

Data I/O: Outputs value in ASCII <NR3> format.

Front Panel Key: Domain\ **SET RANGE\ START**

Related Commands: ZST

Table 10-1. Calibration Coefficient (Error Term) Input/Output Ordering by Calibration Type

Calibration (Related Commands)**	Calibration Coefficient (Error Term)*											
	1	2	3	4	5	6	7	8	9	10	11	12
12-Term (C12, A12)	EDF	ESF	ERF	ETF	ELF	EXF	EDR	ESR	ERR	ETR	ELR	EXR
1 Path 2 Port FWD (C8T, A8T)	EDF	ESF	ERF	ETF	EXF							
1 Path 2 Port REV (C8R, A8R	EDR	ESR	ERR	ETR	EXR							
Reflection Only Port 1 (CRF, ARF)	EDF	ESF	ERF									
Reflection Only Port 2 (CRR, ARR)	EDR	ESR	ERR									
Reflection Only Both Ports (CRB, ARB)	EDF	ESF	ERF	EDR	ESR	ERR						
Transmission Frequency Response FWD (CFT, AFT)	ETF	EXF										
Transmission Frequency Response REV (CRT, ART)	ETR	EXR										
Transmission Frequency Response FWD&REV (CBT, ABT)	ETF	EXF	ETR	EXR								

* See OCx and ICx Series commands.

** The commands listed in parenthesis are used to set and/or simulate calibration process (refer to Chapter 5, Calibration).

Table 10-2. Output Values and Graph Display Types

Graph Display Type (OFF Command)	Units per Division	Reference Value	Related Suffix Units*
Log magnitude	0.001–50	–999.999 to +999.999	DB
Phase	0.01–45	–999.999 to +999.999	
–360 to +360	DEG, RAD		
Log mag & phase	0.001–50,		
0.01–45	–999.999 to +999.999		
–360 to +360	DB,		
DEG, RAD			
Linear magnitude	1E12 to –999.999	–999.999 to +999.999	V, XX1, XX3, XM3
Linear mag & phase	1E12 to –999.999		
0.01–454	–999.999 to +999.999		
–360 to +360	V, XX1, XX3, XM3		
DEG, RAD			
Smith chart	–3, 0, 10, 20, 30	N/A	DB
Inverted Smith	–3, 0, 10, 20, 30	N/A	DB
Group delay	1E15 to 999.999 sec	999.999 sec	SEC, MS, US, NS, PS
Log polar	0.001–50,		
–360 to +360	0.001–50,		
–999.999 to –999.99	DB		
DEG, RAD			
Linear polar	1E–12 to 200,		
–360 to +360	5E–12 to 200,		

Table 10-3 *Color Palette Numbers to be used with Model 37XXXD*

Palette No.	Color	Palette No.	Color	Palette No.	Color
0	Black	16	Goldenrod	32	Cyan
1	Dim Grey	17	Med. Goldenrod	33	Cadet Blue
2	Light Grey	18	Wheat	34	Sky Blue
3	Grey	19	Khaki	35	Steel Blue
4	Salmon	20	Yellow Green	36	Slate Blue
5	Firebrick	21	Green Yellow	37	Blue
6	Brown	22	Pale Green	38	Medium Blue
7	Pink	23	Lime Green	39	Blue Violet
8	Orange red	24	Green	40	Medium Orchid
9	Orange	25	Spring Green	41	Thistle
10	Red	26	Forest Green	42	Plum
11	Coral	27	Sea Green	43	Magenta
12	Gold	28	Aquamarine	44	Purple
13	Sienna	29	Med. Aquamarine	45	Maroon
14	Tan	30	Turquoise	46	Violet red
15	Yellow	31	Dark Turquoise	47	White

Chapter 11
Instrument Data

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Chapter 11
Instrument Data

11-1 INTRODUCTION

This chapter provides general tabular information for the Model 37XXXD VNA. Much of this information is presented in previous chapters, but is repeated here for easy access. The subject of each table in this chapter is listed on the chapter Contents page.

11-2 GPIB RESET CONFIGURATION

The 37XXXD will be set to the default front panel setup conditions listed in Table 11-1 upon receipt of the ***RST** common command. Additionally, GPIB Remote-Only functions are set or cleared as listed in Table 11-2.

Table 11-1. *Default Front Panel Settings (1 of 2)*

Function	Default Setting
Active Menu	Sweep Setup
Measurement	*Maximum Sweep Range:* Model Dependent *Source Power:* Model Dependent *Data Points:* Normal (401 points) *Measurement:* Sweep Mode, restarted *Hold:* Hold/Continue, RF and bias off in hold mode
Channel	Quad (four-channel) display Channel 1 active
Display	*Channel 1:* S11, 1:1 Smith Chart *Channel 2:* S12, Log Magnitude and Phase *Channel 3:* S21, Log Magnitude and Phase *Channel 4:* S22, 1:1 Smith Chart *Scale:* 10 dB/Division or 90°/Division *Offset:* 0.000dB or 0.00 degree *Reference Position:* Midscale *Electrical Delay:* 0.00 seconds *Dielectric:* Air (1.000649) *Normalization:* Off *Normalized Trace Data:* Erased
Enhancement	*Video IF Bandwidth:* Normal *Averaging:* Off, 1 average *Smoothing:* Off, 0%
Calibration	*Correction:* Off and Calibration erased *Trace Mode:* Off *Connector:* Model dependent *Load:* Broadband

Table 11-1. *Default Front Panel Settings (2 of 2)*

Function	Default Setting
Markers/Limits	*Markers On/Off:* All off *Markers Enabled/Disabled:* All enabled Marker Frequency: All set to the start-sweep frequency (or start -time distance Δ *Reference:* Off *Limits:* All set to reference position value
System State and Save/Recall	*Identification and Options Data:* Unchanged *GPIB Addresses:* Unchanged *Frequency Blanking :* Disengaged, *Internal Memory Saved:* Unchanged *Installed Cal Coefficients:* Unchanged
Output	*Output Type:* Printer (full screen, clear headers) *Marker and Sweep Data:* Enabled *Printout:* Every point *Headers:* Cleared and disabled
Diagnostics	*Service Log/Error Messages:* Unchanged *Internal Hardware Calibrations Data:* Unchanged *Troubleshooting:* Recovered from (that is, turned off)
Triggering	*Mode:* Internal *Automatic I.F. Cal:* On

Table 11-2. *GPIB Remote-Only Functions Status*

Memories Saved:	Memories Cleared/Changed:
*Information reported via the *IDN? and *OPT? query commands.* SRQ Standard Event Status Extended Event Status Limits Pass/Fail Status Enable Registers Standard, Extended, And Limits GPIB Input and Output Buffers	Trigger action for *TRG and Group Execute Trigger is set to null. Operation Complete State: Idle Data Transfer Format Defaults: FMA, MSB, DPR0

11-3 CALIBRATION COEFFICIENTS

Table 11-3 lists the calibration coefficients that are generated during the 37XXXD calibration process using the Calibration Coefficients Commands (**OCx - 1Cx**). Refer to Chapter 7, "Calibration Coefficients Data Transfer."

Table 11-3. *Calibration Coefficient (Error Term) Input/Output Ordering by Calibration Type*

Calibration (Related Commands)**	Calibration Coefficient (Error Term)*											
	1	2	3	4	5	6	7	8	9	10	11	12
12-Term (C12, A12)	EDF	ESF	ERF	ETF	ELF	EXF	EDR	ESR	ERR	ETR	ELR	EXR
1 Path 2 Port FWD (C8T, A8T)	EDF	ESF	ERF	ETF	EXF							
1 Path 2 Port REV (C8R, A8R	EDR	ESR	ERR	ETR	EXR							
Reflection Only Port 1 (CRF, ARF)	EDF	ESF	ERF									
Reflection Only Port 2 (CRR, ARR)	EDR	ESR	ERR									
Reflection Only Both Ports (CRB, ARB)	EDF	ESF	ERF	EDR	ESR	ERR						
Transmission Frequency Response FWD (CFT, AFT)	ETF	EXF										
Transmission Frequency Response REV (CRT, ART)	ETR	EXR										
Transmission Frequency Response FWD&REV (CBT, ABT)	ETF	EXF	ETR	EXR								

* See OCx and ICx Series commands.

** The commands listed in parenthesis are used to set and/or simulate calibration process (refer to Chapter 5, Calibration).

11-4 NUMERIC DATA SUFFIX

Table 11-4 lists the numeric data suffix mnemonics for the Model 37XXXD VNA. These mnemonics are used when entering numeric data with GPIB commands (usage of these codes is optional). Refer to Chapter 4, "Data Entry Suffix Codes."

Table 11-4. *Numeric Data Suffix Mnemonics*

Code	Parameter Type	Weighting Factor	Code	Parameter Type	Weighting Factor
DB, DBL, DBM	Power	1.0	NS, NSC	Time	10E-9
DEG	Phase	1.0	PS, PSC	Time	10E-12
RAD	Phase	$180/\pi$	M, MTR	Distance	1.0
HZ	Frequency	1.0	CM, CMT	Distance	10E-2
KHZ	Frequency	10E+3	MM, MMT	Distance	10E-3
MHZ	Frequency	10E+6	OHM	Impedance	1.0
GHZ	Frequency	10E+9	V, VLT	Voltage	1.0
REU	Real	1.0	MV	Voltage	10E-3
IMU	Imaginary	1.0	XM3	Unitless	10E-3
S	Time	1.0	XX1	Unitless	1.0
MS	Time	10E-3	XX3	Unitless	10E+3
US, USC	Time	10E-6			

11-5 OUTPUT VALUES/DISPLAY TYPES

Table 11-5 lists the various characteristics that are related to the different graph types used by the 37XXXD screen displays. This information relates to various input commands described throughout Chapters 4 through 9.

Table 11-5. *Graph Display Type Related Data*

Graph Display Type	Units per Division	Reference Value (OFF Command)	Related Suffix Units*
Log magnitude	0.001–50	–999.999 to +999.999	DB
Phase	0.01–45	–999.999 to +999.999 –360 to +360	DEG, RAD
Log mag & phase	0.001–50, 0.01–45	–999.999 to +999.999 –360 to +360	DB, DEG, RAD
Linear magnitude	$1E^{12}$ to –999.999	–999.999 to +999.999	V, XX1, XX3, XM3
Linear mag & phase	$1E^{12}$ to –999.999 0.01–454	–999.999 to +999.999 –360 to +360	V, XX1, XX3, XM3 DEG, RAD
Smith chart	–3, 0, 10, 20, 30	N/A	DB
Inverted Smith	–3, 0, 10, 20, 30	N/A	DB
Group delay	$1E^{15}$ to 999.999 sec	999.999 sec	SEC, MS, US, NS, PS
Log polar	0.001–50, –360 to +360	0.001–50, –999.999 to –999.99	DB DEG, RAD
Linear polar	$1E^{-12}$ to 200, –360 to +360	$5E^{-12}$ to 200, –360 to +360	V, XX1, XX3, XM3 DEG, RAD
Real	$1E^{-12}$ to +999.999	–999.999 to +999.999	REU
Imaginary	$1E^{-12}$ to +999.999	–999.999 to +999.999	IMU
Real & Imaginary	$1E^{-12}$ to +999.999	–999.999 to +999.999	REU IMU
SWR	$1E^{-12}$ to +999.999	0 to $1E^{6}$	XX1, XX3, XM3

* Suffixes may be used for data input commands, i.e., scale or limit line setting commands.
The RAD suffix equates to $180/\pi$ degrees.

11-6 COLOR PALETTE NUMBERS

Table 11-6 lists the Color Palette numbers (codes) that are used with the GPIB commands that control data graph and menu colors for 37XXXD screen displays. Refer to Chapter 8, System State, Colorization.

Table 11-6 *Color Palette Numbers to be used with Model 37XXXD*

Palette No.	Color	Palette Number	Color	Palette No.	Color
0	Black	16	Goldenrod	32	Cyan
1	Dim Grey	17	Med. Goldenrod	33	Cadet Blue
2	Light Grey	18	Wheat	34	Sky Blue
3	Grey	19	Khaki	35	Steel Blue
4	Salmon	20	Yellow Green	36	Slate Blue
5	Firebrick	21	Green Yellow	37	Blue
6	Brown	22	Pale Green	38	Medium Blue
7	Pink	23	Lime Green	39	Blue Violet
8	Orange red	24	Green	40	Medium Orchid
9	Orange	25	Spring Green	41	Thistle
10	Red	26	Forest Green	42	Plum
11	Coral	27	Sea Green	43	Magenta
12	Gold	28	Aquamarine	44	Purple
13	Sienna	29	Med. Aquamarine	45	Maroon
14	Tan	30	Turquoise	46	Violet red
15	Yellow	31	Dark Turquoise	47	White

11-7 CALCULATING THE BYTE SIZE

This section describes the factors for calculating the byte size of responses to selected remote-only queries. The byte size of the resultant data from several of the remote only queries depends on several factors:

- Parameters per Output
- Numbers Output per Data Point
- Bytes Output per Number
- Size of Block Data
- Number of Bytes Output

Parameters per Output

The set of single parameter output commands is listed in Table 11-7.

Table 11-7. *Single Parameter Output Commands*

Command	Description
OCD	Output corrected data for active channel S-parameter
OFD	Output formatted (final) data for active channel display
OFD1	Output formatted (final) data for channel 1 display
OFD2	Output formatted (final) data for channel 2 display
OFD3	Output formatted (final) data for channel 3 display
OFD4	Output formatted (final) data for channel 4 display
ORD	Output raw data for active channed S-parameter
OS11C	Output S11 corrected data
OS11R	Output S11 raw data
OS12C	Output S12 corrected data
OS12R	Output S12 raw data
OS21C	Output S21 corrected data
OS21R	Output S21 raw data
OS22C	Output S22 corrected data
OS22R	Output S22 raw data

The set of four parameter output commands is listed in Table 11-8.

Table 11-8. *Four Parameter Output Commands*

Command	Description
O4FD	Output formatted (final) data for all four channel displays
O4SC	Output corrected data for all four S-parameters
O4SR	Output raw data for all four S-parameters

Numbers Output per Data Point (NODP)

The data for each data point is a complex number (A + jB) where A and B are floating point numbers. This data is saved internally in a RAW measurement buffer for use and possible future output. Additionally, if an RF correction is active, the RF correction is applied to the RAW measurement and the result is saved internally in the CORRECTED measurement buffer for use and possible future output.

Either the contents of the RAW or CORRECTED measurement buffer are taken and converted into the data format for the display type selected. This data is saved internally in the FORMATTED (final) measurenet buffer for use and possible future output. When this conversion takes place, the data will, in most cases, still be two orthogonal numbers.

However, several of the displays types throw away a portion of the data and the result will be one number only. The display types that produce only one number are:

- GROUP DELAY
- IMAGINARY
- LINEAR MAGNITUDE
- LOG MAGNITUDE
- PHASE
- POWER OUT
- REAL
- SWR

To summarize, the RAW, CORRECTED, and FORMATTED data output will be two numbers per point unless the display type is one of those mentioned above.

NOTE

The **DPR1** code will force ALL output to two numbers per point (see the discussion for the data pair mode).

To avoid confusion with separating the data in the **O4FD** output, the numbers output per data point will always be two.

Bytes Output per Number (BOPN)

The number of bytes output per number is shown below in Table 11-9.

Table 11-9. *Bytes Output per Number*

Number Output Format	Output per Number
FMA (ASCII)	19
FMB (double precision binary)	8
FMC (single precision binary)	4

Size of Data Block (SODB)

In the case where there is only one parameter to output, the formula is:

SODB = **NODP** * **BOPN** * Number of points in the sweep

If the command is **O4SC**, **O4FD**, or **O4SR**, the formula is:

SODB = 8 * **BOPN** * Number of points in the sweep

Number of Bytes Output (NBO)

The number of bytes output is the number of bytes transmitted over the GPIB. In most cases, the data block is preceeded by an arbitrary block header followed by an end character (line feed), as shown below:

Response Message = [Arbitrary Block Header] + [Data Block] + [End Character]

The size of the end character is one byte. The size of the arbitrary block header isvariable between 2 and 11. If we always assume an arbitrary block header size of 11, then:

NBO = 12 + **SODB**

For example:

- The VNA is set up for a four-channel display with a 1601 point display
- Channel 1 is displaying S11 in LogMag and Phase format
- Channel 2 is displaying S12 in LogMag format
- Channel 3 is displaying S21 in Phase format
- Channel 4 is displaying S22 in Smith Chart format

- The output formatting commands **CH2**, **FMC**, and **LSB** are received

The number of output bytes for the **O4FD** query command is:

NBO = 12 + 8 * 4 * 1601 = 51244 bytes

The number of output bytes for the **ORD** query command is:

NBO = 12 + 2 * 4 * 1601 = 12820 bytes

The number of output bytes for the **OFD3** query command is:

NBO = 12 + 1 * 4 * 1601 = 6416 bytes

The number of output bytes for the **FMA** or **O4SR** query command is:

NBO = 12 + 8 * 19 * 1601 = 243364 bytes

Chapter 12
Error Messages

Table of Contents

Chapter 12
Error Messages

12-1 INTRODUCTION

This chapter provides a listing of error messages that appear on the 37XXX display or that are written to the internal software Service Log.

12-2 OPERATIONAL ERROR MESSAGES

Table 12-1 provides a listing and description of the operational error messages. For the most part, these errors are displayed only on the 37XXX display and are caused by incorrectly operating the 37XXX.

12-3 DISK RELATED ERROR MESSAGES

Table 12-2 provides a listing and description of the disk-related-error messages. The numbered errors in this group are also written to the Service Log, since they may indicate system problems.

12-4 GPIB RELATED ERROR MESSAGES

Table 12-3 provides a listing and description of GPIB-related error messages. These errors are entered in the Service Log and output as part of the response of OGE/OGL commands.

12-5 SERVICE LOG ERROR MESSAGES

Table 12-4 provides a listing of the error messages that are written to the internal system service log. These messages are mostly hardware related. Because they may warn of system problems, you should refer to the 37XXX Maintenance Manual for further action by a qualified service engineer. Some of these messages may occur as a result of incorrectly programming the 37XXX. This includes the GPIB errors, 7204–7207, and errors in the 5000 range, RF Power. The RF Power errors may be triggered when setting the 37XXX power to a value greater than its reset level. This feature of the 37XXX lets you take advantage of all available power; however, accuracy cannot be guaranteed when power is unleveled.

Table 12-1. *Operational Error Messages (1 of 2)*

Error Message	Description	Corrective Action
ATTENUATOR UNAVAILABLE	Option 6 Port 2 Test Step Attenuator is not installed.	Install Option 6 Step Attenuator,
DIFFERENT H/W SETUP. RECALL ABORTED	Model and/or options is (are) different from the recalled setup.	Reconfigure system to duplicate the hardware setup that was used to store the saved data.
DIFFERENT S/W VERSION, RECALL ABORTED	Saved state not compatible with software version or options.	Load compatible software (S/W) version and retry.
FREQUENCIES HAVE REACHED UPPER LIMIT	Frequencies being defined in Multiple Source mode have reached upper limits of Sources.	Redefine frequencies to not exceed limits of Sources.
MEMORY LOCATION CORRUPTED	Requested memory location is corrupted.	None. If problem reoccurs after storing a new setup, contact WILTRON Customer Service.
NO BANDS ARE STORED	No frequency bands have been defined and stored.	Define and store frequency bands to turn on Multiple Source mode.
NO STORED MEMORY DATA	No data is stored in memory for display or trace math.	Store or re-save measurement data.
OPTION NOT INSTALLED	Selected an option that is not installed.	None.
OUT OF CAL RANGE	Entered values out of the selected calibration range.	Change calibration range or re-enter values that are within the current range.
OUT OF H/W RANGE	Entered value is out of the instrument's hardware range.	Re-enter values that are within range.
OUT OF RANGE	Entered value is out of range.	Re-enter values that are within range.
RECEIVER OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places receiver frequency out of range when attempting to store band.	Redefine frequency.
SOURCE 1 OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places Source 1 frequency out of range when attempting to store band.	Redefine frequency.
SOURCE 2 OUT OF RANGE BY EQUATION	Equation defined in Multiple Source mode places Source 2 frequency out of range when attempting to store band.	Redefine frequency.

Table 12-1. Operational Error Messages (2 of 2)

Error Message	Description	Corrective Action
STANDARD CAL NOT VALID FOR WAVEGUIDE	Cannot use the standard method when calibrating with waveguide.	Use the Offset Short method with waveguide.
START F FOLLOWS PREVIOUS STOP F	Start frequency of current band immediately follows stop frequency of previous band. Cannot be modified.	None.
START MUST BE LESS THAN STOP	Entered start frequency is greater than the stop frequency.	Re-enter frequency values such that the start frequency is lower than the stop frequency.
STEP IS TOO LARGE	Entered harmonic frequency extends the stop out of range.	Re-enter so that harmonic frequency is within range.
STOP IS OVER RANGE	Entered value exceeds the instrument's stop frequency.	Re-enter stop frequency.
SYSTEM NOT CALIBRATED	37XXX is uncalibrated for the selected measurement values.	Perform a measurement calibration.
TOO FEW POINTS, 2 MINIMUM	Entered too few discrete fill points, 2 is minimum.	Re-enter data points.
TOO MANY POINTS, 1601 MAXIMUM	Entered too many discrete fill points, 1601 points are the maximum allowed.	Re-enter data points.
UNDEFINED DIVIDE BY ZERO	Denominator cannot be zero in equation.	Make denominator a value other than zero.
WINDOW TOO SMALL	Attempted to set time domain range smaller than allowed	Re-enter larger time range.
OUT OF WINDOW RANGE	Attempted to set time domain range larger than allowed	Re-enter values within allowed range.

Table 12-2. *Disk-Related-Error Messages (1 of 1)*

Error Message	Description	Corrective Action
7140 GENERAL FLOPPY DRIVE FAIL	Invalid disk media or format.	Use 1.44 MB diskette and/or format in the 37XXX.
7142 FLOPPY DISK READ ERROR	Read error when accessing disk file.	Use 1.44 MB diskette and/or format in the 37XXX.
7143: FLOPPY DISK WRITE ERROR	Error in writing to disk file.	Use 1.44 MB diskette and/or format in the 37XXX.
7147 FLOPPY DISK UNAVAILABLE	Floppy disk is not available.	Install floppy diskette and/or check floppy disk drive.
7170: GENERAL HARD DISK FAIL	General error in accessing hard disk.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7172: HARD DISK READ ERROR	Read error when accessing disk file.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7173: HARD DISK WRITE ERROR	Error in writing to disk file.	Retry and if still fails, reformat the hard disk drive and/or check floppy disk drive.
7177: HARD DISK UNAVAILABLE	Hard disk is not available.	Install hard disk drive and/or check operation of hard disk.
8140: GENERAL DISK BUFFER ERROR	Out of RAM.	Press the System State, Default Program key, and retry. This will reset the 37XXX to the factory default state.
FILE NOT FOUND	Disk file not found.	None.
FLOPPY DISK HAS NO ROOM FOR FILE	Floppy diskette is full.	Delete files or install new diskette.
FLOPPY DISK NOT READY	Floppy disk is not ready (or not installed.).	Install diskette in floppy drive.
FLOPPY DISK WRITE PROTECTED	Write protect tab in place on floppy diskette.	Remove write-protect tab.
HARD DISK HAS NO ROOM FOR FILE, DELETE EXISTING FILES(S) TO CREATE SPACE	Hard disk is full.	Delete unneeded files.

Table 12-3. GPIB-Related Error Messages (1 of 8)

Error Message	Description
These errors are entered in the Service Log and output as part of the response of OGE/OGL commands for GPIB commands. The list is subdivided into the type of GPIB error: 7204..., 7205..., 7206..., and 7207.	
7204 GPIB COMMAND ERROR DESCRIPTIONS	
Faulty program mnemonic syntax	Generated when the program mnemonic found was not one of the currently defined program mnemonics for the 37XXX.
Faulty suffix mnemonic syntax	Generated when the suffix mnemonic found was not one of the currently defined suffix mnemonics for the 37XXX.
Faulty mnemonic syntax	Generated when the mnemonic found was not one of the currently defined program or suffix mnemonics for the 37XXX.
Missing Program Message Separator	Generated when the required semicolon preceding the next program mnemonic was not found.
Expected NRf data	Generated when a mnemonic is used that requires a trailing NRf numeric data element. The data element was either missing or the first character of the data element was not one of the acceptable NRf characters.
NRf mantissa too long	The maximum allowable number of characters in the NRf numeric element mantissa is 255.
Exponent magnitude too large	The maximum allowable exponent magnitude in an NRf element is +/— 32000.
Faulty NRf syntax	Can be any number of syntactical errors such as more than one decimal point, inclusion of a decimal point in the exponent field, an invalid character imbedded in the numeric or no exponent value following the 'E'.
Expected String Program Data	Generated when a mnemonic is used that requires a trailing string data element. The date element was either missing or no open quote character was found.
Missing close quote character	Generated when a mnemonic is used that requires a trailing string data element. The open quote character was found, but the close quote character was not.
Expected Arbitrary Block data	Generated when a mnemonic is used that requires a trailing arbitrary block data element and the trailing element was not an arbitrary block data element. Or in some cases, the arbitrary block was empty.
Faulty Arbitrary Block	Generated when a defined length arbitrary block data element is terminated early with an EOI or an indefinite length arbitrary block data element is not properly terminated.
Missing Program Data Separator	Two data elements of a program mnemonic that requires multiple program data elements, are not properly separated from each other by a comma.
GET received during PM reception	Generated when the GPIB Command 'Group Execute Trigger' is received during the reception of a program message but before its proper termination with the end message. The partial program message up to but not including the 'Group Execute Trigger' will be executed. Execution of the Group Execute Trigger and any subsequent program message elements received before the end message will be skipped.

Table 12-3. *GPIB-Related Error Messages (2 of 8)*

Error Message	Description
7205 GPIB EXECUTION ERROR DESCRIPTIONS	
Not permitted in a DDT command sequence	When executing a defined device trigger command sequence, a forbidden command was detected.
Too much Arbitrary Block data	The arbitrary block supplied contained more data than was necessary for the currently defined 37XXX state. This can occur when graph types, start/stop frequencies or data points are changed.
Insufficient Arbitrary Block data	The arbitrary block supplied did not have enough data for the currently defined 37XXX state. This can occur when graph types, start/stop frequencies or data points are changed.
Invalid parameter for current graph type	An attempt was made to program a non-existent parameter for the current graph type. For instance, a Smith chart does not have a reference or reference line position (mnemonics OFF and REF).
Parameter out of range	An attempt was made to program an out of integer range value for a parameter. This error is detected by the GPIB MANAGER when converting and rounding to the appropriate integral size (signed/unsigned char/short or long).
Parameter value not permitted	A parameter value was not found in the list of permissible values for that parameter.
CW marker sweep not permitted in time domain	The mnemonics M1C, M2C, M3C, M4C, M5C and M6C are forbidden in time domain.
Parameter unavailable in frequency domain	The mnemonic ODV and OTV are forbidden in frequency domain.
Port 2 Test Attenuator (OPT 6) not installed	The mnemonic TA2 is forbidden when the attenuator is not installed.
Time Domain (OPT 2) not installed	An attempt was made to use one of the time domain mnemonics when the option is not installed.
Return to Local not permitted in Local Lockout	The mnemonic RTL failed due to being in the Local Lockout mode.
Calibration does not exist	An attempt was made to turn on flat power correction or vector error correction when the corresponding calibration does not exist.
Cal term not available	An attempt was made to get a calibration term which does not exist for the current calibration type.
Invalid cal term for calibration type	An attempt was made to program a calibration term which does not exist for the current calibration type.
Front panel setup not valid	An attempt was made to get a front panel setup that did not contain a correct/valid state.

Table 12-3. GPIB-Related Error Messages (3 of 8)

Error Message	Description
Normalization data not valid	An attempt was made to reference normalization data when there was no normalization data currently stored.
Command sequence too long	An attempt was made to define a device trigger command sequence which had more than 255 characters.
Unable to display menu	An attempt was made to display a menu which could not be displayed for the current 37XXX state.
String too long	An attempt was made to enter a string for the following mnemonics which exceeded the specified maximum length. LID, LMS and LNM - maximum length is 15 characters. LOC - maximum length is 79 characters.
Must specify a calibration type first	In order to perform a calibration, the calibration type must be specified by the use of one of the Cxx mnemonics (i.e. C12, C8T, etc.) PRIOR to the issuance of the mnemonics CWC, TDC or BEG.
Parameter value unchanged	An attempt was made to change a start/stop frequency or number of data points to a value outside of the current calibrated range with correction turned on.
Parameter change not permitted	An attempt was made to perform an illegal state change or action based on the current 37XXX state. This includes attempting to store an undefined band definition. Or certain changes from the calibration state or the calibration define state when defining discrete frequencies.
Parameter value out of range Parameter out of hardware range	An attempt was made to set a parameter to a value outside of the permissible range of values for the parameter.
Standard cal method not valid for waveguide	In a waveguide type of calibration, the standard (OSL) cal method is forbidden.
Out of calibrated range	An attempt was made to change a parameter not permitted to be changed with correction on.
Start must be must be less than stop	An attempt was made to set a new start frequency, distance or time greater than or equal to the current stop frequency, distance or time. Or to set a new stop frequency, distance or time less than or equal to the current start frequency, distance or time.
Tune mode requires a 12 term calibration	Perform a 12 term calibration prior to turning on tune mode.
Current and cal frequencies different	The flat power calibration setup does not match the current setup.
Stored data is invalid	An attempt was made to reference normalized data when normalized data was invalid.

Table 12-3. GPIB-Related Error Messages (4 of 8)

Error Message	Description
Parameter change not permitted on current state	An attempt was made to change a parameter while IF cal was active. It is not expected that this message will ever be seen. If you see this message, notify the factory.
Calibration may not be valid	An attempt was made to repeat the previous calibration when there was no record of a previous calibration.
Calibration does not exist	An attempt was made to turn on flat power correction or vector error correction when the corresponding calibration does not exist.
Current calibration is erased	When turning on Multiple Source Mode with vector error correction on, the calibration is destroyed. Not really an error. Message is issued as a warning.
Time Domain and CW mode not permitted	An attempt was made to turn on a time domain mode in CW. This is not permitted.
Not permitted in Time Domain	An attempt was made to select a group delay display or CW mode when in time domain mode or to select a dual overlay display with a frequency/time domain mismatch.
Time Domain not allowed	An attempt was made to turn on a time domain mode but the current 37XXX state does not permit it.
Permitted only in diagnostic mode	Must put the 37XXX into the diagnostics mode via the SDG command before using this mnemonic.
Graph types not appropriate for dual overlay	While in dual overlay mode, and attempt was made to change one of the active graph types to a type which conflicts with dual overlay, or to change one of the active channels into or out of time domain which sets up a dual overlay conflict. Or an attempt was made to select dual overlay mode when there would be a graph type conflict for a frequency/time domain conflict.
New Discrete Fill not allowed in current state	Cannot set up a new discrete fill definition while performing a calibration or when correction is turned on. Also cannot do this when group delay is the graph type on the active channel.
Low Pass mode requires a harmonic sweep	Perform a TD harmonic sweep calibration prior to using this mnemonic.
Receiver out of range by equation	Problems with the internal source, external source or receiver equations in multiple source mode.
New start less than previous stop	An attempt was made to set the start frequency for the new multiple source mode band definition to a frequency less than the stop frequency of the previous band.
Bad filename	The supplied filename was bad. The filename can have 8 characters maximum. No extensions. The filename must start with and alpha type character (A thru Z). After that the allowable characters are alpha, numeric (0 thru 9) and underscore (_).
Conflict with rotary knob	You should not be using the rotary knob and the GPIB at the same time.

Table 12-3. GPIB-Related Error Messages (5 of 8)

Error Message	Description
Too many data points for external source	A 6700B series external source can handle 501 data points. A 68000 series external source can handle 999 data points.
Recalled setup corrupted Hardware mismatch in recalled setup Software mismatch in recalled setup	These are problems with the recalled setup.
Too many data points for Discrete Fill	The maximum number of data points in discrete fill is 1601.
Not enough data points for Discrete Fill	The minimum number or data points in discrete fill is 2.
Discrete Fill end frequency out of range	The number of points for discrete fill puts the end frequency out of range.
Step is too large	When setting up a time domain harmonic sweep, cannot get 2 data points because the start frequency is too high for the approximate stop frequency. In a group delay display, the delay aperture percent of sweep is less than one step size.
Range too small	An attempt was made to set a distance or time span value too small. This can also be done via inappropriate values for start and stop.
Start or stop out of range	An attempt was made to set a distance or time start or stop value out of range. This can also be done via inappropriate values for center and span.
No bands defined	An attempt was made to turn on multiple source mode with no band definitions.
Out of frequencies for new band definition Source out of range by equation External source out of range by equation	The current set of multiple source mode bands use up all the frequency range of the 37XXX. Therefore, no more bands can be defined.
File is read only	An attempt was made to write to a write protected file.
File not found	An attempt was made to access a non-existent file.
Floppy drive not ready	An attempt was made to access the floppy drive with no floppy disk installed.
Floppy disk full Hard disk full	An attempt was made to write to a floppy disk or the hard disk when no space was left on the disk.
Floppy disk write protected	An attempt was made to write to a write protected floppy disk.
Recalled setup or data file corrupt	An attempt to recall a setup from internal memory, the GPIB or disk failed due to software revision or hardware mismatch or checksum error.

Table 12-3. *GPIB-Related Error Messages (6 of 8)*

Error Message	Description
New frequency list not allowed in current state	Cannot set up a new discrete fill definition while performing a calibration or when correction is turned on. Also, cannot do this when group delay is the graph type on the active channel.
State change not permitted	An attempt was made to perform an illegal state change or action based on the current instrument state. This includes attempting to store (1) an undefined band definition, (2) certain changes from the calibration state, or (3) the cal define state when defining discrete frequencies.
Faulty label or file name	The label or file name associated with the current mnemonic is faulty.
Illegal characters in filename	The first character in a filename must be an alpha type. The remaining characters can be alpha, numeric, or underscores. An extension is not permitted.
Filename too long	The maximum ledngth for filenames is 8 characters. An extension is not permitted.
Floppy disk read error Floppy disk write error Hard disk read error Hard disk write error	Read or write error(s) occurred while attempting to access the indicated disk.
Floppy disk not found Hard disk not found General disk buffer error General floppy drive failure Floppy disk init failure General hard disk failure Hard disk control failure Hard disk init failure Unknown disk error	Other error messages which suggest that the indicated drive is in need of service.
7205 GPIB QUERY ERROR DESCRIPTIONS	
No Response data available	Generated if the controller attempts to read response data from the 37XXX and none is available.
No Response data after PM completion	This is the same as the 'no response data available' case above except that a program message was currently being parsed and executed when the controller attempted to read data. Detection of this error was deferred until the parser/execution block was finished with the current program message and it was observed that no response data was generated.
Response after Indefinite Response discarded	This error is generated when the 37XXX's output queue has already received an Arbitrary ASCII response data element and an attempt is made to place another response data element of any kind into the queue. The new response data element is discarded.
Interrupted - Response data discarded	This error is detected when the output queue contains unread response data and the controller sends a new program message. The response data is discarded.

Table 12-3. GPIB-Related Error Messages (7 of 8)

Error Message	Description
Unterminated - Partial PM will be executed	This error is detected when the 37XXX's input queue is currently receiving a program message but has not yet received the end message, and the controller attempts to read response data from the 37XXX. The partial program message in the input queue is executed as if it were properly terminated.
Deadlock - Response data discarded	This error is detected when both of the 37XXX's input and output queues are full and the controller attempts to send another data byte. In order to prevent bus deadlock, the contents of the output queue are discarded.
7205 GPIB DEVICE DEPENDENT ERROR DESCRIPTIONS	
Q_SEND failure in [a procedure name]	An unsuccessful attempt was made to send a message to a task. The procedure name is the place in the software where the error was detected.
Q_RECEIVE failure in [a procedure name]	A failure was detected while waiting for the reception of a message from a task. The procedure name is the place in the software where the error was detected.
Unable to allocate memory in [a procedure name]	An attempt was made to allocate some temporary memory in order to accomplish a task directed in the program message. The procedure name is the place in the software where the error was detected.
Unable to release memory in [a procedure name]	An attempt was made to return some temporary memory within a task and the return failed for some reason. The procedure name is the place in the software where the error was detected.
Unable to get service/error log	An unsuccessful attempt was made to get a copy of the service or error log.
Unable to get calibration term	An unsuccessful attempt was made to get a calibration term.
Unable to get raw or corrected data	An unsuccessful attempt was made to get raw or corrected data.
Unable to get final data	An unsuccessful attempt was made to get final data.
Unable to get setup or data	An unsuccessful attempt was made to get the frequency list from the database.
Unable to get setup	An unsuccessful attempt was made to get a front panel setup.
Unable to store setup	An unsuccessful attempt was made to save a front panel setup.

Table 12-3. *GPIB-Related Error Messages (8 of 8)*

Error Message	Description
Unable to get frequency list	An unsuccessful attempt was made to get setup, trace, or tabular datat from the database.
Unable to store label	An unsuccessful attempt was made to store a label in the database.
Calibration step failure	An error occurred while waiting for completion of a data collection sequence in calibration.

Table 12-4. Service Log Error Messages (1 of 3)

Error Message	Error Message
0000 – 0099 Status Messages or Pass/Fail Result of a Peripheral or Self Test	0413 REF IF LEV STATUS FAIL
0000 INFORMATIONAL MESSAGE	0414 REF PHS CONTROL FAIL
0000 SELF TEST INFO MESSAGE	0500 A TO D CONVERSION FAIL
0094 PRNT INTERFACE TEST PASSED	0511 A TO D COMM FAIL
0095 PRNT INTERFACE TEST FAILED	0512 A TO D 8 BIT D TO A FAIL
0096 GPIB INTERFACE TEST PASSED	0513 A TO D 12 BIT A TO D FAIL
0097 GPIB INTERFACE TEST FAILED	0514 A TO D STEERING DAC FAIL
0098 SELF TEST PASSED	0515 A TO D CONV ACCURACY FAIL
0099 SELF TEST FAILED	0516 A TO D SAMPL HOLD FAIL
0100 – 3999 Primarily Indicate a Self Test Failure	0517 IF SYNC FAIL
0111 LO1 COMM FAIL	0518 PWR SUPPLY SYNC FAIL
0112 LO1 PRE TUNE DAC FAIL	0519 A TO D EXT ANAL OUTP FAIL
0113 LO1 PHS LCK IND FAIL	0520 PWR SUPPLY +5V FAIL
0114 PHS LCK ERR VOL OUT OF TOL	0521 PWR SUPPLY +9V FAIL
0115 LO1 LCK TIME FAIL	0522 PWR SUPPLY +12V FAIL
0211 LO2 COMM FAIL	0524 PWR SUPPLY +18V FAIL
0212 LO2 MAIN PREST DAC FAIL	0525 PWR SUPPLY -18V FAIL
0213 LO2 OFFS PREST DAC FAIL	0526 PWR SUPPLY +27V FAIL
0214 MAIN PHS LCK ERR VOL FAIL	0527 PWR SUPPLY -27V FAIL
0215 OFFST PHS LCK ERR VOL FAIL	0611 TB IF COMM FAIL
0216 DDS PHS LCK ERR VOL FAIL	0612 TB IF 10V REF FAIL
0217 MAIN PHS LCK IND FAIL	0613 TB IF LEVEL STATUS FAIL
0218 OFFST PHS LCK IND FAIL	0614 TB PHS CONTROL FAIL
0219 DDS PHS LCK IND FAIL	0711 LO3 COMM FAIL
0220 LO2 LCK TIME FAIL	0712 LO3 REF OSC FAIL
0221 LO2 SRC TRACKING FAIL	0713 LO3 48.4 LCK IND FAIL
0311 TA IF COMM FAIL	0714 LO3 48.4 LCK ERR VOL FAIL
0312 TA IF 10V REF FAIL	0715 LO3 CAL REF PHS FAIL
0313 TA IF LEVEL STATUS FAIL	0811 SL SIG SEP COMM FAIL
0314 TA PHS CONTROL FAIL	0812 DAC ADJUSTMENT FAIL
0411 REF IF COMM FAIL	0813 TRANSFER SWITCH CNTRL FAIL
0412 REF IF 10V REF FAIL	0814 SRC LCK POL CONTROL FAIL

Table 12-4. *Service Log Error Messages (2 of 3)*

Error Message	Error Message
0815 DIRECT MODE ATTEN FAIL	2122 SRC F TUNE PATH BND8 FAIL
0911 A9 VME BUS INTERFACE FAIL	2123 SRC F TUNE PATH BND9 FAIL
0912 BBRAM CHECK FAIL	2124 SRC F TUNE PATH BND10 FAIL
0913 SRAM CHECK FAIL	2125 SRC PWR LEVEL DAC FAIL
0914 SCSI DEVICE FAIL	2126 SRC DETECTOR ZERO CAL FAIL
0915 MCCHIP FAIL	2127 SRC ALC CAL BND1 FAIL
0915 MCCHIP TIMER 1 FAIL	2128 SRC ALC CAL BND2 FAIL
0916 MCCHIP TIMER 2 FAIL	2129 SRC ALC CAL BND3 FAIL
0917 MCCHIP TIMER 3 FAIL	2130 SRC ALC CAL BND4 FAIL
0918 MCCHIP TIMER 4 FAIL	2131 SRC ALC CAL BND5 FAIL
0919 CLOCK NOT RUNNING	2132 SRC ALC CAL BND6 FAIL
1311 A13 VME BUS INTERFACE FAIL	2133 SRC ALC CAL BND7 FAIL
1312 EXT KEYBD CNTRL FAIL	2134 SRC ALC CAL BND8 FAIL
1313 FLOPPY DISK CNTRL FAIL	2135 SRC ALC CAL BND9 FAIL
1411 A14 VME BUS INTERFACE FAIL	2136 SRC ALC CAL BND10 FAIL
1511 A15 VME BUS INTERFACE FAIL	2137 SRC A1 FM PATH TUNE FAIL
1512 VRAM CHECK FAIL	2138 SRC A2 FM PATH TUNE FAIL
1611 HARD DISK CONTROL FAIL	4100 LO1 CAL FAIL
1811 AUXILLARY IO FAIL	4200 LO2 CAL FAIL
1912 FRONT PANEL CNTRL FAIL	4301 SRC FREQ CAL MEAS UNSTABLE
1913 ROTARY KNOB FAIL	4302 SRC FREQ FM MAIN CAL FAIL
2111 SRC COMM FAIL	4303 SRC FREQ FM SENS CAL FAIL
2112 SRC FTUNE DAC FAIL	4304 SRC FREQ CAL VERIFY FAIL
2113 SRC STATE MACHINE DAC FAIL	4401 SRC ALC LOG AMP CAL FAIL
2114 SRC FM CAL FAIL	4402 SRC ALC CAL VERIFY FAIL
2115 SRC F TUNE PATH BND1 FAIL	4500 IF CAL FAIL
2116 SRC F TUNE PATH BND2 FAIL	4600 GAIN RANGING ERROR
2117 SRC F TUNE PATH BND3 FAIL	4700 STATE MACHINE FAIL
2118 SRC F TUNE PATH BND4 FAIL	***5000 – 5999 Indicate Run-Time RF Power Problems***
2119 SRC F TUNE PATH BND5 FAIL	5110 RF PWR UNLEVELED
2120 SRC F TUNE PATH BND6 FAIL	5210 REF A CHAN RF OVERLOAD
2121 SRC F TUNE PATH BND7 FAIL	5220 REF B CHAN RF OVERLOAD

Table 12-4. *Service Log Error Messages (3 of 3)*

Error Message
5230 TA CHAN RF OVERLOAD
5240 TB CHAN RF OVERLOAD
6000 – 6999 Indicate Phase Lock Problems
6001 - 6128 PHASE LOCK FAILURE
7000 – 7999 Indicate Run-Time Digital Section Problems
7100 FILE MARKED READ ONLY
7140 GENERAL FLOPPY DRIVE FAIL
7142 FLOPPY DISK READ ERROR
7143 FLOPPY DISK WRITE ERROR
7146 FLOPPY DISK CHANGED
7147 FLOPPY DISK UNAVAILABLE
7169 FLOPPY INIT FAIL
7170 GENERAL HARD DISK FAIL
7172 HARD DISK READ ERROR
7173 HARD DISK WRITE ERROR
7177 HARD DISK UNAVAILABLE
7199 HARD DISK INIT FAIL
7200 IEEE 488.2 GPIB BUS ERROR
7201 ABORTED MESSAGES
7202 NOTHING TO SAY
7203 NO LISTENER ON BUS
7204 GPIB COMMAND ERROR
7205 GPIB EXECUTION ERROR
7206 GPIB DEVICE SPECIFIC ERROR
7207 GPIB QUERY ERROR
7210 DEDICATED GPIB BUS ERROR

Error Message
7220 PLOTTER NOT RESPONDING
7221 PLOTTER NOT READY
7222 PLOTTER OUT OF PAPER
7223 PLOTTER PEN UP
7230 POWER METER NOT RESPONDING
7240 FRQ COUNTER NOT RESPONDING
7250 EXT SOURCE NOT RESPONDING
7310 PRINTER NOT RESPONDING
7311 PRINTER NOT READY
7312 PRINTER OUT OF PAPER
7320 AUX I/O PORT ERROR
7330 SERIAL PORT ERROR
7340 ETHERNET PORT ERROR
7350 EXT TRIG RATE TOO FAST
7410 EXT KYBD ERROR
8000 – 8999 Indicate Run-Time Processing System Problems
8100 PWR FAIL
8110 GENERAL VME BUS FAIL
8120 GENERAL MEMORY FAIL
8121 NON-VOLATILE MEMORY FAIL
8130 PROCESSING FAIL
8140 GENERAL DISK BUFFER ERR

Part 4 Supplemental Data

This part consists of four appendices that provide supplemental data that will aid in understanding the 37XXXD programming material.

Appendix A – *contains a primer for the IEEE 488 GPIB. This primer is intended to assist new users in understanding GPIB basics.*

Appendix B – *provides a quick reference to all 37XXXD GPIB commands. Each reference lists the command name, a brief description of the command function, and a reference to the pertinent Chapter in this manual.*

Appendix A Introduction to the IEEE 488 Bus

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Appendix A
Introduction to the IEEE 488 Bus

A-1 INTRODUCTION

This appendix contains general descriptions of the IEEE 488 Bus, generally known as the General Purpose Interface Bus (GPIB).

A-2 IEEE 488.2 STANDARD

The IEEE 488.2 Standard specifies the use of protocols, formats, and certain common commands for use with the GPIB. The applicable information regarding IEEE 488.2 usage for the 37XXXD is documented throughout the 37XXXD Programming Manual where used.

A-3 OVERVIEW

The IEEE-488 General Purpose Interface Bus (GPIB) is an instrumentation interface for integrating instruments, computers, printers, plotters, and other measurement devices into systems. The GPIB uses 16 signal lines to effect transfer of information between all devices connected on the bus.

The following requirements and restrictions apply to the GPIB.

- No more than 15 devices can be interconnected by one contiguous bus; however, an instrumentation system may contain more than one interface bus.
- The maximum total cumulative cable length for one interface bus may not exceed twice the number of devices connected (in meters), or 20 meters whichever is less.
- A maximum data rate of 1 Mb/s across the interface on any signal line.
- Each device on the interface bus must have a unique address, ranging from 00 to 30.

The devices on the GPIB are connected in parallel, as shown in Figure A-1. The interface consists of 16 signal lines and 8 ground lines in a shielded cable. Eight of the signal lines are the data lines, DIO 1 thru DIO 8. These data lines carry messages (data and commands), one byte at a time, among the GPIB devices. Three of the remaining lines are the handshake lines that control the transfer of message bytes between devices. The five remaining signal lines are referred to as interface management lines.

The following paragraphs provide an overview of the GPIB including a description of the functional elements, bus structure, bus data transfer process, interface management bus, device interface function requirements, and message types.

A-4 FUNCTIONAL ELEMENTS

Effective communications between devices on the GPIB requires three functional elements; a talker, a listener, and a controller. Each device on the GPIB is categorized as one of these elements depending on its current interface function and capabilities.

Talker A talker is a device capable of sending device-dependent data to another device on the bus when addressed to talk. Only one GPIB device at a time can be an active talker.

Listener A listener is a device capable of receiving device-dependent data from another device on the bus when addressed to listen. Any number of GPIB devices can be listeners simultaneously.

Controller A controller is a device, usually a computer, capable of managing the operation of the GPIB. Only one GPIB device at a time can be an active controller. The active controller manages the transfer of device-dependent data between GPIB devices by designating who will talk and who will listen.

System Controller The system controller is the device that always retains ultimate control of the GPIB. When the system is first powered-up, the system controller is the active controller and manages the GPIB. The system controller can pass control to a device, making it the new active controller. The new active controller, in turn, may pass control on to yet another device. Even if it is not the active controller, the system controller maintains control of the Interface Clear (IFC) and Remote Enable (REN) interface management lines and can thus take control of the GPIB at anytime.

A-5 BUS STRUCTURE

The GPIB uses 16 signal lines to carry data and commands between the devices connected to the bus. The interface signal lines are organized into three functional groups.

- Data Bus (8 lines)
- Data Byte Transfer Control Bus (3 lines)
- General Interface Management Bus (5 lines)

The signal lines in each of the three groups are designated according to function. Table A-1 lists these designations.

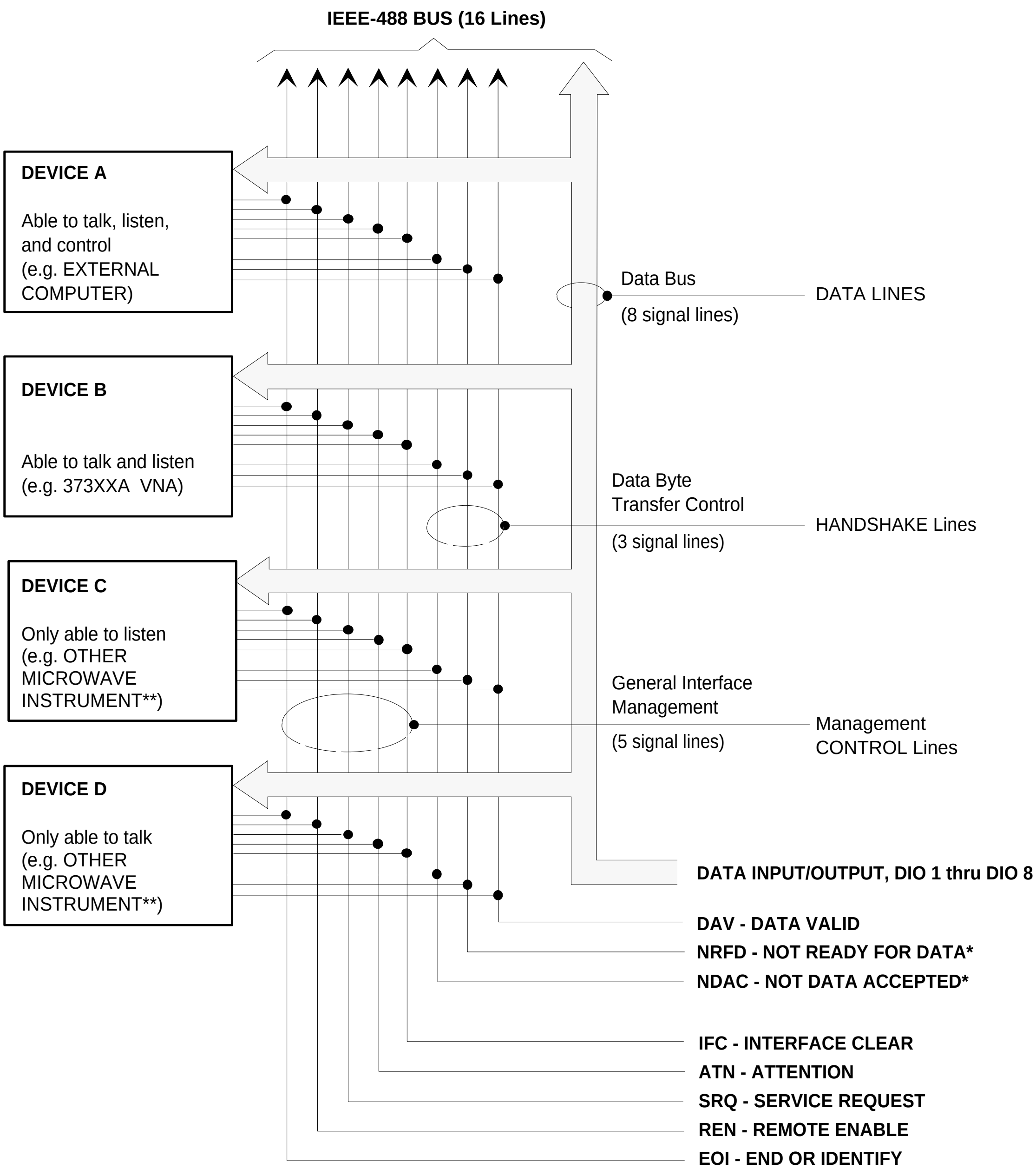
Table A-1. *Interface Bus Signal Line Designations*

Bus Type	Signal Line Name	Function
Data Bus	DIO1–DIO8	Data Input/Output, 1 thru 8
Data Byte Transfer and Control	DAV NRFD NDAC	Data Available Not Ready For Data Not Data Accepted
General Interface Control	ATN IFC SRQ REN EOI	Attention Interface Clear Service Request Remote Enable End Or Identify

A-6 DATA BUS DESCRIPTION

The data bus is the conduit for the transfer of data and commands between the devices on the GPIB. It contains eight bi-directional, active-low signal lines—DIO 1 thru DIO 8. Data and commands are transferred over the data bus in byte-serial, bit-parallel form. This means that one byte of data (eight bits) is transferred over the bus at a time. DIO 1 represents the least-significant bit (LSB) in this byte and DIO 8 represents the most-significant bit (MSB). Bytes of data are normally formatted in seven-bit ASCII (American Standard Code for Information Interchange) code. The eighth (parity) bit is not used.

Each byte placed on the data bus represents either a command or a data byte. If the Attention (ATN) interface management line is TRUE while the data is transferred, then the data bus is carrying a bus command which is to be received by every GPIB device. If ATN is FALSE, then a data byte is being transferred and only the active listeners will receive that byte.



* Negation is represented by low state on these two lines
** The configuration shown in this diagram depicts an external computer connected via GPIB to a 373XXA Vector Network Analyzer and other microwave instruments (if used).

Figure A-1. *Interface Connections and Bus Structure*

A-7 DATA BYTE TRANSFER CONTROL

Control of the transfer of each byte of data on the data bus is accomplished by a technique called the three-wire handshake, which involves the three signal lines of the Data Byte Transfer Control Bus. This technique forces data transfers at the speed of the slowest listener, which ensures data integrity in multiple listener transfers. One line (DAV) is controlled by the talker, while the other two (NRFD and NDAC) are wired-OR lines shared by all active listeners. The handshake lines, like the other GPIB lines, are active low. The technique is described briefly in the following paragraphs and is depicted in Figure A-2. For further information, refer to ANSI/IEEE Std 488.1.

DAV *Data Valid*

This line is controlled by the active talker. Before sending any data, the talker verifies that NDAC is TRUE (active low) which indicates that all listeners have accepted the previous data byte. The talker then places a byte on the data lines and waits until NRFD is FALSE (high), which indicates that all addressed listeners are ready to accept the information. When both NRFD and NDAC are in the proper state, the talker sets the DAV line TRUE (active low) to indicate that the data on the bus is valid (stable).

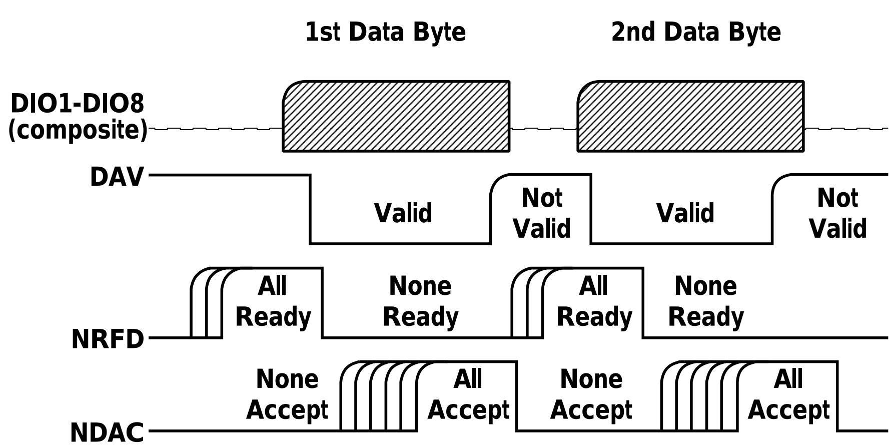


Figure A-2. *Typical GPIB Handshake Operation*

NRFD *Not Ready For Data*

This line is used by the listeners to inform the talker when they are ready to accept new data. The talker must wait for each listener to set the NRFD line FALSE (high), which they will do at their own rate. This assures that all devices that are to accept the data are ready to receive it.

NDAC *Not Data Accepted*

This line is also controlled by the listeners and is used to inform the talker that each device addressed to listen has accepted the data. Each device releases NDAC at its own rate, but NDAC will not go FALSE (high) until the slowest listener has accepted the data byte.

A-8 MANAGEMENT BUS

The general interface management bus is a group of five signal lines used to manage the flow of information across the GPIB. A description of the function of each of the individual control lines is provided below.

ATN *Attention*

The active controller uses the ATN line to define whether the information on the data bus is a command or is data. When ATN is TRUE (low), the bus is in the command mode and the data lines carry bus commands. When ATN is FALSE (high), the bus is in the data mode and the data lines carry device-dependent instructions or data.

EOI *End or Identify*

The EOI line is used to indicate the last byte of a multibyte data transfer. The talker sets the EOI line TRUE during the last data byte.

The active controller also uses the EOI line in conjunction with the ATN line to initiate a parallel poll sequence.

IFC *Interface Clear*

Only the system controller uses this line. When IFC is TRUE (low), all devices on the bus are placed in a known, quiescent state (unaddressed to talk, unaddressed to listen, and service request idle).

REN *Remote Enable*

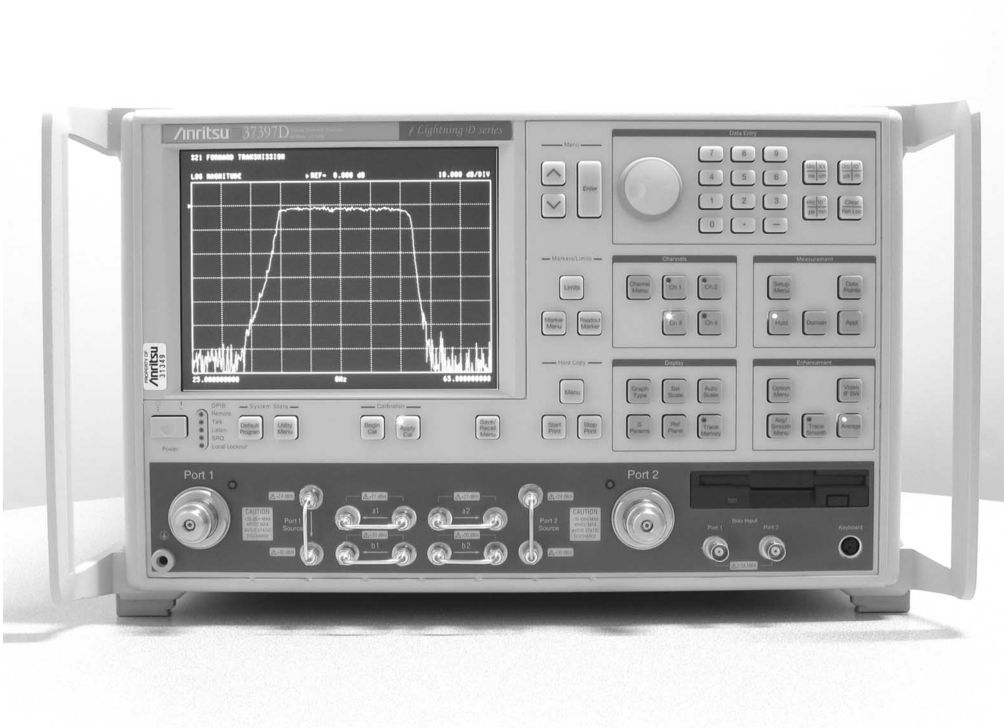
Only the system controller uses this line. When REN is set TRUE (low), the bus is in the remote mode and devices are addressed either to listen or to talk. When the bus is in remote and a device is addressed, it receives instructions from the GPIB rather than from its front panel. When REN is set FALSE (high), the bus and all devices return to local operation.

SRQ *Service Request*

The SRQ line is set TRUE (low) by any device requesting service by the active controller.

Series 37XXXD Vector Network Analyzer

GPIB QUICK REFERENCE GUIDE



This manual supplements the 37XXXD Series Vector Network Analyzer Programming Manual. Insert it behind the tab marked Appendix B, GPIB Quick Reference Guide in that manual.

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37XXXD VNA GPIB Quick Reference Guide

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37XXXD VNA GPIB Quick Reference Guide

1. INTRODUCTION

This appendix provides a quick reference to the 37XXXD GPIB Programming commands.

2. GENERAL

This guide is divided into two listings: alphabetical and functional. The alphabetical listing begins on page 5 and lists the commands alphabetically with a brief description. The functional listing begins on page 39 and lists the commands, a brief description, and the functional group with the list sorted alphabetically by the functional group.

All of these commands are described in detail in Chapter 10 of the 37XXXD Programming Manual.

Command	Description
*CLS	Clear status bytes and structures
*DDT	Enter the 488.2 Define Device Trigger command string
*DDT?	Output the 488.2 Define Device Trigger command string
*ESE	Enter the 488.2 Standard Event Status Enable mask
*ESE?	Output the 488.2 Standard Event Status Enable mask
*ESR?	Output the 488.2 Standard Event Status Register value
*IDN?	Output the 488.2 instrument identification string
*IST?	Output the value of the ist message
*OPC	Initiate the 488.2 Operation Complete sequence
*OPC?	Initiate the 488.2 Operation Complete Query sequence
*OPT?	Output the 488.2 options installed string
*PRE	Enter the 488.2 Parallel Poll Register Enable mask
*PRE?	Output the 488.2 Parallel Poll Register Enable mask
*RST	Instrument reset
*SRE	Enter the 488.2 Service Request Enable mask
*SRE?	Output the 488.2 Service Request Enable mask
*STB?	Output the 488.2 Status Byte value
*TRG	Initiate a Group Execute Trigger sequence
*TST?	Perform self test and output status
*WAI	Wait to continue
A12	Simulate 12-term calibration
A8R	Simulate 1-path 2-port calibration reverse path
A8T	Simulate 1-path 2-port calibration forward path
ABORTCAL	Abort calibration in progress and keep existing calibration data
ABT	Simulate trans freq response calibration forward and reverse
ACAA	Set AutoCal standard to assurance
ACADPL	Enter AutoCal adapter length
ACADPL?	Output AutoCal adapter length
ACADR	Set AutoCal type to adapter removal
ACAL1R2	Set adapter removal port configuration to ADAPT & L=1 and R=2
ACAR1L2	Set adapter removal port configuration to ADAPT & R=1 and L=2
ACARP?	Output AutoCal adapter removal port configuration
ACDEF	Select default AutoCal isolation averaging factor
ACF2P?	Output AutoCal full 2 port configuration
ACF2TC	Set AutoCal 2 port thru type to calibrator
ACF2TT	Set AutoCal 2 port thru type to true thru
ACF2TX?	Output AutoCal 2 port thru type selection
ACHFD	Save AutoCal characterization data to floppy disk
ACHHD	Save AutoCal characterization data to hard disk

Command	Description
ACIAF	Enter user AutoCal isolation averaging factor
ACIAF?	Output user AutoCal isolation averaging factor
ACIAX?	Output AutoCal isolation averaging factor omit/default/user selection
ACISO	Enter AutoCal isolation averaging number
ACISO?	Output AutoCal isolation averaging number
ACL1AR2	Set adapter removal port configuration to L=1 and ADAPT & R=2
ACL1R2	Set AutoCal full 2 port configuration to L=1 and R=2
ACLO	Enter AutoCal load averaging number
ACLO?	Output AutoCal load averaging number
ACLOAD	Set AutoCal standard to load
ACOMIT	Omit using AutoCal isolation averaging factor
ACOPEN	Set AutoCal standard to open
ACP1?	Output AutoCal S11 port configuration
ACP1L	Set AutoCal S11 port configuration to left
ACP1R	Set AutoCal S11 port configuration to right
ACP2?	Output AutoCal S22 port configuration
ACP2L	Set AutoCal S22 port configuration to left
ACP2R	Set AutoCal S22 port configuration to right
ACPL	Set AutoCal S11 port configuration to left
ACPR	Set AutoCal S11 port configuration to right
ACR1AL2	Set adapter removal port configuration to R=1 and ADAPT & L=2
ACR1L2	Set AutoCal full 2 port configuration to R=1 and L=2
ACRFL	Enter AutoCal reflection averaging number
ACRFL?	Output AutoCal reflection averaging number
ACS11	Set AutoCal type to S11
ACS22	Set AutoCal type to S22
ACSF2P	Set AutoCal type to full 2 port
ACSHORT	Set AutoCal standard to short
ACSTD?	Output AutoCal standard
ACSW	Enter AutoCal switch averaging number
ACSW?	Output AutoCal switch averaging number
ACTHRU	Set AutoCal standard to thru
ACTU	Enter AutoCal thru averaging number
ACTU?	Output AutoCal thru averaging number
ACTUAVG	Enter AutoCal thru update averaging number
ACTUAVG?	Output AutoCal thru update averaging number
ACTULS	Apply last thru update cal setup
ACX?	Output AutoCal type
ADD	Select addition as trace math for active channel

Command	Description
ADDFC	Enter frequency counter GPIB address
ADDFC?	Output frequency counter GPIB address
ADDHW?	Output instrument NI hardware address
ADDIP	Enter instrument network IP address
ADDIP?	Output instrument network IP address
ADDPLT	Enter plotter GPIB address
ADDPLT?	Output plotter GPIB address
ADDPM	Enter power meter GPIB address
ADDPM?	Output power meter GPIB address
ADPL	Enter electrical length for adapter removal
ADPL?	Output electrical length for adapter removal
ADRIVE	Select the floppy drive as the default drive
AFT	Simulate transmission frequency response calibration forward path
AH0	Turn automatic DUT protection off
AH1	Turn automatic DUT protection on
AHX?	Output automatic DUT protection on/off status
ALC	Perform ALC loop internal calibration
AMKR	Select active marker on all channels marker mode
ANNCOL	Enter the color number for annotation and menu text
ANNCOL?	Output the color number for annotation and menu text
AOF	Turn averaging off
AOF?	Output averaging on/off status
AON	Turn averaging on
APR	Enter group delay aperture setting on active channel
APR?	Output group delay aperture setting on active channel
ARB	Simulate reflection only calibration both ports
ARF	Simulate reflection only calibration port 1
ARR	Simulate reflection only calibration port 2
ART	Simulate trans freq response calibration reverse path
ASC	Autoscale the active channel display
ASP	Enter polar stop sweep position angle
ASP?	Output polar stop sweep position angle
AST	Enter polar start sweep position angle
AST?	Output polar start sweep position angle
ATTN	Attach next segment and make the active segment
AVG	Enter averaging count and turn on
AVG?	Output averaging count
AVGCNT?	Output the current sweep-by-sweep average sweep count
BBL	Select broadband load for calibration

Command	Description
BBZ	Enter broadband load impedance for calibration
BBZL	Enter broadband load inductance for calibration
BC0	Turn CRT display off (disabled)
BC1	Turn CRT display on (disabled)
BCKCOL	Enter the color number for background
BCKCOL?	Output the color number for background
BCX?	Output CRT display on/off status
BD1	Select band 1 for definition
BD2	Select band 2 for definition
BD3	Select band 3 for definition
BD4	Select band 4 for definition
BD5	Select band 5 for definition
BDMM	Define Millimeter Wave band equations
BEEP0	Disable the instrument beeper on GPIB errors
BEEP1	Enable the instrument beeper on GPIB errors
BEEPX?	Output GPIB beep on error enable/disable status
BEG	Begin taking calibration data
BEGAC	Start AutoCal
BEGCH	Start AutoCal characterization
BEGN	Begin next segment and make it the active segment
BEGTU	Start AutoCal thru update
BH0	Turn bias off while in hold
BH1	Turn bias on while in hold
BHX?	Output bias on/off during hold status
BMPB	Select Black on White as bitmap type
BMPC	Select Color on White as bitmap type
BMPT	Select true color as bitmap type
BPF	Enter break point frequency for 3 line LRL calibration
BRILL	Activate color configuration Brilliant
BSP	Enter band stop frequency
BSP?	Output band stop frequency
BST	Enter band start frequency
BST?	Output band start frequency
BWL3	Set bandwidth loss value to 3 dB
BWLS	Enter bandwidth loss value
BWLS?	Output bandwidth loss value
C12	Select 12 term calibration
C8R	Select 1-path 2-port calibration reverse path
C8T	Select 1-path 2-port calibration forward path

Command	Description
CALR	Perform receiver cal for gain compression testing
CAS	Clear active segmented limit vertical/horizontal definitions
CBT	Select trans freq response calibration forward and reverse
CC0	Enter capacitance coefficient 0 for open
CC1	Enter capacitance coefficient 1 for open
CC2	Enter capacitance coefficient 2 for open
CC3	Enter capacitance coefficient 3 for open
CCD	Collect corrected data in an internal buffer
CD	Change default directory
CDRIVE	Select the hard disk as the default drive
CF1	Select female 1.0 mm connector for current port
CF2	Select female 2.4mm connector for current port
CF3	Select female GPC-3.5 connector for current port
CF716	Select female 7/16 connector for current port
CFC	Select female TNC connector for current port
CFD	Collect final data in an internal buffer
CFK	Select female K connector for current port
CFN	Select female Type N connector for current port
CFN75	Select Female type N 75-ohm connector for current port
CFS	Select female SMA connector for current port
CFSP	Select Special Female connector for current port
CFSPA	Select Band A special female connector for current port
CFSPB	Select Band B special female connector for current port
CFSPC	Select Band C special female connector for current port
CFT	Select trans freq response calibration forward path
CFV	Select female V connector for current port
CH1	Make channel 1 the active channel
CH2	Make channel 2 the active channel
CH3	Make channel 3 the active channel
CH4	Make channel 4 the active channel
CHX?	Output active channel number
CL0	Enter inductive coefficient 0 for short
CL1	Enter inductive coefficient 1 for short
CL2	Enter inductive coefficient 2 for short
CL3	Enter inductive coefficient 3 for short
CLASS	Activate color configuration Classic
CLB	Clear all multiple source band definitions
CLBMM	Clear the new Millimeter Wave band definitions
CM	Suffix sets distance data type and scales by 1E-2

Command	Description
CM1	Select male 1.0 mm connector for current port
CM2	Select male 2.4mm connector for current port
CM3	Select male GPC-3.5 connector for current port
CM716	Select male 7/16 connector for current port
CMC	Select male TNC connector for current port
CMK	Select male K connector for current port
CMN	Select male N connector for current port
CMN75	Select Male type N 75-Ohm connector for current port
CMS	Select male SMA connector for current port
CMSP	Select Special Male connector for current port
CMSPA	Select Band A special male connector for current port
CMSPB	Select Band B special male connector for current port
CMSPC	Select Band C special male connector for current port
CMT	Suffix sets distance data type and scales by 1E-2
CMV	Select male V connector for current port
CMX?	Output calibration method
CND	Select user specified connector for current port
CNG	Select GPC-7 connector for current port
CNTR	Enter center frequency
CNTR?	Output center frequency
COF	Turn error correction off
CON	Turn error correction on
CON?	Output error correction on/off status
COO	Enter offset for open for user specified connector (Standard Calibration)
COPY	Copy a files contents to another file
COS	Enter offset for short for user specified connector
CRB	Select reflection only calibration both ports
CRD	Collect raw data in an internal buffer
CRF	Select reflection only calibration port 1
CRR	Select reflection only calibration port 2
CRT	Select trans freq response calibration reverse path
CSB	Clear status bytes and structures (same as *CLS)
CSF?	Output cal start frequency
CSL	Clear service log
CTF?	Output cal stop frequency
CTN	Continue sweeping from current point
CWC	Select CW frequency calibration data points
CWD?	Output current working directory string
CWDEC	Subtract 1 from the current CW index

Command	Description
CWF	Enter CW frequency and turn CW on
CWF2I?	Output index for frequency given
CWF?	Output CW frequency
CWI	Enter index for CW frequency and turn CW on
CWI2F?	Output frequency for index given
CWI?	Output current index number
CWINC	Add 1 to the current CW index
CWN2I	Add N to the current CW index
CWON	Turn CW on at current CW frequency
CWON?	Output CW on/off status
CWP	Enter number of points drawn in CW
CWP?	Output number of points drawn in CW
CWSRT	Set CW frequency to the start frequency
CWSTP	Set CW frequency to the stop frequency
CXD?	Output internal buffer data collection mode
CXX?	Output calibration type
D13	Display channels 1 & 3
D14	Display all four channels
D24	Select dual channel display with channels 2 & 4
DA1	Select a1 = Ra as denominator for parameter being defined
DA2	Select a2 = Rb as denominator for parameter being defined
DAT	Display data only on active channel
DAT?	Output trace memory display mode
DATCOL	Enter the color number for data
DATCOL?	Output the color number for data
DATE	Enter the system date
DATE?	Output the system date
DB	Suffix sets power data type
DB1	Select b1 = Ta as denominator for parameter being defined
DB2	Select b2 = Tb as denominator for parameter being defined
DBL	Suffix sets power data type
DBM	Suffix sets power data type
DBP	Select distance bandpass mode for active channel
DC1	Display channel 1 and 2 operating parameters
DC3	Display channel 3 and 4 operating parameters
DCA	Select automatic DC term calculation for lowpass
DCCTN	Resume internal buffer data collection
DCCTN?	Output internal buffer data collection resume/suspend status
DCHLD	Suspend internal buffer data collection

Command	Description
DCMRK	Inserts the mark value into the internal buffer
DCO	Select open for DC term for lowpass
DCOFF	Turn internal buffer data collection mode off
DCP	Display calibration parameters 1st page
DCP1	Display calibration parameters 1st page
DCP2	Display calibration parameters 2nd page
DCPCUR?	Outputs the current point count in the collect buffer
DCPMAX?	Outputs the maximum number of points that can be collected in the collect buffer
DCS	Select short for DC term for lowpass
DCV	Enter value for DC term for lowpass
DCV?	Output lowpass DC term value
DCX?	Output lowpass DC term selection
DCZ	Select line impedance for DC term for lowpass
DD0	Turn data drawing off
DD1	Turn data drawing on
DD1?	Output data drawing on/off status
DDX?	Output active channel domain parameter frequency distance or time
DE1	Select unity as denominator for parameter being defined
DEFGT	Enter instrument default gateway IP address
DEFGT?	Output instrument default gateway IP address
DEG	Suffix sets phase data type
DEL	Delete a file from disk
DEN?	Output denominator selection for parameter being defined
DF1	Display 1.0 mm female connector information
DF2	Display 2.4mm female connector information
DF3	Display GPC-3.5 female connector information
DF716	Display 7/16 female connector information
DFC	Select discrete frequency calibration data points
DFD	Done specifying discrete frequency ranges
DFK	Display K female connector information
DFN	Display N female connector information
DFN75	Display N Female 75-Ohm connector information
DFP	Display Front panel instrument state
DFQ	Enter single discrete frequency
DFS	Display SMA female connector information
DFSP	Display Special Female connector information
DFT	Display TNC female connector information
DFV	Display V female connector information
DG7	Display GPC-7 Male connector information

Command	Description
DGS	Display GPIB status information
DGT	Display 1st CRT test pattern
DGT1	Display 1st CRT test pattern
DGT2	Display 2nd CRT test pattern
DGT3	Display 3rd CRT test pattern
DIA	Select air as active dielectric
DIE	Enter a dielectric value
DIM	Select microporous teflon as active dielectric
DIP	Select polyethylene as active dielectric
DIR	Output a directory listing to the GPIB
DIS	Display active segmented limit
DIS?	Output active segmented limit on/off status
DISKRD	Output disk file data to the GPIB
DISKWR	Write GPIB data to a disk file
DIT	Select Teflon as active dielectric
DIV	Select division as trace math for active channel
DIX?	Output dielectric constant
DLA	Select group delay display for active channel
DLP	Select distance lowpass mode for active channel
DM1	Display 1.0 mm male connector information
DM2	Display 2.4mm male connector information
DM3	Display GPC-3.5 male connector information
DM716	Display 7/16 male connector information
DMK	Display K male connector information
DMN	Display N male connector information
DMN75	Display N Male 75-Ohm connector information
DMS	Display SMA male connector information
DMSP	Display Special Male connector information
DMT	Display TNC male connector information
DMV	Display V male connector information
DNM	Display data normalized to trace memory on active channel
DOASF	Display band A special female connector offset-short information
DOASM	Display band A special male connector offset-short information
DOBSF	Display band B special female connector offset-short information
DOBSM	Display band B special male connector offset-short information
DOCSF	Display band C special female connector offset-short information
DOCSM	Display band C special male connector offset-short information
DOF1	Display 1.0 mm female connector offset-short information
DOM1	Display 1.0 mm male connector offset-short information

Command	Description
DPI	Select distance phasor impulse mode for active channel
DPN	Enter pen number for data
DPN?	Output pen number for data
DPR0	Visible data only OFD format
DPR1	Data pair always OFD format
DPRX?	Output data pair mode visible only or pair always
DR1	Select Marker 1 as Delta Reference Marker
DR2	Select Marker 2 as Delta Reference Marker
DR3	Select Marker 3 as Delta Reference Marker
DR4	Select Marker 4 as Delta Reference Marker
DR5	Select Marker 5 as Delta Reference Marker
DR6	Select Marker 6 as Delta Reference Marker
DRF	Turn delta reference mode on
DRL	Diagnostic read latch
DRO	Turn delta reference mode off
DRO?	Output delta reference mode on/off status
DRX?	Output delta reference marker number
DSF0	Disable filter shape factor calculation
DSF1	Enable filter shape factor calculation
DSFX?	Output filter shape factor calculation enable/disable status
DSP	Select single channel display
DSP?	Output channel display mode
DSPS21	Select Gain Compression bottom graph displays S21
DSPS21?	Output Gain Compression bottom graph selection Normalized/S2
DSQ0	Disable filter Q calculation
DSQ1	Enable filter Q calculation
DSQX?	Output filter Q calculation enable/disable status
DTM	Display measurement data and trace memory on active channel
DVM	Enter DVM channel number
DWG	Display waveguide parameters
DWL	Diagnostic write latch
E12	Set Millimeter Wave band to E band (WR-12)
E12E	Set Millimeter Wave band to E band (WR-12)
EANAIN	Measure External Analog In on active channel
ECW	Select CW operation for component being edited
ED1	Edit source 1 equation
ED2	Edit source 2 equation
EDED	Select De-embedding as embedding/de-embedding method
EDEE	Select Embedding as embedding/de-embedding method

Command	Description
EDEED?	Output embedding/de-embedding method selection
EDENORM	Normal port orientation of embedding/de-embedding network
EDEPORT1	Apply the embedding/de-embedding network to Port 1
EDEPORT2	Apply the embedding/de-embedding network to Port 2
EDEPORT?	Output port receiving the embedding/de-embedding network
EDESWAP	Swap port orientation of embedding/de-embedding network
EDESWAP?	Output port orientation of embedding/de-embedding network swapped/normal
EDG	End diagnostics mode
EDR	Edit receiver equation
EDV	Enter divisor value for equation being edited
EDV?	Output divisor value for equation being edited
EKT	Select external keyboard testing
EML	Enter multiplier value for equation being edited
EML?	Output multiplier value for equation being edited
EOS	Enter offset frequency for equation being edited
EOS?	Output offset frequency for equation being edited
ESW	Select sweep operation for component being edited
EX1RF0	Turn external source 1 rf off
EX1RF1	Turn external source 1 rf on
EX2RF0	Turn external source 2 rf off
EX2RF1	Turn external source 2 rf on
EXD	Display external A/D input
EXISTD?	Output directory existence information
EXISTF?	Output file existence information
EXW?	Output multiple source sweep flag for equation being edited
F08	Set Millimeter Wave Band to F Band (WR-8)
FCW0	Turn fast CW measurement mode off
FCW1	Turn fast CW measurement mode on
FCW2	Turn Fast CW mode 2 on
FCWX?	Output fast CW measurement mode on/off status
FDE0	Disable Output Data End Message
FDE1	Enable Output Data End Message
FDEX?	Output Output Data End Message enable/disable status
FDH0	Select variable length arbitrary block headers
FDH1	Select fixed length arbitrary block headers
FDH2	Select zero length arbitrary block headers
FDHX?	Output arbitrary block header length selection
FFD	Send form feed to printer and stop print/plot
FGT	Select frequency with time gate for active channel

Command	Description
FHI	Set data points to 1601
FIL	Fill defined discrete frequency range
FLC	Source frequency linearity internal calibration
FLO	Set data points to 101
FLTBW?	Output filter bandwidth
FLTC?	Output filter center frequency
FLTL?	Output filter loss at reference value
FLTQ?	Output filter Q
FLTS?	Output filter shape factor
FMA	Select ASCII data transfer format
FMB	Select IEEE754 64 bit data transfer format
FMC	Select IEEE754 32 bit data transfer format
FME	Set data points to 401
FMKR	Select filter parameters marker mode
FMT0	Select normal ascii data element delimiting
FMT1	Select enhanced ascii data element delimiting
FMTX?	Output ascii data element delimiting mode
FMX?	Output data output mode FMA FMB or FMC
FOF	Blank frequency information
FON	Display frequency information
FOX?	Output frequency information on/off status
FP0	Turn flat power correction off
FP1	Turn flat power correction on
FPT	Select front panel keypad testing
FPX?	Output flat power correction on/off status
FQD	Select frequency domain for active channel
FRC	Clear all defined discrete frequency ranges
FRI	Enter Discrete Fill increment frequency
FRP	Enter Discrete Fill number of points
FRS	Enter Discrete Fill start frequency
GCMP	Enter gain compression point search value
GCMP?	Output gain compression point search value
GCT	Enter gate center value distance or time
GCT?	Output gate center value
GDS	Gate symbols displayed on active channel
GHZ	Suffix sets frequency data type and scales by 1E9
GLS	Select low sidelobe gate shape
GMS	Select minimum sidelobe gate shape
GNM	Select nominal gate shape

Command	Description
GOF	Turn off gating on active channel
GOF?	Output gating mode on active channel
GON	Turn on gating on active channel
GPN	Enter pen number for graticule
GPN?	Output pen number for graticule
GRF?	Output graph type for active channel
GRT	Select Rectangular gate shape
GRTCOL	Enter the color number for the graticule
GRTCOL?	Output the color number for the graticule
GSN	Enter gate span value distance or time
GSN?	Output gate span value
GSP	Enter gate stop value distance or time
GSP?	Output gate stop value
GST	Enter gate start value distance or time
GST?	Output gate start value
GSX?	Output gate shape
HC0	Disable internal IF calibration
HC1	Enable internal IF calibration and trigger an IF calibration
HCT	Trigger an IF calibration
HCX?	Output internal IF calibration enable/disable status
HD0	Turn off tabular data headers and page formatting
HD1	Turn on tabular data headers and page formatting
HID	Hide active segmented limit
HIST0	Turns off GPIB history writing to disk
HIST1	Turns on GPIB history writing to disk
HISTX?	Outputs the history writes to hard disk enable/disable status
HLD	Put sweep into hold mode
HLD?	Output the sweep hold status
HLDX?	Output hold mode (continue, restart, or single sweep)
HPN	Enter pen number for header
HPN?	Output pen number for header
HZ	Suffix sets frequency data type
IACCHAR	Input AutoCal characterization data from the GPIB
IARF	Enter adapter removal data from GPIB and calibrate
IC1	Enter calibration coefficient 1
IC10	Enter calibration coefficient 10
IC11	Enter calibration coefficient 11
IC12	Enter calibration coefficient 12
IC2	Input Calibration Coefficient 2

Command	Description
IC3	Enter calibration coefficient 3
IC4	Enter calibration coefficient 4
IC5	Enter calibration coefficient 5
IC6	Enter calibration coefficient 6
IC7	Enter calibration coefficient 7
IC8	Enter calibration coefficient 8
IC9	Enter calibration coefficient 9
ICA	Enter calibration coefficient 10
ICB	Enter calibration coefficient 11
ICC	Enter calibration coefficient 12
ICD	Enter corrected data for active channel parameter
ICF	Enter front panel setup and calibration data
ICL	Enter all applicable calibration coefficients for cal type
IEDEF	Enter embedding/de-embedding files from GPIB and embed/de-embed
IEM	Enter extended status byte mask
IF1	Select 10 Hz IF bandwidth
IF2	Select 100 Hz IF bandwidth
IF3	Select 1 KHz IF bandwidth
IF4	Select 10 KHz IF bandwidth
IFA	Select 30 KHz IF bandwidth
IFB	Select 1st IF bandpass testing
IFD	Enter final data for active channel parameter
IFM	Select 10 Hz IF bandwidth
IFN	Select 1 KHz IF bandwidth
IFP	Enter current front panel setup
IFPC	Enter flat power coefficients
IFR	Select 100 Hz IF bandwidth
IFV	Enter frequency values
IFX?	Output IF bandwidth
IHDW	Enter hardware cal data from GPIB
IKIT	Enter calkit data from GPIB
ILM	Enter limits status byte mask
IMCF	Enter merge calibration files from GPIB and combine
IMG	Select imaginary display for active channel
IMU	Suffix sets imaginary data type
IND	Input Normalization data
INRM	Enter normalization data from GPIB
INT	Initialize (format) floppy disk
INVER	Activate color configuration Inverse

Command	Description
INXNO1	Enter NxN data and send device1 data to GPIB
INXNO2	Enter NxN data and send device2 data to GPIB
INXNO3	Enter NxN data and send device3 data to GPIB
INXNSV1	Enter NxN data and save device1 data to disk
INXNSV2	Enter NxN data and save device2 data to disk
INXNSV3	Enter NxN data and save device3 data to disk
IODF	Enter the optical file data from GPIB and calibrate
IPM	Enter the 488.2 Service Request Enable mask
IPSC	Enter power sweep linearity calibration coefficients
IS1	Enter front panel setup 1
IS10	Enter front panel setup 10
IS2	Enter front panel setup 2
IS3	Enter front panel setup 3
IS4	Enter front panel setup 4
IS5	Enter front panel setup 5
IS6	Enter front panel setup 6
IS7	Enter front panel setup 7
IS8	Enter front panel setup 8
IS9	Enter front panel setup 9
ISC	Enter scale and select inverted compressed Smith Chart display
ISE	Enter scale and select inverted expanded Smith Chart display
ISF	Exclude isolation
ISM	Select normal inverted Smith Chart for active channel
ISN	Include isolation
KEC	Keep existing calibration data
KHZ	Suffix sets frequency data type and scales by 1E3
L1C	Perform LO1 internal calibration
L2C	Perform LO2 internal calibration
LA1	Select a1 = Ra as phase lock for parameter being defined
LA2	Select a2 = Rb as phase lock for parameter being defined
LAND	Select landscape mode for output plot
LAX?	Output phase lock selection for parameter being defined
LAYCOL	Enter the color number for overlay data
LAYCOL?	Output the color number for overlay data
LB0	Turn limits testing beep on failure off
LB1	Turn limits testing beep on failure on
LBX?	Output limits testing beeper enable status
LCM	Select LRL calibration method
LDARF	Load adapter removal files from disk and calibrate

Command	Description
LDEDEF	Load Embedding/De-embedding files from disk and embed/de-embed
LDMCF	Load merge calibration files from disk and combine
LDNXNO1	Load NxN files from disk and send device1 data to GPIB
LDNXNO2	Load NxN files from disk and send device2 data to GPIB
LDNXNO3	Load NxN files from disk and send device3 data to GPIB
LDNXNSV1	Load NxN data from disk and save device1 data to disk
LDNXNSV2	Load NxN data from disk and save device2 data to disk
LDNXNSV3	Load NxN data from disk and save device3 data to disk
LDODF	Load optical data files from disk and calibrate
LDT0	Disable printing date/time
LDT1	Enable printing date/time
LFD	Enter limit frequency readout delta value
LFD2	Enter limit frequency readout delta value for bottom graph
LFD2?	Output limit frequency readout delta value for bottom graph
LFD?	Output limit frequency readout delta value
LFP	Select limit frequency readout for phase displays
LFR	Select limit frequency readout for active channel
LID	Enter string for DUT identity
LID?	Output string for DUT identity
LIN	Select linear magnitude display for active channel
LKS0	Disable lock search mode
LKS1	Enable lock search mode
LKT	Load calibration kit information from floppy disk
LL1	Enter length of line 1 for LRL calibration
LL2	Enter length of line 2 for LRL calibration
LL3	Enter length of line 3 for LRL calibration
LLM?	Output limit line display mode single or segmented
LLO	Enter lower limit value for top graph on active channel
LLO2	Enter lower limit value for bottom graph on active channel
LLO2?	Output lower limit value for bottom graph on active channel
LLO?	Output lower limit value for top graph on active channel
LLZ	Enter line impedance for LRL calibration
LM2	Select a match for the second device during a LRM type calibration
LM3	Select a match for the third device during a LRM type calibration
LMS	Enter string for DUT model/serial number
LMS?	Output string for DUT model/serial number
LMZ	Enter match impedance for LRM calibration
LMZ?	Output match impedance for LRM calibration
LMZL	Enter match inductance for LRM calibration

Command	Description
LMZL?	Output match inductance for LRM calibration
LNM	Enter string for operator name
LNM?	Output string for operator name
LO11	Select LO1 phase lock voltage testing
LO12	Select LO1 D/A voltage testing
LO21	Select LO2 main phase lock voltage testing
LO22	Select LO2 offset phase lock voltage testing
LO23	Select LO2 DDS phase lock voltage testing
LO24	Select LO2 main D/A voltage testing
LO25	Select LO2 offset D/A voltage testing
LOC	Enter string for operator comment
LOC?	Output string for operator comment
LOF	Limits display off
LOGO0	Turn hard copy logo off
LOGO1	Turn hard copy logo on
LOGO?	Output hard copy logo selection standard/user defined
LOGOS	Select standard hard copy logo
LOGOU	Select user defined hard copy logo
LOGOX?	Output hard copy logo on/off status
LOL0	Turn lower limit off
LOL1	Turn lower limit on at current value
LOL20	Turn lower limit off for bottom graph
LOL21	Turn lower limit on at current value for bottom graph
LOL2X?	Output lower limit on/off status for bottom graph
LOLX?	Output lower limit on/off status
LON	Limits display on
LON?	Output limits display on/off status
LPF1?	Output limit test failure status on channel 1
LPF2?	Output limit test failure status on channel 2
LPF3?	Output limit test failure status on channel 3
LPF4?	Output limit test failure status on channel 4
LPF?	Output limit test failure status all channels
LPH	Select linear magnitude and phase display for active channel
LPI	Select lowpass impulse response for active channel
LPS	Select lowpass step response for active channel
LPSX?	Output lowpass response for active channel impulse or step
LR2	Specify 2 line LRL calibration
LR3	Specify 3 line LRL calibration
LS1	Set lower segmented limit 100 as the active segment

Command	Description
LS10	Select lower segmented limit 10 as the active segment
LS2	Select lower segmented limit 2 as the active segment
LS3	Select lower segmented limit 3 as the active segment
LS4	Select lower segmented limit 4 as the active segment
LS5	Select lower segmented limit 5 as the active segment
LS6	Select lower segmented limit 6 as the active segment
LS7	Select lower segmented limit 7 as the active segment
LS8	Select lower segmented limit 8 as the active segment
LS9	Select lower segmented limit 9 as the active segment
LSB	Select least significant byte first binary transfer
LSEG	Select segmented limit line display mode
LSNG	Select single limit line display mode
LSX?	Output active segmented limit
LT0	Turn limits testing off
LT1	Turn limits testing on
LT1?	Output limits testing enable status
LTC	Select coaxial transmission line for calibration
LTRD	Output response data from the dedicated GPIB bus
LTST	Display the limits testing menu
LTU	Select microstrip transmission line for calibration
LTW	Select waveguide transmission line for calibration
LTWRT	Send program data to the dedicated GPIB bus
LTX?	Output line type
LUP	Enter upper limit value for top graph on active channel
LUP2	Enter upper limit value for bottom graph on active channel
LUP2?	Output upper limit value for bottom graph on active channel
LUP?	Output upper limit value for top graph on active channel
LVH	Select high as limits testing TTL level
LVL	Select low as limits testing TTL level
LVX?	Output limits testing ttl level status
M	Suffix sets distance data type
M1C	Set CW mode at marker 1 frequency
M1E	Set sweep/zoom end to marker 1 frequency distance or time
M1S	Set sweep/zoom start to marker 1 frequency distance or time
M2C	Set CW mode at marker 2 frequency
M2E	Set sweep/zoom end to marker 2 frequency distance or time
M2S	Set sweep/zoom start to marker 2 frequency distance or time
M3C	Set CW mode at marker 3 frequency
M3E	Set sweep/zoom end to marker 3 frequency distance or time

Command	Description
M3S	Set sweep/zoom start to marker 3 frequency distance or time
M4C	Set CW mode at marker 4 frequency
M4E	Set sweep/zoom end to marker 4 frequency distance or time
M4S	Set sweep/zoom start to marker 4 frequency distance or time
M5C	Set CW mode at marker 5 frequency
M5E	Set sweep/zoom end to marker 5 frequency distance or time
M5S	Set sweep/zoom start to marker 5 frequency distance or time
M6C	Set CW mode at marker 6 frequency
M6E	Set sweep/zoom end to marker 6 frequency distance or time
M6S	Set sweep/zoom start to marker 6 frequency distance or time
MAG	Select log magnitude display for active channel
MAT	Select matched reflective devices during cal
MD	Create a new disk directory
MEASDLY	Set Measurement Delay time
MEASDLY0	Disable Measurement Delay
MEASDLY1	Enable Measurement Delay
MEASDLY?	Output Measurement Delay time
MEASDLYX?	Output Measurement Delay on/off status
MEM	Display trace memory on active channel
MFGCT	Start multiple frequency swept power gain compression test
MHZ	Suffix sets frequency data type and scales by 1E6
MIN	Select subtraction as trace math for active channel
MIX	Select mixed reflective devices during calibration
MK1	Enter marker 1 frequency distance or time and turn on
MK1?	Output marker 1 frequency distance or time
MK2	Enter marker 2 frequency distance or time and turn on
MK2?	Output marker 2 frequency distance or time
MK3	Enter marker 3 frequency distance or time and turn on
MK3?	Output marker 3 frequency distance or time
MK4	Enter marker 4 frequency distance or time and turn on
MK4?	Output marker 4 frequency distance or time
MK5	Enter marker 5 frequency distance or time and turn on
MK5?	Output marker 5 frequency distance or time
MK6	Enter marker 6 frequency distance or time and turn on
MK6?	Output marker 6 frequency distance or time
MKRC	Select interpolated marker functionality
MKRCOL	Enter the color number for the markers
MKRCOL?	Output the color number for the markers
MKRD	Select discrete marker functionality

Command	Description
MKRX?	Output interpolated/discrete marker functionality
MKSL	Marker search left
MKSR	Marker search right
MKT0	Turn marker tracking off
MKT1	Turn marker tracking on
MKTX?	Output marker tracking on/off status
MM	Suffix sets distance data type and scales by 1E-3
MMBX?	Output Millimeter Wave band selection
MMN	Move active marker to minimum trace value
MMT	Suffix sets distance data type and scales by 1E-3
MMX	Move active marker to maximum trace value
MNUCOL	Enter the color number for the menu headers
MNUCOL?	Output the color number for the menu headers
MO1	Turn off marker 1
MO2	Turn off marker 2
MO3	Turn off marker 3
MO4	Turn off marker 4
MO5	Turn off marker 5
MO6	Turn off marker 6
MOF	Turn marker display off
MON	Turn marker display on
MON?	Output marker display on/off status
MOSET	Enter constant offset log magnitude for active channel
MOSET?	Output constant offset log magnitude for active channel
MPH	Select log magnitude and phase display for active channel
MPN	Enter pen number for markers and limits
MPN?	Output pen number for markers and limits
MR1	Turn marker 1 on and make it the active marker
MR1?	Output marker 1 on/off status
MR2	Turn marker 2 on and make it the active marker
MR2?	Output marker 2 on/off status
MR3	Turn marker 3 on and make it the active marker
MR3?	Output marker 3 on/off status
MR4	Turn marker 4 on and make it the active marker
MR4?	Output marker 4 on/off status
MR5	Turn marker 5 on and make it the active marker
MR5?	Output marker 5 on/off status
MR6	Turn marker 6 on and make it the active marker
MR6?	Output marker 6 on/off status

Command	Description
MRM	Display the Marker Readout menu
MRR	Restore original marker range
MRX?	Output active marker number
MS	Suffix sets time data type and scales by 1E-3
MS0	Turn multiple source mode off
MS1	Turn multiple source mode on
MSB	Select most significant byte first binary transfer
MSD	Select multiple source define mode
MSFH	Enter high loss value for shape factor calculation
MSFH?	Output high loss value for shape factor calculation
MSFL	Enter low loss value for shape factor calculation
MSFL?	Output low loss value for shape factor calculation
MSR0	Select 0 as reference for marker search and bandwidth calculation
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation
MSRM	Select maximum as reference for marker search and bandwidth calculation
MSRX?	Output reference selection for marker search and bandwidth calculation
MSX?	Output multiple source mode on/off/define
MTH?	Output trace math math type
MTR	Suffix sets distance data type
MUL	Select multiplication as trace math for active channel
MV	Suffix sets voltage data type and scales by 1E-3
NA1	Select a1 as numerator for parameter being defined
NA2	Select a2 as numerator for parameter being defined
NB1	Select b1 as numerator for parameter being defined
NB2	Select b2 as numerator for parameter being defined
NCS	Go to next calibration step
NEWCO	Activate color configuration New
NMKR	Select normal markers on active channel marker mode
NOC	Select normal calibration data points
NOFST	Enter nominal offset value for external gain
NOFST?	Output nominal offset value for external gain
NP101	Set data points to 101
NP1601	Set data points to 1601
NP201	Set data points to 201
NP401	Set data points to 401
NP51	Set data points to 51
NP801	Set data points to 801
NRD	Display non-ratioed parameters on 4 channels
NRMS	Normalize S21 for gain compression testing

Command	Description
NRMS21	Select Gain Compression bottom graph displays Normalized S21
NS	Suffix sets time data type and scales by 1E-9
NSC	Suffix sets time data type and scales by 1E-9
NU1	Select unity as numerator for parameter being defined
NUM?	Output numerator selection for parameter being defined
NXNL1	Enter length for NxN device 1
NXNL1?	Output length for NxN device 1
NXNL2	Enter length for NxN device 2
NXNL2?	Output length for NxN device 2
NXNL3	Enter length for NxN device 3
NXNL3?	Output length for NxN device 3
O3CM	Select Triple Offset Short calibration method
O4FD	Output final data for all 4 channels to the GPIB
O4SC	Output corrected data for all four S-parameters
O4SR	Output raw data for all four S-parameters
OACCHAR	Output AutoCal characterization data to the GPIB
OACSER	Output auto-cal box serial number
OACTYPE	Output auto-cal box type
OAM1	Output channel 1 active marker value
OAM2	Output channel 2 active marker value
OAM3	Output channel 3 active marker value
OAM4	Output channel 4 active marker value
OBMP	Output the display as a bitmap
OC1	Output calibration coefficients 1
OC10	Output calibration coefficients 10
OC11	Output calibration coefficients 11
OC12	Output calibration coefficients 12
OC2	Output calibration coefficients 2
OC3	Output calibration coefficients 3
OC4	Output calibration coefficients 4
OC5	Output calibration coefficients 5
OC6	Output calibration coefficients 6
OC7	Output calibration coefficients 7
OC8	Output calibration coefficients 8
OC9	Output calibration coefficients 9
OCA	Output calibration coefficient A
OCB	Output calibration coefficient B
OCC	Output calibration coefficient C
OCD	Output corrected data for active channel parameter

Command	Description
OCF	Output front panel setup and calibration data
OCL	Output all applicable calibration coefficients for cal type
OCM	Select offset short calibration method
OCS	Output internal buffer collected data
ODAT	Output hard copy tabular data to GPIB
ODR	Output directory listing of the floppy drive
ODRH	Output directory listing of the hard drive
ODV	Output distance values for time domain
OEB	Output extended status byte
OEL	Output error list
OEM	Output extended status byte mask
OFD	Output final data for active channel parameter
OFD1	Output final data for channel 1 parameter
OFD2	Output final data for channel 2 parameter
OFD3	Output final data for channel 3 parameter
OFD4	Output final data for channel 4 parameter
OFF	Enter offset value for top graph of active channel
OFF2	Enter offset value for bottom graph of active channel
OFF2?	Output offset value for bottom graph of active channel
OFF?	Output offset value for top graph of active channel
OFP	Output current front panel setup
OFPC	Output flat power coefficients
OFV	Output frequency values
OGCFD	Output gain compression final data to GPIB
OGCFV	Output gain compression frequency values to GPIB
OGCTXT	Output text format gain compression data to GPIB
OGE	Output extended description of current GPIB error
OGL	Output extended description of previous GPIB error
OHDR	Output hard copy header information to GPIB
OHDW	Output hardware cal data to GPIB
OHGL	Output HPGL format data to GPIB
OHM	Suffix sets impedance data type
OID	Output instrument identification string
OLB	Output limits status byte
OLM	Output limits status byte mask
OM1	Output marker 1 value
OM2	Output marker 2 value
OM3	Output marker 3 value
OM4	Output marker 4 value

Command	Description
OM5	Output marker 5 value
OM6	Output marker 6 value
ONCP	Output number of points for current calibration
ONCT	Output number of cal terms for current calibration
OND	Output Normalization data
ONDF	Output number of discrete frequencies
ONE	Output number of lines in the error list
ONP	Output number of points currently being measured
ONPV	Output the number of power sweep power values
ONRM	Output stored normalization data to GPIB
OPB	Output the 488.2 Status Byte value (same as *STB?)
OPSC	Output power sweep linearity calibration coefficients
OPSV	Output power sweep power values
ORD	Output raw data for active channel parameter
OS1	Output front panel setup number 1
OS10	Output front panel setup number 10
OS11C	Output corrected S11 data
OS11R	Output raw S11 data
OS12C	Output corrected S12 data
OS12R	Output raw S12 data
OS2	Output front panel setup number 2
OS21C	Output corrected S21 data
OS21R	Output raw S21 data
OS22C	Output corrected S22 data
OS22R	Output raw S22 data
OS2P	Output S2P format data to GPIB
OS3	Output front panel setup number 3
OS4	Output front panel setup number 4
OS5	Output front panel setup number 5
OS6	Output front panel setup number 6
OS7	Output front panel setup number 7
OS8	Output front panel setup number 8
OS9	Output front panel setup number 9
OSL	Output service log
OTV	Output time values for time domain
OTXT	Output text format data to GPIB
P1C	Select port 1 for connector specification
P1C?	Output port 1 connector type
P1MMA	Set Port 1 Millimeter Wave Head to Amplified (3742)

Command	Description
P1MMN	Set Port 1 Millimeter Wave Head to None
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)
P1MMX?	Output Port 1 Millimeter Wave Head type
P1P?	Output approximate power level at port 1
P2ALC	Perform Port 2 ALC loop internal calibration
P2C	Select port 2 for connector specification
P2C?	Output port 2 connector type
P2MMA	Set Port 2 Millimeter Wave Head to Amplified (3742)
P2MMN	Set Port 2 Millimeter Wave Head to none
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)
P2MMX?	Output Port 2 Millimeter Wave Head type
PBL	Select 1/4 size plot bottom left corner
PBR	Select 1/4 size plot bottom right corner
PCP	Select measurement phase polar chart mode
PCS	Select sweep position polar chart mode
PCX?	Output polar chart mode
PDR	Print directory listing of the floppy drive
PDRH	Print directory listing of the hard drive
PEL	Print the error list
PFL	Select full-size plot
PFS	Print full screen image
PFSC	Configure for printing entire screen graphic image
PGR	Print graph area screen image
PGRC	Configure for printing data area graphic image
PGT	Plot graticule
PGTC	Configure for plotting graticule
PHA	Select phase display for active channel
PHO	Enter phase offset for display channel
PHO?	Output phase offset for display channel
PLD	Plot data area only
PLDC	Configure for plotting data area
PLG	Select log polar display for active channel
PLH	Plot header
PLHC	Configure for plotting header
PLM	Plot markers and limits
PLMC	Configure for plotting markers and limits
PLO?	Output plot mode portrait or landscape

Command	Description
PLR	Select linear polar display for active channel
PLS	Plot entire screen
PLSC	Configure for plotting entire screen
PLT	Plot data traces only
PLTC	Configure for plotting data traces
PMK	Print tabular data for Markers
PMKC	Configure for printing tabular data for markers
PMN	Plot menu
PMNC	Configure for plotting menu
PMT	Print tabular data for traces and markers
PMTC	Configure for printing tabular data for traces and markers
PORT	Select portrait mode for output plot
POSET	Enter constant offset phase for active channel
POSET?	Output constant offset phase for active channel
POW	Select power out display for active channel
PRT?	Perform printer test and output status
PS	Suffix sets time data type and scales by 1E02
PSC	Suffix sets time data type and scales by 1E02
PSCNFRQ?	Output the power sweep linearity cal number of frequency poi
PSCNPWR?	Output the power sweep linearity cal number of power points
PSCSTEP?	Output the power sweep linearity cal power step size
PSL	Print the service log
PSP	Enter number of power sweeps for flat power correction (obsolete)
PSP?	Output number of power sweeps for flat power correction (obsolete)
PSPWR	Enter power sweep off power level
PSPWR?	Output power sweep off power level
PST	Stop print/plot
PSTEP	Enter power sweep step size
PSTEP?	Output power sweep step size
PSTOP	Enter power sweep stop power
PSTOP?	Output power sweep stop power
PSTRT	Enter power sweep start power
PSTRT?	Output power sweep start power
PSWC	Perform power sweep linearity calibration
PSWC0	Turn power sweep linearity calibration off
PSWC1	Turn power sweep linearity calibration on
PSWCX?	Output power sweep linearity calibration on/off status
PSWP0	Turn power sweep off
PSWP1	Turn power sweep on

Command	Description
PSWPX?	Output power sweep on/off status
PT0	Set tabular printout points skipped to 0
PT1	Set tabular printout points skipped to 1
PT2	Set tabular printout points skipped to 2
PT3	Set tabular printout points skipped to 3
PT4	Set tabular printout points skipped to 4
PT5	Set tabular printout points skipped to 5
PT6	Set tabular printout points skipped to 6
PT7	Set tabular printout points skipped to 7
PT8	Set tabular printout points skipped to 8
PT9	Set tabular printout points skipped to 9
PTAVG	Set averaging type to point-by-point averaging
PTB	Print tabular data for Traces
PTBC	Configure for printing tabular data for traces
PTL	Select 1/4 size plot top left corner
PTP	Enter the target power for flat power correction
PTP?	Output the target power for flat power correction
PTR	Select 1/4 size plot top right corner
PTS	Enter number of points to be skipped during flat power correction
PTS?	Output number of points to be skipped during flat power correction
PW1	Enter external source 1 power level
PW1?	Output external source 1 power level
PW2	Enter external source power level
PW2?	Output external source power level
PWR	Enter internal source power level
PWR?	Output internal source power level
Q22	Set Millimeter Wave Band to Q Band (WR-22)
RAD	Suffix sets phase data type and scales by 180/pi
RC1	Recall front panel setup number 1 from memory
RC10	Recall front panel setup number 10 from memory
RC2	Recall front panel setup number 2 from memory
RC3	Recall front panel setup number 3 from memory
RC4	Recall front panel setup number 4 from memory
RC5	Recall front panel setup number 5 from memory
RC6	Recall front panel setup number 6 from memory
RC7	Recall front panel setup number 7 from memory
RC8	Recall front panel setup number 8 from memory
RC9	Recall front panel setup number 9 from memory
RD	Remove a disk directory

Command	Description
RDA	Select automatic reference delay calculation
RDD	Enter reference delay in distance for active channel
RDD?	Output reference delay in distance for active channel
RDT	Enter reference delay in time for active channel
RDT?	Output reference delay in time for active channel
RECALL	Recall a data file from disk to a task
REF	Enter reference line for top graph of active channel
REF2	Enter reference line for bottom graph of active channel
REF2?	Output reference line for bottom graph of active channel
REF?	Output reference line for top graph of active channel
REL	Select real display for active channel
REU	Suffix sets real data type
RGZ	Select reflective device greater than Z0
RH0	Select RF off in hold mode
RH1	Select RF on in hold
RHX?	Output RF on/off during hold status
RIM	Select real and imaginary display for active channel
RLZ	Select reflective device less than Z0
RM1	Select reference plane at line 1 midpoint
ROL	Enter reflective device offset length
RPC	Repeat previous calibration
RPO	Enter rear panel dc voltage value
RPO?	Output rear panel dc voltage value
RRP	Select reference plane at reflection plane
RST	Instrument reset (same as *RST)
RST0	Reset instrument front panel memories and reserved parameters
RST1	Reset instrument and front panel memories
RSTAVG	Reset the sweep-by-sweep averaging sweep count
RSTCOL	Reset color configuration to default
RSTGC	Reset gain compression parameters to default
RT0	Turn retrace rf off
RT1	Turn retrace rf on
RTL	Return to local
RTX?	Output retrace rf on/off status
RV0	Turn rear panel output voltage off
RV1	Turn rear panel output voltage on
RV1?	Output rear panel output voltage on/off status
RVD	Set rear panel output mode to dc value
RVH	Set rear panel output mode to horizontal

Command	Description
RVL	Set rear panel output mode to lock direction
RVV	Set rear panel output mode to vertical
RVX?	Output rear panel output mode
S	Suffix sets time data type
S11	Measure S11 on active channel
S12	Measure S12 on active channel
S21	Measure S21 on active channel
S22	Measure S22 on active channel
SA1	Enter port 1 source attenuator value
SA1?	Output port 1 source attenuator value
SA1MAX?	Output port 1 source attenuator max value
SAMP2	Use 2 samplers for measurements
SAMP3	Use 3 samplers for measurements
SAMP?	Output the number of samplers used for measurements
SAVE	Save a data file to disk
SAVEGC	Save text format gain compression data to disk
SBD	Enter substrate dielectric for microstrip calibration
SBT	Enter substrate thickness for microstrip calibration
SCL	Enter Scale Resolution for top graph of active channel
SCL2	Enter Scale Resolution for bottom graph of active channel
SCL2?	Output Scale Resolution for bottom graph of active channel
SCL?	Output Scale Resolution for top graph of active channel
SCM	Select standard calibration method
SDG	Start diagnostics mode
SDR	Select standard receiver mode
SDR?	Output receiver mode
SELBB	Select Broadband test set operation
SELINT	Select Internal (normal) test set operation
SELMM	Select Millimeter Wave test set operation
SELSP	Select S-parameter test set operation
SELXX?	Output the test set selection MMWave/Internal
SETUP	Display setup menu
SFC	Perform flat test port calibration
SFGCA	Select swept frequency gain compression application
SFGCT	Start swept frequency gain compression test
SH1	Set offset short 1 or 2 offset length for offset short calibration
SH2	Set offset short 1 or 2 offset length for offset short calibration
SL1	Select source lock mode
SLC	Clear all segmented limits definitions

Command	Description
SLD	Select sliding load for calibration
SLH	Enter segmented limits horizontal offset
SLH?	Output segmented limits horizontal offset
SLL0	Turn lower segmented limits display off
SLL1	Turn lower segmented limits display on
SLLX?	Output lower segmented limits display on/off status
SLT	Perform SLT internal calibration
SLU0	Turn upper segmented limits display off
SLU1	Turn upper segmented limits display on
SLUX?	Output upper segmented limits display on/off status
SLV	Enter segmented limits vertical offset
SLV?	Output segmented limits vertical offset
SMC	Enter scale and select compressed Smith Chart display
SME	Enter scale and select expanded Smith Chart display
SMI	Select normal Smith Chart for active channel
SMKR	Select marker search marker mode
SOF	Turn off smoothing
SOF?	Output smoothing on/off status
SOFTCO	Activate color configuration Soft
SON	Enter smoothing value and turn on
SON?	Output smoothing value
SPAMPMT	Start swept power gain compression AM/PM test
SPAN	Enter frequency span
SPAN?	Output frequency span
SPD	Enter pen speed percentage
SPGCA	Select swept power gain compression application
SPGCT	Start swept power gain compression test
SPH	Enter active segmented limit horizontal stop position
SPH?	Output active segmented limit horizontal stop position
SPLN	Select normal source lock polarity
SPLR	Select reverse source lock polarity
SPLX?	Output source lock polarity normal/reverse status
SPR0	Turn spur reduction off
SPR1	Turn spur reduction on
SPRX?	Output spur reduction on/off status
SPTS?	Output number of smoothing points
SPV	Enter active segmented limit vertical stop position
SPV?	Output active segmented limit vertical stop position
SRC1	Select source linearity voltage testing

Command	Description
SRC1?	Output external source 1 existence information
SRC1AC	Select source 1 as active
SRC1AC?	Output source 1 active/inactive status
SRC1ADD	Enter external source 1 GPIB address
SRC1ADD?	Output external source 1 GPIB address
SRC1EX	Select source 1 as external
SRC1EX?	Output source 1 external/internal status
SRC1G0	Turn source 1 GPIB control off
SRC1G1	Turn source 1 GPIB control on
SRC1GX?	Output source 1 GPIB control on/off status
SRC1MOD?	Output external source 1 model/version string
SRC1NA	Select source 1 as not active
SRC1NT	Select source 1 as internal
SRC2	Select source power voltage testing
SRC2?	Output external source 2 existence information
SRC2AC	Select source 2 as active
SRC2AC?	Output source 2 active/inactive status
SRC2ADD	Enter external source 2 GPIB address
SRC2ADD?	Output external source 2 GPIB address
SRC2G0	Turn source 2 GPIB control off
SRC2G1	Turn source 2 GPIB control on
SRC2GX?	Output source 2 GPIB control on/off status
SRC2MOD?	Output external Source 2 model/version string
SRC2NA	Select source 2 as not active
SRCH	Enter marker search value
SRCH?	Output marker search value
SRT	Enter start frequency
SRT?	Output start frequency
ST1	Select set on mode
STD	Store trace to memory on active channel
STH	Enter active segmented limit horizontal start position
STH?	Output active segmented limit horizontal start position
STOCO	Store the current color configuration as Reset
STP	Enter stop frequency
STP?	Output stop frequency
STV	Enter active segmented limit vertical start position
STV?	Output active segmented limit vertical start position
SUBMSK	Enter instrument Subnet Mask
SUBMSK?	Output instrument Subnet Mask

Command	Description
SV1	Save front panel setup number 1 to memory
SV10	Save front panel setup number 10 to memory
SV2	Save front panel setup number 2 to memory
SV3	Save front panel setup number 3 to memory
SV4	Save front panel setup number 4 to memory
SV5	Save front panel setup number 5 to memory
SV6	Save front panel setup number 6 to memory
SV7	Save front panel setup number 7 to memory
SV8	Save front panel setup number 8 to memory
SV9	Save front panel setup number 9 to memory
SVB	Save current band definitions
SVBMM	Save and activate the new Millimeter Wave band definitions
SWAVG	Set averaging type to sweep-by-sweep averaging
SWAVG?	Output averaging type (sweep-by-sweep or point-by-point)
SWP	Return to normal sweep mode
SWP?	Output sweep mode
SWPDIR?	Output instantaneous sweep direction forward/reverse
SWR	Select SWR display for active channel
SXX?	Output s parameter or user defined parameter of active channel
T13	Select overlaid channel 1 and 3 display
T24	Select overlaid channel 2 and 4 display
TA2	Enter port 2 test attenuator value
TA2?	Output port 2 test attenuator value
TA2MAX?	Output port 2 test attenuator max value
TACD	Take AutoCal data
TBP	Select time bandpass mode for active channel
TC1	Take calibration data for port 1
TC2	Take calibration data for port 2
TCD	Take calibration data on one or both ports as necessary
TCM	Select the TRM calibration method
TDC	Select time domain harmonic frequency calibration data points
TDDIST	Set time domain parameter to distance for active channel
TDDIST?	Output active channel time domain parameter distance or time
TDPI0	Turn phasor impulse response off for active channel
TDPI1	Turn phasor impulse response on for active channel
TDPIX?	Output phasor impulse on/off status for active channel
TDTIME	Set time domain parameter to time for active channel
TDX?	Output domain mode for active channel
TEB	Select external trigger and executes *DDT definition

Command	Description
TEX	Select external (rear panel) measurement triggering
TIB	Select GPIB measurement triggering
TIME	Enter the system time
TIME?	Output the system time
TIN	Select internal measurement triggering
TK1	Select tracking mode
TLP	Select time lowpass mode for active channel
TLZ	Enter through line impedance for calibration
TOL	Enter through offset length for calibration
TPI	Select time phasor impulse mode for active channel
TPN	Enter pen number for trace overlay data
TPN?	Output pen number for trace overlay data
TRCCOL	Enter the color number for memory data
TRCCOL?	Output the color number for memory data
TRS	Trigger/restart sweep
TST	Perform self test and output status (same as *TST?)
TXX?	Output trigger source internal/external/get/extddt status
U10	Select 10 mil UTF calibration kit
U15	Select 15 mil UTF calibration kit
U25	Select 25 mil UTF calibration kit
UNDOGC	Exit gain compression and undo changes
UPL0	Turn upper limit off
UPL1	Turn upper limit on at current value
UPL20	Turn upper limit off for bottom graph
UPL21	Turn upper limit on at current value for bottom graph
UPL2X?	Output upper limit on/off status for bottom graph
UPLX?	Output upper limit on/off status
US	Suffix sets time data type and scales by 1E-6
US1	Select upper segmented limit 1 as the active segment
US10	Select upper segmented limit 10 as the active segment
US2	Select upper segmented limit 2 as the active segment
US3	Select upper segmented limit 3 as the active segment
US4	Select upper segmented limit 4 as the active segment
US5	Select upper segmented limit 5 as the active segment
US6	Select upper segmented limit 6 as the active segment
US7	Select upper segmented limit 7 as the active segment
US8	Select upper segmented limit 8 as the active segment
US9	Select upper segmented limit 9 as the active segment
USC	Suffix sets time data type and scales by 1E-6

Command	Description
USE	Enter effective dielectric for microstrip calibration
USL	Enter label string for user parameter being defined
USL?	Output label string for user parameter being defined
USR1	Measure user parameter 1 on active channel
USR2	Measure user parameter 2 on active channel
USR3	Measure user parameter 3 on active channel
USR4	Measure user parameter 4 on active channel
USW	Enter microstrip width for microstrip calibration
USZ	Enter microstrip impedance for microstrip calibration
V	Suffix sets voltage data type
V15	Set Millimeter Wave Band to V Band (WR-15)
VLT	Suffix sets voltage data type
VSP	Enter rear panel stop voltage value
VSP?	Output rear panel stop voltage value
VST	Enter rear panel start voltage value
VST?	Output rear panel start voltage value
W10	Set Millimeter Wave Band to W Band (WR-10)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)
WCO	Enter waveguide cutoff frequency for user defined kit
WFS	Wait full sweep until all display data is valid
WIDE	Use entire display width for graphs
WKD	Select user defined waveguide calibration kit
WKI	Select installed waveguide calibration kit
WLS	Select low sidelobe window shape
WMS	Select minimum sidelobe window shape
WNM	Select nominal window shape
WRT	Select rectangular window shape
WSH1	Enter waveguide short offset 1 for user defined kit
WSH2	Enter waveguide short offset 2 for user defined kit
WSH3	Enter waveguide short 3 offset for user defined kit
WSX?	Output window shape
XM3	Suffix sets unitless data type and scales by 1E-3
XMKR?	Output marker mode
XSB?	Output byte order for output data LSB or MSB
XX1	Suffix sets unitless data type
XX3	Suffix sets unitless data type and scales by 1E3
ZCT	Enter zoom range center value time or distance
ZCT?	Output zoom range center value
ZSN	Enter zoom range span value time or distance

Command	Description
ZSN?	Output zoom range span value
ZSP	Enter zoom range stop value time or distance
ZSP?	Output zoom range stop value
ZST	Enter zoom range start value time or distance
ZST?	Output zoom range start value

Command	Description	Group
ADPL	Enter electrical length for adapter removal	ADAPTER REMOVAL (Ch 9)
ADPL?	Output electrical length for adapter removal	ADAPTER REMOVAL (Ch 9)
IARF	Enter adapter removal data from GPIB and calibrate	ADAPTER REMOVAL (Ch 9)
ADDFC	Enter frequency counter GPIB address	ADDRESSING (Ch 8)
ADDFC?	Output frequency counter GPIB address	ADDRESSING (Ch 8)
ADDHW?	Output instrument NI hardware address	ADDRESSING (Ch 8)
ADDIP	Enter instrument network IP address	ADDRESSING (Ch 8)
ADDIP?	Output instrument network IP address	ADDRESSING (Ch 8)
ADDPLT	Enter plotter GPIB address	ADDRESSING (Ch 8)
ADDPLT?	Output plotter GPIB address	ADDRESSING (Ch 8)
ADDPM	Enter power meter GPIB address	ADDRESSING (Ch 8)
ADDPM?	Output power meter GPIB address	ADDRESSING (Ch 8)
DEFGT	Enter instrument default gateway IP address	ADDRESSING (Ch 8)
DEFGT?	Output instrument default gateway IP address	ADDRESSING (Ch 8)
SRC1ADD	Enter external source 1 GPIB address	ADDRESSING (Ch 8)
SRC1ADD?	Output external source 1 GPIB address	ADDRESSING (Ch 8)
SRC2ADD	Enter external source 2 GPIB address	ADDRESSING (Ch 8)
SRC2ADD?	Output external source 2 GPIB address	ADDRESSING (Ch 8)
SUBMSK	Enter instrument Subnet Mask	ADDRESSING (Ch 8)
SUBMSK?	Output instrument Subnet Mask	ADDRESSING (Ch 8)
ABORTCAL	Abort calibration in progress and keep existing calibration data	AUTOCAL (Ch 5)
ACAA	Set AutoCal standard to assurance	AUTOCAL (Ch 5)
ACADPL	Enter AutoCal adapter length	AUTOCAL (Ch 5)
ACADPL?	Output AutoCal adapter length	AUTOCAL (Ch 5)
ACADR	Set AutoCal type to adapter removal	AUTOCAL (Ch 5)
ACAL1R2	Set adapter removal port configuration to ADAPT & L=1 and R=2	AUTOCAL (Ch 5)
ACAR1L2	Set adapter removal port configuration to ADAPT & R=1 and L=2	AUTOCAL (Ch 5)
ACARP?	Output AutoCal adapter removal port configuration	AUTOCAL (Ch 5)
ACDEF	Select default AutoCal isolation averaging factor	AUTOCAL (Ch 5)
ACF2P?	Output AutoCal full 2 port configuration	AUTOCAL (Ch 5)
ACF2TC	Set AutoCal 2 port thru type to calibrator	AUTOCAL (Ch 5)
ACF2TT	Set AutoCal 2 port thru type to true thru	AUTOCAL (Ch 5)
ACF2TX?	Output AutoCal 2 port thru type selection	AUTOCAL (Ch 5)

Command	Description	Group
ACHFD	Save AutoCal characterization data to floppy disk	AUTOCAL (Ch 5)
ACHHD	Save AutoCal characterization data to hard disk	AUTOCAL (Ch 5)
ACIAF	Enter user AutoCal isolation averaging factor	AUTOCAL (Ch 5)
ACIAF?	Output user AutoCal isolation averaging factor	AUTOCAL (Ch 5)
ACIAX?	Output AutoCal isolation averaging factor omit/default/user selection	AUTOCAL (Ch 5)
ACISO	Enter AutoCal isolation averaging number	AUTOCAL (Ch 5)
ACISO?	Output AutoCal isolation averaging number	AUTOCAL (Ch 5)
ACL1AR2	Set adapter removal port configuration to L=1 and ADAPT & R=2	AUTOCAL (Ch 5)
ACL1R2	Set AutoCal full 2 port configuration to L=1 and R=2	AUTOCAL (Ch 5)
ACLO	Enter AutoCal load averaging number	AUTOCAL (Ch 5)
ACLO?	Output AutoCal load averaging number	AUTOCAL (Ch 5)
ACLOAD	Set AutoCal standard to load	AUTOCAL (Ch 5)
ACOMIT	Omit using AutoCal isolation averaging factor	AUTOCAL (Ch 5)
ACOPEN	Set AutoCal standard to open	AUTOCAL (Ch 5)
ACP1?	Output AutoCal S11 port configuration	AUTOCAL (Ch 5)
ACP1L	Set AutoCal S11 port configuration to left	AUTOCAL (Ch 5)
ACP1R	Set AutoCal S11 port configuration to right	AUTOCAL (Ch 5)
ACP2?	Output AutoCal S22 port configuration	AUTOCAL (Ch 5)
ACP2L	Set AutoCal S22 port configuration to left	AUTOCAL (Ch 5)
ACP2R	Set AutoCal S22 port configuration to right	AUTOCAL (Ch 5)
ACPL	Set AutoCal S11 port configuration to left	AUTOCAL (Ch 5)
ACPR	Set AutoCal S11 port configuration to right	AUTOCAL (Ch 5)
ACR1AL2	Set adapter removal port configuration to R=1 and ADAPT & L=2	AUTOCAL (Ch 5)
ACR1L2	Set AutoCal full 2 port configuration to R=1 and L=2	AUTOCAL (Ch 5)
ACRFL	Enter AutoCal reflection averaging number	AUTOCAL (Ch 5)
ACRFL?	Output AutoCal reflection averaging number	AUTOCAL (Ch 5)
ACS11	Set AutoCal type to S11	AUTOCAL (Ch 5)
ACS22	Set AutoCal type to S22	AUTOCAL (Ch 5)
ACSF2P	Set AutoCal type to full 2 port	AUTOCAL (Ch 5)
ACSHORT	Set AutoCal standard to short	AUTOCAL (Ch 5)
ACSTD?	Output AutoCal standard	AUTOCAL (Ch 5)
ACSW	Enter AutoCal switch averaging number	AUTOCAL (Ch 5)

Command	Description	Group
ACSW?	Output AutoCal switch averaging number	AUTOCAL (Ch 5)
ACTHRU	Set AutoCal standard to thru	AUTOCAL (Ch 5)
ACTU	Enter AutoCal thru averaging number	AUTOCAL (Ch 5)
ACTU?	Output AutoCal thru averaging number	AUTOCAL (Ch 5)
ACTUAVG	Enter AutoCal thru update averaging number	AUTOCAL (Ch 5)
ACTUAVG?	Output AutoCal thru update averaging number	AUTOCAL (Ch 5)
ACTULS	Apply last thru update cal setup	AUTOCAL (Ch 5)
ACX?	Output AutoCal type	AUTOCAL (Ch 5)
BEGAC	Start AutoCal	AUTOCAL (Ch 5)
BEGCH	Start AutoCal characterization	AUTOCAL (Ch 5)
BEGTU	Start AutoCal thru update	AUTOCAL (Ch 5)
IACCHAR	Input AutoCal characterization data from the GPIB	AUTOCAL (Ch 5)
OACCHAR	Output AutoCal characterization data to the GPIB	AUTOCAL (Ch 5)
OACSER	Output auto-cal box serial number	AUTOCAL (Ch 5)
OACTYPE	Output auto-cal box type	AUTOCAL (Ch 5)
TACD	Take AutoCal data	AUTOCAL (Ch 5)
A12	Simulate 12-term calibration	CALIBRATION (Ch 5)
A8R	Simulate 1-path 2-port calibration reverse path	CALIBRATION (Ch 5)
A8T	Simulate 1-path 2-port calibration forward path	CALIBRATION (Ch 5)
ABT	Simulate trans freq response calibration forward and reverse	CALIBRATION (Ch 5)
AFT	Simulate transmission frequency response calibration forward path	CALIBRATION (Ch 5)
ARB	Simulate reflection only calibration both ports	CALIBRATION (Ch 5)
ARF	Simulate reflection only calibration port 1	CALIBRATION (Ch 5)
ARR	Simulate reflection only calibration port 2	CALIBRATION (Ch 5)
ART	Simulate trans freq response calibration reverse path	CALIBRATION (Ch 5)
BBL	Select broadband load for calibration	CALIBRATION (Ch 5)
BBZ	Enter broadband load impedance for calibration	CALIBRATION (Ch 5)
BBZL	Enter broadband load inductance for calibration	CALIBRATION (Ch 5)
LR2	Specify 2 line LRL calibration	CALIBRATION (Ch 5)
LR3	Specify 3 line LRL calibration	CALIBRATION (Ch 5)

Command	Description	Group
LTC	Select coaxial transmission line for calibration	CALIBRATION (Ch 5)
BEG	Begin taking calibration data	CALIBRATION (Ch 5)
BPF	Enter break point frequency for 3 line LRL calibration	CALIBRATION (Ch 5)
C12	Select 12 term calibration	CALIBRATION (Ch 5)
C8R	Select 1-path 2-port calibration reverse path	CALIBRATION (Ch 5)
C8T	Select 1-path 2-port calibration forward path	CALIBRATION (Ch 5)
CBT	Select trans freq response calibration forward and reverse	CALIBRATION (Ch 5)
CC0	Enter capacitance coefficient 0 for open	CALIBRATION (Ch 5)
CC1	Enter capacitance coefficient 1 for open	CALIBRATION (Ch 5)
CC2	Enter capacitance coefficient 2 for open	CALIBRATION (Ch 5)
CC3	Enter capacitance coefficient 3 for open	CALIBRATION (Ch 5)
CF1	Select female 1.0 mm connector for current port	CALIBRATION (Ch 5)
CF2	Select female 2.4mm connector for current port	CALIBRATION (Ch 5)
CF3	Select female GPC-3.5 connector for current port	CALIBRATION (Ch 5)
CF716	Select female 7/16 connector for current port	CALIBRATION (Ch 5)
CFC	Select female TNC connector for current port	CALIBRATION (Ch 5)
CFK	Select female K connector for current port	CALIBRATION (Ch 5)
CFN	Select female Type N connector for current port	CALIBRATION (Ch 5)
CFN75	Select Female type N 75-ohm connector for current port	CALIBRATION (Ch 5)
CFS	Select female SMA connector for current port	CALIBRATION (Ch 5)
CFSP	Select Special Female connector for current port	CALIBRATION (Ch 5)
CFSPA	Select Band A special female connector for current port	CALIBRATION (Ch 5)
CFSPB	Select Band B special female connector for current port	CALIBRATION (Ch 5)
CFSPC	Select Band C special female connector for current port	CALIBRATION (Ch 5)
CFT	Select trans freq response calibration forward path	CALIBRATION (Ch 5)
CFV	Select female V connector for current port	CALIBRATION (Ch 5)
CL0	Enter inductive coefficient 0 for short	CALIBRATION (Ch 5)
CL1	Enter inductive coefficient 1 for short	CALIBRATION (Ch 5)

Command	Description	Group
CL2	Enter inductive coefficient 2 for short	CALIBRATION (Ch 5)
CL3	Enter inductive coefficient 3 for short	CALIBRATION (Ch 5)
CM1	Select male 1.0 mm connector for current port	CALIBRATION (Ch 5)
CM2	Select male 2.4mm connector for current port	CALIBRATION (Ch 5)
CM3	Select male GPC-3.5 connector for current port	CALIBRATION (Ch 5)
CM716	Select male 7/16 connector for current port	CALIBRATION (Ch 5)
CMC	Select male TNC connector for current port	CALIBRATION (Ch 5)
CMK	Select male K connector for current port	CALIBRATION (Ch 5)
CMN	Select male N connector for current port	CALIBRATION (Ch 5)
CMN75	Select Male type N 75-Ohm connector for current port	CALIBRATION (Ch 5)
CMS	Select male SMA connector for current port	CALIBRATION (Ch 5)
CMSP	Select Special Male connector for current port	CALIBRATION (Ch 5)
CMSPA	Select Band A special male connector for current port	CALIBRATION (Ch 5)
CMSPB	Select Band B special male connector for current port	CALIBRATION (Ch 5)
CMSPC	Select Band C special male connector for current port	CALIBRATION (Ch 5)
CMV	Select male V connector for current port	CALIBRATION (Ch 5)
CMX?	Output calibration method	CALIBRATION (Ch 5)
CND	Select user specified connector for current port	CALIBRATION (Ch 5)
CNG	Select GPC-7 connector for current port	CALIBRATION (Ch 5)
COF	Turn error correction off	CALIBRATION (Ch 5)
CON	Turn error correction on	CALIBRATION (Ch 5)
CON?	Output error correction on/off status	CALIBRATION (Ch 5)
COO	Enter offset for open for user specified connector (Standard Calibration)	CALIBRATION (Ch 5)
COS	Enter offset for short for user specified connector	CALIBRATION (Ch 5)
CRB	Select reflection only calibration both ports	CALIBRATION (Ch 5)
CRF	Select reflection only calibration port 1	CALIBRATION (Ch 5)
CRR	Select reflection only calibration port 2	CALIBRATION (Ch 5)
CRT	Select trans freq response calibration reverse path	CALIBRATION (Ch 5)
CSF?	Output cal start frequency	CALIBRATION (Ch 5)
CTF?	Output cal stop frequency	CALIBRATION (Ch 5)
CWC	Select CW frequency calibration data points	CALIBRATION (Ch 5)

Command	Description	Group
CXX?	Output calibration type	CALIBRATION (Ch 5)
DFC	Select discrete frequency calibration data points	CALIBRATION (Ch 5)
DFD	Done specifying discrete frequency ranges	CALIBRATION (Ch 5)
DFQ	Enter single discrete frequency	CALIBRATION (Ch 5)
IC2	Input Calibration Coefficient 2	CALIBRATION (Ch 5)
IC3	Enter calibration coefficient 3	CALIBRATION (Ch 5)
IC4	Enter calibration coefficient 4	CALIBRATION (Ch 5)
IC5	Enter calibration coefficient 5	CALIBRATION (Ch 5)
IC6	Enter calibration coefficient 6	CALIBRATION (Ch 5)
IC7	Enter calibration coefficient 7	CALIBRATION (Ch 5)
IC8	Enter calibration coefficient 8	CALIBRATION (Ch 5)
IC9	Enter calibration coefficient 9	CALIBRATION (Ch 5)
ICA	Enter calibration coefficient 10	CALIBRATION (Ch 5)
ICB	Enter calibration coefficient 11	CALIBRATION (Ch 5)
ICC	Enter calibration coefficient 12	CALIBRATION (Ch 5)
ICD	Enter corrected data for active channel parameter	CALIBRATION (Ch 5)
ICF	Enter front panel setup and calibration data	CALIBRATION (Ch 5)
ICL	Enter all applicable calibration coefficients for cal type	CALIBRATION (Ch 5)
IFD	Enter final data for active channel parameter	CALIBRATION (Ch 5)
ISF	Exclude isolation	CALIBRATION (Ch 5)
ISN	Include isolation	CALIBRATION (Ch 5)
KEC	Keep existing calibration data	CALIBRATION (Ch 5)
LCM	Select LRL calibration method	CALIBRATION (Ch 5)
LL1	Enter length of line 1 for LRL calibration	CALIBRATION (Ch 5)
LL2	Enter length of line 2 for LRL calibration	CALIBRATION (Ch 5)
LL3	Enter length of line 3 for LRL calibration	CALIBRATION (Ch 5)
LLZ	Enter line impedance for LRL calibration	CALIBRATION (Ch 5)
LM2	Select a match for the second device during a LRM type calibration	CALIBRATION (Ch 5)
LM3	Select a match for the third device during a LRM type calibration	CALIBRATION (Ch 5)
LMZ	Enter match impedance for LRM calibration	CALIBRATION (Ch 5)
LMZ?	Output match impedance for LRM calibration	CALIBRATION (Ch 5)
LMZL	Enter match inductance for LRM calibration	CALIBRATION (Ch 5)
LMZL?	Output match inductance for LRM calibration	CALIBRATION (Ch 5)

Command	Description	Group
LTU	Select microstrip transmission line for calibration	CALIBRATION (Ch 5)
LTW	Select waveguide transmission line for calibration	CALIBRATION (Ch 5)
LTX?	Output line type	CALIBRATION (Ch 5)
MAT	Select matched reflective devices during cal	CALIBRATION (Ch 5)
MIX	Select mixed reflective devices during calibration	CALIBRATION (Ch 5)
NCS	Go to next calibration step	CALIBRATION (Ch 5)
NOC	Select normal calibration data points	CALIBRATION (Ch 5)
O3CM	Select Triple Offset Short calibration method	CALIBRATION (Ch 5)
OCM	Select offset short calibration method	CALIBRATION (Ch 5)
ONCT	Output number of cal terms for current calibration	CALIBRATION (Ch 5)
P1C	Select port 1 for connector specification	CALIBRATION (Ch 5)
P1C?	Output port 1 connector type	CALIBRATION (Ch 5)
P1P?	Output approximate power level at port 1	CALIBRATION (Ch 5)
P2C	Select port 2 for connector specification	CALIBRATION (Ch 5)
P2C?	Output port 2 connector type	CALIBRATION (Ch 5)
PSP	Enter number of power sweeps for flat power correction (obsolete)	CALIBRATION (Ch 5)
PSP?	Output number of power sweeps for flat power correction (obsolete)	CALIBRATION (Ch 5)
PTS	Enter number of points to be skipped during flat power correction	CALIBRATION (Ch 5)
PTS?	Output number of points to be skipped during flat power correction	CALIBRATION (Ch 5)
TC1	Take calibration data for port 1	CALIBRATION (Ch 5)
TC2	Take calibration data for port 2	CALIBRATION (Ch 5)
TCD	Take calibration data on one or both ports as necessary	CALIBRATION (Ch 5)
TCM	Select the TRM calibration method	CALIBRATION (Ch 5)
TDC	Select time domain harmonic frequency calibration data points	CALIBRATION (Ch 5)
RGZ	Select reflective device greater than Z0	CALIBRATION (Ch 5)
RLZ	Select reflective device less than Z0	CALIBRATION (Ch 5)
RM1	Select reference plane at line 1 midpoint	CALIBRATION (Ch 5)
ROL	Enter reflective device offset length	CALIBRATION (Ch 5)
RPC	Repeat previous calibration	CALIBRATION (Ch 5)
RRP	Select reference plane at reflection plane	CALIBRATION (Ch 5)
SBD	Enter substrate dielectric for microstrip calibration	CALIBRATION (Ch 5)

Command	Description	Group
SBT	Enter substrate thickness for microstrip calibration	CALIBRATION (Ch 5)
SCM	Select standard calibration method	CALIBRATION (Ch 5)
SFC	Perform flat test port calibration	CALIBRATION (Ch 5)
SH1	Set offset short 1 or 2 offset length for offset short calibration	CALIBRATION (Ch 5)
SH2	Set offset short 1 or 2 offset length for offset short calibration	CALIBRATION (Ch 5)
SLD	Select sliding load for calibration	CALIBRATION (Ch 5)
TLZ	Enter through line impedance for calibration	CALIBRATION (Ch 5)
TOL	Enter through offset length for calibration	CALIBRATION (Ch 5)
U10	Select 10 mil UTF calibration kit	CALIBRATION (Ch 5)
U15	Select 15 mil UTF calibration kit	CALIBRATION (Ch 5)
U25	Select 25 mil UTF calibration kit	CALIBRATION (Ch 5)
USE	Enter effective dielectric for microstrip calibration	CALIBRATION (Ch 5)
USW	Enter microstrip width for microstrip calibration	CALIBRATION (Ch 5)
USZ	Enter microstrip impedance for microstrip calibration	CALIBRATION (Ch 5)
WCO	Enter waveguide cutoff frequency for user defined kit	CALIBRATION (Ch 5)
WKD	Select user defined waveguide calibration kit	CALIBRATION (Ch 5)
WKI	Select installed waveguide calibration kit	CALIBRATION (Ch 5)
WSH1	Enter waveguide short offset 1 for user defined kit	CALIBRATION (Ch 5)
WSH2	Enter waveguide short offset 2 for user defined kit	CALIBRATION (Ch 5)
WSH3	Enter waveguide short 3 offset for user defined kit	CALIBRATION (Ch 5)
CH1	Make channel 1 the active channel	CHANNELS (Ch 4)
CH2	Make channel 2 the active channel	CHANNELS (Ch 4)
CH3	Make channel 3 the active channel	CHANNELS (Ch 4)
CH4	Make channel 4 the active channel	CHANNELS (Ch 4)
CHX?	Output active channel number	CHANNELS (Ch 4)
D13	Display channels 1 & 3	CHANNELS (Ch 4)
D14	Display all four channels	CHANNELS (Ch 4)
D24	Select dual channel display with channels 2 & 4	CHANNELS (Ch 4)
DSP	Select single channel display	CHANNELS (Ch 4)
DSP?	Output channel display mode	CHANNELS (Ch 4)
T24	Select overlaid channel 2 and 4 display	CHANNELS (Ch 4)

Command	Description	Group
T13	Select overlaid channel 1 and 3 display	CHANNELS (Ch 4)
DEG	Suffix sets phase data type	DATA ENTRY SUFFIXES (Ch 4)
CM	Suffix sets distance data type and scales by 1E-2	DATA ENTRY SUFFIXES (Ch 4)
CMT	Suffix sets distance data type and scales by 1E-2	DATA ENTRY SUFFIXES (Ch 4)
DB	Suffix sets power data type	DATA ENTRY SUFFIXES (Ch 4)
DBL	Suffix sets power data type	DATA ENTRY SUFFIXES (Ch 4)
DBM	Suffix sets power data type	DATA ENTRY SUFFIXES (Ch 4)
GHZ	Suffix sets frequency data type and scales by 1E9	DATA ENTRY SUFFIXES (Ch 4)
HZ	Suffix sets frequency data type	DATA ENTRY SUFFIXES (Ch 4)
IMU	Suffix sets imaginary data type	DATA ENTRY SUFFIXES (Ch 4)
KHZ	Suffix sets frequency data type and scales by 1E3	DATA ENTRY SUFFIXES (Ch 4)
M	Suffix sets distance data type	DATA ENTRY SUFFIXES (Ch 4)
MHZ	Suffix sets frequency data type and scales by 1E6	DATA ENTRY SUFFIXES (Ch 4)
MM	Suffix sets distance data type and scales by 1E-3	DATA ENTRY SUFFIXES (Ch 4)
MMT	Suffix sets distance data type and scales by 1E-3	DATA ENTRY SUFFIXES (Ch 4)
MS	Suffix sets time data type and scales by 1E-3	DATA ENTRY SUFFIXES (Ch 4)
MTR	Suffix sets distance data type	DATA ENTRY SUFFIXES (Ch 4)
MV	Suffix sets voltage data type and scales by 1E-3	DATA ENTRY SUFFIXES (Ch 4)
NS	Suffix sets time data type and scales by 1E-9	DATA ENTRY SUFFIXES (Ch 4)
NSC	Suffix sets time data type and scales by 1E-9	DATA ENTRY SUFFIXES (Ch 4)
OHM	Suffix sets impedance data type	DATA ENTRY SUFFIXES (Ch 4)
PS	Suffix sets time data type and scales by 1E02	DATA ENTRY SUFFIXES (Ch 4)
PSC	Suffix sets time data type and scales by 1E02	DATA ENTRY SUFFIXES (Ch 4)
RAD	Suffix sets phase data type and scales by 180/pi	DATA ENTRY SUFFIXES (Ch 4)
REU	Suffix sets real data type	DATA ENTRY SUFFIXES (Ch 4)
S	Suffix sets time data type	DATA ENTRY SUFFIXES (Ch 4)
US	Suffix sets time data type and scales by 1E-6	DATA ENTRY SUFFIXES (Ch 4)
USC	Suffix sets time data type and scales by 1E-6	DATA ENTRY SUFFIXES (Ch 4)

Command	Description	Group
V	Suffix sets voltage data type	DATA ENTRY SUFFIXES (Ch 4)
VLT	Suffix sets voltage data type	DATA ENTRY SUFFIXES (Ch 4)
XM3	Suffix sets unitless data type and scales by 1E-3	DATA ENTRY SUFFIXES (Ch 4)
XX1	Suffix sets unitless data type	DATA ENTRY SUFFIXES (Ch 4)
XX3	Suffix sets unitless data type and scales by 1E3	DATA ENTRY SUFFIXES (Ch 4)
LSB	Select least significant byte first binary transfer	DATA TRANSFER (Ch 7)
DPR0	Visible data only OFD format	DATA TRANSFER (Ch 7)
DPR1	Data pair always OFD format	DATA TRANSFER (Ch 7)
FDE0	Disable Output Data End Message	DATA TRANSFER (Ch 7)
FDE1	Enable Output Data End Message	DATA TRANSFER (Ch 7)
FDEX?	Output Output Data End Message enable/disable status	DATA TRANSFER (Ch 7)
FMA	Select ASCII data transfer format	DATA TRANSFER (Ch 7)
FMB	Select IEEE754 64 bit data transfer format	DATA TRANSFER (Ch 7)
FMC	Select IEEE754 32 bit data transfer format	DATA TRANSFER (Ch 7)
FMX?	Output data output mode FMA FMB or FMC	DATA TRANSFER (Ch 7)
IC1	Enter calibration coefficient 1	DATA TRANSFER (Ch 7)
IC10	Enter calibration coefficient 10	DATA TRANSFER (Ch 7)
IC11	Enter calibration coefficient 11	DATA TRANSFER (Ch 7)
IC12	Enter calibration coefficient 12	DATA TRANSFER (Ch 7)
IFPC	Enter flat power coefficients	DATA TRANSFER (Ch 7)
MSB	Select most significant byte first binary transfer	DATA TRANSFER (Ch 7)
O4FD	Output final data for all 4 channels to the GPIB	DATA TRANSFER (Ch 7)
O4SC	Output corrected data for all four S-parameters	DATA TRANSFER (Ch 7)
O4SR	Output raw data for all four S-parameters	DATA TRANSFER (Ch 7)
OAM1	Output channel 1 active marker value	DATA TRANSFER (Ch 7)
OAM2	Output channel 2 active marker value	DATA TRANSFER (Ch 7)
OAM3	Output channel 3 active marker value	DATA TRANSFER (Ch 7)
OAM4	Output channel 4 active marker value	DATA TRANSFER (Ch 7)
OC1	Output calibration coefficients 1	DATA TRANSFER (Ch 7)
OC10	Output calibration coefficients 10	DATA TRANSFER (Ch 7)
OC11	Output calibration coefficients 11	DATA TRANSFER (Ch 7)
OC12	Output calibration coefficients 12	DATA TRANSFER (Ch 7)
OC2	Output calibration coefficients 2	DATA TRANSFER (Ch 7)
OC3	Output calibration coefficients 3	DATA TRANSFER (Ch 7)

Command	Description	Group
OC4	Output calibration coefficients 4	DATA TRANSFER (Ch 7)
OC5	Output calibration coefficients 5	DATA TRANSFER (Ch 7)
OC6	Output calibration coefficients 6	DATA TRANSFER (Ch 7)
OC7	Output calibration coefficients 7	DATA TRANSFER (Ch 7)
OC8	Output calibration coefficients 8	DATA TRANSFER (Ch 7)
OC9	Output calibration coefficients 9	DATA TRANSFER (Ch 7)
OCA	Output calibration coefficient A	DATA TRANSFER (Ch 7)
OCB	Output calibration coefficient B	DATA TRANSFER (Ch 7)
OCC	Output calibration coefficient C	DATA TRANSFER (Ch 7)
OCD	Output corrected data for active channel parameter	DATA TRANSFER (Ch 7)
OCF	Output front panel setup and calibration data	DATA TRANSFER (Ch 7)
OCL	Output all applicable calibration coefficients for cal type	DATA TRANSFER (Ch 7)
ODR	Output directory listing of the floppy drive	DATA TRANSFER (Ch 7)
ODRH	Output directory listing of the hard drive	DATA TRANSFER (Ch 7)
ODV	Output distance values for time domain	DATA TRANSFER (Ch 7)
OEL	Output error list	DATA TRANSFER (Ch 7)
OFD	Output final data for active channel parameter	DATA TRANSFER (Ch 7)
OFD1	Output final data for channel 1 parameter	DATA TRANSFER (Ch 7)
OFD2	Output final data for channel 2 parameter	DATA TRANSFER (Ch 7)
OFD3	Output final data for channel 3 parameter	DATA TRANSFER (Ch 7)
OFD4	Output final data for channel 4 parameter	DATA TRANSFER (Ch 7)
OFP	Output current front panel setup	DATA TRANSFER (Ch 7)
OFPC	Output flat power coefficients	DATA TRANSFER (Ch 7)
OFV	Output frequency values	DATA TRANSFER (Ch 7)
OGE	Output extended description of current GPIB error	DATA TRANSFER (Ch 7)
OGL	Output extended description of previous GPIB error	DATA TRANSFER (Ch 7)
OID	Output instrument identification string	DATA TRANSFER (Ch 7)
OLM	Output limits status byte mask	DATA TRANSFER (Ch 7)
OM1	Output marker 1 value	DATA TRANSFER (Ch 7)
OM2	Output marker 2 value	DATA TRANSFER (Ch 7)
OM3	Output marker 3 value	DATA TRANSFER (Ch 7)
OM4	Output marker 4 value	DATA TRANSFER (Ch 7)
OM5	Output marker 5 value	DATA TRANSFER (Ch 7)
OM6	Output marker 6 value	DATA TRANSFER (Ch 7)

Command	Description	Group
ONCP	Output number of points for current calibration	DATA TRANSFER (Ch 7)
OND	Output Normalization data	DATA TRANSFER (Ch 7)
ONE	Output number of lines in the error list	DATA TRANSFER (Ch 7)
ORD	Output raw data for active channel parameter	DATA TRANSFER (Ch 7)
OS1	Output front panel setup number 1	DATA TRANSFER (Ch 7)
OS10	Output front panel setup number 10	DATA TRANSFER (Ch 7)
OS2	Output front panel setup number 2	DATA TRANSFER (Ch 7)
OS3	Output front panel setup number 3	DATA TRANSFER (Ch 7)
OS4	Output front panel setup number 4	DATA TRANSFER (Ch 7)
OS5	Output front panel setup number 5	DATA TRANSFER (Ch 7)
OS6	Output front panel setup number 6	DATA TRANSFER (Ch 7)
OS7	Output front panel setup number 7	DATA TRANSFER (Ch 7)
OS8	Output front panel setup number 8	DATA TRANSFER (Ch 7)
OS9	Output front panel setup number 9	DATA TRANSFER (Ch 7)
OSL	Output service log	DATA TRANSFER (Ch 7)
XSB?	Output byte order for output data LSB or MSB	DATA TRANSFER (Ch 7)
ALC	Perform ALC loop internal calibration	DIAGNOSTICS (Ch 8)
DBP	Select distance bandpass mode for active channel	DIAGNOSTICS (Ch 8)
DCA	Select automatic DC term calculation for lowpass	DIAGNOSTICS (Ch 8)
DCO	Select open for DC term for lowpass	DIAGNOSTICS (Ch 8)
DLP	Select distance lowpass mode for active channel	DIAGNOSTICS (Ch 8)
DRL	Diagnostic read latch	DIAGNOSTICS (Ch 8)
DVM	Enter DVM channel number	DIAGNOSTICS (Ch 8)
DWL	Diagnostic write latch	DIAGNOSTICS (Ch 8)
EDG	End diagnostics mode	DIAGNOSTICS (Ch 8)
EXD	Display external A/D input	DIAGNOSTICS (Ch 8)
FLC	Source frequency linearity internal calibration	DIAGNOSTICS (Ch 8)
FPX?	Output flat power correction on/off status	DIAGNOSTICS (Ch 8)
IFB	Select 1st IF bandpass testing	DIAGNOSTICS (Ch 8)
L1C	Perform LO1 internal calibration	DIAGNOSTICS (Ch 8)
L2C	Perform LO2 internal calibration	DIAGNOSTICS (Ch 8)
LKS0	Disable lock search mode	DIAGNOSTICS (Ch 8)
LKS1	Enable lock search mode	DIAGNOSTICS (Ch 8)
LO11	Select LO1 phase lock voltage testing	DIAGNOSTICS (Ch 8)

Command	Description	Group
LO12	Select LO1 D/A voltage testing	DIAGNOSTICS (Ch 8)
LO21	Select LO2 main phase lock voltage testing	DIAGNOSTICS (Ch 8)
LO22	Select LO2 offset phase lock voltage testing	DIAGNOSTICS (Ch 8)
LO23	Select LO2 DDS phase lock voltage testing	DIAGNOSTICS (Ch 8)
LO24	Select LO2 main D/A voltage testing	DIAGNOSTICS (Ch 8)
LO25	Select LO2 offset D/A voltage testing	DIAGNOSTICS (Ch 8)
NRD	Display non-ratioed parameters on 4 channels	DIAGNOSTICS (Ch 8)
P2ALC	Perform Port 2 ALC loop internal calibration	DIAGNOSTICS (Ch 8)
PSL	Print the service log	DIAGNOSTICS (Ch 8)
SDG	Start diagnostics mode	DIAGNOSTICS (Ch 8)
SDR	Select standard receiver mode	DIAGNOSTICS (Ch 8)
SLT	Perform SLT internal calibration	DIAGNOSTICS (Ch 8)
SRC1	Select source linearity voltage testing	DIAGNOSTICS (Ch 8)
ADRIVE	Select the floppy drive as the default drive	DISK FUNCTION (Ch 8)
DEL	Delete a file from disk	DISK FUNCTION (Ch 8)
CD	Change default directory	DISK FUNCTION (Ch 8)
CDRIVE	Select the hard disk as the default drive	DISK FUNCTION (Ch 8)
COPY	Copy a files contents to another file	DISK FUNCTION (Ch 8)
CWD?	Output current working directory string	DISK FUNCTION (Ch 8)
DIR	Output a directory listing to the GPIB	DISK FUNCTION (Ch 8)
DISKRD	Output disk file data to the GPIB	DISK FUNCTION (Ch 8)
DISKWR	Write GPIB data to a disk file	DISK FUNCTION (Ch 8)
EXISTD?	Output directory existence information	DISK FUNCTION (Ch 8)
EXISTF?	Output file existence information	DISK FUNCTION (Ch 8)
INT	Initialize (format) floppy disk	DISK FUNCTION (Ch 8)
LDARF	Load adapter removal files from disk and calibrate	DISK FUNCTION (Ch 8)
LKT	Load calibration kit information from floppy disk	DISK FUNCTION (Ch 8)
MD	Create a new disk directory	DISK FUNCTION (Ch 8)
PDR	Print directory listing of the floppy drive	DISK FUNCTION (Ch 8)
PDRH	Print directory listing of the hard drive	DISK FUNCTION (Ch 8)
PGT	Plot graticule	DISK FUNCTION (Ch 8)
RD	Remove a disk directory	DISK FUNCTION (Ch 8)
RECALL	Recall a data file from disk to a task	DISK FUNCTION (Ch 8)
SAVE	Save a data file to disk	DISK FUNCTION (Ch 8)
SAVEGC	Save text format gain compression data to disk	DISK FUNCTION (Ch 8)

Command	Description	Group
ADD	Select addition as trace math for active channel	DISPLAY (Ch 4)
APR	Enter group delay aperture setting on active channel	DISPLAY (Ch 4)
APR?	Output group delay aperture setting on active channel	DISPLAY (Ch 4)
ASC	Autoscale the active channel display	DISPLAY (Ch 4)
ASP	Enter polar stop sweep position angle	DISPLAY (Ch 4)
ASP?	Output polar stop sweep position angle	DISPLAY (Ch 4)
AST	Enter polar start sweep position angle	DISPLAY (Ch 4)
AST?	Output polar start sweep position angle	DISPLAY (Ch 4)
LPH	Select linear magnitude and phase display for active channel	DISPLAY (Ch 4)
DAT	Display data only on active channel	DISPLAY (Ch 4)
DAT?	Output trace memory display mode	DISPLAY (Ch 4)
DIA	Select air as active dielectric	DISPLAY (Ch 4)
DIE	Enter a dielectric value	DISPLAY (Ch 4)
DIM	Select microporous teflon as active dielectric	DISPLAY (Ch 4)
DIP	Select polyethylene as active dielectric	DISPLAY (Ch 4)
DIT	Select Teflon as active dielectric	DISPLAY (Ch 4)
DIV	Select division as trace math for active channel	DISPLAY (Ch 4)
DIX?	Output dielectric constant	DISPLAY (Ch 4)
DLA	Select group delay display for active channel	DISPLAY (Ch 4)
DNM	Display data normalized to trace memory on active channel	DISPLAY (Ch 4)
DTM	Display measurement data and trace memory on active channel	DISPLAY (Ch 4)
GRF?	Output graph type for active channel	DISPLAY (Ch 4)
IMG	Select imaginary display for active channel	DISPLAY (Ch 4)
ISC	Enter scale and select inverted compressed Smith Chart display	DISPLAY (Ch 4)
ISE	Enter scale and select inverted expanded Smith Chart display	DISPLAY (Ch 4)
ISM	Select normal inverted Smith Chart for active channel	DISPLAY (Ch 4)
LIN	Select linear magnitude display for active channel	DISPLAY (Ch 4)
MAG	Select log magnitude display for active channel	DISPLAY (Ch 4)
MEM	Display trace memory on active channel	DISPLAY (Ch 4)

Command	Description	Group
MIN	Select subtraction as trace math for active channel	DISPLAY (Ch 4)
MOSET	Enter constant offset log magnitude for active channel	DISPLAY (Ch 4)
MOSET?	Output constant offset log magnitude for active channel	DISPLAY (Ch 4)
MPH	Select log magnitude and phase display for active channel	DISPLAY (Ch 4)
MTH?	Output trace math math type	DISPLAY (Ch 4)
MUL	Select multiplication as trace math for active channel	DISPLAY (Ch 4)
OFF	Enter offset value for top graph of active channel	DISPLAY (Ch 4)
OFF?	Output offset value for top graph of active channel	DISPLAY (Ch 4)
OFF2	Enter offset value for bottom graph of active channel	DISPLAY (Ch 4)
OFF2?	Output offset value for bottom graph of active channel	DISPLAY (Ch 4)
PCP	Select measurement phase polar chart mode	DISPLAY (Ch 4)
PCS	Select sweep position polar chart mode	DISPLAY (Ch 4)
PCX?	Output polar chart mode	DISPLAY (Ch 4)
PHA	Select phase display for active channel	DISPLAY (Ch 4)
PHO	Enter phase offset for display channel	DISPLAY (Ch 4)
PHO?	Output phase offset for display channel	DISPLAY (Ch 4)
PLG	Select log polar display for active channel	DISPLAY (Ch 4)
PLR	Select linear polar display for active channel	DISPLAY (Ch 4)
POSET	Enter constant offset phase for active channel	DISPLAY (Ch 4)
POSET?	Output constant offset phase for active channel	DISPLAY (Ch 4)
POW	Select power out display for active channel	DISPLAY (Ch 4)
RDA	Select automatic reference delay calculation	DISPLAY (Ch 4)
RDD	Enter reference delay in distance for active channel	DISPLAY (Ch 4)
RDD?	Output reference delay in distance for active channel	DISPLAY (Ch 4)
RDT	Enter reference delay in time for active channel	DISPLAY (Ch 4)
RDT?	Output reference delay in time for active channel	DISPLAY (Ch 4)
REF	Enter reference line for top graph of active channel	DISPLAY (Ch 4)

Command	Description	Group
REF?	Output reference line for top graph of active channel	DISPLAY (Ch 4)
REF2	Enter reference line for bottom graph of active channel	DISPLAY (Ch 4)
REF2?	Output reference line for bottom graph of active channel	DISPLAY (Ch 4)
REL	Select real display for active channel	DISPLAY (Ch 4)
RIM	Select real and imaginary display for active channel	DISPLAY (Ch 4)
SCL	Enter Scale Resolution for top graph of active channel	DISPLAY (Ch 4)
SCL?	Output Scale Resolution for top graph of active channel	DISPLAY (Ch 4)
SCL2	Enter Scale Resolution for bottom graph of active channel	DISPLAY (Ch 4)
SCL2?	Output Scale Resolution for bottom graph of active channel	DISPLAY (Ch 4)
SETUP	Display setup menu	DISPLAY (Ch 4)
SMC	Enter scale and select compressed Smith Chart display	DISPLAY (Ch 4)
SME	Enter scale and select expanded Smith Chart display	DISPLAY (Ch 4)
SMI	Select normal Smith Chart for active channel	DISPLAY (Ch 4)
STD	Store trace to memory on active channel	DISPLAY (Ch 4)
SWR	Select SWR display for active channel	DISPLAY (Ch 4)
EDED	Select De-embedding as embedding/de-embedding method	EMBED/DE-EMBED (Ch 9)
EDEE	Select Embedding as embedding/de-embedding method	EMBED/DE-EMBED (Ch 9)
EDEED?	Output embedding/de-embedding method selection	EMBED/DE-EMBED (Ch 9)
EDENORM	Normal port orientation of embedding/de-embedding network	EMBED/DE-EMBED (Ch 9)
EDEPORT?	Output port receiving the embedding/de-embedding network	EMBED/DE-EMBED (Ch 9)
EDEPORT1	Apply the embedding/de-embedding network to Port 1	EMBED/DE-EMBED (Ch 9)
EDEPORT2	Apply the embedding/de-embedding network to Port 2	EMBED/DE-EMBED (Ch 9)
EDESWAP	Swap port orientation of embedding/de-embedding network	EMBED/DE-EMBED (Ch 9)
EDESWAP?	Output port orientation of embedding/de-embedding network swapped/normal	EMBED/DE-EMBED (Ch 9)

Command	Description	Group
IEDEF	Enter embedding/de-embedding files from GPIB and embed/de-embed	EMBED/DE-EMBED (Ch 9)
LDEDEF	Load Embedding/De-embedding files from disk and embed/de-embed	EMBED/DE-EMBED (Ch 9)
AOF	Turn averaging off	ENHANCEMENT (Ch 4)
AOF?	Output averaging on/off status	ENHANCEMENT (Ch 4)
AON	Turn averaging on	ENHANCEMENT (Ch 4)
AVG	Enter averaging count and turn on	ENHANCEMENT (Ch 4)
AVG?	Output averaging count	ENHANCEMENT (Ch 4)
AVGCNT?	Output the current sweep-by-sweep average sweep count	ENHANCEMENT (Ch 4)
IF1	Select 10 Hz IF bandwidth	ENHANCEMENT (Ch 4)
IF2	Select 100 Hz IF bandwidth	ENHANCEMENT (Ch 4)
IF3	Select 1 KHz IF bandwidth	ENHANCEMENT (Ch 4)
IF4	Select 10 KHz IF bandwidth	ENHANCEMENT (Ch 4)
IFA	Select 30 KHz IF bandwidth	ENHANCEMENT (Ch 4)
IFM	Select 10 Hz IF bandwidth	ENHANCEMENT (Ch 4)
IFN	Select 1 KHz IF bandwidth	ENHANCEMENT (Ch 4)
IFR	Select 100 Hz IF bandwidth	ENHANCEMENT (Ch 4)
IFX?	Output IF bandwidth	ENHANCEMENT (Ch 4)
MEASDLY	Set Measurement Delay time	ENHANCEMENT (Ch 4)
MEASDLY?	Output Measurement Delay time	ENHANCEMENT (Ch 4)
MEASDLY0	Disable Measurement Delay	ENHANCEMENT (Ch 4)
MEASDLY1	Enable Measurement Delay	ENHANCEMENT (Ch 4)
MEASDLYX?	Output Measurement Delay on/off status	ENHANCEMENT (Ch 4)
PTAVG	Set averaging type to point-by-point averaging	ENHANCEMENT (Ch 4)
RSTAVG	Reset the sweep-by-sweep averaging sweep count	ENHANCEMENT (Ch 4)
SOF	Turn off smoothing	ENHANCEMENT (Ch 4)
SOF?	Output smoothing on/off status	ENHANCEMENT (Ch 4)
SON	Enter smoothing value and turn on	ENHANCEMENT (Ch 4)
SON?	Output smoothing value	ENHANCEMENT (Ch 4)
SPLN	Select normal source lock polarity	ENHANCEMENT (Ch 4)
SPLR	Select reverse source lock polarity	ENHANCEMENT (Ch 4)
SPLX?	Output source lock polarity normal/reverse status	ENHANCEMENT (Ch 4)
SPR0	Turn spur reduction off	ENHANCEMENT (Ch 4)
SPR1	Turn spur reduction on	ENHANCEMENT (Ch 4)
SPRX?	Output spur reduction on/off status	ENHANCEMENT (Ch 4)

Command	Description	Group
SWAVG	Set averaging type to sweep-by-sweep averaging	ENHANCEMENT (Ch 4)
SWAVG?	Output averaging type (sweep-by-sweep or point-by-point)	ENHANCEMENT (Ch 4)
FCW0	Turn fast CW measurement mode off	FAST CW (Ch 7)
FCW1	Turn fast CW measurement mode on	FAST CW (Ch 7)
FCW2	Turn Fast CW mode 2 on	FAST CW (Ch 7)
FCWX?	Output fast CW measurement mode on/off status	FAST CW (Ch 7)
CALR	Perform receiver cal for gain compression testing	GAIN COMPRESSION (Ch 9)
DSPS21	Select Gain Compression bottom graph displays S21	GAIN COMPRESSION (Ch 9)
DSPS21?	Output Gain Compression bottom graph selection Normalized/S2	GAIN COMPRESSION (Ch 9)
GCMP	Enter gain compression point search value	GAIN COMPRESSION (Ch 9)
GCMP?	Output gain compression point search value	GAIN COMPRESSION (Ch 9)
IPSC	Enter power sweep linearity calibration coefficients	GAIN COMPRESSION (Ch 9)
MFGCT	Start multiple frequency swept power gain compression test	GAIN COMPRESSION (Ch 9)
NOFST	Enter nominal offset value for external gain	GAIN COMPRESSION (Ch 9)
NOFST?	Output nominal offset value for external gain	GAIN COMPRESSION (Ch 9)
NRMS	Normalize S21 for gain compression testing	GAIN COMPRESSION (Ch 9)
NRMS21	Select Gain Compression bottom graph displays Normalized S21	GAIN COMPRESSION (Ch 9)
OPSC	Output power sweep linearity calibration coefficients	GAIN COMPRESSION (Ch 9)
PSCNFRQ?	Output the power sweep linearity cal number of frequency poi	GAIN COMPRESSION (Ch 9)
PSCNPWR?	Output the power sweep linearity cal number of power points	GAIN COMPRESSION (Ch 9)
PSCSTEP?	Output the power sweep linearity cal power step size	GAIN COMPRESSION (Ch 9)
PSPWR	Enter power sweep off power level	GAIN COMPRESSION (Ch 9)
PSPWR?	Output power sweep off power level	GAIN COMPRESSION (Ch 9)
PSTEP	Enter power sweep step size	GAIN COMPRESSION (Ch 9)
PSTEP?	Output power sweep step size	GAIN COMPRESSION (Ch 9)
PSTOP	Enter power sweep stop power	GAIN COMPRESSION (Ch 9)
PSTOP?	Output power sweep stop power	GAIN COMPRESSION (Ch 9)
PSTRT	Enter power sweep start power	GAIN COMPRESSION (Ch 9)
PSTRT?	Output power sweep start power	GAIN COMPRESSION (Ch 9)
PSWC	Perform power sweep linearity calibration	GAIN COMPRESSION (Ch 9)

Command	Description	Group
PSWC0	Turn power sweep linearity calibration off	GAIN COMPRESSION (Ch 9)
PSWC1	Turn power sweep linearity calibration on	GAIN COMPRESSION (Ch 9)
PSWCX?	Output power sweep linearity calibration on/off status	GAIN COMPRESSION (Ch 9)
PSWP0	Turn power sweep off	GAIN COMPRESSION (Ch 9)
PSWP1	Turn power sweep on	GAIN COMPRESSION (Ch 9)
PSWPX?	Output power sweep on/off status	GAIN COMPRESSION (Ch 9)
RSTGC	Reset gain compression parameters to default	GAIN COMPRESSION (Ch 9)
SFGCA	Select swept frequency gain compression application	GAIN COMPRESSION (Ch 9)
SFGCT	Start swept frequency gain compression test	GAIN COMPRESSION (Ch 9)
SPAMPMT	Start swept power gain compression AM/PM test	GAIN COMPRESSION (Ch 9)
SPGCA	Select swept power gain compression application	GAIN COMPRESSION (Ch 9)
SPGCT	Start swept power gain compression test	GAIN COMPRESSION (Ch 9)
UNDOGC	Exit gain compression and undo changes	GAIN COMPRESSION (Ch 9)
BMPB	Select Black on White as bitmap type	HARD COPY (Ch 8)
BMPC	Select Color on White as bitmap type	HARD COPY (Ch 8)
BMPT	Select true color as bitmap type	HARD COPY (Ch 8)
DPN	Enter pen number for data	HARD COPY (Ch 8)
DPN?	Output pen number for data	HARD COPY (Ch 8)
FFD	Send form feed to printer and stop print/plot	HARD COPY (Ch 8)
GPN	Enter pen number for graticule	HARD COPY (Ch 8)
GPN?	Output pen number for graticule	HARD COPY (Ch 8)
HD0	Turn off tabular data headers and page formatting	HARD COPY (Ch 8)
HD1	Turn on tabular data headers and page formatting	HARD COPY (Ch 8)
HIST0	Turns off GPIB history writing to disk	HARD COPY (Ch 8)
HIST1	Turns on GPIB history writing to disk	HARD COPY (Ch 8)
HISTX?	Outputs the history writes to hard disk enable/disable status	HARD COPY (Ch 8)
HPN	Enter pen number for header	HARD COPY (Ch 8)
HPN?	Output pen number for header	HARD COPY (Ch 8)
LAND	Select landscape mode for output plot	HARD COPY (Ch 8)
LDT0	Disable printing date/time	HARD COPY (Ch 8)
LDT1	Enable printing date/time	HARD COPY (Ch 8)
LMS	Enter string for DUT model/serial number	HARD COPY (Ch 8)
LMS?	Output string for DUT model/serial number	HARD COPY (Ch 8)

Command	Description	Group
LNM	Enter string for operator name	HARD COPY (Ch 8)
LNM?	Output string for operator name	HARD COPY (Ch 8)
LOC	Enter string for operator comment	HARD COPY (Ch 8)
LOC?	Output string for operator comment	HARD COPY (Ch 8)
LOGO?	Output hard copy logo selection standard/user defined	HARD COPY (Ch 8)
LOGO0	Turn hard copy logo off	HARD COPY (Ch 8)
LOGO1	Turn hard copy logo on	HARD COPY (Ch 8)
LOGOS	Select standard hard copy logo	HARD COPY (Ch 8)
LOGOU	Select user defined hard copy logo	HARD COPY (Ch 8)
LOGOX?	Output hard copy logo on/off status	HARD COPY (Ch 8)
MPN	Enter pen number for markers and limits	HARD COPY (Ch 8)
MPN?	Output pen number for markers and limits	HARD COPY (Ch 8)
OBMP	Output the display as a bitmap	HARD COPY (Ch 8)
ODAT	Output hard copy tabular data to GPIB	HARD COPY (Ch 8)
OGCTXT	Output text format gain compression data to GPIB	HARD COPY (Ch 8)
OHDR	Output hard copy header information to GPIB	HARD COPY (Ch 8)
OHGL	Output HPGL format data to GPIB	HARD COPY (Ch 8)
OS2P	Output S2P format data to GPIB	HARD COPY (Ch 8)
OTXT	Output text format data to GPIB	HARD COPY (Ch 8)
PBL	Select 1/4 size plot bottom left corner	HARD COPY (Ch 8)
PBR	Select 1/4 size plot bottom right corner	HARD COPY (Ch 8)
PFL	Select full-size plot	HARD COPY (Ch 8)
PFS	Print full screen image	HARD COPY (Ch 8)
PFSC	Configure for printing entire screen graphic image	HARD COPY (Ch 8)
PGR	Print graph area screen image	HARD COPY (Ch 8)
PGRC	Configure for printing data area graphic image	HARD COPY (Ch 8)
PGTC	Configure for plotting graticule	HARD COPY (Ch 8)
PLD	Plot data area only	HARD COPY (Ch 8)
PLDC	Configure for plotting data area	HARD COPY (Ch 8)
PLH	Plot header	HARD COPY (Ch 8)
PLHC	Configure for plotting header	HARD COPY (Ch 8)
PLM	Plot markers and limits	HARD COPY (Ch 8)
PLMC	Configure for plotting markers and limits	HARD COPY (Ch 8)
PLO?	Output plot mode portrait or landscape	HARD COPY (Ch 8)
PLS	Plot entire screen	HARD COPY (Ch 8)

Command	Description	Group
PLSC	Configure for plotting entire screen	HARD COPY (Ch 8)
PLT	Plot data traces only	HARD COPY (Ch 8)
PLTC	Configure for plotting data traces	HARD COPY (Ch 8)
PMK	Print tabular data for Markers	HARD COPY (Ch 8)
PMKC	Configure for printing tabular data for markers	HARD COPY (Ch 8)
PMN	Plot menu	HARD COPY (Ch 8)
PMNC	Configure for plotting menu	HARD COPY (Ch 8)
PMT	Print tabular data for traces and markers	HARD COPY (Ch 8)
PMTC	Configure for printing tabular data for traces and markers	HARD COPY (Ch 8)
PORT	Select portrait mode for output plot	HARD COPY (Ch 8)
PST	Stop print/plot	HARD COPY (Ch 8)
PT0	Set tabular printout points skipped to 0	HARD COPY (Ch 8)
PT1	Set tabular printout points skipped to 1	HARD COPY (Ch 8)
PT2	Set tabular printout points skipped to 2	HARD COPY (Ch 8)
PT3	Set tabular printout points skipped to 3	HARD COPY (Ch 8)
PT4	Set tabular printout points skipped to 4	HARD COPY (Ch 8)
PT5	Set tabular printout points skipped to 5	HARD COPY (Ch 8)
PT6	Set tabular printout points skipped to 6	HARD COPY (Ch 8)
PT7	Set tabular printout points skipped to 7	HARD COPY (Ch 8)
PT8	Set tabular printout points skipped to 8	HARD COPY (Ch 8)
PT9	Set tabular printout points skipped to 9	HARD COPY (Ch 8)
PTB	Print tabular data for Traces	HARD COPY (Ch 8)
PTBC	Configure for printing tabular data for traces	HARD COPY (Ch 8)
PTL	Select 1/4 size plot top left corner	HARD COPY (Ch 8)
PTR	Select 1/4 size plot top right corner	HARD COPY (Ch 8)
SPD	Enter pen speed percentage	HARD COPY (Ch 8)
TPN	Enter pen number for trace overlay data	HARD COPY (Ch 8)
TPN?	Output pen number for trace overlay data	HARD COPY (Ch 8)
*CLS	Clear status bytes and structures	IEEE 488.2 (Ch 7)
*DDT	Enter the 488.2 Define Device Trigger command string	IEEE 488.2 (Ch 7)
*DDT?	Output the 488.2 Define Device Trigger command string	IEEE 488.2 (Ch 7)
*ESE	Enter the 488.2 Standard Event Status Enable mask	IEEE 488.2 (Ch 7)
*ESE?	Output the 488.2 Standard Event Status Enable mask	IEEE 488.2 (Ch 7)
*ESR?	Output the 488.2 Standard Event Status Register value	IEEE 488.2 (Ch 7)

Command	Description	Group
*IDN?	Output the 488.2 instrument identification string	IEEE 488.2 (Ch 7)
*IST?	Output the value of the ist message	IEEE 488.2 (Ch 7)
*OPC	Initiate the 488.2 Operation Complete sequence	IEEE 488.2 (Ch 7)
*OPC?	Initiate the 488.2 Operation Complete Query sequence	IEEE 488.2 (Ch 7)
*PRE	Enter the 488.2 Parallel Poll Register Enable mask	IEEE 488.2 (Ch 7)
*PRE?	Output the 488.2 Parallel Poll Register Enable mask	IEEE 488.2 (Ch 7)
*RST	Instrument reset	IEEE 488.2 (Ch 7)
*SRE	Enter the 488.2 Service Request Enable mask	IEEE 488.2 (Ch 7)
*SRE?	Output the 488.2 Service Request Enable mask	IEEE 488.2 (Ch 7)
*STB?	Output the 488.2 Status Byte value	IEEE 488.2 (Ch 7)
*TRG	Initiate a Group Execute Trigger sequence	IEEE 488.2 (Ch 7)
*TST?	Perform self test and output status	IEEE 488.2 (Ch 7)
*WAI	Wait to continue	IEEE 488.2 (Ch 7)
OPB	Output the 488.2 Status Byte value (same as *STB?)	IEEE 488.2 (Ch 7)
TST	Perform self test and output status (same as *TST?)	IEEE 488.2 (Ch 7)
CCD	Collect corrected data in an internal buffer	INT. BUFFER DATA COLL. (Ch 7)
CFD	Collect final data in an internal buffer	INT. BUFFER DATA COLL. (Ch 7)
CRD	Collect raw data in an internal buffer	INT. BUFFER DATA COLL. (Ch 7)
CXD?	Output internal buffer data collection mode	INT. BUFFER DATA COLL. (Ch 7)
DCCTN	Resume internal buffer data collection	INT. BUFFER DATA COLL. (Ch 7)
DCCTN?	Output internal buffer data collection resume/suspend status	INT. BUFFER DATA COLL. (Ch 7)
DCHLD	Suspend internal buffer data collection	INT. BUFFER DATA COLL. (Ch 7)
DCMRK	Inserts the mark value into the internal buffer	INT. BUFFER DATA COLL. (Ch 7)
DCOFF	Turn internal buffer data collection mode off	INT. BUFFER DATA COLL. (Ch 7)
DCPCUR?	Outputs the current point count in the collect buffer	INT. BUFFER DATA COLL. (Ch 7)
DCPMAX?	Outputs the maximum number of points that can be collected in the collect buffer	INT. BUFFER DATA COLL. (Ch 7)
OCS	Output internal buffer collected data	INT. BUFFER DATA COLL. (Ch 7)
ATTN	Attach next segment and make the active segment	LIMITS (Ch 6)
LPF2?	Output limit test failure status on channel 2	LIMITS (Ch 6)
LPF3?	Output limit test failure status on channel 3	LIMITS (Ch 6)

Command	Description	Group
LPF4?	Output limit test failure status on channel 4	LIMITS (Ch 6)
LS1	Set lower segmented limit 100 as the active segment	LIMITS (Ch 6)
LS10	Select lower segmented limit 10 as the active segment	LIMITS (Ch 6)
LS2	Select lower segmented limit 2 as the active segment	LIMITS (Ch 6)
LS3	Select lower segmented limit 3 as the active segment	LIMITS (Ch 6)
LS4	Select lower segmented limit 4 as the active segment	LIMITS (Ch 6)
LS5	Select lower segmented limit 5 as the active segment	LIMITS (Ch 6)
LS6	Select lower segmented limit 6 as the active segment	LIMITS (Ch 6)
LS7	Select lower segmented limit 7 as the active segment	LIMITS (Ch 6)
LS8	Select lower segmented limit 8 as the active segment	LIMITS (Ch 6)
LS9	Select lower segmented limit 9 as the active segment	LIMITS (Ch 6)
LSEG	Select segmented limit line display mode	LIMITS (Ch 6)
LSNG	Select single limit line display mode	LIMITS (Ch 6)
LSX?	Output active segmented limit	LIMITS (Ch 6)
LT0	Turn limits testing off	LIMITS (Ch 6)
LT1	Turn limits testing on	LIMITS (Ch 6)
LT1?	Output limits testing enable status	LIMITS (Ch 6)
BEGN	Begin next segment and make it the active segment	LIMITS (Ch 6)
CAS	Clear active segmented limit vertical/horizontal definitions	LIMITS (Ch 6)
DIS	Display active segmented limit	LIMITS (Ch 6)
DIS?	Output active segmented limit on/off status	LIMITS (Ch 6)
HID	Hide active segmented limit	LIMITS (Ch 6)
LB0	Turn limits testing beep on failure off	LIMITS (Ch 6)
LB1	Turn limits testing beep on failure on	LIMITS (Ch 6)
LBX?	Output limits testing beeper enable status	LIMITS (Ch 6)
LFD	Enter limit frequency readout delta value	LIMITS (Ch 6)
LFD?	Output limit frequency readout delta value	LIMITS (Ch 6)
LFD2	Enter limit frequency readout delta value for bottom graph	LIMITS (Ch 6)
LFD2?	Output limit frequency readout delta value for bottom graph	LIMITS (Ch 6)

Command	Description	Group
LFP	Select limit frequency readout for phase displays	LIMITS (Ch 6)
LFR	Select limit frequency readout for active channel	LIMITS (Ch 6)
LLM?	Output limit line display mode single or segmented	LIMITS (Ch 6)
LLO	Enter lower limit value for top graph on active channel	LIMITS (Ch 6)
LLO?	Output lower limit value for top graph on active channel	LIMITS (Ch 6)
LLO2	Enter lower limit value for bottom graph on active channel	LIMITS (Ch 6)
LLO2?	Output lower limit value for bottom graph on active channel	LIMITS (Ch 6)
LOF	Limits display off	LIMITS (Ch 6)
LOL0	Turn lower limit off	LIMITS (Ch 6)
LOL1	Turn lower limit on at current value	LIMITS (Ch 6)
LOL20	Turn lower limit off for bottom graph	LIMITS (Ch 6)
LOL21	Turn lower limit on at current value for bottom graph	LIMITS (Ch 6)
LOL2X?	Output lower limit on/off status for bottom graph	LIMITS (Ch 6)
LOLX?	Output lower limit on/off status	LIMITS (Ch 6)
LON	Limits display on	LIMITS (Ch 6)
LON?	Output limits display on/off status	LIMITS (Ch 6)
LPF?	Output limit test failure status all channels	LIMITS (Ch 6)
LPF1?	Output limit test failure status on channel 1	LIMITS (Ch 6)
LTST	Display the limits testing menu	LIMITS (Ch 6)
LUP	Enter upper limit value for top graph on active channel	LIMITS (Ch 6)
LUP?	Output upper limit value for top graph on active channel	LIMITS (Ch 6)
LUP2	Enter upper limit value for bottom graph on active channel	LIMITS (Ch 6)
LUP2?	Output upper limit value for bottom graph on active channel	LIMITS (Ch 6)
LVH	Select high as limits testing TTL level	LIMITS (Ch 6)
LVL	Select low as limits testing TTL level	LIMITS (Ch 6)
LVX?	Output limits testing ttl level status	LIMITS (Ch 6)
SLC	Clear all segmented limits definitions	LIMITS (Ch 6)
SLH	Enter segmented limits horizontal offset	LIMITS (Ch 6)
SLH?	Output segmented limits horizontal offset	LIMITS (Ch 6)
SLL0	Turn lower segmented limits display off	LIMITS (Ch 6)

Command	Description	Group
SLL1	Turn lower segmented limits display on	LIMITS (Ch 6)
SLLX?	Output lower segmented limits display on/off status	LIMITS (Ch 6)
SLU0	Turn upper segmented limits display off	LIMITS (Ch 6)
SLU1	Turn upper segmented limits display on	LIMITS (Ch 6)
SLV	Enter segmented limits vertical offset	LIMITS (Ch 6)
SLV?	Output segmented limits vertical offset	LIMITS (Ch 6)
SPH	Enter active segmented limit horizontal stop position	LIMITS (Ch 6)
SPH?	Output active segmented limit horizontal stop position	LIMITS (Ch 6)
SPV	Enter active segmented limit vertical stop position	LIMITS (Ch 6)
SPV?	Output active segmented limit vertical stop position	LIMITS (Ch 6)
STH	Enter active segmented limit horizontal start position	LIMITS (Ch 6)
STH?	Output active segmented limit horizontal start position	LIMITS (Ch 6)
STV	Enter active segmented limit vertical start position	LIMITS (Ch 6)
STV?	Output active segmented limit vertical start position	LIMITS (Ch 6)
UPL0	Turn upper limit off	LIMITS (Ch 6)
UPL1	Turn upper limit on at current value	LIMITS (Ch 6)
UPL20	Turn upper limit off for bottom graph	LIMITS (Ch 6)
UPL21	Turn upper limit on at current value for bottom graph	LIMITS (Ch 6)
UPL2X?	Output upper limit on/off status for bottom graph	LIMITS (Ch 6)
UPLX?	Output upper limit on/off status	LIMITS (Ch 6)
US1	Select upper segmented limit 1 as the active segment	LIMITS (Ch 6)
US10	Select upper segmented limit 10 as the active segment	LIMITS (Ch 6)
US2	Select upper segmented limit 2 as the active segment	LIMITS (Ch 6)
US3	Select upper segmented limit 3 as the active segment	LIMITS (Ch 6)
US4	Select upper segmented limit 4 as the active segment	LIMITS (Ch 6)
US5	Select upper segmented limit 5 as the active segment	LIMITS (Ch 6)
US6	Select upper segmented limit 6 as the active segment	LIMITS (Ch 6)

Command	Description	Group
US7	Select upper segmented limit 7 as the active segment	LIMITS (Ch 6)
US8	Select upper segmented limit 8 as the active segment	LIMITS (Ch 6)
US9	Select upper segmented limit 9 as the active segment	LIMITS (Ch 6)
SLUX?	Output upper segmented limits display on/off status	LMITS (Ch 7)
AMKR	Select active marker on all channels marker mode	MARKERS (Ch 6)
BWL3	Set bandwidth loss value to 3 dB	MARKERS (Ch 6)
BWLS	Enter bandwidth loss value	MARKERS (Ch 6)
BWLS?	Output bandwidth loss value	MARKERS (Ch 6)
DR1	Select Marker 1 as Delta Reference Marker	MARKERS (Ch 6)
DR2	Select Marker 2 as Delta Reference Marker	MARKERS (Ch 6)
DR3	Select Marker 3 as Delta Reference Marker	MARKERS (Ch 6)
DR4	Select Marker 4 as Delta Reference Marker	MARKERS (Ch 6)
DR5	Select Marker 5 as Delta Reference Marker	MARKERS (Ch 6)
DR6	Select Marker 6 as Delta Reference Marker	MARKERS (Ch 6)
DRF	Turn delta reference mode on	MARKERS (Ch 6)
DRO	Turn delta reference mode off	MARKERS (Ch 6)
DRO?	Output delta reference mode on/off status	MARKERS (Ch 6)
DRX?	Output delta reference marker number	MARKERS (Ch 6)
DSF0	Disable filter shape factor calculation	MARKERS (Ch 6)
DSF1	Enable filter shape factor calculation	MARKERS (Ch 6)
DSFX?	Output filter shape factor calculation enable/disable status	MARKERS (Ch 6)
DSQ0	Disable filter Q calculation	MARKERS (Ch 6)
DSQ1	Enable filter Q calculation	MARKERS (Ch 6)
DSQX?	Output filter Q calculation enable/disable status	MARKERS (Ch 6)
FLTBW?	Output filter bandwidth	MARKERS (Ch 6)
FLTC?	Output filter center frequency	MARKERS (Ch 6)
FLTL?	Output filter loss at reference value	MARKERS (Ch 6)
FLTQ?	Output filter Q	MARKERS (Ch 6)
FLTS?	Output filter shape factor	MARKERS (Ch 6)
FMKR	Select filter parameters marker mode	MARKERS (Ch 6)
M1C	Set CW mode at marker 1 frequency	MARKERS (Ch 6)
M1E	Set sweep/zoom end to marker 1 frequency distance or time	MARKERS (Ch 6)
M1S	Set sweep/zoom start to marker 1 frequency distance or time	MARKERS (Ch 6)

Command	Description	Group
M2C	Set CW mode at marker 2 frequency	MARKERS (Ch 6)
M2E	Set sweep/zoom end to marker 2 frequency distance or time	MARKERS (Ch 6)
M2S	Set sweep/zoom start to marker 2 frequency distance or time	MARKERS (Ch 6)
M3C	Set CW mode at marker 3 frequency	MARKERS (Ch 6)
M3E	Set sweep/zoom end to marker 3 frequency distance or time	MARKERS (Ch 6)
M3S	Set sweep/zoom start to marker 3 frequency distance or time	MARKERS (Ch 6)
M4C	Set CW mode at marker 4 frequency	MARKERS (Ch 6)
M4E	Set sweep/zoom end to marker 4 frequency distance or time	MARKERS (Ch 6)
M4S	Set sweep/zoom start to marker 4 frequency distance or time	MARKERS (Ch 6)
M5C	Set CW mode at marker 5 frequency	MARKERS (Ch 6)
M5E	Set sweep/zoom end to marker 5 frequency distance or time	MARKERS (Ch 6)
M5S	Set sweep/zoom start to marker 5 frequency distance or time	MARKERS (Ch 6)
M6C	Set CW mode at marker 6 frequency	MARKERS (Ch 6)
M6E	Set sweep/zoom end to marker 6 frequency distance or time	MARKERS (Ch 6)
M6S	Set sweep/zoom start to marker 6 frequency distance or time	MARKERS (Ch 6)
MK1	Enter marker 1 frequency distance or time and turn on	MARKERS (Ch 6)
MK1?	Output marker 1 frequency distance or time	MARKERS (Ch 6)
MK2	Enter marker 2 frequency distance or time and turn on	MARKERS (Ch 6)
MK2?	Output marker 2 frequency distance or time	MARKERS (Ch 6)
MK3	Enter marker 3 frequency distance or time and turn on	MARKERS (Ch 6)
MK3?	Output marker 3 frequency distance or time	MARKERS (Ch 6)
MK4	Enter marker 4 frequency distance or time and turn on	MARKERS (Ch 6)
MK4?	Output marker 4 frequency distance or time	MARKERS (Ch 6)
MK5	Enter marker 5 frequency distance or time and turn on	MARKERS (Ch 6)
MK5?	Output marker 5 frequency distance or time	MARKERS (Ch 6)
MK6	Enter marker 6 frequency distance or time and turn on	MARKERS (Ch 6)
MK6?	Output marker 6 frequency distance or time	MARKERS (Ch 6)
MKRC	Select interpolated marker functionality	MARKERS (Ch 6)

Command	Description	Group
MKRD	Select discrete marker functionality	MARKERS (Ch 6)
MKRX?	Output interpolated/discrete marker functionality	MARKERS (Ch 6)
MKSL	Marker search left	MARKERS (Ch 6)
MKSR	Marker search right	MARKERS (Ch 6)
MKT0	Turn marker tracking off	MARKERS (Ch 6)
MKT1	Turn marker tracking on	MARKERS (Ch 6)
MKTX?	Output marker tracking on/off status	MARKERS (Ch 6)
MMN	Move active marker to minimum trace value	MARKERS (Ch 6)
MMX	Move active marker to maximum trace value	MARKERS (Ch 6)
MO1	Turn off marker 1	MARKERS (Ch 6)
MO2	Turn off marker 2	MARKERS (Ch 6)
MO3	Turn off marker 3	MARKERS (Ch 6)
MO4	Turn off marker 4	MARKERS (Ch 6)
MO5	Turn off marker 5	MARKERS (Ch 6)
MO6	Turn off marker 6	MARKERS (Ch 6)
MOF	Turn marker display off	MARKERS (Ch 6)
MON	Turn marker display on	MARKERS (Ch 6)
MON?	Output marker display on/off status	MARKERS (Ch 6)
MR1	Turn marker 1 on and make it the active marker	MARKERS (Ch 6)
MR1?	Output marker 1 on/off status	MARKERS (Ch 6)
MR2	Turn marker 2 on and make it the active marker	MARKERS (Ch 6)
MR2?	Output marker 2 on/off status	MARKERS (Ch 6)
MR3	Turn marker 3 on and make it the active marker	MARKERS (Ch 6)
MR3?	Output marker 3 on/off status	MARKERS (Ch 6)
MR4	Turn marker 4 on and make it the active marker	MARKERS (Ch 6)
MR4?	Output marker 4 on/off status	MARKERS (Ch 6)
MR5	Turn marker 5 on and make it the active marker	MARKERS (Ch 6)
MR5?	Output marker 5 on/off status	MARKERS (Ch 6)
MR6	Turn marker 6 on and make it the active marker	MARKERS (Ch 6)
MR6?	Output marker 6 on/off status	MARKERS (Ch 6)
MRM	Display the Marker Readout menu	MARKERS (Ch 6)
MRX?	Output active marker number	MARKERS (Ch 6)
MSFH	Enter high loss value for shape factor calculation	MARKERS (Ch 6)

Command	Description	Group
MSFH?	Output high loss value for shape factor calculation	MARKERS (Ch 6)
MSFL	Enter low loss value for shape factor calculation	MARKERS (Ch 6)
MSFL?	Output low loss value for shape factor calculation	MARKERS (Ch 6)
MSR0	Select 0 as reference for marker search and bandwidth calculation	MARKERS (Ch 6)
MSRD	Select delta reference marker as reference for marker search and bandwidth calculation	MARKERS (Ch 6)
MSRM	Select maximum as reference for marker search and bandwidth calculation	MARKERS (Ch 6)
MSRX?	Output reference selection for marker search and bandwidth calculation	MARKERS (Ch 6)
NMKR	Select normal markers on active channel marker mode	MARKERS (Ch 6)
SMKR	Select marker search marker mode	MARKERS (Ch 6)
SRCH	Enter marker search value	MARKERS (Ch 6)
SRCH?	Output marker search value	MARKERS (Ch 6)
XMKR?	Output marker mode	MARKERS (Ch 6)
AH0	Turn automatic DUT protection off	MEASUREMENT (Ch 4)
AH1	Turn automatic DUT protection on	MEASUREMENT (Ch 4)
AHX?	Output automatic DUT protection on/off status	MEASUREMENT (Ch 4)
BH0	Turn bias off while in hold	MEASUREMENT (Ch 4)
BH1	Turn bias on while in hold	MEASUREMENT (Ch 4)
BHX?	Output bias on/off during hold status	MEASUREMENT (Ch 4)
CNTR	Enter center frequency	MEASUREMENT (Ch 4)
CNTR?	Output center frequency	MEASUREMENT (Ch 4)
CTN	Continue sweeping from current point	MEASUREMENT (Ch 4)
CWDEC	Subtract 1 from the current CW index	MEASUREMENT (Ch 4)
CWF	Enter CW frequency and turn CW on	MEASUREMENT (Ch 4)
CWF?	Output CW frequency	MEASUREMENT (Ch 4)
CWF2I?	Output index for frequency given	MEASUREMENT (Ch 4)
CWI	Enter index for CW frequency and turn CW on	MEASUREMENT (Ch 4)
CWI?	Output current index number	MEASUREMENT (Ch 4)
CWI2F?	Output frequency for index given	MEASUREMENT (Ch 4)
CWINC	Add 1 to the current CW index	MEASUREMENT (Ch 4)
CWN2I	Add N to the current CW index	MEASUREMENT (Ch 4)
CWON	Turn CW on at current CW frequency	MEASUREMENT (Ch 4)

Command	Description	Group
CWON?	Output CW on/off status	MEASUREMENT (Ch 4)
CWP	Enter number of points drawn in CW	MEASUREMENT (Ch 4)
CWP?	Output number of points drawn in CW	MEASUREMENT (Ch 4)
CWSRT	Set CW frequency to the start frequency	MEASUREMENT (Ch 4)
CWSTP	Set CW frequency to the stop frequency	MEASUREMENT (Ch 4)
EANAIN	Measure External Analog In on active channel	MEASUREMENT (Ch 4)
FHI	Set data points to 1601	MEASUREMENT (Ch 4)
FIL	Fill defined discrete frequency range	MEASUREMENT (Ch 4)
FLO	Set data points to 101	MEASUREMENT (Ch 4)
FME	Set data points to 401	MEASUREMENT (Ch 4)
FP0	Turn flat power correction off	MEASUREMENT (Ch 4)
FP1	Turn flat power correction on	MEASUREMENT (Ch 4)
FRC	Clear all defined discrete frequency ranges	MEASUREMENT (Ch 4)
FRI	Enter Discrete Fill increment frequency	MEASUREMENT (Ch 4)
FRP	Enter Discrete Fill number of points	MEASUREMENT (Ch 4)
FRS	Enter Discrete Fill start frequency	MEASUREMENT (Ch 4)
HC0	Disable internal IF calibration	MEASUREMENT (Ch 4)
HC1	Enable internal IF calibration and trigger an IF calibration	MEASUREMENT (Ch 4)
HCT	Trigger an IF calibration	MEASUREMENT (Ch 4)
HCX?	Output internal IF calibration enable/disable status	MEASUREMENT (Ch 4)
HLD	Put sweep into hold mode	MEASUREMENT (Ch 4)
HLD?	Output the sweep hold status	MEASUREMENT (Ch 4)
HLDX?	Output hold mode (continue, restart, or single sweep)	MEASUREMENT (Ch 4)
IFP	Enter current front panel setup	MEASUREMENT (Ch 4)
IFV	Enter frequency values	MEASUREMENT (Ch 4)
IS1	Enter front panel setup 1	MEASUREMENT (Ch 4)
IS10	Enter front panel setup 10	MEASUREMENT (Ch 4)
IS2	Enter front panel setup 2	MEASUREMENT (Ch 4)
IS3	Enter front panel setup 3	MEASUREMENT (Ch 4)
IS4	Enter front panel setup 4	MEASUREMENT (Ch 4)
IS5	Enter front panel setup 5	MEASUREMENT (Ch 4)
IS6	Enter front panel setup 6	MEASUREMENT (Ch 4)
IS7	Enter front panel setup 7	MEASUREMENT (Ch 4)
IS8	Enter front panel setup 8	MEASUREMENT (Ch 4)
IS9	Enter front panel setup 9	MEASUREMENT (Ch 4)

Command	Description	Group
LA1	Select a1 = Ra as phase lock for parameter being defined	MEASUREMENT (Ch 4)
LA2	Select a2 = Rb as phase lock for parameter being defined	MEASUREMENT (Ch 4)
LAX?	Output phase lock selection for parameter being defined	MEASUREMENT (Ch 4)
NP101	Set data points to 101	MEASUREMENT (Ch 4)
NP1601	Set data points to 1601	MEASUREMENT (Ch 4)
NP201	Set data points to 201	MEASUREMENT (Ch 4)
NP401	Set data points to 401	MEASUREMENT (Ch 4)
NP51	Set data points to 51	MEASUREMENT (Ch 4)
NP801	Set data points to 801	MEASUREMENT (Ch 4)
ONDF	Output number of discrete frequencies	MEASUREMENT (Ch 4)
PTP	Enter the target power for flat power correction	MEASUREMENT (Ch 4)
PTP?	Output the target power for flat power correction	MEASUREMENT (Ch 4)
PW1	Enter external source 1 power level	MEASUREMENT (Ch 4)
PW1?	Output external source 1 power level	MEASUREMENT (Ch 4)
PW2	Enter external source power level	MEASUREMENT (Ch 4)
PW2?	Output external source power level	MEASUREMENT (Ch 4)
PWR	Enter internal source power level	MEASUREMENT (Ch 4)
PWR?	Output internal source power level	MEASUREMENT (Ch 4)
TA2	Enter port 2 test attenuator value	MEASUREMENT (Ch 4)
TA2?	Output port 2 test attenuator value	MEASUREMENT (Ch 4)
TA2MAX?	Output port 2 test attenuator max value	MEASUREMENT (Ch 4)
RH0	Select RF off in hold mode	MEASUREMENT (Ch 4)
RH1	Select RF on in hold	MEASUREMENT (Ch 4)
RHX?	Output RF on/off during hold status	MEASUREMENT (Ch 4)
RT0	Turn retrace rf off	MEASUREMENT (Ch 4)
RT1	Turn retrace rf on	MEASUREMENT (Ch 4)
RTX?	Output retrace rf on/off status	MEASUREMENT (Ch 4)
S11	Measure S11 on active channel	MEASUREMENT (Ch 4)
S12	Measure S12 on active channel	MEASUREMENT (Ch 4)
S21	Measure S21 on active channel	MEASUREMENT (Ch 4)
S22	Measure S22 on active channel	MEASUREMENT (Ch 4)
SA1	Enter port 1 source attenuator value	MEASUREMENT (Ch 4)
SA1?	Output port 1 source attenuator value	MEASUREMENT (Ch 4)
SA1MAX?	Output port 1 source attenuator max value	MEASUREMENT (Ch 4)
SAMP?	Output the number of samplers used for measurements	MEASUREMENT (Ch 4)

Command	Description	Group
SAMP2	Use 2 samplers for measurements	MEASUREMENT (Ch 4)
SAMP3	Use 3 samplers for measurements	MEASUREMENT (Ch 4)
SPAN	Enter frequency span	MEASUREMENT (Ch 4)
SPAN?	Output frequency span	MEASUREMENT (Ch 4)
SRC2?	Output external source 2 existence information	MEASUREMENT (Ch 4)
SRT	Enter start frequency	MEASUREMENT (Ch 4)
SRT?	Output start frequency	MEASUREMENT (Ch 4)
STP	Enter stop frequency	MEASUREMENT (Ch 4)
STP?	Output stop frequency	MEASUREMENT (Ch 4)
SWP	Return to normal sweep mode	MEASUREMENT (Ch 4)
SWP?	Output sweep mode	MEASUREMENT (Ch 4)
SWPDIR?	Output instantaneous sweep direction forward/reverse	MEASUREMENT (Ch 4)
SXX?	Output s parameter or user defined parameter of active channel	MEASUREMENT (Ch 4)
TEX	Select external (rear panel) measurement triggering	MEASUREMENT (Ch 4)
TIN	Select internal measurement triggering	MEASUREMENT (Ch 4)
TRS	Trigger/restart sweep	MEASUREMENT (Ch 4)
TXX?	Output trigger source internal/external/get/extddt status	MEASUREMENT (Ch 4)
WFS	Wait full sweep until all display data is valid	MEASUREMENT (Ch 4)
DPRX?	Output data pair mode visible only or pair always	MEASUREMENT DATA (Ch 7)
OGCFD	Output gain compression final data to GPIB	MEASUREMENT DATA (Ch 7)
OGCFV	Output gain compression frequency values to GPIB	MEASUREMENT DATA (Ch 7)
ONP	Output number of points currently being measured	MEASUREMENT DATA (Ch 7)
ONPV	Output the number of power sweep power values	MEASUREMENT DATA (Ch 7)
OPSV	Output power sweep power values	MEASUREMENT DATA (Ch 7)
OS11C	Output corrected S11 data	MEASUREMENT DATA (Ch 7)
OS11R	Output raw S11 data	MEASUREMENT DATA (Ch 7)
OS12C	Output corrected S12 data	MEASUREMENT DATA (Ch 7)
OS12R	Output raw S12 data	MEASUREMENT DATA (Ch 7)
OS21C	Output corrected S21 data	MEASUREMENT DATA (Ch 7)
OS21R	Output raw S21 data	MEASUREMENT DATA (Ch 7)
OS22C	Output corrected S22 data	MEASUREMENT DATA (Ch 7)
OS22R	Output raw S22 data	MEASUREMENT DATA (Ch 7)
OTV	Output time values for time domain	MEASUREMENT DATA (Ch 7)

Command	Description	Group
IMCF	Enter merge calibration files from GPIB and combine	MERGE CAL FILES (Ch 9)
LDMCF	Load merge calibration files from disk and combine	MERGE CAL FILES (Ch 9)
BDMM	Define Millimeter Wave band equations	MILLIMETER WAVE (Ch 9)
BSP	Enter band stop frequency	MILLIMETER WAVE (Ch 9)
BSP?	Output band stop frequency	MILLIMETER WAVE (Ch 9)
BST	Enter band start frequency	MILLIMETER WAVE (Ch 9)
BST?	Output band start frequency	MILLIMETER WAVE (Ch 9)
CLBMM	Clear the new Millimeter Wave band definitions	MILLIMETER WAVE (Ch 9)
E12	Set Millimeter Wave band to E band (WR-12)	MILLIMETER WAVE (Ch 9)
E12E	Set Millimeter Wave band to E band (WR-12)	MILLIMETER WAVE (Ch 9)
F08	Set Millimeter Wave Band to F Band (WR-8)	MILLIMETER WAVE (Ch 9)
MMBX?	Output Millimeter Wave band selection	MILLIMETER WAVE (Ch 9)
P1MMA	Set Port 1 Millimeter Wave Head to Amplified (3742)	MILLIMETER WAVE (Ch 9)
P1MMN	Set Port 1 Millimeter Wave Head to None	MILLIMETER WAVE (Ch 9)
P1MMR	Set Port 1 Millimeter Wave Head to Receiver (3741)	MILLIMETER WAVE (Ch 9)
P1MMT	Set Port 1 Millimeter Wave Head to Transmit/Receiver (3740)	MILLIMETER WAVE (Ch 9)
P1MMX?	Output Port 1 Millimeter Wave Head type	MILLIMETER WAVE (Ch 9)
P2MMA	Set Port 2 Millimeter Wave Head to Amplified (3742)	MILLIMETER WAVE (Ch 9)
P2MMN	Set Port 2 Millimeter Wave Head to none	MILLIMETER WAVE (Ch 9)
P2MMR	Set Port 2 Millimeter Wave Head to Receiver (3741)	MILLIMETER WAVE (Ch 9)
P2MMT	Set Port 2 Millimeter Wave Head to Transmit/Receiver (3740)	MILLIMETER WAVE (Ch 9)
P2MMX?	Output Port 2 Millimeter Wave Head type	MILLIMETER WAVE (Ch 9)
Q22	Set Millimeter Wave Band to Q Band (WR-22)	MILLIMETER WAVE (Ch 9)
SELBB	Select Broadband test set operation	MILLIMETER WAVE (Ch 9)
SELINT	Select Internal (normal) test set operation	MILLIMETER WAVE (Ch 9)
SELMM	Select Millimeter Wave test set operation	MILLIMETER WAVE (Ch 9)
SELSP	Select S-parameter test set operation	MILLIMETER WAVE (Ch 9)
SELXX?	Output the test set selection MMWave/Internal	MILLIMETER WAVE (Ch 9)
SVBMM	Save and activate the new Millimeter Wave band definitions	MILLIMETER WAVE (Ch 9)

Command	Description	Group
V15	Set Millimeter Wave Band to V Band (WR-15)	MILLIMETER WAVE (Ch 9)
W10	Set Millimeter Wave Band to W Band (WR-10)	MILLIMETER WAVE (Ch 9)
W10E	Set Millimeter Wave Band to extended W Band (WR-10E)	MILLIMETER WAVE (Ch 9)
IHDW	Enter hardware cal data from GPIB	MISCELLANEOUS (Ch 7)
IKIT	Enter calkit data from GPIB	MISCELLANEOUS (Ch 7)
IND	Input Normalization data	MISCELLANEOUS (Ch 7)
INRM	Enter normalization data from GPIB	MISCELLANEOUS (Ch 7)
LID	Enter string for DUT identity	MISCELLANEOUS (Ch 7)
LID?	Output string for DUT identity	MISCELLANEOUS (Ch 7)
OHDW	Output hardware cal data to GPIB	MISCELLANEOUS (Ch 7)
ONRM	Output stored normalization data to GPIB	MISCELLANEOUS (Ch 7)
BD1	Select band 1 for definition	MULTIPLE SOURCE CONTROL (Ch 9)
BD2	Select band 2 for definition	MULTIPLE SOURCE CONTROL (Ch 9)
BD3	Select band 3 for definition	MULTIPLE SOURCE CONTROL (Ch 9)
BD4	Select band 4 for definition	MULTIPLE SOURCE CONTROL (Ch 9)
BD5	Select band 5 for definition	MULTIPLE SOURCE CONTROL (Ch 9)
CLB	Clear all multiple source band definitions	MULTIPLE SOURCE CONTROL (Ch 9)
ECW	Select CW operation for component being edited	MULTIPLE SOURCE CONTROL (Ch 9)
ED1	Edit source 1 equation	MULTIPLE SOURCE CONTROL (Ch 9)
ED2	Edit source 2 equation	MULTIPLE SOURCE CONTROL (Ch 9)
EDR	Edit receiver equation	MULTIPLE SOURCE CONTROL (Ch 9)
EDV	Enter divisor value for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EDV?	Output divisor value for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EML	Enter multiplier value for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EML?	Output multiplier value for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EOS	Enter offset frequency for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EOS?	Output offset frequency for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
ESW	Select sweep operation for component being edited	MULTIPLE SOURCE CONTROL (Ch 9)
EX1RF0	Turn external source 1 rf off	MULTIPLE SOURCE CONTROL (Ch 9)
EX1RF1	Turn external source 1 rf on	MULTIPLE SOURCE CONTROL (Ch 9)
EX2RF0	Turn external source 2 rf off	MULTIPLE SOURCE CONTROL (Ch 9)
EX2RF1	Turn external source 2 rf on	MULTIPLE SOURCE CONTROL (Ch 9)

Command	Description	Group
EXW?	Output multiple source sweep flag for equation being edited	MULTIPLE SOURCE CONTROL (Ch 9)
LTRD	Output response data from the dedicated GPIB bus	MULTIPLE SOURCE CONTROL (Ch 9)
LTWRT	Send program data to the dedicated GPIB bus	MULTIPLE SOURCE CONTROL (Ch 9)
MS0	Turn multiple source mode off	MULTIPLE SOURCE CONTROL (Ch 9)
MS1	Turn multiple source mode on	MULTIPLE SOURCE CONTROL (Ch 9)
MSD	Select multiple source define mode	MULTIPLE SOURCE CONTROL (Ch 9)
MSX?	Output multiple source mode on/off/define	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1?	Output external source 1 existence information	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1AC	Select source 1 as active	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1AC?	Output source 1 active/inactive status	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1EX	Select source 1 as external	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1EX?	Output source 1 external/internal status	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1G0	Turn source 1 GPIB control off	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1G1	Turn source 1 GPIB control on	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1GX?	Output source 1 GPIB control on/off status	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1MOD?	Output external source 1 model/version string	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1NA	Select source 1 as not active	MULTIPLE SOURCE CONTROL (Ch 9)
SRC1NT	Select source 1 as internal	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2	Select source power voltage testing	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2AC	Select source 2 as active	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2AC?	Output source 2 active/inactive status	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2G0	Turn source 2 GPIB control off	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2G1	Turn source 2 GPIB control on	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2GX?	Output source 2 GPIB control on/off status	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2MOD?	Output external Source 2 model/version string	MULTIPLE SOURCE CONTROL (Ch 9)
SRC2NA	Select source 2 as not active	MULTIPLE SOURCE CONTROL (Ch 9)
SVB	Save current band definitions	MULTIPLE SOURCE CONTROL (Ch 9)
INXNO1	Enter NxN data and send device1 data to GPIB	NXN SOLUTION (Ch 9)
INXNO2	Enter NxN data and send device2 data to GPIB	NXN SOLUTION (Ch 9)
INXNO3	Enter NxN data and send device3 data to GPIB	NXN SOLUTION (Ch 9)
INXNSV1	Enter NxN data and save device1 data to disk	NXN SOLUTION (Ch 9)

Command	Description	Group
INXNSV2	Enter NxN data and save device2 data to disk	NXN SOLUTION (Ch 9)
INXNSV3	Enter NxN data and save device3 data to disk	NXN SOLUTION (Ch 9)
LDNXNO1	Load NxN files from disk and send device1 data to GPIB	NXN SOLUTION (Ch 9)
LDNXNO2	Load NxN files from disk and send device2 data to GPIB	NXN SOLUTION (Ch 9)
LDNXNO3	Load NxN files from disk and send device3 data to GPIB	NXN SOLUTION (Ch 9)
LDNXNSV1	Load NxN data from disk and save device1 data to disk	NXN SOLUTION (Ch 9)
LDNXNSV2	Load NxN data from disk and save device2 data to disk	NXN SOLUTION (Ch 9)
LDNXNSV3	Load NxN data from disk and save device3 data to disk	NXN SOLUTION (Ch 9)
NXNL1	Enter length for NxN device 1	NXN SOLUTION (Ch 9)
NXNL1?	Output length for NxN device 1	NXN SOLUTION (Ch 9)
NXNL2	Enter length for NxN device 2	NXN SOLUTION (Ch 9)
NXNL2?	Output length for NxN device 2	NXN SOLUTION (Ch 9)
NXNL3	Enter length for NxN device 3	NXN SOLUTION (Ch 9)
NXNL3?	Output length for NxN device 3	NXN SOLUTION (Ch 9)
IODF	Enter the optical file data from GPIB and calibrate	OPTICAL APPLICATION (Ch 9)
LDODF	Load optical data files from disk and cali-brate	OPTICAL APPLICATION (Ch 9)
DGT	Display 1st CRT test pattern	PERIPHERAL TESTS (Ch 8)
DGT1	Display 1st CRT test pattern	PERIPHERAL TESTS (Ch 8)
DGT2	Display 2nd CRT test pattern	PERIPHERAL TESTS (Ch 8)
DGT3	Display 3rd CRT test pattern	PERIPHERAL TESTS (Ch 8)
EKT	Select external keyboard testing	PERIPHERAL TESTS (Ch 8)
FPT	Select front panel keypad testing	PERIPHERAL TESTS (Ch 8)
PRT?	Perform printer test and output status	PERIPHERAL TESTS (Ch 8)
RPO	Enter rear panel dc voltage value	REAR PANEL OUTPUT (Ch 9)
RPO?	Output rear panel dc voltage value	REAR PANEL OUTPUT (Ch 9)
RV0	Turn rear panel output voltage off	REAR PANEL OUTPUT (Ch 9)
RV1	Turn rear panel output voltage on	REAR PANEL OUTPUT (Ch 9)
RV1?	Output rear panel output voltage on/off sta-tus	REAR PANEL OUTPUT (Ch 9)
RVD	Set rear panel output mode to dc value	REAR PANEL OUTPUT (Ch 9)
RVH	Set rear panel output mode to horizontal	REAR PANEL OUTPUT (Ch 9)
RVL	Set rear panel output mode to lock direction	REAR PANEL OUTPUT (Ch 9)

Command	Description	Group
RVV	Set rear panel output mode to vertical	REAR PANEL OUTPUT (Ch 9)
RVX?	Output rear panel output mode	REAR PANEL OUTPUT (Ch 9)
VSP	Enter rear panel stop voltage value	REAR PANEL OUTPUT (Ch 9)
VSP?	Output rear panel stop voltage value	REAR PANEL OUTPUT (Ch 9)
VST	Enter rear panel start voltage value	REAR PANEL OUTPUT (Ch 9)
VST?	Output rear panel start voltage value	REAR PANEL OUTPUT (Ch 9)
SDR?	Output receiver mode	RECEIVER MODE (Ch 9)
SL1	Select source lock mode	RECEIVER MODE (Ch 9)
ST1	Select set on mode	RECEIVER MODE (Ch 9)
TK1	Select tracking mode	RECEIVER MODE (Ch 9)
RC1	Recall front panel setup number 1 from memory	SAVE/RECALL (Ch 8)
RC10	Recall front panel setup number 10 from memory	SAVE/RECALL (Ch 8)
RC2	Recall front panel setup number 2 from memory	SAVE/RECALL (Ch 8)
RC3	Recall front panel setup number 3 from memory	SAVE/RECALL (Ch 8)
RC4	Recall front panel setup number 4 from memory	SAVE/RECALL (Ch 8)
RC5	Recall front panel setup number 5 from memory	SAVE/RECALL (Ch 8)
RC6	Recall front panel setup number 6 from memory	SAVE/RECALL (Ch 8)
RC7	Recall front panel setup number 7 from memory	SAVE/RECALL (Ch 8)
RC8	Recall front panel setup number 8 from memory	SAVE/RECALL (Ch 8)
RC9	Recall front panel setup number 9 from memory	SAVE/RECALL (Ch 8)
SV1	Save front panel setup number 1 to memory	SAVE/RECALL (Ch 8)
SV10	Save front panel setup number 10 to mem-ory	SAVE/RECALL (Ch 8)
SV2	Save front panel setup number 2 to memory	SAVE/RECALL (Ch 8)
SV3	Save front panel setup number 3 to memory	SAVE/RECALL (Ch 8)
SV4	Save front panel setup number 4 to memory	SAVE/RECALL (Ch 8)
SV5	Save front panel setup number 5 to memory	SAVE/RECALL (Ch 8)
SV6	Save front panel setup number 6 to memory	SAVE/RECALL (Ch 8)
SV7	Save front panel setup number 7 to memory	SAVE/RECALL (Ch 8)
SV8	Save front panel setup number 8 to memory	SAVE/RECALL (Ch 8)
SV9	Save front panel setup number 9 to memory	SAVE/RECALL (Ch 8)
*OPT?	Output the 488.2 options installed string	SERVICE LOG (Ch 8)

Command	Description	Group
CSL	Clear service log	SERVICE LOG (Ch 8)
PEL	Print the error list	SERVICE LOG (Ch 8)
ILM	Enter limits status byte mask	STATUS BYTE (Ch 7)
IPM	Enter the 488.2 Service Request Enable mask	STATUS BYTE (Ch 7)
IEM	Enter extended status byte mask	STATUS BYTE (Ch 8)
CSB	Clear status bytes and structures (same as *CLS)	STATUS REPORTING (Ch 7)
OEB	Output extended status byte	STATUS REPORTING (Ch 7)
OEM	Output extended status byte mask	STATUS REPORTING (Ch 7)
OLB	Output limits status byte	STATUS REPORTING (Ch 7)
ANNCOL	Enter the color number for annotation and menu text	SYSTEM STATE (Ch 8)
ANNCOL?	Output the color number for annotation and menu text	SYSTEM STATE (Ch 8)
BC0	Turn CRT display off (disabled)	SYSTEM STATE (Ch 8)
BC1	Turn CRT display on (disabled)	SYSTEM STATE (Ch 8)
BCKCOL	Enter the color number for background	SYSTEM STATE (Ch 8)
BCKCOL?	Output the color number for background	SYSTEM STATE (Ch 8)
DD1	Turn data drawing on	SYSTEM STATE (Ch 8)
DD1?	Output data drawing on/off status	SYSTEM STATE (Ch 8)
BCX?	Output CRT display on/off status	SYSTEM STATE (Ch 8)
BEEP0	Disable the instrument beeper on GPIB errors	SYSTEM STATE (Ch 8)
BEEP1	Enable the instrument beeper on GPIB errors	SYSTEM STATE (Ch 8)
BEEPX?	Output GPIB beep on error enable/disable status	SYSTEM STATE (Ch 8)
BRILL	Activate color configuration Brilliant	SYSTEM STATE (Ch 8)
CLASS	Activate color configuration Classic	SYSTEM STATE (Ch 8)
DATCOL	Enter the color number for data	SYSTEM STATE (Ch 8)
DATCOL?	Output the color number for data	SYSTEM STATE (Ch 8)
DATE	Enter the system date	SYSTEM STATE (Ch 8)
DATE?	Output the system date	SYSTEM STATE (Ch 8)
DC1	Display channel 1 and 2 operating parameters	SYSTEM STATE (Ch 8)
DC3	Display channel 3 and 4 operating parameters	SYSTEM STATE (Ch 8)
DCP	Display calibration parameters 1st page	SYSTEM STATE (Ch 8)
DCP1	Display calibration parameters 1st page	SYSTEM STATE (Ch 8)
DCP2	Display calibration parameters 2nd page	SYSTEM STATE (Ch 8)
DD0	Turn data drawing off	SYSTEM STATE (Ch 8)

Command	Description	Group
DF1	Display 1.0 mm female connector information	SYSTEM STATE (Ch 8)
DF2	Display 2.4mm female connector information	SYSTEM STATE (Ch 8)
DF3	Display GPC-3.5 female connector information	SYSTEM STATE (Ch 8)
DF716	Display 7/16 female connector information	SYSTEM STATE (Ch 8)
DFK	Display K female connector information	SYSTEM STATE (Ch 8)
DFN	Display N female connector information	SYSTEM STATE (Ch 8)
DFN75	Display N Female 75-Ohm connector information	SYSTEM STATE (Ch 8)
DFP	Display Front panel instrument state	SYSTEM STATE (Ch 8)
DFS	Display SMA female connector information	SYSTEM STATE (Ch 8)
DFSP	Display Special Female connector information	SYSTEM STATE (Ch 8)
DFT	Display TNC female connector information	SYSTEM STATE (Ch 8)
DFV	Display V female connector information	SYSTEM STATE (Ch 8)
DG7	Display GPC-7 Male connector information	SYSTEM STATE (Ch 8)
DGS	Display GPIB status information	SYSTEM STATE (Ch 8)
DM1	Display 1.0 mm male connector information	SYSTEM STATE (Ch 8)
DM2	Display 2.4mm male connector information	SYSTEM STATE (Ch 8)
DM3	Display GPC-3.5 male connector information	SYSTEM STATE (Ch 8)
DM716	Display 7/16 male connector information	SYSTEM STATE (Ch 8)
DMK	Display K male connector information	SYSTEM STATE (Ch 8)
DMN	Display N male connector information	SYSTEM STATE (Ch 8)
DMN75	Display N Male 75-Ohm connector information	SYSTEM STATE (Ch 8)
DMS	Display SMA male connector information	SYSTEM STATE (Ch 8)
DMSP	Display Special Male connector information	SYSTEM STATE (Ch 8)
DMT	Display TNC male connector information	SYSTEM STATE (Ch 8)
DMV	Display V male connector information	SYSTEM STATE (Ch 8)
DOASF	Display band A special female connector offset-short information	SYSTEM STATE (Ch 8)
DOASM	Display band A special male connector offset-short information	SYSTEM STATE (Ch 8)
DOBSF	Display band B special female connector offset-short information	SYSTEM STATE (Ch 8)
DOBSM	Display band B special male connector offset-short information	SYSTEM STATE (Ch 8)
DOCSF	Display band C special female connector offset-short information	SYSTEM STATE (Ch 8)

Command	Description	Group
DOCSM	Display band C special male connector off-set-short information	SYSTEM STATE (Ch 8)
DOF1	Display 1.0 mm female connector off-set-short information	SYSTEM STATE (Ch 8)
DOM1	Display 1.0 mm male connector offset-short information	SYSTEM STATE (Ch 8)
DWG	Display waveguide parameters	SYSTEM STATE (Ch 8)
FOF	Blank frequency information	SYSTEM STATE (Ch 8)
FON	Display frequency information	SYSTEM STATE (Ch 8)
FOX?	Output frequency information on/off status	SYSTEM STATE (Ch 8)
GRTCOL	Enter the color number for the graticule	SYSTEM STATE (Ch 8)
GRTCOL?	Output the color number for the graticule	SYSTEM STATE (Ch 8)
INVER	Activate color configuration Inverse	SYSTEM STATE (Ch 8)
LAYCOL	Enter the color number for overlay data	SYSTEM STATE (Ch 8)
LAYCOL?	Output the color number for overlay data	SYSTEM STATE (Ch 8)
MKRCOL	Enter the color number for the markers	SYSTEM STATE (Ch 8)
MKRCOL?	Output the color number for the markers	SYSTEM STATE (Ch 8)
MNUCOL	Enter the color number for the menu headers	SYSTEM STATE (Ch 8)
MNUCOL?	Output the color number for the menu headers	SYSTEM STATE (Ch 8)
NEWCO	Activate color configuration New	SYSTEM STATE (Ch 8)
RST	Instrument reset (same as *RST)	SYSTEM STATE (Ch 8)
RST0	Reset instrument front panel memories and reserved parameters	SYSTEM STATE (Ch 8)
RST1	Reset instrument and front panel memories	SYSTEM STATE (Ch 8)
RSTCOL	Reset color configuration to default	SYSTEM STATE (Ch 8)
RTL	Return to local	SYSTEM STATE (Ch 8)
SOFTCO	Activate color configuration Soft	SYSTEM STATE (Ch 8)
SPTS?	Output number of smoothing points	SYSTEM STATE (Ch 8)
STOCO	Store the current color configuration as Reset	SYSTEM STATE (Ch 8)
TIME	Enter the system time	SYSTEM STATE (Ch 8)
TIME?	Output the system time	SYSTEM STATE (Ch 8)
TRCCOL	Enter the color number for memory data	SYSTEM STATE (Ch 8)
TRCCOL?	Output the color number for memory data	SYSTEM STATE (Ch 8)
WIDE	Use entire display width for graphs	SYSTEM STATE (Ch 8)
DDX?	Output active channel domain parameter frequency distance or time	TIME DOMAIN (Ch 9)
LPI	Select lowpass impulse response for active channel	TIME DOMAIN (Ch 9)

Command	Description	Group
LPS	Select lowpass step response for active channel	TIME DOMAIN (Ch 9)
LPSX?	Output lowpass response for active channel impulse or step	TIME DOMAIN (Ch 9)
DCS	Select short for DC term for lowpass	TIME DOMAIN (Ch 9)
DCV	Enter value for DC term for lowpass	TIME DOMAIN (Ch 9)
DCV?	Output lowpass DC term value	TIME DOMAIN (Ch 9)
DCX?	Output lowpass DC term selection	TIME DOMAIN (Ch 9)
DCZ	Select line impedance for DC term for lowpass	TIME DOMAIN (Ch 9)
DPI	Select distance phasor impulse mode for active channel	TIME DOMAIN (Ch 9)
FGT	Select frequency with time gate for active channel	TIME DOMAIN (Ch 9)
FQD	Select frequency domain for active channel	TIME DOMAIN (Ch 9)
GCT	Enter gate center value distance or time	TIME DOMAIN (Ch 9)
GCT?	Output gate center value	TIME DOMAIN (Ch 9)
GDS	Gate symbols displayed on active channel	TIME DOMAIN (Ch 9)
GLS	Select low sidelobe gate shape	TIME DOMAIN (Ch 9)
GMS	Select minimum sidelobe gate shape	TIME DOMAIN (Ch 9)
GNM	Select nominal gate shape	TIME DOMAIN (Ch 9)
GOF	Turn off gating on active channel	TIME DOMAIN (Ch 9)
GOF?	Output gating mode on active channel	TIME DOMAIN (Ch 9)
GON	Turn on gating on active channel	TIME DOMAIN (Ch 9)
GRT	Select Rectangular gate shape	TIME DOMAIN (Ch 9)
GSN	Enter gate span value distance or time	TIME DOMAIN (Ch 9)
GSN?	Output gate span value	TIME DOMAIN (Ch 9)
GSP	Enter gate stop value distance or time	TIME DOMAIN (Ch 9)
GSP?	Output gate stop value	TIME DOMAIN (Ch 9)
GST	Enter gate start value distance or time	TIME DOMAIN (Ch 9)
GST?	Output gate start value	TIME DOMAIN (Ch 9)
GSX?	Output gate shape	TIME DOMAIN (Ch 9)
MRR	Restore original marker range	TIME DOMAIN (Ch 9)
TBP	Select time bandpass mode for active channel	TIME DOMAIN (Ch 9)
TDDIST	Set time domain parameter to distance for active channel	TIME DOMAIN (Ch 9)
TDDIST?	Output active channel time domain parameter distance or time	TIME DOMAIN (Ch 9)
TDPI0	Turn phasor impulse response off for active channel	TIME DOMAIN (Ch 9)

Command	Description	Group
TDPI1	Turn phasor impulse response on for active channel	TIME DOMAIN (Ch 9)
TDPIX?	Output phasor impulse on/off status for active channel	TIME DOMAIN (Ch 9)
TDTIME	Set time domain parameter to time for active channel	TIME DOMAIN (Ch 9)
TDX?	Output domain mode for active channel	TIME DOMAIN (Ch 9)
TLP	Select time lowpass mode for active channel	TIME DOMAIN (Ch 9)
TPI	Select time phasor impulse mode for active channel	TIME DOMAIN (Ch 9)
WLS	Select low sidelobe window shape	TIME DOMAIN (Ch 9)
WMS	Select minimum sidelobe window shape	TIME DOMAIN (Ch 9)
WNM	Select nominal window shape	TIME DOMAIN (Ch 9)
WRT	Select rectangular window shape	TIME DOMAIN (Ch 9)
WSX?	Output window shape	TIME DOMAIN (Ch 9)
ZCT	Enter zoom range center value time or distance	TIME DOMAIN (Ch 9)
ZCT?	Output zoom range center value	TIME DOMAIN (Ch 9)
ZSN	Enter zoom range span value time or distance	TIME DOMAIN (Ch 9)
ZSN?	Output zoom range span value	TIME DOMAIN (Ch 9)
ZSP	Enter zoom range stop value time or distance	TIME DOMAIN (Ch 9)
ZSP?	Output zoom range stop value	TIME DOMAIN (Ch 9)
ZST	Enter zoom range start value time or distance	TIME DOMAIN (Ch 9)
ZST?	Output zoom range start value	TIME DOMAIN (Ch 9)
FDH0	Select variable length arbitrary block headers	TRANSMISSION METHODS (Ch 7)
FDH1	Select fixed length arbitrary block headers	TRANSMISSION METHODS (Ch 7)
FDH2	Select zero length arbitrary block headers	TRANSMISSION METHODS (Ch 7)
FDHX?	Output arbitrary block header length selection	TRANSMISSION METHODS (Ch 7)
FMT0	Select normal ascii data element delimiting	TRANSMISSION METHODS (Ch 7)
FMT1	Select enhanced ascii data element delimiting	TRANSMISSION METHODS (Ch 7)
FMTX?	Output ascii data element delimiting mode	TRANSMISSION METHODS (Ch 7)
TEB	Select external trigger and executes *DDT definition	TRIGGERS (Ch 7)
TIB	Select GPIB measurement triggering	TRIGGERS (Ch 7)
DE1	Select unity as denominator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)

Command	Description	Group
DA1	Select a1 = Ra as denominator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
DA2	Select a2 = Rb as denominator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
DB1	Select b1 = Ta as denominator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
DB2	Select b2 = Tb as denominator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
DEN?	Output denominator selection for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NA1	Select a1 as numerator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NA2	Select a2 as numerator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NB1	Select b1 as numerator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NB2	Select b2 as numerator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NU1	Select unity as numerator for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
NUM?	Output numerator selection for parameter being defined	USER DEFINED PARAMETERS (Ch 9)
USL	Enter label string for user parameter being defined	USER DEFINED PARAMETERS (Ch 9)
USL?	Output label string for user parameter being defined	USER DEFINED PARAMETERS (Ch 9)
USR1	Measure user parameter 1 on active channel	USER DEFINED PARAMETERS (Ch 9)
USR2	Measure user parameter 2 on active channel	USER DEFINED PARAMETERS (Ch 9)
USR3	Measure user parameter 3 on active channel	USER DEFINED PARAMETERS (Ch 9)
USR4	Measure user parameter 4 on active channel	USER DEFINED PARAMETERS (Ch 9)

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