Programming Guide

Agilent Technologies
PSG Family Signal Generators

This guide applies to the signal generator models and associated serial number prefixes listed below. Depending on your firmware revision, signal generator operation may vary from descriptions in this guide.

E8241A: US4124
E8244A: US4124

E8251A: US4124
E8254A: US4124

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1 Getting Started

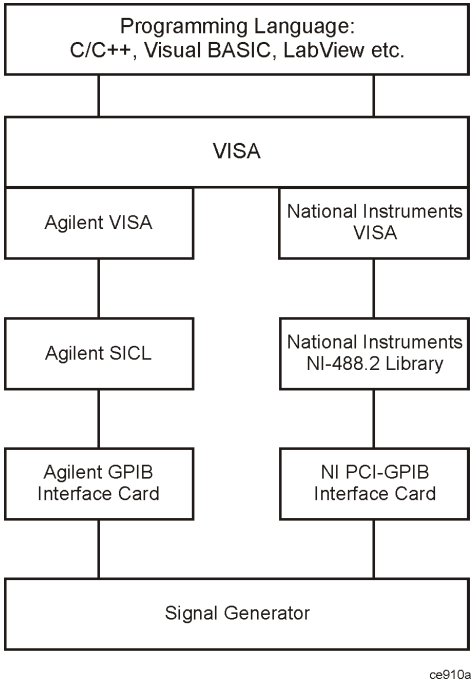
Introduction to Remote Operation

PSG family signal generators support the following interfaces:

- General Purpose Interface Bus (GPIB)
- Local Area Network (LAN)
- ANSI/EIA232 (RS-232) serial connection

Each of these interfaces, in combination with an IO library and programming language, can be used to remotely control the signal generator. Figure 1-1 uses the GPIB as an example of the relationships between the interface, IO libraries, programming language, and signal generator.

Figure 1-1 Software/Hardware Layers



Interfaces

GPIB — GPIB is used extensively when a dedicated computer is available for remote control of each instrument or system. Data transfer is fast because the GPIB handles information in 8-bit bytes. GPIB is physically restricted by the location and distance between the instrument/system and the computer; cables are limited to an average length of two meters per device with a total length of 20 meters.

LAN — LAN based communication is supported by the signal generator. Data transfer is fast as the LAN handles packets of data. The distance between a computer and the signal generator is limited to 100 meters (10BASE-T). The following protocols can be used to communicate with the signal generator over the LAN:

- VMEbus Extensions for Instrumentation (VXI) as defined in VXI-11
- Sockets LAN
- Telephone Network (TELNET)
- File Transfer Protocol (FTP)

RS-232 — RS-232 is a common method used to communicate with a single instrument; its primary use is to control printers and external disk drives, and connect to a modem. Communication over RS-232 is much slower than with GPIB or LAN because data is sent and received one bit at a time. It also requires that certain parameters, such as baud rate, be matched on both the computer and signal generator.

IO Libraries

An IO library is a collection of functions used by a programming language to send instrument commands. An IO library must be installed on your computer before writing any programs to control the signal generator.

NOTE Agilent IO libraries support the VXI-11 standard.

Programming Language

The programming language is used along with Standard Commands for Programming Instructions (SCPI) and IO library functions to remotely control the signal generator. Common programming languages include:

- C/C++
- Agilent BASIC
- LabView
- Java™

Java is a U.S. trademark of Sun Microsystems, Inc.

Using GPIB

The GPIB allows instruments to be connected together and controlled by a computer. The GPIB and its associated interface operations are defined in the ANSI/IEEE Standard 488.1-1987 and ANSI/IEEE Standard 488.2-1992. See the IEEE website, www.ieee.org, for details on these standards.

1. Installing the GPIB Interface Card

A GPIB interface card must be installed in your computer. Two common GPIB interface cards are the National Instruments (NI) PCI–GPIB and the Agilent GPIB interface cards. Follow the GPIB interface card instructions for installing and configuring the card in your computer. The following tables provide information on interface cards.

Table 1-1 Agilent GPIB Interface Card for PC-Based Systems

Interface Card	Operating System	IO Library	Languages	Backplane /BUS	Max IO (kB/sec)	Buffering
Agilent 82341C for ISA bus computers	Windows 95/98/NT/ 2000®	VISA / SICL	C/C++, Visual Basic, Agilent VEE, Agilent Basic for Windows	ISA/EISA, 16 bit	750	Built-in
Agilent 82341D Plug&Play for PC	Windows 95	VISA / SICL	C/C++, Visual Basic, Agilent VEE, Agilent Basic for Windows	ISA/EISA, 16 bit	750	Built-in
Agilent 82350A for PCI bus computers	Windows 95/98/NT/ 2000	VISA / SICL	C/C++, Visual Basic, Agilent VEE, Agilent Basic for Windows	PCI 32 bit	750	Built-in

Windows 95, 98, NT and 2000 are registered trademarks of Microsoft Corporation

Table 1-2 NI-GPIB Interface Card for PC-Based Systems

Interface Card	Operating System	IO Library	Languages	Backplane /BUS	Max IO
National Instrument's PCI-GPIB	Windows 95/98/2000/ ME/NT	VISA NI-488.2™	C/C++, Visual BASIC, LabView	PCI 32 bit	1.5 Mbytes/s
National Instrument's PCI-GPIB+	Windows NT	VISA NI-488.2	C/C++, Visual BASIC, LabView	PCI 32 bit	1.5 Mbytes/s

NI-488.2 is a trademark of National Instruments Corporation

Table 1-3 Agilent-GPIB Interface Card for HP-UX Workstations

Interface Card	Operating System	IO Library	Languages	Backplane /BUS	Max IO (kB/sec)	Buffering
Agilent E2071C	HP-UX 9.x, HP-UX 10.01	VISA/SICL	ANSI C, Agilent VEE, Agilent BASIC, HP-UX	EISA	750	Built-in
Agilent E2071D	HP-UX 10.20	VISA/SICL	ANSI C, Agilent VEE, Agilent BASIC, HP-UX	EISA	750	Built-in
Agilent E2078A	HP-UX 10.20	VISA/SICL	ANSI C, Agilent VEE, Agilent BASIC, HP-UX	PCI	750	Built-in

2. Selecting IO Libraries for GPIB

The IO libraries are included with your GPIB interface card. These libraries can also be downloaded from the National Instruments website or the Agilent website. The following is a discussion on these libraries.

VISA — VISA is an IO library used to develop IO applications and instrument drivers that comply with industry standards. It is recommended that the VISA library be used for programming the signal generator. The NI-VISA™ and Agilent VISA libraries are similar implementations of VISA and have the same commands, syntax, and functions. The differences are in the lower level IO libraries; NI-488.2 and SICL respectively. It is best to use the Agilent VISA library with the Agilent GPIB interface card or NI-VISA with the NI PCI-GPIB interface card.

SICL — Agilent SICL can be used without the VISA overlay. The SICL functions can be called from a program. However, if this method is used, executable programs will not be portable to other hardware platforms. For example, a program using SICL functions will not run on a computer with NI libraries (PCI-GPIB interface card).

NI-488.2 — NI-488.2 can be used without the VISA overlay. The NI-488.2 functions can be called from a program. However, if this method is used, executable programs will not be portable to other hardware platforms. For example, a program using NI-488.2 functions will not run on a computer with Agilent SICL (Agilent GPIB interface card).

3. Setting Up the GPIB Interface

1. Press **Utility** > **GPIB/RS-232** > **GPIB Address**.
2. Use the numeric keypad, the arrow keys, or rotate the front panel knob to set the desired address.

   The signal generator's GPIB address is set to 19 at the factory. The acceptable range of addresses is 0 through 30. Once initialized, the state of the GPIB address is not affected by a signal generator preset or by a power cycle. Other instruments on the GPIB cannot use the same address as the signal generator.
3. Press **Enter**.
4. Connect a GPIB interface cable between the signal generator and the computer. (Refer to Table 1-4 for cable part numbers.)

NI-VISA is a registered trademark of National Instruments Corporation

Table 1-4 Agilent GPIB Cables

Model	10833A	10833B	10833C	10833D	10833F	10833G
Length	1 meter	2 meters	4 meters	.5 meter	6 meters	8 meters

4. Verifying GPIB Functionality

Use the VISA Assistant, available with the Agilent IO Library or the Getting Started Wizard available with the National Instrument IO Library, to verify GPIB functionality. These utility programs allow you to communicate with the signal generator and verify its operation over the GPIB. Refer to the Help menu available in each utility for information and instructions on running these programs.

If You Have Problems

1. Verify the signal generator's address matches that declared in the program (example programs in Chapter 2 use address 19).
2. Remove all other instruments connected to the GPIB and re-run the program.
3. Verify that the GPIB card's name or id number matches the GPIB name or id number configured for your PC.

GPIB Interface Terms

An instrument that is part of a GPIB network is categorized as a listener, talker, or controller, depending on its current function in the network.

listener	A listener is a device capable of receiving data or commands from other instruments. Several instruments in the GPIB network can be listeners simultaneously.
talker	A talker is a device capable of transmitting data. To avoid confusion, a GPIB system allows only one device at a time to be an active talker.
controller	A controller, typically a computer, can specify the talker and listeners (including itself) for an information transfer. Only one device at a time can be an active controller.

GPIB Function Statements

Function statements are the basis for GPIB programming and instrument control. These function statements combined with SCPI provide management and data communication for the GPIB interface and the signal generator.

This section describes functions used by different IO libraries. Refer to the NI-488.2 Function Reference Manual for Windows, Agilent Standard Instrument Control Library reference manual, and Microsoft® Visual C++ 6.0 documentation for more information.

Abort Function

The Agilent BASIC function ABORT and the other listed IO library functions terminate listener/talker activity on the GPIB and prepare the signal generator to receive a new command from the computer. Typically, this is an initialization command used to place the GPIB in a known starting condition.

Table 1-5

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 ABORT 7`	`viTerminate` (parameter list)	`ibstop(int ud)`	`iabort (id)`

Agilent BASIC — The ABORT function stops all GPIB activity.

VISA Library — In VISA, the viTerminate command requests a VISA session to terminate normal execution of an asynchronous operation. The parameter list describes the session and job id.

NI-488.2 Library — The NI-488.2 library function aborts any asynchronous read, write, or command operation that is in progress. The parameter ud is the interface or device descriptor.

SICL — The Agilent SICL function aborts any command currently executing with the session id. This function is supported with C/C++ on Windows 3.1 and Series 700 HP-UX.

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Remote Function

The Agilent BASIC function REMOTE and the other listed IO library functions cause the signal generator to change from local operation to remote operation. In remote operation, the front panel keys are disabled except for the **Local** key and the line power switch. Pressing the **Local** key on the signal generator front panel restores manual operation.

Table 1-6

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 REMOTE 719`	N/A	`EnableRemote` (parameter list)	`iremote` (id)

Agilent BASIC — The `REMOTE 719` function disables the front panel operation of all keys with the exception of the **Local** key.

VISA Library — The VISA library, at this time, does not have a similar command.

NI-488.2 Library — This NI-488.2 library function asserts the Remote Enable (REN) GPIB line. All devices listed in the parameter list are put into a listen-active state although no indication is generated by the signal generator. The parameter list describes the interface or device descriptor.

SICL — The Agilent SICL function puts an instrument, identified by the `id` parameter, into remote mode and disables the front panel keys. Pressing the **Local** key on the signal generator front panel restores manual operation. The parameter id is the session identifier.

Local Lockout Function

The Agilent BASIC function `LOCAL LOCKOUT` and the other listed IO library functions can be used to disable the front panel keys including the **Local** key. With the **Local** key disabled, only the controller (or a hard reset of the line power switch) can restore local control.

Table 1-7

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 LOCAL LOCKOUT 719`	N/A	`SetRWLS` (parameter list)	`igpibllo (id)`

Agilent BASIC — The `LOCAL LOCKOUT` function disables all front-panel signal generator keys. Return to local control can occur only with a hard on/off, when the `LOCAL` command is sent or if the **Preset** key is pressed.

VISA Library — The VISA library, at this time, does not have a similar command.

NI-488.2 Library — The NI-488.2 library function places the instrument described in the parameter list in remote mode by asserting the Remote Enable (REN) GPIB line. The lockout state is then set using the Local Lockout (LLO) GPIB message. Local control can be restored only with the EnableLocal NI-488.2 routine or hard reset. The parameter list describes the interface or device descriptor.

SICL — The Agilent SICL igpibllo function prevents user access to front panel keys operation. The function puts an instrument, identified by the `id` parameter, into remote mode with local lockout. The parameter `id` is the session identifier and instrument address list.

Local Function

The Agilent BASIC function `LOCAL` and the other listed functions cause the signal generator to return to local control with a fully enabled front panel.

Table 1-8

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 LOCAL 719`	N/A	`ibloc (int ud)`	`iloc(id)`

Agilent BASIC — The `LOCAL 719` function returns the signal generator to manual operation, allowing access to the signal generator's front panel keys.

VISA Library — The VISA library, at this time, does not have a similar command.

NI-488.2 Library — The NI-488.2 library function places the interface in local mode and allows operation of the signal generator's front panel keys. The `ud` parameter in the parameter list is the interface or device descriptor.

SICL — The Agilent SICL function puts the signal generator into Local operation; enabling front panel key operation. The `id` parameter identifies the session.

Clear Function

The Agilent BASIC function CLEAR and the other listed IO library functions cause the signal generator to assume a cleared condition.

Table 1-9

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 CLEAR 719`	`viClear(ViSession vi)`	`ibclr(int ud)`	`iclear (id)`

Agilent BASIC — The CLEAR 719 function causes all pending output-parameter operations to be halted, the parser (interpreter of programming codes) to reset and prepare for a new programming code, stops any sweep in progress, and continuous sweep to be turned off.

VISA Library — The VISA library uses the viClear function. This function performs an IEEE 488.1 clear of the signal generator.

NI-488.2 Library — The NI-488.2 library function sends the GPIB Selected Device Clear (SDC) message to the device described by ud.

SICL — The Agilent SICL function clears a device or interface. The function also discards data in both the read and write formatted IO buffers. The id parameter identifies the session.

Output Function

The Agilent BASIC IO function OUTPUT and the other listed IO library functions put the signal generator into a listen mode and prepare it to receive ASCII data, typically SCPI commands.

Table 1-10

Agilent BASIC	VISA	NI-488.2	Agilent SICL
`10 OUTPUT 719`	`viPrintf(parameter list)`	`ibwrt(parameter list)`	`iprintf (parameter list)`

Agilent BASIC — The function OUTPUT 719 puts the signal generator into remote mode, makes it a listener, and prepares it to receive data.

VISA Library — The VISA library uses the above function and associated parameter list to output data. This function formats according to the format string and sends data to the device. The parameter list describes the session id and data to send.

NI-488.2 Library — The NI-488.2 library function addresses the GPIB and writes data to the signal generator. The parameter list includes the instrument address, session id, and the data to send.

SICL — The Agilent SICL function converts data using the *format* string. The *format* string specifies how the argument is converted before it is output. The function sends the characters in the format string directly to the instrument. The parameter list includes the instrument address, data buffer to write, and so forth.

Enter Function

The Agilent BASIC function ENTER reads formatted data from the signal generator. Other IO libraries use similar functions to read data from the signal generator.

Table 1-11

Agilent BASIC	VISA	NI-488.2	Agilent SICL
10 ENTER 719;	viScanf (parameter list)	ibrd (parameter list)	iscanf (parameter list)

Agilent BASIC — The function ENTER 719 puts the signal generator into remote mode, makes it a talker, and assigns data or status information to a designated variable.

VISA Library — The VISA library uses the viScanf function and an associated parameter list to receive data. This function receives data from the instrument, formats it using the format string, and stores the data in the argument list. The parameter list includes the session id and string argument.

NI-488.2 Library — The NI-488.2 library function addresses the GPIB, reads data bytes from the signal generator, and stores the data into a specified buffer. The parameter list includes the instrument address and session id.

SICL — The Agilent SICL function reads formatted data, converts it, and stores the results into the argument list. The conversion is done using conversion rules for the *format* string. The parameter list includes the instrument address, formatted data to read, and so forth.

Using LAN

The signal generator can be remotely programmed via a LAN interface and LAN-connected computer using one of several LAN interface protocols. The LAN allows instruments to be connected together and controlled by a LAN-based computer. LAN and its associated interface operations are defined in the IEEE 802.2 standard. See the IEEE website for more details.

The signal generator supports the following LAN interface protocols:

- VXI-11
- Sockets LAN
- Telephone Network (TELNET)
- File Transfer Protocol (FTP)

VXI-11 and sockets LAN are used for general programming using the LAN interface, TELNET is used for interactive, one command at a time instrument control, and FTP is for file transfer.

1. Selecting IO Libraries for LAN

The TELNET and FTP protocols do not require IO libraries to be installed on your computer. However, to write programs to control your signal generator, an I/O library must be installed on your computer and the computer configured for instrument control using the LAN interface.

The IO libraries can be downloaded from the Agilent website. The following is a discussion on these libraries.

Agilent VISA	VISA is an IO library used to develop IO applications and instrument drivers that comply with industry standards. Use the Agilent VISA library for programming the signal generator over the LAN interface.
SICL	Agilent SICL is a lower level library that is installed along with Agilent VISA.

2. Setting Up the LAN Interface

For LAN operation, an IP address must be assigned to the signal generator and the signal generator connected to the LAN. Your IT administrator can issue a hostname and IP address for the signal generator.

1. Press **Utility** > **GPIB/RS-232 LAN** > **LAN Setup**.
2. Press **Hostname**.

   Use the alphanumeric softkeys to enter a hostname. The name is not case sensitive.
3. Press **Enter**.
4. Press **IP Address**.

   Use the left and right arrow keys to move the cursor. Use the up and down arrow keys, the front panel knob or the numeric keypad to enter an IP address. You can press the **Clear Text** softkey to erase the current address.
5. Press **Enter** and then cycle the signal generator's power, using the LINE switch.

   This assigns a hostname and IP address to the signal generator. The hostname and IP address are not affected by an instrument preset or by a power cycle.
6. Connect the signal generator to the LAN using a 10BASE-T LAN cable.

3. Verifying LAN Functionality

Verify the communications link between the computer and the signal generator remote file server using the ping utility. Compare your ping response to those described in Table 1-12.

From a UNIX ® workstation, type:

```
ping hostname 64 10
```

where `hostname` is your instruments name and 64 is the packet size, and 10 is the number of packets transmitted. Type `man ping` at the UNIX prompt for details on the ping command.

From the MS-DOS® Command Prompt or Windows environment, type:

```
ping -n 10 hostname
```

where `hostname` is your instruments name and 10 is the number of echo requests. Type `ping` at the command prompt for details on the ping command.

UNIX is a registered trademark of the Open Group
MS-DOS is a registered trademark of Microsoft Corporation

Table 1-12 Ping Responses

Normal Response for UNIX	A normal response to the ping command will be a total of 9 or 10 packets received with a minimal average round-trip time. The minimal average will be different from network to network. LAN traffic will cause the round-trip time to vary widely.
Normal Response for DOS or Windows	A normal response to the ping command will be a total of 9 or 10 packets received if 10 echo requests were specified.
Error Messages	If error messages appear, then check the command syntax before continuing with troubleshooting. If the syntax is correct, resolve the error messages using your network documentation or by consulting your network administrator. If an unknown host error message appears, try using the IP address instead of the hostname. Also, verify that the host name and IP address for the signal generator have been registered by your IT administrator. Check that the hostname and IP address are correctly entered in the node names database. To do this, enter `the nslookup <hostname>` command from the command prompt.
No Response	If there is no response from a ping, no packets were received. Check that the typed address or hostname matches the IP address or hostname assigned to the signal generator in the System **Utility > GPIB/RS-232 LAN > LAN Setup** menu. Ping each node along the route between your workstation and the signal generator, starting with your workstation. If a node doesn't respond, contact your IT administrator. If the signal generator still does not respond to ping, you should suspect a hardware problem.
Intermittent Response	If you received 1 to 8 packets back, there maybe a problem with the network. In networks with switches and bridges, the first few pings may be lost until the these devices 'learn' the location of hosts. Also, because the number of packets received depends on your network traffic and integrity, the number might be different for your network. Problems of this nature are best resolved by your IT department.

Using VXI-11

The signal generator supports the LAN interface protocol described in the VXI-11 standard. VXI-11 is an instrument control protocol based on Open Network Computing/Remote Procedure Call (ONC/RPC) interfaces running over TCP/IP. It is intended to provide GBIB capabilities such as SRQ (Service Request), status byte reading, and DCAS (Device Clear State) over a LAN interface. This protocol is a good choice for migrating from GPIB to LAN as it has full Agilent VISA/SICL support. See the VXI website, www.vsi.org, for more information and details on the specification.

Configuring for VXI-11

The Agilent IO library has a program, IO Config, that is used to setup the computer/signal generator interface for the VXI-11 protocol. Download the latest version of the Agilent IO library from the Agilent website. Refer to the Agilent IO library user manual, documentation, and Help menu for information on running the IO Config program and configuring the VXI-11 interface.

Use the IO Config program to configure the LAN client. Once the computer is configured for a LAN client, you can use the VXI-11 protocol and the VISA library to send SCPI commands to the signal generator over the LAN interface. Example programs for this protocol are included in "LAN Programming Examples" on page 64 of this programming guide.

NOTE For Agilent IO library version J.01.0100, the "identify devices at run-time" check box must be unchecked. Refer to Figure 1-2.

Figure 1-2 Show Devices Form

Using Sockets LAN

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

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

Your signal generator implements a sockets Applications Programming Interface (API) that is compatible with Berkeley sockets, for UNIX systems, and Winsock for Microsoft systems. The signal generator is also compatible with other standard sockets APIs. The signal generator can be controlled using SCPI commands that are output to a socket connection established in your program.

Before you can use sockets LAN, you must select the signal generator's sockets port number to use:

- Standard mode. Available on port 7777. Use this port for simple programming.
- TELNET mode. Available on port 7778.

An example using sockets LAN is given in Chapter 2 of this programming guide.

Using TELNET LAN

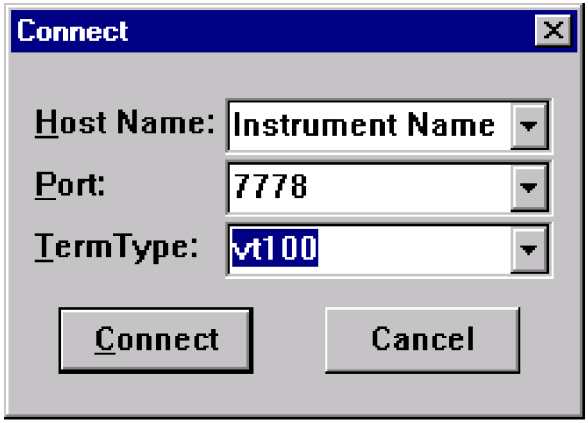
TELNET provides a means of communicating with the signal generator over the LAN. The TELNET client, run on a LAN connected computer, will create a login session on the signal generator. A connection, established between computer and signal generator, generates a user interface display screen with SCPI> prompts on the command line.

Using the TELNET protocol to send commands to the signal generator is similar communicating with the signal generator over GPIB. You establish a connection with the signal generator and then send or receive information using SCPI commands. Communication is interactive: one command at a time.

Using TELNET and MS-DOS Command Prompt

1. On the PC click **Start** > **Programs** > **Command Prompt**.
2. At the command prompt, type in `telnet`.
3. Press enter. The TELNET display screen will be displayed.
4. Click on the **Connect** menu then select **Remote System**. A connection form will be displayed. Refer to Figure 1-3.
5. Enter the hostname, port number, and TermType then click Connect. Refer to Figure 1-3.
   - Host Name - IP address or hostname
   - Port - 7778
   - Term Type - vt100
6. At the SCPI> prompt, enter SCPI commands. Refer to Figure 1-4 on page 22.
7. To signal device clear, press Ctrl-C on your keyboard.
8. Select **Exit** from the **Connect** menu and type `exit` at the command prompt to end the TELNET session.

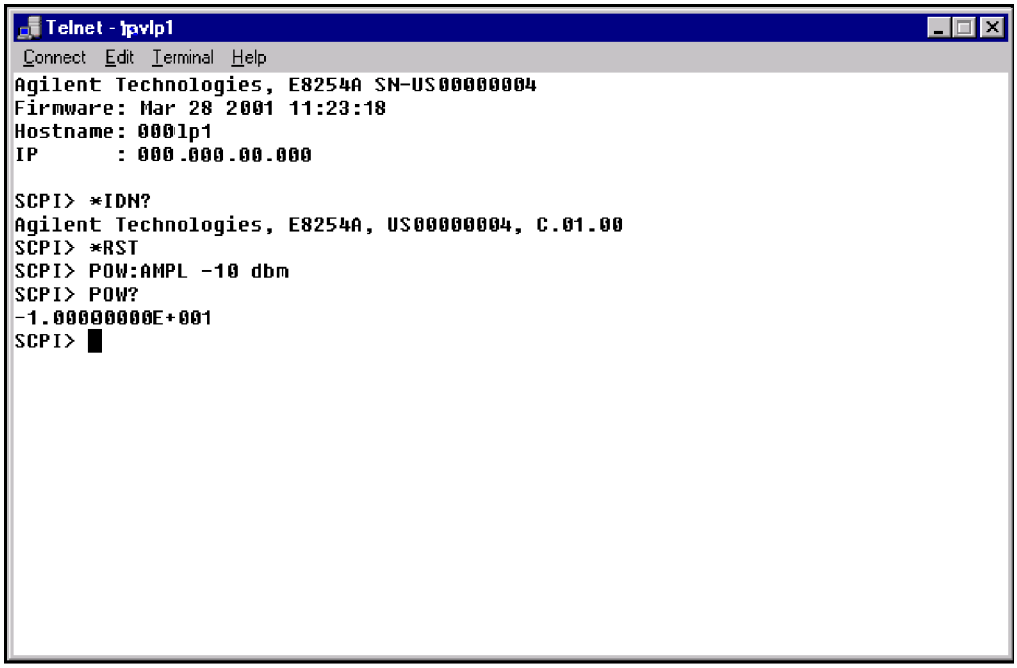
Figure 1-3 Connect Form



Using TELNET On a PC With a Host/Port Setting Menu GUI

1. On your PC click **Start > Run**.
2. Type `telnet` then click the **Ok** button. The TELNET connection screen will be displayed.
3. Click on the **Connect** menu then select **Remote System**. A connection form will be displayed. Refer to Figure 1-3.
4. Enter the hostname, port number, and TermType then click Connect. Refer to Figure 1-3.
   - Host Name - signal generator's IP address or hostname
   - Port - 7778
   - Term Type - vt100
5. At the `SCPI>` prompt, enter SCPI commands. Refer to Figure 1-4.
6. To signal device clear, press Ctrl-C.
7. Select **Exit** from the **Connect** menu to end the TELNET session.

Figure 1-4 TELNET Window



ce918a

The Standard UNIX TELNET Command

Synopsis `telnet` [`host` [`port`]]

Description This command is used to communicate with another host using the TELNET protocol. When the command `telnet` is invoked with `host` or `port` arguments, a connection is opened to the host, and input is sent from the user to the host.

Options and Parameters The command `telnet` operates in character-at-a-time or line-by-line mode. In line-by-line mode, typed text is echoed to the screen. When the line is completed (by pressing the **Enter** key), the text line is sent to `host`. In character-at-a-time mode, text is echoed to the screen and sent to `host` as it is typed. At the UNIX prompt, type `man telnet` to view the options and parameters available with the `telnet` command.

NOTE If your TELNET connection is in line-by-line mode, there is no local echo. This means you cannot see the characters you are typing until you press the Enter key. To remedy this, change your TELNET connection to character-by-character mode. Escape out of TELNET and, at the `telnet>` prompt, type `mode char`. If this does not work, consult your TELNET program's documentation.

Unix TELNET Example

To connect to the instrument with host name `myInstrument` and port number `7778`, enter the following command on the command line:

```
telnet myInstrument 7778
```

When you connect to the signal generator, the UNIX window will display a welcome message and a SCPI command prompt. The instrument is now ready to accept your SCPI commands. As you type SCPI commands, query results appear on the next line. When you are done, break the TELNET connection using an escape character. For example, Ctrl -],where the control key and the] are pressed at the same time.

The following example shows TELNET commands:

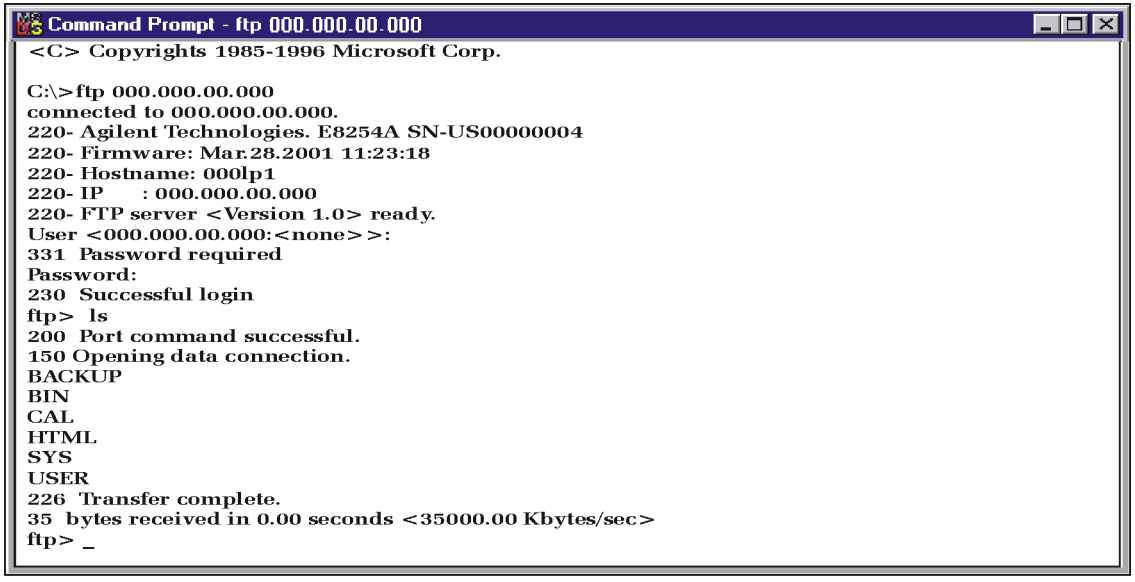
```
$ telnet myinstrument 7778

Trying....

Connected to signal generator

Escape character is '^]'.

Agilent Technologies, E8254A SN-US00000001

Firmware:

Hostname: your instrument

IP :xxx.xx.xxx.xxx

SCPI>
```

Using FTP

FTP allows users to transfer files between the signal generator and any computer connected to the LAN. For example, you can use FTP to download instrument screen images to a computer. When logged onto the signal generator with the FTP command, the signal generator's file structure can be accessed. Figure 1-5 shows the FTP interface and lists the directories in the signal generator's user level directory.

NOTE File access is limited to the signal generator's `/user` directory.

Figure 1-5 FTP Screen



ce917a

The following steps outline a sample FTP session from the MS-DOS Command Prompt:

1. On the PC click **Start** > **Programs** > **Command Prompt**.
2. At the command prompt enter:

   `ftp` < `IP address` > or < `hostname` >
3. At the user name prompt, press enter.
4. At the password prompt, press enter.

   You are now in the signal generator's user directory. Typing help at the command prompt will show you the FTP commands that are available on your system.
5. Type `quit` or `bye` to end your FTP session.

Using RS-232

The RS-232 serial interface can be used to communicate with the signal generator. The RS-232 connection is standard on most PCs and can be connected to the signal generator's rear-panel AUXILIARY INTERFACE connector using the cable described in Table 1-13 on page 27. Many functions provided by GPIB, with the exception of indefinite blocks, serial polling, GET, non-SCPI remote languages, and remote mode are available using the RS-232 interface.

The serial port sends and receives data one bit at a time, therefore RS-232 communication is slow. The data transmitted and received is usually in ASCII format with SCPI commands being sent to the signal generator and ASCII data returned. The interface uses three-line communication: Transmit, Receive, and Ground.

1. Selecting IO Libraries for RS-232

The IO libraries can be downloaded from the National Instrument website, www.ni.com, or Agilent's website, www.agilent.com. The following is a discussion on these libraries.

Agilent BASIC	The Agilent BASIC language has an extensive IO library that can be used to control the signal generator over the RS-232 interface. This library has many low level functions that can be used in BASIC applications to control the signal generator over the RS-232 interface.
VISA	VISA is an IO library used to develop IO applications and instrument drivers that comply with industry standards. It is recommended that the VISA library be used for programming the signal generator. The NI-VISA and Agilent VISA libraries are similar implementations of VISA and have the same commands, syntax, and functions. The differences are in the lower level IO libraries used to communicate over the RS-232; NI-488.2 and SICL respectively.
NI-488.2	NI-488.2 IO libraries can be used to develop applications for the RS-232 interface. See National Instrument's website for information on NI-488.2.
SICL	Agilent SICL can be used to develop applications for the RS-232 interface. See Agilent's website for information on SICL.

2. Setting Up the RS-232 Interface

1. Press **Utility** > **GPIB/RS-232** > **RS-232 Baud Rate** > **9600**

   Use baud rates 57600 or lower only. Select the signal generator's baud rate to match the baud rate of your computer or UNIX workstation or adjust the baud rate settings on your computer to match the baud rate setting of the signal generator.

NOTE The default baud rate for VISA is 9600. This baud rate can be changed with the "VI_ATTR_ASRL_BAUD" VISA attribute.

2. Press **Utility** > **GPIB/RS-232** > **RS-232 Setup** > **Trans/Recv Pace None Xon** until None is highlighted.

   The signal generator does not support hardware handshake. Software flow control is enabled with the **Xon** selection in the above key menu.

3. Press **Utility** > **GPIB/RS-232** > **RS-232 Echo Off On** until Off is highlighted.

   Set the signal generator's RS-232 echo. Selecting **On** echoes or returns characters sent to the signal generator and prints them to the display.

4. Connect an RS-232 cable from the computer's serial connector to the signal generator's AXILLARY INTERFACE connector. Refer to Table 1-13 for RS-232 cable information.

Table 1-13 RS-232 Serial Interface Cable

Quantity	Description	Agilent Part Number
1	Serial RS-232 cable 9-pin (male) to 9-pin (female)	8120-6188

NOTE Any 9 pin (male) to 9 pin (female) straight-through cable that directly wires pins 2,3, and 5 may be used.

3. Verifying RS-232 Functionality

You can use the HyperTerminal program available on your computer to verify the RS-232 interface functionality.

To run the HyperTerminal program, connect the RS-232 cable between the computer and the signal generator, set the signal generator's baud rate to 9600, and perform the following steps:

1. On the PC click **Start** >**Programs** > **Accessories** > **HyperTerminal**.
2. Select **HyperTerminal**.
3. Enter a name for the session in the text box and select an icon.
4. Select COM1 (COM2 can be used if COM1 is unavailable).
5. In the COM1(or COM2, if selected) properties, set the following parameters:
   - Bits per second: 9600 *must match computer's baud rate*
   - Data bits: 8
   - Parity: None
   - Flow Control: None

NOTE With software flow control the user cannot transmit binary data (file IO).

6. Go to the HyperTerminal window and select **File** > **Properties**
7. Go to **Settings** > **Emulation** and select **VT100**.
8. Go to **Settings** > **ASCII Setup**.
9. Check the first two boxes and leave the other boxes as default values.

Once the connection is established, enter the SCPI command `*IDN?` in the HyperTerminal window.

The signal generator should return a string similar to the following, depending on model:

<*instrument model name and number*>, US37040098 B.03.00

If You Have Problems

1. Verify that the baud rate, parity, stop bits, and flow control are the same for the computer and signal generator.
2. Verify that the RS-232 cable is identical to the cable specified in Table 1-13.
3. Verify that the application is using the correct computer COM port and that the RS-232 cable is properly connected to that port.

Character Format Parameters

The signal generator uses the following character format parameters when communicating via RS-232:

- Character Length: Eight data bits are used for each character, excluding start, stop, and parity bits.
- Parity Enable: Parity is disabled (absent) for each character.
- Stop Bits: One stop bit is included with each character.
- Software flow control or no Software flow control.

2 Programming Examples

Using the Programming Examples

The programming examples for remote control of the signal generator use the GPIB, LAN, and RS-232 interfaces and demonstrate instrument control using different I/O libraries and programming languages. Many of the example programs in this chapter are interactive; the user will be prompted to perform certain actions or verify signal generator operation or functionality. Example programs are written in the following languages:

- Agilent BASIC
- C/C++
- Java
- PERL

See Chapter 1 of this programming guide for information on interfaces, I/O libraries, and programming languages.

The example programs are also available on the PSG Family Documentation CD-ROM, allowing you to cut and paste the examples into a text editor.

NOTE The example programs set the signal generator into remote mode; front panel keys, except the **Local** key, are disabled. Press the **Local** key to revert to manual operation.

NOTE To update the signal generator's front panel display so that it reflects remote command setups, enable the remote display: press **Utility** > **Display** > **Update in Remote Off On** softkey until On is highlighted or send the SCPI command `:DISPlay:REMote ON`. For faster test execution, disable front panel updates.

Programming Examples Development Environment

The C/C++ examples in this guide were written using an IBM-compatible personal computer (PC) with the following configuration:

- Pentium® processor
- Windows NT 4.0 operating system
- C/C++ programming language with the Microsoft Visual C++ 6.0 IDE
- National Instruments PCI- GPIB interface card or Agilent GPIB interface card
- National Instruments VISA Library or Agilent VISA library
- COM1 or COM2 serial port available
- LAN interface card

The Agilent BASIC examples were run on a UNIX 700 Series workstation

Running C/C++ Programming Examples

To run the example programs written in C/C++ you must include the required files in the Microsoft Visual C++ 6.0 project.

If you are using the VISA library do the following:

- add the visa32.lib file to the Resource Files
- add the visa.h file to the Header Files

If you are using the NI-488.2 library do the following:

- add the GPIB-32.OBJ file to the Resource Files
- add the windows.h file to the Header Files
- add the Deci-32.h file to the Header Files

Refer to the National Instrument website for information on the NI-488.2 library and file requirements. For information on the VISA library see the Agilent website or National Instrument's website.

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GPIB Programming Examples

Before Using the Examples

If the Agilent GPIB interface card is used, then the Agilent VISA library should be installed along with Agilent SICL. If the National Instruments PCI-GPIB interface card is used, the NI-VISA library along with the NI-488.2 library should be installed. Refer to "2. Selecting IO Libraries for GPIB" on page 7 and the documentation for your GPIB interface card for details.

NOTE Agilent BASIC addresses the signal generator at 719. The GPIB card is addressed at 7 and the signal generator at 19. The GPIB address designator for other libraries is typically GPIB0 or GPIB1.

Interface Check using Agilent BASIC

This simple program causes the signal generator to perform an instrument reset. The SCPI command *RST places the signal generator into a pre-defined state and the remote annunciator (R) appears on the front panel display.

The following program example is available on the PSG Family Documentation CD-ROM as basicex1.txt.

```
10    !*****************************************************************************
20    !
30    !  PROGRAM NAME:          basicex1.txt
40    !
50    !  PROGRAM DESCRIPTION:  This program verifies that the GPIB connections and
60    !                        interface are functional.
70    !
80    !  Connect a controller to the signal generator using a GPIB cable.
90    !
100   !
110   !  CLEAR and RESET the controller and type in the following commands and then
120   !  RUN the program:
130   !
140   !*****************************************************************************
150   !
160   Sig_gen=719    ! Declares a variable to hold the signal generator's address
170   LOCAL Sig_gen  ! Places the signal generator into Local mode
180   CLEAR Sig_gen  ! Clears any pending data I/O and resets the parser
190   REMOTE 719     ! Puts the signal generator into remote mode
200   CLEAR SCREEN   ! Clears the controllers display
210   REMOTE 719
220   OUTPUT Sig_gen;"*RST"  ! Places the signal generator into a defined state
230   PRINT "The signal generator should now be in REMOTE."
240   PRINT
250   PRINT "Verify that the remote [R] annunciator is on.  Press the 'Local' key, "
260   PRINT "on the front panel to return the signal generator to local control."
270   PRINT
280   PRINT "Press RUN to start again."
290   END   ! Program ends
```

Interface Check Using NI-488.2 and C++

This example uses the NI-488.2 library to verify that the GPIB connections and interface are functional. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as niex1.cpp.

```
// ***************************************************************************************
//
// PROGRAM NAME: niex1.cpp
//
// PROGRAM DESCRIPTION: This program verifies that the GPIB connections and
// interface are functional.
//
// Connect a GPIB cable from the PC GPIB card to the signal generator
// Enter the following code into the source .cpp file and execute the program
//
// ***************************************************************************************

#include "stdafx.h"
#include <iostream>
#include "windows.h"
#include "Decl-32.h"
using namespace std;

int GPIB0=   0;         // Board handle
Addr4882_t Address[31]; // Declares an array of type Addr4882_t

int main(void)

{
     int sig;                          // Declares a device descriptor variable
     sig = ibdev(0, 19, 0, 13, 1, 0); // Aquires a device descriptor
     ibclr(sig);                       // Sends device clear message to signal generator
     ibwrt(sig, "*RST", 4);            // Places the signal generator into a defined state

                                       // Print data to the output window
     cout << "The signal generator should now be in REMOTE. The remote indicator"<<endl;
     cout <<"annunciator R should appear on the signal generator display"<<endl;

  return 0;

}
```

Interface Check using VISA and C

This program uses VISA library functions and the C language to communicate with the signal generator. The program verifies that the GPIB connections and interface are functional. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex1.cpp.

```
//*************************************************************************************
// PROGRAM NAME:visaex1.cpp
//
// PROGRAM DESCRIPTION:This example program verifies that the GPIB connections and
// and interface are functional.
// Turn signal generator power off then on and then run the progam
//
//*************************************************************************************

#include <visa.h>
#include <stdio.h>
#include "StdAfx.h"
#include <stdlib.h>

void main ()
{
               ViSession defaultRM, vi;        // Declares a variable of type ViSession
                                               // for instrument communication
               ViStatus viStatus = 0;
                                 // Opens a session to the GPIB device
                                 // at address 19
               viStatus=viOpenDefaultRM(&defaultRM);
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}

               viPrintf(vi, "*RST\n");         // initializes signal generator
                                               // prints to the output window
               printf("The signal generator should now be in REMOTE. The remote
                       indicator\n");
               printf("annunciator R should appear on the signal generator display\n");
               printf("\n");

               viClose(vi);                    // closes session
               viClose(defaultRM);             // closes default session
}
```

Local Lockout Using Agilent BASIC

This example demonstrates the Local Lockout function. Local Lockout disables the front panel signal generator keys.

The following program example is available on the PSG Family Documentation CD-ROM as basicex2.txt.

```
10    !************************************************************************
20    !
30    !  PROGRAM NAME:         basicex2.txt
40    !
50    !  PROGRAM DESCRIPTION:  In REMOTE mode, access to the signal generators
60    !                        functional front panel keys are disabled except for
70    !                        the Local and Contrast keys.  The LOCAL LOCKOUT
80    !                        command will disable the Local key.
90    !                        The LOCAL command, executed from the controller, is then
100   !                        the only way to return the signal generator to front panel,
110   !                        Local, control.
120   !************************************************************************
130   Sig_gen=719       ! Declares a variable to hold signal generator address
140   CLEAR Sig_gen     ! Resets signal generator parser and clears any output
150   LOCAL Sig_gen     ! Places the signal generator in local mode
160   REMOTE Sig_gen    ! Places the signal generator in remote mode
170   CLEAR SCREEN      ! Clears the controllers display
180   OUTPUT Sig_gen;"*RST"       ! Places the signal generator in a defined state
190   ! The following print statements are user prompts
200   PRINT "The signal generator should now be in remote."
210   PRINT "Verify that the 'R' and 'L' annunciators are visable"
220   PRINT ".......... Press Continue"
230   PAUSE
240   LOCAL LOCKOUT 7   ! Puts the signal generator in LOCAL LOCKOUT mode
250   PRINT             ! Prints user prompt messages
260   PRINT "Signal generator should now be in LOCAL LOCKOUT mode."
270   PRINT
280   PRINT "Verify that all keys including 'Local' (except Contrast keys) have no
effect."
290   PRINT
300   PRINT ".......... Press Continue"
310   PAUSE
320   PRINT
330   LOCAL 7           ! Returns signal generator to Local control
340   ! The following print statements are user prompts
350   PRINT "Signal generator should now be in Local mode."
360   PRINT
370   PRINT "Verify that the signal generator's front-panel keyboard is functional."
380   PRINT
390   PRINT "To re-start this program press RUN."
400   END
```

Local Lockout Using NI-488.2 and C++

This example uses the NI-488.2 library to set the signal generator local lockout mode. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as niex2.cpp.

```
// ************************************************************************************
// PROGRAM NAME: niex2.cpp
//
// PROGRAM DESCRIPTION: This program will place the signal generator into
// LOCAL LOCKOUT mode. All front panel keys, except the Contrast key, will be disabled.
// The local command, 'ibloc(sig)' executed via program code, is the only way to
// return the signal generator to front panel, Local, control.
// ************************************************************************************

#include "stdafx.h"
#include <iostream>
#include "windows.h"
#include "Decl-32.h"
using namespace std;
int GPIB0=   0;                          // Board handle
Addr4882_t Address[31];                  // Declares a variable of type Addr4882_t

int main()

{
      int sig;                           // Declares variable to hold interface descriptor
      sig = ibdev(0, 19, 0, 13, 1, 0);   // Opens and initialize a device descriptor
      ibclr(sig);                        // Sends GPIB Selected Device Clear (SDC) message
      ibwrt(sig, "*RST", 4);             // Places signal generator in a defined state
      cout << "The signal generator should now be in REMOTE. The remote mode R "<<endl;
      cout <<"annunciator should appear on the signal generator display."<<endl;
      cout <<"Press Enter to continue"<<endl;
      cin.ignore(10000,'\n');
      SendIFC(GPIB0);                    // Resets the GPIB interface
      Address[0]=19;                     // Signal generator's address
      Address[1]=NOADDR;                 // Signifies end element in array. Defined in
                                         // DECL-32.H
      SetRWLS(GPIB0, Address);           // Places device in Remote with Lockout State.

      cout<< "The signal generator should now be in LOCAL LOCKOUT. Verify that all
             keys"<<endl;
      cout<< "including the 'Local' key are disabled (Contrast keys are not
              affected)"<<endl;
      cout <<"Press Enter to continue"<<endl;
      cin.ignore(10000,'\n');
      ibloc(sig);                        // Returns signal generator to local control
```

```
      cout<<endl;
      cout<<"The signal generator should now be in local mode\n";
 return 0;}
}
```

Queries Using Agilent BASIC

This example demonstrates signal generator query commands. The signal generator can be queried for conditions and setup parameters. Query commands are identified by the question mark as in the identify command *IDN?

The following program example is available on the PSG Family Documentation CD-ROM as basicex3.txt.

```
10    !*****************************************************************************
20    !
30    !  PROGRAM NAME:          basicex3.txt
40    !
50    !  PROGRAM DESCRIPTION:   In this example, query commands are used with response
60    !                         data formats.
70    !
80    !  CLEAR and RESET the controller and RUN the following program:
90    !
100   !*****************************************************************************
110   !
120   DIM A$[10],C$[100],D$[10]   ! Declares variables to hold string response data
130   INTEGER B                   ! Declares variable to hold integer response data
140   Sig_gen=719                 ! Declares variable to hold signal generator address
150   LOCAL Sig_gen               ! Puts signal generator in Local mode
160   CLEAR Sig_gen               ! Resets parser and clears any pending output
170   CLEAR SCREEN                ! Clears the controller's display
180   OUTPUT Sig_gen;"*RST"       ! Puts signal generator into a defined state
190   OUTPUT Sig_gen;"FREQ:CW?"   ! Querys the signal generator CW frequency setting
200   ENTER Sig_gen;F             ! Enter the CW frequency setting
210   ! Print frequency setting to the controller display
220   PRINT "Present source CW frequency is: ";F/1.E+6;"MHz"
230   PRINT
240   OUTPUT Sig_gen;"POW:AMPL?"  ! Querys the signal generator power level
250   ENTER Sig_gen;W             ! Enter the power level
260   ! Print power level to the controller display
270   PRINT "Current power setting is: ";W;"dBM"
280   PRINT
290   OUTPUT Sig_gen;"FREQ:MODE?" ! Querys the signal generator for frequency mode
300   ENTER Sig_gen;A$            ! Enter in the mode: CW, Fixed or List
310   ! Print frequency mode to the controller display
320   PRINT "Source's frequency mode is: ";A$
330   PRINT
340   OUTPUT Sig_gen;"OUTP OFF"   ! Turns signal generator RF state off
350   OUTPUT Sig_gen;"OUTP?"      ! Querys the operating state of the signal generator
360   ENTER Sig_gen;B             ! Enter in the state (0 for off)
370   ! Print the on/off state of the signal generator to the controller display
380   IF B>0 THEN
390     PRINT "Signal Generator output is: on"
400   ELSE
410     PRINT "Signal Generator output is: off"
```

```
420   END IF
430   OUTPUT Sig_gen;"*IDN?"      ! Querys for signal generator ID
440   ENTER Sig_gen;C$            ! Enter in the signal generator ID
450   ! Print the signal generator ID to the controller display
460   PRINT
470   PRINT "This signal generator is a ";C$
480   PRINT
490   ! The next command is a query for the signal generator's GPIB address
500   OUTPUT Sig_gen;"SYST:COMM:GPIB:ADDR?"
510   ENTER Sig_gen;D$            ! Enter in the signal generator's address
520   ! Print the signal generator's GPIB address to the controllers display
530   PRINT "The GPIB address is ";D$
540   PRINT
550   ! Print user prompts to the controller's display
560   PRINT "The signal generator is now under local control"
570   PRINT "or  Press RUN to start again."
580   END
```

Queries Using NI-488.2 and C++

This example uses the NI-488.2 library to query different instrument states and conditions. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as niex3.cpp.

```
//**************************************************************************************
// PROGRAM NAME: niex3.cpp
//
// PROGRAM DESCRIPTION: This example demonstrates the use of query commands.
//
// The signal generator can be queried for conditions and instrument states.
// These commands are of the type "*IDN?" where the question mark indicates
// a query.
//
//**************************************************************************************

#include "stdafx.h"
#include <iostream>
#include "windows.h"
#include "Decl-32.h"
using namespace std;
int GPIB0=   0;                          // Board handle
Addr4882_t Address[31];                  // Declare a variable of type Addr4882_t

int main()

{
  int sig;                         // Declares variable to hold interface descriptor
  int num;
  char rdVal[100];                 // Declares variable to read instrument responses
  sig = ibdev(0, 19, 0, 13, 1, 0); // Open and initialize a device descriptor
  ibloc(sig);                      // Places the signal generator in local mode
  ibclr(sig);                      // Sends Selected Device Clear(SDC) message
  ibwrt(sig, "*RST", 4);           // Places signal generator in a defined state
  ibwrt(sig, ":FREQuency:CW?",14); // Querys the CW frequency
  ibrd(sig, rdVal,100);            // Reads in the response into rdVal
  rdVal[ibcntl] = '\0';            // Null character indicating end of array
  cout<<"Source CW frequency is "<<rdVal;   // Print frequency of signal generator
  cout<<"Press any key to continue"<<endl;
  cin.ignore(10000,'\n');
  ibwrt(sig, "POW:AMPL?",10);      // Querys the signal generator
  ibrd(sig, rdVal,100);            // Reads the signal generator power level
  rdVal[ibcntl] = '\0';            // Null character indicating end of array
                                                 // Prints signal generator power level
  cout<<"Source power (dBm) is : "<<rdVal;
  cout<<"Press any key to continue"<<endl;
```

```
  cin.ignore(10000,'\n');
  ibwrt(sig, ":FREQ:MODE?",11);    // Querys source frequency mode
  ibrd(sig, rdVal,100);            // Enters in the source frequency mode
  rdVal[ibcntl] = '\0';            // Null character indicating end of array
  cout<<"Source frequency mode is "<<rdVal; // Print source frequency mode
  cout<<"Press any key to continue"<<endl;
  cin.ignore(10000,'\n');
  ibwrt(sig, "OUTP OFF",12);       // Turns off RF source
  ibwrt(sig, "OUTP?",5);           // Querys the on/off state of the instrument
  ibrd(sig,rdVal,2);               // Enter in the source state
  rdVal[ibcntl] = '\0';
  num = (int (rdVal[0]) -('0'));
  if (num > 0){
      cout<<"Source RF state is : On"<<endl;
  }else{
      cout<<"Source RF state is : Off"<<endl;}
  cout<<endl;
  ibwrt(sig, "*IDN?",5);           // Querys the instrument ID
  ibrd(sig, rdVal,100);            // Reads the source ID
  rdVal[ibcntl] = '\0';            // Null character indicating end of array
  cout<<"Source ID is : "<<rdVal;  // Prints the source ID
  cout<<"Press any key to continue"<<endl;
  cin.ignore(10000,'\n');
  ibwrt(sig, "SYST:COMM:GPIB:ADDR?",20); //Querys source address
  ibrd(sig, rdVal,100);            // Reads the source address
  rdVal[ibcntl] = '\0';            // Null character indicates end of array
                                          // Prints the signal generator address
  cout<<"Source GPIB address is : "<<rdVal;
  cout<<endl;
  cout<<"Press the 'Local' key to return the signal generator to LOCAL control"<<endl;
  cout<<endl;
return 0;
}
```

Queries Using VISA and C

This example uses VISA library functions to query different instrument states and conditions. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex3.cpp.

```
//**************************************************************************************
// PROGRAM FILE NAME:visaex3.cpp
//
// PROGRAM DESCRIPTION:This example demonstrates the use of query commands. The signal
// generator can be queried for conditions and instrument states. These commands are of
// the type "*IDN?"; the question mark indicates a query.
//
//**************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>
#include <conio.h>
#include <stdlib.h>
using namespace std;


void main ()
{
               ViSession defaultRM, vi;    // Declares variables of type ViSession
                                           // for instrument communication
               ViStatus viStatus = 0;      // Declares a variable of type ViStatus
                                           // for GPIB verifications
               char rdBuffer [256];        // Declares variable to hold string data
               int num;                    // Declares variable to hold integer data
                                           // Initialize the VISA system
               viStatus=viOpenDefaultRM(&defaultRM);
                                           // Open session to GPIB device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){               // If problems, then prompt user
                   printf("Could not open ViSession!\n");
                   printf("Check instruments and connections\n");
                   printf("\n");
                   exit(0);}
               viPrintf(vi, "*RST\n");         // Resets signal generator
               viPrintf(vi, "FREQ:CW?\n");     // Querys the CW frequency
               viScanf(vi, "%t", rdBuffer);    // Reads response into rdBuffer
                                               // Prints the source frequency
               printf("Source CW frequency is : %s\n", rdBuffer);
               printf("Press any key to continue\n");
               printf("\n");                   // Prints new line character to the display
```

```
                getch();
                viPrintf(vi, "POW:AMPL?\n");    // Querys the power level
                viScanf(vi, "%t", rdBuffer);    // Reads the response into rdBuffer
                                                // Prints the source power level
                printf("Source power (dBm) is : %s\n", rdBuffer);
                printf("Press any key to continue\n");
                printf("\n");                   // Prints new line character to the display
                getch();
                viPrintf(vi, "FREQ:MODE?\n");   // Querys the frequency mode
                viScanf(vi, "%t", rdBuffer);    // Reads the response into rdBuffer
                                                // Prints the source freq mode
                printf("Source frequency mode is : %s\n", rdBuffer);
                printf("Press any key to continue\n");
                printf("\n");                   // Prints new line character to the display
                getch();
                viPrintf(vi, "OUTP OFF\n");     // Turns source RF state off
                viPrintf(vi, "OUTP?\n");        // Querys the signal generator's RF state
                viScanf(vi, "%1i", &num);       // Reads the response (integer value)
                                                // Prints the on/off RF state
                if (num > 0 ) {
                                printf("Source RF state is : on\n");
                }else{
                                printf("Source RF state is : off\n");
                }
                                    // Close the sessions
                viClose(vi);
                viClose(defaultRM);
}
```

Generating a CW Signal Using VISA and C

This example uses VISA library functions to control the signal generator. The signal generator is set for a CW frequency of 500 kHz and a power level of –2.3 dBm. Launch Microsoft Visual C++ 6.0, add the required files, and enter the code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex4.cpp.

```
//**********************************************************************************************
// PROGRAM FILE NAME:   visaex4.cpp
//
// PROGRAM DESCRIPTION: This example demonstrates query commands. The signal generator
// frequency and power level.
// The RF state of the signal generator is turn on and then the state is queried. The
// response will indicate that the RF state is on. The RF state is then turned off and
// queried. The response should indicate that the RF state is off. The query results are
// printed to the to the display window.
//
//**********************************************************************************************

#include "StdAfx.h"
#include <visa.h>
#include <iostream>
#include <stdlib.h>
#include <conio.h>

void main ()
{
               ViSession   defaultRM, vi;      // Declares variables of type ViSession
                                               // for instrument communication
               ViStatus viStatus = 0;          // Declares a variable of type ViStatus
                                               // for GPIB verifications
               char rdBuffer [256];            // Declare variable to hold string data
               int num;                        // Declare variable to hold integer data

               viStatus=viOpenDefaultRM(&defaultRM);     // Initialize VISA system
                                              // Open session to GPIB device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                  // If problems then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}

               viPrintf(vi, "*RST\n");         // Reset the signal generator
               viPrintf(vi, "FREQ 500 kHz\n"); // Set the source CW frequency for 500 kHz
               viPrintf(vi, "FREQ:CW?\n");     // Query the CW frequency
               viScanf(vi, "%t", rdBuffer);    // Read signal generator response
               printf("Source CW frequency is : %s\n", rdBuffer);  // Print the frequency
```

```
                viPrintf(vi, "POW:AMPL -2.3 dBm\n");  // Set the power level to -2.3 dBm
                viPrintf(vi, "POW:AMPL?\n");    // Query the power level
                viScanf(vi, "%t", rdBuffer);    // Read the response into rdBuffer
                printf("Source power (dBm) is : %s\n", rdBuffer); // Print the power level
                viPrintf(vi, "OUTP:STAT ON\n"); // Turn source RF state on
                viPrintf(vi, "OUTP?\n");        // Query the signal generator's RF state
                viScanf(vi, "%1i", &num);       // Read the response (integer value)

                                                // Print the on/off RF state
                if (num > 0 ) {
                                printf("Source RF state is : on\n");
                }else{
                                printf("Source RF state is : off\n");
                }
                printf("\n");
                printf("Verify RF state then press continue\n");
                printf("\n");
                getch();
                viClear(vi);
                viPrintf(vi,"OUTP:STAT OFF\n"); // Turn source RF state off
                viPrintf(vi, "OUTP?\n");        // Query the signal generator's RF state
                viScanf(vi, "%1i", &num);       // Read the response

                                                // Print the on/off RF state
                if (num > 0 ) {
                                printf("Source RF state is now: on\n");
                }else{
                                printf("Source RF state is now: off\n");
                }
                                        // Close the sessions
                printf("\n");
                viClear(vi);
                viClose(vi);
                viClose(defaultRM);
}
```

Generating an Externally Applied AC-Coupled FM Signal Using VISA and C

In this example, the VISA library is used to generate an ac-coupled FM signal at a carrier frequency of 700 MHz, a power level of –2.5 dBm, and a deviation of 20 kHz. Before running the program:

- Connect the output of a modulating signal source to the signal generator's EXT 2 input connector.
- Set the modulation signal source for the desired FM characteristics.

Launch Microsoft Visual C++ 6.0, add the required files, and enter the code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex5.cpp.

```
//**************************************************************************************
// PROGRAM FILE NAME:visaex5.cpp
//
// PROGRAM DESCRIPTION:This example sets the signal generator FM source to External 2,
// coupling to AC, deviation to 20 kHZ, carrier frequency to 700 MHz and the power level
// to -2.5 dBm. The RF state is set to on.
//
//**************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>
#include <stdlib.h>
#include <conio.h>

void main ()
{
               ViSession defaultRM, vi;           // Declares variables of type ViSession
                                                  // for instrument communication
               ViStatus viStatus = 0;             // Declares a variable of type ViStatus
                                                  // for GPIB verifications
                                                  // Initialize VISA session
               viStatus=viOpenDefaultRM(&defaultRM);
                                             // open session to gpib device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                        // If problems, then prompt user
                   printf("Could not open ViSession!\n");
                   printf("Check instruments and connections\n");
                   printf("\n");
                   exit(0);}

               printf("Example program to set up the signal generator\n");
```

```
                printf("for an AC-coupled FM signal\n");
                printf("Press any key to continue\n");
                printf("\n");
                getch();
                printf("\n");

                viPrintf(vi, "*RST\n");              // Resets the signal generator
                viPrintf(vi, "FM:SOUR EXT2\n");      // Sets EXT 2 source for FM
                viPrintf(vi, "FM:EXT2:COUP AC\n");   // Sets FM path 2 coupling to AC
                viPrintf(vi, "FM:DEV 20 kHz\n");     // Sets FM path 2 deviation to 20 kHz
                viPrintf(vi, "FREQ 700 MHz\n");      // Sets carrier frequency to 700 MHz
                viPrintf(vi, "POW:AMPL -2.5 dBm\n"); // Sets the power level to -2.5 dBm
                viPrintf(vi, "FM:STAT ON\n");        // Turns on frequency modulation
                viPrintf(vi, "OUTP:STAT ON\n");      // Turns on RF output
                                                     // Print user information
                printf("Power level : -2.5 dBm\n");
                printf("FM state : on\n");
                printf("RF output : on\n");
                printf("Carrier Frequency : 700 MHZ\n");
                printf("Deviation : 20 kHZ\n");
                printf("EXT2 and AC coupling are selected\n");
                printf("\n");                        // Prints a carrage return
                                                     // Close the sessions
                viClose(vi);
                viClose(defaultRM);
}
```

Generating an Internal AC-Coupled FM Signal Using VISA and C

In this example the VISA library is used to generate an ac-coupled internal FM signal at a carrier frequency of 900 MHz and a power level of –15 dBm. The FM rate will be 5 kHz and the peak deviation will be 100 kHz. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex6.cpp.

```
//**************************************************************************************
// PROGRAM FILE NAME:visaex6.cpp
//
// PROGRAM DESCRIPION:This example generates an AC-coupled internal FM signal at a 900
// MHz carrier frequency and a power level of -15 dBm. The FM rate is 5 kHz and the peak
// deviation 100 kHz
//
//**************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>
#include <stdlib.h>
#include <conio.h>

void main ()
{
               ViSession defaultRM, vi;           // Declares variables of type ViSession
                                                  // for instrument communication
               ViStatus viStatus = 0;             // Declares a variable of type ViStatus
                                                  // for GPIB verifications

               viStatus=viOpenDefaultRM(&defaultRM); // Initialize VISA session
                                       // open session to gpib device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                      // If problems, then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}

               printf("Example program to set up the signal generator\n");
               printf("for an AC-coupled FM signal\n");
               printf("\n");
               printf("Press any key to continue\n");
               getch();
               viClear(vi);                       // Clears the signal generator
               viPrintf(vi, "*RST\n");            // Resets the signal generator
               viPrintf(vi, "FM2:INT:FREQ 5 kHz\n"); // Sets EXT 2 source for FM
               viPrintf(vi, "FM2:DEV 100 kHz\n");    // Sets FM path 2 coupling to AC
```

```
                viPrintf(vi, "FREQ 900 MHz\n");       // Sets carrier frequency to 700 MHz
                viPrintf(vi, "POW -15 dBm\n");        // Sets the power level to -2.3 dBm
                viPrintf(vi, "FM2:STAT ON\n");        // Turns on frequency modulation
                viPrintf(vi, "OUTP:STAT ON\n");       // Turns on RF output
                printf("\n");                         // Prints a carriage return
                                                      // Print user information
                printf("Power level : -15 dBm\n");
                printf("FM state : on\n");
                printf("RF output : on\n");
                printf("Carrier Frequency : 900 MHZ\n");
                printf("Deviation : 100 kHZ\n");
                printf("Internal modulation : 5 kHz\n");
                printf("\n");                            // Print a carrage return
                                                  // Close the sessions
                viClose(vi);
                viClose(defaultRM);
}
```

Generating a Step-Swept Signal Using VISA and C

In this example the VISA library is used to set the signal generator for a continuous step sweep on a defined set of points from 500 MHz to 800 MHz. The number of steps is set for 10 and the dwell time at each step is set to 500 ms. The signal generator will then be set to local mode which allows the user to make adjustments from the front panel. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex7.cpp.

```
//*********************************************************************************************
// PROGRAM FILE NAME:visaex7.cpp
//
// PROGRAM DESCRIPTION:This example will program the signal generator to perform a step
// sweep from 500-800 MHz with a .5 sec dwell at each frequency step.
//
//*********************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>

void main ()
{
               ViSession defaultRM, vi;      // Declares variables of type ViSession
                                             // vi establishes instrument communication
               ViStatus viStatus = 0;        // Declares a variable of type ViStatus
                                             // for GPIB verifications

               viStatus=viOpenDefaultRM(&defaultRM); // Initialize VISA session
                                          // Open session to GPIB device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                 // If problems, then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}

               viClear(vi);                           // Clears the signal generator
               viPrintf(vi, "*RST\n");                // Resets the signal generator
               viPrintf(vi, "*CLS\n");                // Clears the status byte register
               viPrintf(vi, "FREQ:MODE LIST\n");      // Sets the sig gen freq mode to list
               viPrintf(vi, "LIST:TYPE STEP\n");      // Sets sig gen LIST type to step
               viPrintf(vi, "FREQ:STAR 500 MHz\n");   // Sets start frequency
               viPrintf(vi, "FREQ:STOP 800 MHz\n");   // Sets stop frequency
               viPrintf(vi, "SWE:POIN 10\n");         // Sets number of steps (30 mHz/step)
               viPrintf(vi, "SWE:DWEL .5 S\n");       // Sets dwell time to 500 ms/step
               viPrintf(vi, "POW:AMPL -5 dBm\n");     // Sets the power level for -5 dBm
               viPrintf(vi, "OUTP:STAT ON\n");        // Turns RF output on
```

```
                viPrintf(vi, "INIT:CONT ON\n");       // Begins the step sweep operation
                                                      // Print user information
                printf("The signal generator is in step sweep mode. The frequency range
                          is\n");
                printf("500 to 800 mHz. There is a .5 sec dwell time at each 30 mHz
                          step.\n");
                printf("\n");                         // Prints a carriage return/line feed
                viPrintf(vi, "OUTP:STAT OFF\n");      // Turns the RF output off
                printf("Press the front panel Local key to return the\n");
                printf("signal generoator to manual operation.\n");
                                                      // Closes the sessions
                printf("\n");
                viClose(vi);
                viClose(defaultRM);
}
```

Saving and Recalling States Using VISA and C

In this example, instrument settings are saved in the signal generator's save register. These settings can then be recalled separately; either from the keyboard or from the signal generator's front panel. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex8.cpp.

```
//*************************************************************************************
// PROGRAM FILE NAME:visaex8.cpp
//
// PROGRAM DESCRIPTION:In this example, instrument settings are saved in the signal
// generator's registers and then recalled.
// Instrument settings can be recalled from the keyboard or, when the signal generator
// is put into Local control, from the front panel.
// This program will initialize the signal generator for an instrument state, store the
// state to register #1. An *RST command will reset the signal generator and a *RCL
// command will return it to the stored state. Following this remote operation the user
// will be instructed to place the signal generator in Local mode.
//
//*************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>
#include <conio.h>

void main ()
{
               ViSession defaultRM, vi;      // Declares variables of type ViSession
                                             // for instrument communication
               ViStatus viStatus = 0;        // Declares a variable of type ViStatus
                                             // for GPIB verifications
               long lngDone = 0;             // Operation complete flag

               viStatus=viOpenDefaultRM(&defaultRM);     // Initialize VISA session
                                             // Open session to gpib device at address 19
               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                 // If problems, then prompt user
                   printf("Could not open ViSession!\n");
                   printf("Check instruments and connections\n");
                   printf("\n");
                   exit(0);}
               printf("\n");
               viClear(vi);                          // Clears the signal generator
               viPrintf(vi, "*CLS\n");               // Resets the status byte register
                                                     // Print user information
               printf("Programming example using the  *SAV,*RCL   SCPI commands\n");
```

```
                printf("used to save and recall an instrument's state\n");
                printf("\n");
                viPrintf(vi, "*RST\n");               // Resets the signal generator
                viPrintf(vi, "FREQ 5 MHz\n");         // Sets sig gen frequency
                viPrintf(vi, "POW:ALC OFF\n");        // Turns ALC Off
                viPrintf(vi, "POW:AMPL -3.2 dBm\n");  // Sets power for -3.2 dBm
                viPrintf(vi, "OUTP:STAT ON\n");       // Turns RF output On
                viPrintf(vi, "*OPC?\n");              // Checks for operation complete
                while (!lngDone)
                    viScanf (vi ,"%d",&lngDone);      // Waits for setup to complete
                viPrintf(vi, "*SAV 1\n");             // Saves sig gen state to register #1
                                                      // Print user information
                printf("The current signal generator operating state will be saved\n");
                printf("to Register #1. Observe the state then press Enter\n");
                printf("\n");                         // Prints new line character
                getch();                              // Wait for user input
                lngDone=0;                            // Resets the operation complete flag
                viPrintf(vi, "*RST\n");               // Resets the signal generator
                viPrintf(vi, "*OPC?\n");              // Checks for operation complete
                while (!lngDone)
                    viScanf (vi ,"%d",&lngDone);      // Waits for setup to complete
                                                      // Print user infromation
                printf("The instrument is now in it's Reset operating state. Press the\n");
                printf("Enter key to return the signal generator to the Register #1
                        state\n");
                printf("\n");                         // Prints new line character
                getch();                              // Waits for user input
                lngDone=0;                            // Reset the operation complete flag
                viPrintf(vi, "*RCL 1\n");             // Recalls stored register #1 state
                viPrintf(vi, "*OPC?\n");              // Checks for operation complete
                while (!lngDone)
                    viScanf (vi ,"%d",&lngDone);      // Waits for setup to complete
                                                      // Print user information
                printf("The signal generator has been returned to it's Register #1
                        state\n");
                printf("Press Enter to continue\n");
                printf("\n");                         // Prints new line character
                getch();                              // Waits for user input
                lngDone=0;                            // Reset the operation complete flag
                viPrintf(vi, "*RST\n");               // Resets the signal generator
                viPrintf(vi, "*OPC?\n");              // Checks for operation complete
                while (!lngDone)
                    viScanf (vi ,"%d",&lngDone);      // Waits for setup to complete
                                                      // Print user information
                printf("Press Local on instrument front panel to return to manual mode\n");
                printf("\n");                         // Prints new line character
                                                      // Close the sessions
                viClose(vi);
                viClose(defaultRM);
}
```

Reading the Data Questionable Status Register Using VISA and C

In this example, the signal generator's data questionable status register is read. You will be asked to set up the signal generator for error generating conditions. The data questionable status register will be read and the program will notify the user of the error condition that the setup caused. Follow the user prompts presented when the program runs. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex9.cpp.

```
//*************************************************************************************
// PROGRAM NAME:              visaex9.cpp
//
// PROGRAM DESCRIPTION:In this example, the data questionable status register is read.
// The data questionable status register is enabled to read an unleveled condition.
// The signal generator is then set up for an unleveled condition and the data
// questionable status register read. The results are then displayed to the user.
// The status questionable register is then setup to monitor a modulation error condition.
// The signal generator is set up for a modulation error condition and the data
// questionable status register is read.
// The results are displayed to the active window.
//
//*************************************************************************************

#include <visa.h>
#include "StdAfx.h"
#include <iostream>
#include <conio.h>

void main ()
{
               ViSession defaultRM, vi;      // Declares a variables of type ViSession
                                             // for instrument communication
               ViStatus viStatus = 0;        // Declares a variable of type ViStatus
                                             // for GPIB verifications
               int num=0;                    // Declares a variable for switch statements

               char rdBuffer[256]={0};         // Declare a variable for response data

               viStatus=viOpenDefaultRM(&defaultRM);     // Initialize VISA session
                                            // Open session to GPIB device at address 19

               viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
               if(viStatus){                   // If problems, then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}
               printf("\n");
```

```
viClear(vi);                    // Clears the signal generator
                                // Prints user information
printf("Programming example to demonstrate reading the signal generator's
         Status Byte\n");
printf("\n");
printf("Manually set up the sig gen for an unleveled output condition:\n");
printf("* Set signal generator output amplitude to +20 dBm\n");
printf("* Set frequency to maximum value\n");
printf("* Turn On signal generator's RF Output\n");
printf("* Check signal generator's display for the UNLEVEL annuniator\n");
printf("\n");
printf("Press Enter when ready\n");
printf("\n");
getch();                                    // Waits for keyboard user input
viPrintf(vi, "STAT:QUES:POW:ENAB 2\n");    // Enables the Data Questionable
                                            // Power Condition Register Bits
                                          // Bits '0' and '1'
viPrintf(vi, "STAT:QUES:POW:COND?\n");     // Querys the register for any
                                          // set bits
viScanf(vi, "%s", rdBuffer);               // Reads the decimal sum of the
                                          // set bits
num=(int (rdBuffer[1]) -('0'));            // Converts string data to
                                          // numeric

switch (num)                                // Based on the decimal value
{
    case 1:
                printf("Signal Generator Reverse Power Protection
                           Tripped\n");
                printf("/n");
                break;
    case 2:
                printf("Signal Generator Power is Unleveled\n");
                printf("\n");
                break;
    default:
                printf("No Power Unleveled condition detected\n");
                printf("\n");
}
viClear(vi);                                // Clears the signal generator
                                            // Prints user information
printf("-------------------------------------------------------------\n");
printf("\n");
printf("Manually set up the sig gen for an unleveled output condition:\n");
printf("\n");
printf("* Select AM modulation\n");
printf("* Select AM Source Ext 1 and Ext Coupling AC\n");
printf("* Turn On the modulation.\n");
printf("* Do not connect any source to the input\n");
printf("* Check signal generator's display for the EXT1 LO annunciator\n");
printf("\n");
```

```
printf("Press Enter when ready\n");
printf("\n");
getch();                                    // Waits for keyboard user input
viPrintf(vi, "STAT:QUES:MOD:ENAB 16\n");  // Enables the Data Questionable
                                            // Modulation Condition Register
                                          // bits '0','1','2','3' and  '4'
viPrintf(vi, "STAT:QUES:MOD:COND?\n");    // Querys the register for any
                                          // set bits
viScanf(vi, "%s", rdBuffer);              // Reads the decimal sum of the
                                          // set bits
num=(int (rdBuffer[1]) -('0')); // Converts string data to numeric

switch (num)                              // Based on the decimal value
{
    case 1:
                printf("Signal Generator Modulation 1 Undermod\n");
                printf("\n");
                break;
    case 2:
                printf("Signal Generator Modulation 1 Overmod\n");
                printf("\n");
                break;
    case 4:
                printf("Signal Generator Modulation 2 Undermod\n");
                printf("\n");
                break;
    case 8:
                printf("Signal Generator Modulation 2 Overmod\n");
                printf("\n");
                break;
    case 16:
                printf("Signal Generator Modulation Uncalibrated\n");
                printf("\n");
                break;
    default:
                printf("No Problems with Modulation\n");
                printf("\n");
}
                                // Close the sessions
viClose(vi);
viClose(defaultRM);

}
```

Reading the Service Request Interrupt (SRQ) Using VISA and C

This example demonstrates use of the Service Request (SRQ) interrupt. By using the SRQ, the computer can attend to other tasks while the signal generator is busy performing a function or operation. When the signal generator finishes it's operation, or detects a failure, then a Service Request can be generated. The computer will respond to the SRQ and, depending on the code, can perform some other operation or notify the user of failures or other conditions.

This program sets up a step sweep function for the signal generator and, while the operation is in progress, prints out a series of asterisks. When the step sweep operation is complete, an SRQ is generated and the printing ceases.

Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as visaex10.cpp.

```
//*************************************************************************
//
// PROGRAM FILE NAME:visaex10.cpp
//
// PROGRAM DESCRIPTION: This example demonstrates the use of a Service Request(SRQ)
// interupt. The program sets up conditions to enable the SRQ and then sets the signal
// generator for a step mode sweep. The program will enter a printing loop which prints
// an * character and ends when the sweep has completed and an SRQ received.
//
//*************************************************************************


#include "visa.h"
#include <stdio.h>
#include "StdAfx.h"
#include "windows.h"
#include <conio.h>

#define  MAX_CNT 1024

int sweep=1;  // End of sweeep flag

/* Prototypes */

ViStatus _VI_FUNCH interupt(ViSession vi, ViEventType eventType, ViEvent event, ViAddr
addr);

int main ()
{
               ViSession defaultRM, vi;      // Declares variables of type ViSession
                                             // for instrument communication
```

```
ViStatus viStatus = 0;        // Declares a variable of type ViStatus
                              // for GPIB verifications
char rdBuffer[MAX_CNT];       // Declare a block of memory data

viStatus=viOpenDefaultRM(&defaultRM);// Initialize VISA session
if(viStatus < VI_SUCCESS){    // If problems, then prompt user
               printf("ERROR initializing VISA... exiting\n");
               printf("\n");
return -1;     }
                              // Open session to gpib device at address 19
viStatus=viOpen(defaultRM, "GPIB::19::INSTR", VI_NULL, VI_NULL, &vi);
if(viStatus){                 // If problems then prompt user
               printf("ERROR: Could not open communication with
                           instrument\n");
               printf("\n");
return -1;     }

viClear(vi);                  // Clears the signal generator
viPrintf(vi, "*RST\n");       // Resets signal generator
                              // Print program header and information
printf("** End of Sweep Service Request **\n");
printf("\n");
printf("The signal generator will be set up for a step sweep mode
         operation.\n");
printf("An '*' will be printed while the instrument is sweeping. The end of
         \n");
printf("sweep will be indicated by an SRQ on the GPIB and the program will
         end.\n");
printf("\n");
printf("Press Enter to continue\n");
printf("\n");
getch();

viPrintf(vi, "*CLS\n");       // Clears signal generator status byte
viPrintf(vi, "STAT:OPER:NTR 8\n");// Sets the Operation Status Group
                              // Negative Transition Filter to indicate a
                              // negative transition in Bit 3 (Sweeping)
                              // which will set a corresponding event in
                              // the Operation Event Register. This occurs
                              // the end of a sweep.
viPrintf(vi, "STAT:OPER:PTR 0\n");// Sets the Operation Status Group
                              // Positive Transition Filter so that no
                              // positive transition on Bit 3 affects the
                              // Operation Event Register. The positive
                              // transition occurs at the start of a sweep.
viPrintf(vi, "STAT:OPER:ENAB 8\n");// Enables Operation Status Event Bit 3
                              // to report the event to Status Byte
                              // Register Summary Bit 7.
viPrintf(vi, "*SRE 128\n");   // Enables Status Byte Register Summary Bit 7
                              // The next line of code indicates the
                              // function to call on an event
```

```
                viStatus = viInstallHandler(vi, VI_EVENT_SERVICE_REQ, interupt, rdBuffer);
                                            // The next line of code enables the
                                            // detection of an event
                viStatus = viEnableEvent(vi, VI_EVENT_SERVICE_REQ, VI_HNDLR, VI_NULL);

                viPrintf(vi, "FREQ:MODE LIST\n");// Sets frequency mode to list
                viPrintf(vi, "LIST:TYPE STEP\n");// Sets sweep to step
                viPrintf(vi, "LIST:TRIG:SOUR IMM\n");// Immediately trigger the sweep
                viPrintf(vi, "LIST:MODE AUTO\n");// Sets mode for the list sweep
                viPrintf(vi, "FREQ:STAR 40 MHZ\n"); // Start frequency set to 40 MHz
                viPrintf(vi, "FREQ:STOP 900 MHZ\n");// Stop frequency set to 900 MHz
                viPrintf(vi, "SWE:POIN 25\n");// Set number of points for the step sweep
                viPrintf(vi, "SWE:DWEL .5 S\n");// Allow .5 sec dwell at each point
                viPrintf(vi, "INIT:CONT OFF\n");// Set up for single sweep
                viPrintf(vi, "TRIG:SOUR IMM\n");// Triggers the sweep
                viPrintf(vi, "INIT\n");         // Takes a single sweep
                printf("\n");
                                            // While the instrument is sweeping have the
                                            // program busy with printing to the display.
                                            // The Sleep function, defined in the header
                                            // file windows.h, will pause the program
                                            // operation for .5 seconds
                while (sweep==1){
                              printf("*");
                              Sleep(500);}
                printf("\n");
                                            // The following lines of code will stop the
                                            // events and close down the session

                viStatus = viDisableEvent(vi, VI_ALL_ENABLED_EVENTS,VI_ALL_MECH);
                viStatus = viUninstallHandler(vi, VI_EVENT_SERVICE_REQ, interupt,
                                              rdBuffer);
                viStatus = viClose(vi);
                viStatus = viClose(defaultRM);
                return 0;

}

// The following function is called when an SRQ event occurs. Code specific to your
// requirements would be entered in the body of the function.

ViStatus _VI_FUNCH interupt(ViSession vi, ViEventType eventType, ViEvent event, ViAddr
                            addr)
{
                ViStatus status;
                ViUInt16 stb;

                status = viReadSTB(vi, &stb); // Reads the Status Byte
                sweep=0;                      // Sets the flag to stop the '*' printing
                printf("\n");                 // Print user information
                printf("An SRQ, indicating end of sweep has occurred\n");
```

```
            viClose(event);              // Closes the event
            return VI_SUCCESS;
}
```

LAN Programming Examples

The LAN programming examples in this section demonstrate the use of VXI-11 and Sockets LAN to control the signal generator. For details on using FTP and TELNET refer to "Using FTP" on page 24 and "Using TELNET LAN" on page 20 of this guide.

Before Using the Examples

To use these programming examples you must change references to the IP address and hostname to match the IP address and hostname of your signal generator.

VXI-11 Programing

The signal generator supports the VXI-11 standard for instrument communication over the LAN interface. Agilent IO Libraries support the VXI-11 standard and must be installed on your computer before using the VXI-11 protocol. Refer to "Using VXI-11" on page 17 of this Programming Guide for information on configuring and using the VXI-11 protocol.

The VXI-11 examples use TCPIP0 as the board address.

VXI-11 Programming Using SICL in C

The following program uses the VXI-11 protocol and SICL to control the signal generator. The signal generator is set to a 1 GHz CW frequency and then queried for its ID string. Before running this code, you must set up the interface using the Agilent IO Libraries IO Config utility.

The following program example is available on the PSG Family Documentation CD-ROM as vxisicl.cpp.

```
//**************************************************************************************
//
// PROGRAM NAME:              vxisicl.cpp
//
// PROGRAM DESCRIPTION:Sample test program using SICL and the VXI-11 protocol
//
// NOTE: You must have the Agilent IO Libraries installed to run this program.
//
// This example uses the VXI-11 protocol to set the signal generator for a 1 gHz CW
// frequency. The signal generator is queried for operation complete and then queried
// for its ID string. The frequency and ID string are then printed to the display.
//
// IMPORTANT: Enter in your signal generators hostname in the instrumentName declaration
// where the "xxxxx" appears.
//
//**************************************************************************************

#include "stdafx.h"
#include <sicl.h>
#include <stdlib.h>
#include <stdio.h>

int main(int argc, char* argv[])
{

               INST id;                                        // Device session id
               int opcResponse;                                // Variable for response flag

               char instrumentName[] = "xxxxx"; // Put your instrument's hostname here
               char instNameBuf[256];        // Variable to hold instrument name
```

```
                char buf[256];                // Variable for id string
                ionerror(I_ERROR_EXIT);       // Register SICL error handler

                 // Open SICL instrument handle using VXI-11 protocol

                sprintf(instNameBuf, "lan[%s]:inst0", instrumentName);
                id = iopen(instNameBuf);      // Open instrument session
                itimeout(id, 1000);           // Set 1 second timeout for operations
                printf("Setting frequency to 1 Ghz...\n");
                iprintf(id, "freq 1 GHz\n");  // Set frequency to 1 GHz

                printf("Waiting for source to settle...\n");
                iprintf(id, "*opc?\n");       // Query for operation complete
                iscanf(id, "%d", &opcResponse);  // Operation complete flag
                if (opcResponse != 1)         // If operation fails, prompt user
                 {
                   printf("Bad response to 'OPC?'\n");
                   iclose(id);
                   exit(1);
                                              }
                iprintf(id, "FREQ?\n");       // Query the frequency
                iscanf(id, "%t", &buf);       // Read the signal generator frequency
                printf("\n");                 // Print the frequency to the display
                printf("Frequency of signal generator is  %s\n", buf);
                ipromptf(id, "*IDN?\n", "%t", buf);// Query for id string
                printf("Instrument ID: %s\n", buf);// Print id string to display
                iclose(id);                   // Close the session

                return 0;
}
```

VXI-11 Programming Using VISA in C

The following program uses the VXI-11 protocol and the VISA library to control the signal generator. The signal generator is set to a 1 GHz CW frequency and queried for its ID string. Before running this code, you must set up the interface using the Agilent IO Libraries IO Config utility.

The following program example is available on the PSG Family Documentation CD-ROM as vxivisa.cpp.

```
//*****************************************************************************
// PROGRAM FILE NAME:vxivisa.cpp
// Sample test program using the VISA libraries and the VXI-11 protocol
//
// NOTE: You must have the Agilent Libraries installed on your computer to run
// this program
//
// PROGRAM DESCRIPTION:This example uses the VXI-11 protocol and VISA to query
// the signal generator for its ID string. The ID string is then printed to the
```

```
// screen. Next the signal generator is set for a -5 dBm power level and then
// queried for the power level. The power level is printed to the screen.
//
// IMPORTANT: Set up the LAN Client using the IO Config utility
//
//*****************************************************************************************

#include <visa.h>
#include <stdio.h>
#include "StdAfx.h"
#include <stdlib.h>
#include <conio.h>

#define MAX_COUNT 200

int main (void)

{

               ViStatus status;              // Declares a type ViStatus variable
               ViSession defaultRM, instr;   // Declares a type ViSession variable
               ViUInt32 retCount;            // Return count for string I/O
               ViChar buffer[MAX_COUNT];     // Buffer for string I/O

               status = viOpenDefaultRM(&defaultRM);    // Initialize the system
                                                        // Open communication with Serial
                                                        // Port 2
               status = viOpen(defaultRM, "TPCIP0::19::INSTR", VI_NULL, VI_NULL, &instr);

               if(status){                              // If problems then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
                              printf("\n");
                              exit(0);}
                                        // Set timeout for 5 seconds
               viSetAttribute(instr, VI_ATTR_TMO_VALUE, 5000);
                                                        // Ask for sig gen ID string
               status = viWrite(instr, (ViBuf)"*IDN?\n", 6, &retCount);

                                                        // Read the sig gen response
               status = viRead(instr, (ViBuf)buffer, MAX_COUNT, &retCount);
               buffer[retCount]= '\0';                  // Indicate the end of the string
               printf("Signal Generator ID = ");        // Print header for ID
               printf(buffer);                          // Print the ID string
               printf("\n");                            // Print carriage return
                                                        // Flush the read buffer
                                                        // Set sig gen power to -5dbm
               status = viWrite(instr, (ViBuf)"POW:AMPL -5dbm\n", 15, &retCount);
                                                        // Query the power level
               status = viWrite(instr, (ViBuf)"POW?\n",5,&retCount);
                                                        // Read the power level
```

```
                status = viRead(instr, (ViBuf)buffer, MAX_COUNT, &retCount);
                buffer[retCount]= '\0';                  // Indicate the end of the string
                printf("Power level = ");                // Print header to the screen
                printf(buffer);                          // Print the queried power level
                printf("\n");
                status = viClose(instr);                 // Close down the system
                status = viClose(defaultRM);
                return 0;
}
```

Sockets LAN Programming using C

The program listing shown in "Setting Parameters and Sending Queries Using Sockets and C" on page 72 consists of two files; lanio.c and getopt.c. The lanio.c file has two main functions; `int main()` and an `int main1()`.

The `int main()` function allows communication with the signal generator interactively from the command line. The program reads the signal generator's hostname from the command line, followed by the SCPI command. It then opens a socket to the signal generator, using port 7777, and sends the command. If the command appears to be a query, the program queries the signal generator for a response, and prints the response.

The int main1(), after renaming to int main(), will output a sequence of commands to the signal generator. You can use the format as a template and then add your own code.

This program is available on the PSG Family Documentation CD-ROM as lanio.c

Sockets on UNIX

In UNIX, LAN communication via sockets is very similar to reading or writing a file. The only difference is the openSocket() routine, which uses a few network library routines to create the TCP/IP network connection. Once this connection is created, the standard fread() and fwrite() routines are used for network communication. The following steps outline the process:

1. Copy the lanio.c and getopt.c files to your home UNIX directory. For example, `/users/mydir/.`
2. At the UNIX prompt in your home directory type: `cc -Aa -O -o lanio lanio.c`
3. At the UNIX prompt in your home directory type: `./lanio xxxxx "*IDN?"` where `xxxxx` is the hostname for the signal generator. Use this same format to output SCPI commands to the signal generator.

The `int main1()` function will output a sequence of commands in a program format. If you want to run a program using a sequence of commands then perform the following:

1. Rename the lanio.c `int main1()` to `int main()` and the original `int main()` to `int main1()`.
2. In the `main()`, `openSocket()` function, change the "your hostname here" string to the hostname of the signal generator you want to control.
3. Resave the lanio.c program
4. At the UNIX prompt type: `cc -Aa -O -o lanio lanio.c`
5. At the UNIX prompt type: `./lanio`

The program will run and output a sequence of SCPI commands to the signal generator. The UNIX display will show a display similar to the following:

```
unix machine: /users/mydir
$ ./lanio
ID: Agilent Technologies, E8254A, US00000001, C.01.00

Frequency: +2.5000000000000E+09
Power Level: -5.00000000E+000
```

Sockets on Windows

In Windows, the routines send() and recv() must be used, since fread() and fwrite() may not work on sockets. The following steps outline the process for running the interactive program in the Microsoft Visual C++ 6.0 environment:

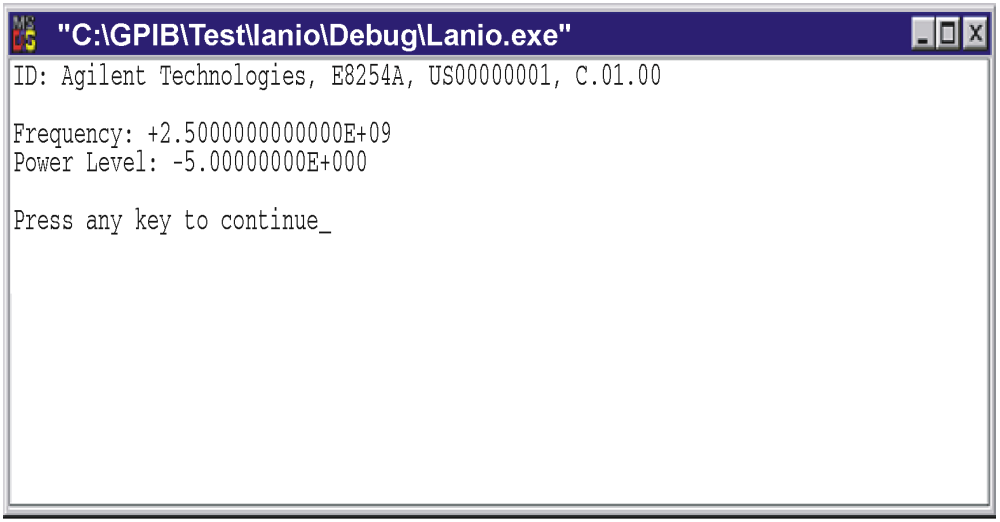
1. Rename the lanio.c to lanio.cpp and getopt.c to getopt.cpp and add them to the Source folder of the Visual C++ project.
2. Select **Rebuild All** from **Build** menu. Then select **Execute Lanio.exe**.
3. Click **Start**, click **Programs**, then click **Command Prompt**.
4. At the command prompt, `cd` to the directory containing the lanio.cpp file and then to the Debug folder. For example C:\SocketIO\Lanio\Debug
5. Type in `lanio xxxxx "*IDN?"` at the command prompt. For example: `C:\SocketIO\Lanio\Debug>lanio xxxxx "*IDN?"` where the xxxxx is the hostname of your signal generator. Use this format to output SCPI commands to the signal generator in a line by line format from the command prompt.
6. Type `exit` at the command prompt to quit the program.

The `int main1()` function will output a sequence of commands in a program format. If you want to run a program using a sequence of commands then perform the following:

1. Enter the hostname of your signal generator in the openSocket function of the `main1()` function of the lanio.c program
2. Rename the lanio.cpp `int main1()` function to `int main()` and the original `int main()` function to `int main1()`.
3. Select **Rebuild All** from **Build** menu. Then select **Execute Lanio.exe**.

The program will run and display the results as shown in Figure 2-1.

Figure 2-1 Program Output Screen



ce914a

Setting Parameters and Sending Queries Using Sockets and C

The following programming examples are available on the PSG Family Documentation CD-ROM as lanio.c and getopt.c.

```
/*************************************************************************
*  $Header: lanio.c 04/24/01
*  $Revision: 1.1 $
*  $Date: 04/24/01
*  PROGRAM NAME:   lanio.c
*
*  $Description:     Functions to talk to an Agilent signal generator
*                    via TCP/IP.  Uses command-line arguments.
*
*                    A TCP/IP connection to port 7777 is established and
*                    the resultant file descriptor is used to "talk" to the
*                    instrument using regular socket I/O mechanisms. $
*
*
*
*  Examples:
*
*   Query the signal generator frequency:
*        lanio xx.xxx.xx.x 'FREQ?'
*
*   Query the signal generator power level:
*        lanio xx.xxx.xx.x  'POW?'
*
*   Check for errors (gets one error):
*        lanio xx.xxx.xx.x  'syst:err?'
*
*   Send a list of commands from a file, and number them:
*        cat scpi_cmds | lanio -n xx.xxx.xx.x
*
*************************************************************************
*
*  This program compiles and runs under
*     - HP-UX 10.20 (UNIX), using HP cc or gcc:
*          + cc -Aa    -O -o lanio  lanio.c
*          + gcc -Wall -O -o lanio  lanio.c
*
*     - Windows 95, using Microsoft Visual C++ 4.0 Standard Edition
*     - Windows NT 3.51, using Microsoft Visual C++ 4.0
*          + Be sure to add  WSOCK32.LIB  to your list of libraries!
*          + Compile both lanio.c and getopt.c
*          + Consider re-naming the files to lanio.cpp and getopt.cpp
*
*  Considerations:
*     - On UNIX systems, file I/O can be used on network sockets.
*       This makes programming very convenient, since routines like
*       getc(), fgets(), fscanf() and fprintf() can be used.  These
```

```
 *       routines typically use the lower level read() and write() calls.
 *
 *     - In the Windows environment, file operations such as read(), write(),
 *       and close() cannot be assumed to work correctly when applied to
 *       sockets.  Instead, the functions send() and recv() MUST be used.
 ******************************************************************************/

/* Support both Win32 and HP-UX UNIX environment */

#ifdef _WIN32     /* Visual C++ 6.0 will define this */
#  define WINSOCK
#endif

#ifndef WINSOCK
#  ifndef _HPUX_SOURCE
#  define _HPUX_SOURCE
#  endif
#endif

#include <stdio.h>         /* for fprintf and NULL  */
#include <string.h>        /* for memcpy and memset */
#include <stdlib.h>        /* for malloc(), atol() */
#include <errno.h>         /* for strerror          */

#ifdef WINSOCK

#include <windows.h>

#  ifndef _WINSOCKAPI_
#  include <winsock.h>   // BSD-style socket functions
#  endif

#else                        /* UNIX with BSD sockets */

#  include <sys/socket.h>    /* for connect and socket*/
#  include <netinet/in.h>    /* for sockaddr_in       */
#  include <netdb.h>         /* for gethostbyname     */

#  define SOCKET_ERROR (-1)
#  define INVALID_SOCKET (-1)

   typedef  int SOCKET;

#endif /* WINSOCK */

#ifdef WINSOCK
  /* Declared in getopt.c.  See example programs disk. */
  extern char *optarg;
  extern int  optind;
  extern int getopt(int argc, char * const argv[], const char* optstring);
#else
```

```
#  include <unistd.h>           /* for getopt(3C) */
#endif

#define COMMAND_ERROR  (1)
#define NO_CMD_ERROR  (0)

#define SCPI_PORT  7777
#define INPUT_BUF_SIZE (64*1024)



/*****************************************************************************
 * Display usage
 *****************************************************************************/
static void usage(char *basename)
{
    fprintf(stderr,"Usage: %s [-nqu] <hostname> [<command>]\n", basename);
    fprintf(stderr,"       %s [-nqu] <hostname> < stdin\n", basename);
    fprintf(stderr,"  -n, number output lines\n");
    fprintf(stderr,"  -q, quiet; do NOT echo lines\n");
    fprintf(stderr,"  -e, show messages in error queue when done\n");
}



#ifdef WINSOCK
int init_winsock(void)
{
    WORD wVersionRequested;
    WSADATA wsaData;
    int err;
    wVersionRequested = MAKEWORD(1, 1);
    wVersionRequested = MAKEWORD(2, 0);

    err = WSAStartup(wVersionRequested, &wsaData);

    if (err != 0) {
        /* Tell the user that we couldn't find a useable */
        /* winsock.dll.     */
        fprintf(stderr, "Cannot initialize Winsock 1.1.\n");
        return -1;
    }
    return 0;
}

int close_winsock(void)
{
    WSACleanup();
    return 0;
}
#endif /* WINSOCK */
```

```
/*************************************************************************
 *
 > $Function: openSocket$
 *
 * $Description:  open a TCP/IP socket connection to the instrument $
 *
 * $Parameters:  $
 *    (const char *) hostname . . . . Network name of instrument.
 *                                    This can be in dotted decimal notation.
 *    (int) portNumber  . . . . . . . The TCP/IP port to talk to.
 *                                    Use 7777 for the SCPI port.
 *
 * $Return:     (int)  . . . . . . . . A file descriptor similar to open(1).$
 *
 * $Errors:     returns -1 if anything goes wrong $
 *
 *************************************************************************/
SOCKET openSocket(const char *hostname, int portNumber)
{
    struct hostent *hostPtr;
    struct sockaddr_in peeraddr_in;
    SOCKET s;


    memset(&peeraddr_in, 0, sizeof(struct sockaddr_in));

    /*******************************************/
    /* map the desired host name to internal form. */
    /*******************************************/
    hostPtr = gethostbyname(hostname);
    if (hostPtr == NULL)
    {
        fprintf(stderr,"unable to resolve hostname '%s'\n", hostname);
        return INVALID_SOCKET;
    }

    /******************/
    /* create a socket */
    /******************/
    s = socket(AF_INET, SOCK_STREAM, 0);
    if (s == INVALID_SOCKET)
    {
        fprintf(stderr,"unable to create socket to '%s': %s\n",
                hostname, strerror(errno));
        return INVALID_SOCKET;
    }

    memcpy(&peeraddr_in.sin_addr.s_addr, hostPtr->h_addr, hostPtr->h_length);
```

```
    peeraddr_in.sin_family = AF_INET;
    peeraddr_in.sin_port = htons((unsigned short)portNumber);

    if (connect(s, (const struct sockaddr*)&peeraddr_in,
                sizeof(struct sockaddr_in)) == SOCKET_ERROR)
    {
        fprintf(stderr,"unable to create socket to '%s': %s\n",
                hostname, strerror(errno));
        return INVALID_SOCKET;
    }

    return s;
}



/*************************************************************************
 *
 > $Function: commandInstrument$
 *
 * $Description:  send a SCPI command to the instrument.$
 *
 * $Parameters:  $
 *     (FILE *) . . . . . file pointer associated with TCP/IP socket.
 *     (const char *command)  . . SCPI command string.
 * $Return:  (char *) . . . . . a pointer to the result string.
 *
 * $Errors:   returns 0 if send fails $
 *
 *************************************************************************/
int commandInstrument(SOCKET sock,
                      const char *command)
{
    int count;

    /* fprintf(stderr, "Sending \"%s\".\n", command);  */
    if (strchr(command, '\n') == NULL) {
       fprintf(stderr, "Warning: missing newline on command %s.\n", command);
    }

    count = send(sock, command, strlen(command), 0);
    if (count == SOCKET_ERROR) {
        return COMMAND_ERROR;
    }

    return NO_CMD_ERROR;
}


/*************************************************************************
 * recv_line(): similar to fgets(), but uses recv()
```

```
 ***************************************************************************/
char * recv_line(SOCKET sock, char * result, int maxLength)
{
#ifdef WINSOCK
    int cur_length = 0;
    int count;
    char * ptr = result;
    int err = 1;

    while (cur_length < maxLength) {
        /* Get a byte into ptr */
        count = recv(sock, ptr, 1, 0);

        /* If no chars to read, stop. */
        if (count < 1) {
            break;
        }
        cur_length += count;

        /* If we hit a newline, stop. */
        if (*ptr == '\n') {
            ptr++;
            err = 0;
            break;
        }
        ptr++;

    }

    *ptr = '\0';

    if (err) {
        return NULL;
    } else {
        return result;
    }
#else
    /***************************************************************************
     * Simpler UNIX version, using file I/O.  recv() version works too.
     * This demonstrates how to use file I/O on sockets, in UNIX.
     ***************************************************************************/
    FILE * instFile;
    instFile = fdopen(sock, "r+");
    if (instFile == NULL)
    {
        fprintf(stderr, "Unable to create FILE * structure : %s\n",
                strerror(errno));
        exit(2);
    }
    return fgets(result, maxLength, instFile);
#endif
```

```
}



/*************************************************************************
 *
 > $Function: queryInstrument$
 *
 * $Description:  send a SCPI command to the instrument, return a response.$
 *
 * $Parameters:  $
 *     (FILE *) . . . . . file pointer associated with TCP/IP socket.
 *     (const char *command)  . . SCPI command string.
 *     (char *result) . . . . . where to put the result.
 *     (size_t) maxLength . . . . maximum size of result array in bytes.
 *
 * $Return:  (long) . . . . . The number of bytes in result buffer.
 *
 * $Errors:   returns 0 if anything goes wrong. $
 *
 *************************************************************************/
long queryInstrument(SOCKET sock,
                     const char *command, char *result, size_t maxLength)
{
    long ch;
    char tmp_buf[8];
    long resultBytes = 0;
    int command_err;
    int count;

    /*******************************************************
     * Send command to signal generator
     *******************************************************/
    command_err = commandInstrument(sock, command);
    if (command_err) return COMMAND_ERROR;


    /*******************************************************
     * Read response from signal generator
     *******************************************************/
    count = recv(sock, tmp_buf, 1, 0); /* read 1 char */
    ch = tmp_buf[0];

    if ((count < 1) || (ch == EOF)  || (ch == '\n'))
    {
        *result = '\0';  /* null terminate result for ascii */
        return 0;
    }

    /* use a do-while so we can break out */
    do
```

```
{
    if (ch == '#')
    {
        /* binary data encountered - figure out what it is */
        long numDigits;
        long numBytes = 0;
        /* char length[10]; */

        count = recv(sock, tmp_buf, 1, 0); /* read 1 char */
        ch = tmp_buf[0];
        if ((count < 1) || (ch == EOF)) break; /* End of file */

        if (ch < '0' || ch > '9') break;  /* unexpected char */
        numDigits = ch - '0';

        if (numDigits)
        {
            /* read numDigits bytes into result string. */
            count = recv(sock, result, (int)numDigits, 0);
            result[count] = 0;  /* null terminate */
            numBytes = atol(result);
        }

        if (numBytes)
        {
            resultBytes = 0;
            /* Loop until we get all the bytes we requested. */
            /* Each call seems to return up to 1457 bytes, on HP-UX 9.05 */
            do {
                int rcount;
                rcount = recv(sock, result, (int)numBytes, 0);
                resultBytes += rcount;
                result      += rcount;  /* Advance pointer */
            } while ( resultBytes < numBytes );

            /*********************************************************
             * For LAN dumps, there is always an extra trailing newline
             * Since there is no EOI line.  For ASCII dumps this is
             * great but for binary dumps, it is not needed.
             *********************************************************/
            if (resultBytes == numBytes)
            {
                char junk;
                count = recv(sock, &junk, 1, 0);
            }
        }
        else
        {
            /* indefinite block ... dump til we can an extra line feed */
            do
            {
```

```
                    if (recv_line(sock, result, maxLength) == NULL) break;
                    if (strlen(result)==1 && *result == '\n') break;
                    resultBytes += strlen(result);
                    result += strlen(result);
                } while (1);
            }
        }
        else
        {
            /* ASCII response (not a binary block) */
            *result = (char)ch;
            if (recv_line(sock, result+1, maxLength-1) == NULL) return 0;

            /* REMOVE trailing newline, if present.  And terminate string. */
            resultBytes = strlen(result);
            if (result[resultBytes-1] == '\n') resultBytes -= 1;
            result[resultBytes] = '\0';
        }
    } while (0);

    return resultBytes;
}



/*****************************************************************************
 *
 > $Function: showErrors$
 *
 * $Description: Query the SCPI error queue, until empty.  Print results. $
 *
 * $Return:  (void)
 *
 *****************************************************************************/
void showErrors(SOCKET sock)
{
    const char * command = "SYST:ERR?\n";
    char result_str[256];

    do {
        queryInstrument(sock, command, result_str, sizeof(result_str)-1);

        /*****************************************************************
         * Typical result_str:
         *     -221,"Settings conflict; Frequency span reduced."
         *     +0,"No error"
         * Don't bother decoding.
         *****************************************************************/
        if (strncmp(result_str, "+0,", 3) == 0) {
            /* Matched +0,"No error" */
```

```
            break;
        }
        puts(result_str);
    } while (1);

}


/************************************************************************
 *
 > $Function: isQuery$
 *
 * $Description: Test current SCPI command to see if it a query. $
 *
 * $Return:  (unsigned char) . . . non-zero if command is a query.  0 if not.
 *
 ************************************************************************/
unsigned char isQuery( char* cmd )
{
    unsigned char q = 0 ;
    char *query ;

    /*********************************************************/
    /* if the command has a '?' in it, use queryInstrument.  */
    /* otherwise, simply send the command.                   */
    /* Actually, we must be a more specific so that   */
    /* marker value querys are treated as commands.         */
    /* Example:  SENS:FREQ:CENT (CALC1:MARK1:X?)             */
    /*********************************************************/
    if ( (query = strchr(cmd,'?')) != NULL)
    {
        /* Make sure we don't have a marker value query, or
         * any command with a '?' followed by a ')' character.
         * This kind of command is not a query from our point of view.
         * The signal generator does the query internally, and uses the result.
         */
        query++ ;       /* bump past '?' */
        while (*query)
        {
            if (*query == ' ') /* attempt to ignore white spc */
                query++ ;
            else break ;
        }

        if ( *query != ')' )
        {
            q = 1 ;
        }
    }
    return q ;
}
```

```
/*************************************************************************
 *
 > $Function: main$
 *
 * $Description: Read command line arguments, and talk to signal generator.
                 Send query results to stdout. $
 *
 * $Return:  (int) . . . non-zero if an error occurs
 *
 *************************************************************************/

int main(int argc, char *argv[])
{

    SOCKET instSock;
    char *charBuf = (char *) malloc(INPUT_BUF_SIZE);
    char *basename;
    int chr;
    char command[1024];
    char *destination;
    unsigned char quiet = 0;
    unsigned char show_errs = 0;
    int number = 0;

    basename = strrchr(argv[0], '/');
    if (basename != NULL)
        basename++ ;
    else
        basename = argv[0];

    while ( ( chr = getopt(argc,argv,"qune")) != EOF )
        switch (chr)
        {
            case 'q':  quiet = 1; break;
            case 'n':  number = 1; break ;
            case 'e':  show_errs = 1; break ;
            case 'u':
            case '?':  usage(basename); exit(1) ;
        }

    /* now look for hostname and optional <command>*/
    if (optind < argc)
    {
        destination = argv[optind++] ;
        strcpy(command, "");
        if (optind < argc)
        {
            while (optind < argc) {
                /* <hostname> <command> provided; only one command string */
                strcat(command, argv[optind++]);
```

```
                if (optind < argc) {
                    strcat(command, " ");
                } else {
                    strcat(command, "\n");
                }
            }
        }
        else
        {
            /*Only <hostname> provided; input on <stdin> */
            strcpy(command, "");

            if (optind > argc)
            {
                usage(basename);
                exit(1);
            }
        }
    }
    else
    {
        /* no hostname! */
        usage(basename);
        exit(1);
    }

    /*****************************************************
    /* open a socket connection to the instrument
    /*****************************************************/

#ifdef WINSOCK
    if (init_winsock() != 0) {
        exit(1);
    }
#endif /* WINSOCK */

    instSock = openSocket(destination, SCPI_PORT);
    if (instSock == INVALID_SOCKET) {
        fprintf(stderr, "Unable to open socket.\n");
        return 1;
    }
    /* fprintf(stderr, "Socket opened.\n"); */

    if (strlen(command) > 0)
    {
    /*****************************************************
    /* if the command has a '?' in it, use queryInstrument. */
    /* otherwise, simply send the command.                  */
    /*****************************************************/
        if ( isQuery(command) )
        {
```

```
            long bufBytes;
            bufBytes = queryInstrument(instSock, command,
                                       charBuf, INPUT_BUF_SIZE);
            if (!quiet)
            {
                fwrite(charBuf, bufBytes, 1, stdout);
                fwrite("\n", 1, 1, stdout) ;
                fflush(stdout);
            }
        }
        else
        {
            commandInstrument(instSock, command);
        }
    }
    else
    {
        /* read a line from <stdin> */
        while ( gets(charBuf) != NULL )
        {
            if ( !strlen(charBuf) )
                continue ;

            if ( *charBuf == '#' || *charBuf == '!' )
                continue ;

            strcat(charBuf, "\n");

            if (!quiet)
            {
                if (number)
                {
                    char num[10];
                    sprintf(num,"%d: ",number);
                    fwrite(num, strlen(num), 1, stdout);
                }
                fwrite(charBuf, strlen(charBuf), 1, stdout) ;
                fflush(stdout);
            }

            if ( isQuery(charBuf) )
            {
                long bufBytes;

                /* Put the query response into the same buffer as the*/
                /* command string appended after the null terminator.*/

                bufBytes = queryInstrument(instSock, charBuf,
                                           charBuf + strlen(charBuf) + 1,
                                           INPUT_BUF_SIZE -strlen(charBuf) );
                if (!quiet)
```

```
                {
                    fwrite("  ", 2, 1, stdout) ;
                    fwrite(charBuf + strlen(charBuf)+1, bufBytes, 1, stdout);
                    fwrite("\n", 1, 1, stdout) ;
                    fflush(stdout);
                }
            }
            else
            {
                commandInstrument(instSock, charBuf);
            }
            if (number) number++;
        }
    }

    if (show_errs) {
        showErrors(instSock);
    }

#ifdef WINSOCK
    closesocket(instSock);
    close_winsock();
#else
    close(instSock);
#endif /* WINSOCK */

    return 0;
}

/* End of lanio.cpp  *



/*************************************************************************/
/* $Function: main1$                                                     */
/* $Description: Output a series of SCPI commands to the signal generator */
/*               Send query results to stdout. $                         */
/*                                                                       */
/* $Return:  (int) . . . non-zero if an error occurs                     */
/*                                                                       */
/*************************************************************************/
/* Rename this int main1() function to int main(). Re-compile and the    */
/* execute the program                                                   */
/*************************************************************************/

int main1()
{

               SOCKET instSock;
               long bufBytes;
    char *charBuf = (char *) malloc(INPUT_BUF_SIZE);
```

```
    /*****************************************/
    /* open a socket connection to the instrument*/
    /*****************************************/

#ifdef WINSOCK
    if (init_winsock() != 0) {
        exit(1);
    }
#endif /* WINSOCK */

    instSock = openSocket("xxxxxx", SCPI_PORT); /* Put your hostname here */
    if (instSock == INVALID_SOCKET) {
        fprintf(stderr, "Unable to open socket.\n");
        return 1;
    }
    /* fprintf(stderr, "Socket opened.\n"); */

   bufBytes = queryInstrument(instSock, "*IDN?\n", charBuf, INPUT_BUF_SIZE);
   printf("ID: %s\n",charBuf);
   commandInstrument(instSock, "FREQ 2.5 GHz\n");
   printf("\n");
   bufBytes = queryInstrument(instSock, "FREQ:CW?\n", charBuf, INPUT_BUF_SIZE);
   printf("Frequency: %s\n",charBuf);
   commandInstrument(instSock, "POW:AMPL -5 dBm\n");
   bufBytes = queryInstrument(instSock, "POW:AMPL?\n", charBuf, INPUT_BUF_SIZE);
   printf("Power Level: %s\n",charBuf);
   printf("\n");


#ifdef WINSOCK
    closesocket(instSock);
    close_winsock();
#else
    close(instSock);
#endif /* WINSOCK */

    return 0;
}
/*****************************************************************************

 getopt(3C)                                                        getopt(3C)

 PROGRAM FILE NAME: getopt.c
 getopt - get option letter from argument vector

 SYNOPSIS
      int getopt(int argc, char * const argv[], const char *optstring);
      extern char *optarg;
      extern int optind, opterr, optopt;
```

```
 PRORGAM DESCRIPTION:
      getopt returns the next option letter in argv (starting from argv[1])
      that matches a letter in optstring.  optstring is a string of
      recognized option letters; if a letter is followed by a colon, the
      option is expected to have an argument that may or may not be
      separated from it by white space.  optarg is set to point to the start
      of the option argument on return from getopt.

      getopt places in optind the argv index of the next argument to be
      processed.  The external variable optind is initialized to 1 before
      the first call to the function getopt.

      When all options have been processed (i.e., up to the first non-option
      argument), getopt returns EOF.  The special option -- can be used to
      delimit the end of the options; EOF is returned, and -- is skipped.

 ***************************************************************************/


#include <stdio.h>      /* For NULL, EOF */
#include <string.h>     /* For strchr() */

char    *optarg;        /* Global argument pointer. */
int     optind = 0;     /* Global argv index. */

static char     *scan = NULL;   /* Private scan pointer. */

int getopt( int argc, char * const argv[], const char* optstring)
{
    char c;
    char *posn;

    optarg = NULL;

    if (scan == NULL || *scan == '\0') {
        if (optind == 0)
            optind++;

        if (optind >= argc || argv[optind][0] != '-' || argv[optind][1] == '\0')
            return(EOF);
        if (strcmp(argv[optind], "--")==0) {
            optind++;
            return(EOF);
        }

        scan = argv[optind]+1;
        optind++;
    }

    c = *scan++;
```

```
    posn = strchr(optstring, c);        /* DDP */

    if (posn == NULL || c == ':') {
        fprintf(stderr, "%s: unknown option -%c\n", argv[0], c);
        return('?');
    }

    posn++;
    if (*posn == ':') {
        if (*scan != '\0') {
            optarg = scan;
            scan = NULL;
        } else {
            optarg = argv[optind];
            optind++;
        }
    }

    return(c);
}
```

Sockets LAN Programming Using PERL

This example uses PERL script to control the signal generator over the sockets LAN interface. The signal generator power level is set to – 5 dBm, queried for operation complete and then queried for it's identify string. This example was developed using PERL version 5.6.0 and requires a PERL version with the IO::Socket library.

1. In the code below, enter your signal generator's hostname in place of the xxxxx in the code line: `my $instrumentName= "xxxxx";` .
2. Save the code using the filename `lanperl`.
3. Run the program by typing `perl lanperl` at the UNIX term window prompt.

Setting the Power Level and Sending Queries Using PERL

The following program example is available on the PSG Family Documentation CD-ROM as perl.txt.

```
#!/usr/bin/perl
# PROGRAM NAME: perl.txt
# Example of talking to the signal generator via SCPI-over-sockets
#
use IO::Socket;
# Change to your instrument's name
my $instrumentName = "xxxxx";

# Get socket
$sock = new IO::Socket::INET ( PeerAddr => $instrumentName,
                               PeerPort => 7777,
                               Proto => 'tcp',
                               );
die "Socket Could not be created, Reason: $!\n" unless $sock;

# Set freq
print "Setting frequency...\n";
print $sock "freq 1 GHz\n";

# Wait for completion
print "Waiting for source to settle...\n";
print $sock "*opc?\n";
my $response = <$sock>;
chomp $response;           # Removes newline from response
if ($response ne "1")
{
   die "Bad response to '*OPC?' from instrument!\n";
}

# Send identification query
print $sock "*IDN?\n";
```

```
$response = <$sock>;
chomp $response;
print "Instrument ID: $response\n";
```

Sockets LAN Programming Using Java

In this example the Java program connects to the signal generator via sockets LAN. This program requires Java version 1.1 or later be installed on your PC. To run the program perform the following steps:

1. In the code example below, type in the hostname or IP address of your signal generator. For example, `String instrumentName =` (your signal generator's hostname).
2. Copy the program as `ScpiSockTest.java` and save it in a convenient directory on your computer. For example save the file to the `C:\jdk1.3.0_2\bin\javac` directory.
3. Launch the Command Prompt program on your computer. Click **Start** > **Programs** > **Command Prompt**.
4. Compile the program. At the command prompt type: `javac ScpiSockTest.java`. The directory path for the Java compiler must be specified. For example: `C:\>jdk1.3.0_2\bin\javac ScpiSockTest.java`
5. Run the program by typing `java ScpiSockTest` at the command prompt.
6. Type `exit` at the command prompt to end the program.

Generating a CW Signal Using Java

The following program example is available on the PSG Family Documentation CD-ROM as javaex.txt.

```
//**************************************************************************
// PROGRAM NAME: javaex.txt
// Sample java program to talk to the signal generator via SCPI-over-sockets
// This program requires Java version 1.1 or later.
// Save this code as ScpiSockTest.java
// Compile by typing: javac ScpiSockTest.java
// Run by typing: java ScpiSockTest
// The signal generator is set for 1 GHz and queried for its id string
//**************************************************************************

import java.io.*;
import java.net.*;
class ScpiSockTest
{
    public static void main(String[] args)
    {
       String instrumentName = "xxxxx";           // Put your hostname here
              try
        {
       Socket t = new Socket(instrumentName,7777);  // Connect to instrument
```

```
            // Setup read/write mechanism
            BufferedWriter out =
            new BufferedWriter(
            new OutputStreamWriter(t.getOutputStream()));
            BufferedReader in =
            new BufferedReader(
            new InputStreamReader(t.getInputStream()));
            System.out.println("Setting frequency to 1 GHz...");
            out.write("freq 1GHz\n");               // Sets frequency
            out.flush();
            System.out.println("Waiting for source to settle...");
            out.write("*opc?\n");                   // Waits for completion
            out.flush();
            String opcResponse = in.readLine();
            if (!opcResponse.equals("1"))
             {
              System.err.println("Invalid response to '*OPC?'!");
              System.exit(1);
             }
       System.out.println("Retrieving instrument ID...");
       out.write("*idn?\n");                       // Querys the id string
       out.flush();
       String idnResponse = in.readLine();         // Reads the id string
                                                   // Prints the id string
       System.out.println("Instrument ID: " + idnResponse);
       }
       catch (IOException e)
       {
       System.out.println("Error" + e);
     }
   }
}
```

RS-232 Programming Examples

Before Using the Examples

On the signal generator select the following settings:

- Baud Rate - 9600 *must match computer's baud rate*
- Transmit Pace - None
- Receive Pace - None
- RTS/CTS - None
- RS-232 Echo - Off

Interface Check Using Agilent BASIC

This example program causes the signal generator to perform an instrument reset. The SCPI command *RST will place the signal generator into a pre-defined state.

The serial interface address for the signal generator in this example is 9. The serial port used is COM1 (Serial A on some computers). Refer to "Using RS-232" on page 26 for more information.

Watch for the signal generator's Listen annunciator (L) and the 'remote preset....' message on the front panel display. If there is no indication, check that the RS-232 cable is properly connected to the computer serial port and that the manual setup listed above is correct.

If the compiler displays an error message, or the program hangs, it is possible that the program was typed incorrectly. Press the signal generator's **Reset RS-232** softkey and re-run the program. Refer to "If You Have Problems" on page 8 for more help.

The following program example is available on the PSG Family Documentation CD-ROM as rs232ex1.txt.

```
10    !*************************************************************************
20    !
30    !  PROGRAM NAME:         rs232ex1.txt
40    !
50    !  PROGRAM DESCRIPTION:  This program verifies that the RS-232 connections and
60    !                        interface are functional.
70    !
80    !  Connect the UNIX workstation to the signal generator using an RS-232 cable
90    !
100   !
110   !  Run Agilent BASIC, type in the following commands and then RUN the program
120   !
130   !
140   !*************************************************************************
150   !
160    INTEGER Num
170    CONTROL 9,0;1       ! Resets the RS-232 interface
180    CONTROL 9,3;9600    ! Sets the baud rate to match the sig gen
190    STATUS 9,4;Stat     ! Reads the value of register 4
200    Num=BINAND(Stat,7)  ! Gets the AND value
210    CONTROL 9,4;Num     ! Sets parity to NONE
220    OUTPUT 9;"*RST"     ! Outputs reset to the sig gen
230    END                 ! End the program
```

Interface Check Using VISA and C

This program uses VISA library functions to communicate with the signal generator. The program verifies that the RS-232 connections and interface are functional. In this example the COM2 port is used. The serial port is referred to in the VISA library as 'ASRL1' or 'ASRL2' depending on the computer serial port you are using. Launch Microsoft Visual C++, add the required files, and enter the following code into the .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as rs232ex1.cpp.

```
//**************************************************************************************
// PROGRAM NAME:        rs232ex1.cpp
//
// PROGRAM DESCRIPTION: This code example uses the RS-232 serial interface to
// control the signal generator.
//
// Connect the computer to the signal generator using an RS-232 serial cable.
// The user is asked to set the signal generator for a 0 dBm power level
// A reset command *RST is sent to the signal generator via the RS-232
// interface and the power level will reset to the -135 dBm level.The default
// attributes e.g. 9600 baud, no parity, 8 data bits,1 stop bit are used.
// These attributes can be changed using VISA functions.
//
// IMPORTANT: Set the signal generator BAUD rate to 9600 for this test
//**************************************************************************************

#include <visa.h>
#include <stdio.h>
#include "StdAfx.h"
#include <stdlib.h>
#include <conio.h>



void main ()
{

               int baud=9600;                // Set baud rate to 9600
               printf("Manually set the signal generator power level to 0 dBm\n");
               printf("\n");
               printf("Press any key to continue\n");
               getch();
               printf("\n");
               ViSession defaultRM, vi;      // Declares a variable of type ViSession
                                             // for instrument communication on COM 2 port
               ViStatus viStatus = 0;
                                    // Opens session to RS-232 device at serial port 2
               viStatus=viOpenDefaultRM(&defaultRM);
               viStatus=viOpen(defaultRM, "ASRL2::INSTR", VI_NULL, VI_NULL, &vi);
```

```
                if(viStatus){                 // If operation fails, prompt user
                    printf("Could not open ViSession!\n");
                    printf("Check instruments and connections\n");
                    printf("\n");
                    exit(0);}
                                              // initialize device
                viStatus=viEnableEvent(vi, VI_EVENT_IO_COMPLETION, VI_QUEUE,VI_NULL);

                viClear(vi);                  // Sends device clear command
                                              // Set attributes for the session
                viSetAttribute(vi,VI_ATTR_ASRL_BAUD,baud);
                viSetAttribute(vi,VI_ATTR_ASRL_DATA_BITS,8);

                viPrintf(vi, "*RST\n");       // Resets the signal generator
                printf("The signal generator has been reset\n");
                printf("Power level should be -135 dBm\n");
                printf("\n");                 // Prints new line character to the display
                viClose(vi);                  // Closes session
                viClose(defaultRM);           // Closes default session
}
```

Queries Using Agilent BASIC

This example program demonstrates signal generator query commands over RS-232. Query commands are of the type *IDN? and are identified by the question mark that follows the mnemonic.

Start Agilent BASIC, type in the following commands, and then RUN the program:

The following program example is available on the PSG Family Documentation CD-ROM as rs232ex2.txt.

```
10    !*****************************************************************************
20    !
30    !  PROGRAM NAME:         rs232ex2.txt
40    !
50    !  PROGRAM DESCRIPTION:  In this example, query commands are used to read
60    !                        data from the signal generator.
70    !
80    !  Start Agilent BASIC, type in the following code and then RUN the program.
90    !
100   !*****************************************************************************
110   !
120    INTEGER Num
130    DIM Str$[200],Str1$[20]
140    CONTROL 9,0;1              ! Resets the RS-232 interface
150    CONTROL 9,3;9600           ! Sets the baud rate to match signal generator rate
160    STATUS 9,4;Stat            ! Reads the value of register 4
170    Num=BINAND(Stat,7)         ! Gets the AND value
180    CONTROL 9,4;Num            ! Sets the parity to NONE
190    OUTPUT 9;"*IDN?"           ! Querys the sig gen ID
200    ENTER 9;Str$               ! Reads the ID
210    WAIT 2                     ! Waits 2 seconds
220    PRINT "ID =",Str$          ! Prints ID to the screen
230    OUTPUT 9;"POW:AMPL -5 dbm" ! Sets the the power level to -5 dbm
240    OUTPUT 9;"POW?"            ! Querys the power level of the sig gen
250    ENTER 9;Str1$              ! Reads the queried value
260    PRINT "Power = ",Str1$     ! Prints the power level to the screen
270    END                        ! End the program
```

Queries Using VISA and C

This example uses VISA library functions to communicate with the signal generator. The program verifies that the RS-232 connections and interface are functional. Launch Microsoft Visual C++, add the required files, and enter the following code into your .cpp source file.

The following program example is available on the PSG Family Documentation CD-ROM as rs232ex2.cpp.

```
//*****************************************************************************
//
// PROGRAM NAME:       rs232ex2.cpp
//
// PROGRAM DESCRIPTION: This code example uses the RS-232 serial interface to control
// the signal generator.
//
// Connect the computer to the signal generator using the RS-232 serial cable
// and enter the following code into the project .cpp source file.
// The program queries the signal generator ID string and sets and queries the power
// level. Query results are printed to the screen. The default attributes e.g. 9600 baud,
// parity, 8 data bits,1 stop bit are used. These attributes can be changed using VISA
// functions.
//
// IMPORTANT: Set the signal generator BAUD rate to 9600 for this test
//*****************************************************************************


#include <visa.h>
#include <stdio.h>
#include "StdAfx.h"
#include <stdlib.h>
#include <conio.h>

#define MAX_COUNT 200

int main (void)
{

               ViStatus       status;          // Declares a type ViStatus variable
               ViSession      defaultRM, instr;// Declares type ViSession variables
               ViUInt32       retCount;        // Return count for string I/O
               ViChar         buffer[MAX_COUNT];// Buffer for string I/O

               status = viOpenDefaultRM(&defaultRM);// Initializes the system
                                          // Open communication with Serial Port 2
               status = viOpen(defaultRM, "ASRL2::INSTR", VI_NULL, VI_NULL, &instr);

               if(status){                   // If problems, then prompt user
                              printf("Could not open ViSession!\n");
                              printf("Check instruments and connections\n");
```

```
                printf("\n");
                exit(0);}
                                // Set timeout for 5 seconds
        viSetAttribute(instr, VI_ATTR_TMO_VALUE, 5000);
                                // Asks for sig gen ID string
        status = viWrite(instr, (ViBuf)"*IDN?\n", 6, &retCount);

                                // Reads the sig gen response
        status = viRead(instr, (ViBuf)buffer, MAX_COUNT, &retCount);
        buffer[retCount]= '\0';       // Indicates the end of the string
        printf("Signal Generator ID: "); // Prints header for ID
        printf(buffer);               // Prints the ID string to the screen
        printf("\n");                 // Prints carriage return
                                // Flush the read buffer
                                // Sets sig gen power to -5dbm
        status = viWrite(instr, (ViBuf)"POW:AMPL -5dbm\n", 15, &retCount);
                                // Querys the sig gen for power level
        status = viWrite(instr, (ViBuf)"POW?\n",5,&retCount);
                                // Read the power level
        status = viRead(instr, (ViBuf)buffer, MAX_COUNT, &retCount);
        buffer[retCount]= '\0';       // Indicates the end of the string
        printf("Power level = ");     // Prints header to the screen
        printf(buffer);               // Prints the queried power level
        printf("\n");
        status = viClose(instr);      // Close down the system
        status = viClose(defaultRM);
        return 0;
}
```

3 Programming the Status Register System

Overview

During remote operation, it is important to monitor the status of the signal generator. In most applications, it is sufficient to use the :SYSTem:ERRor? query (Refer to “:ERRor[:NEXT]” on page 208) to see if any errors have been posted in the signal generator's error queue.

The status register system, described in this chapter, is an alternative method to monitor the status of the signal generator. The status register system is more complex than the simple :SYSTem:ERROR? query, but does provide two major advantages:

- You can monitor the settling of the signal generator using the Settling Bit of the Operation Status Group.
- You can use the SRQ interrupt technique to avoid status polling, which may give you a speed advantage.

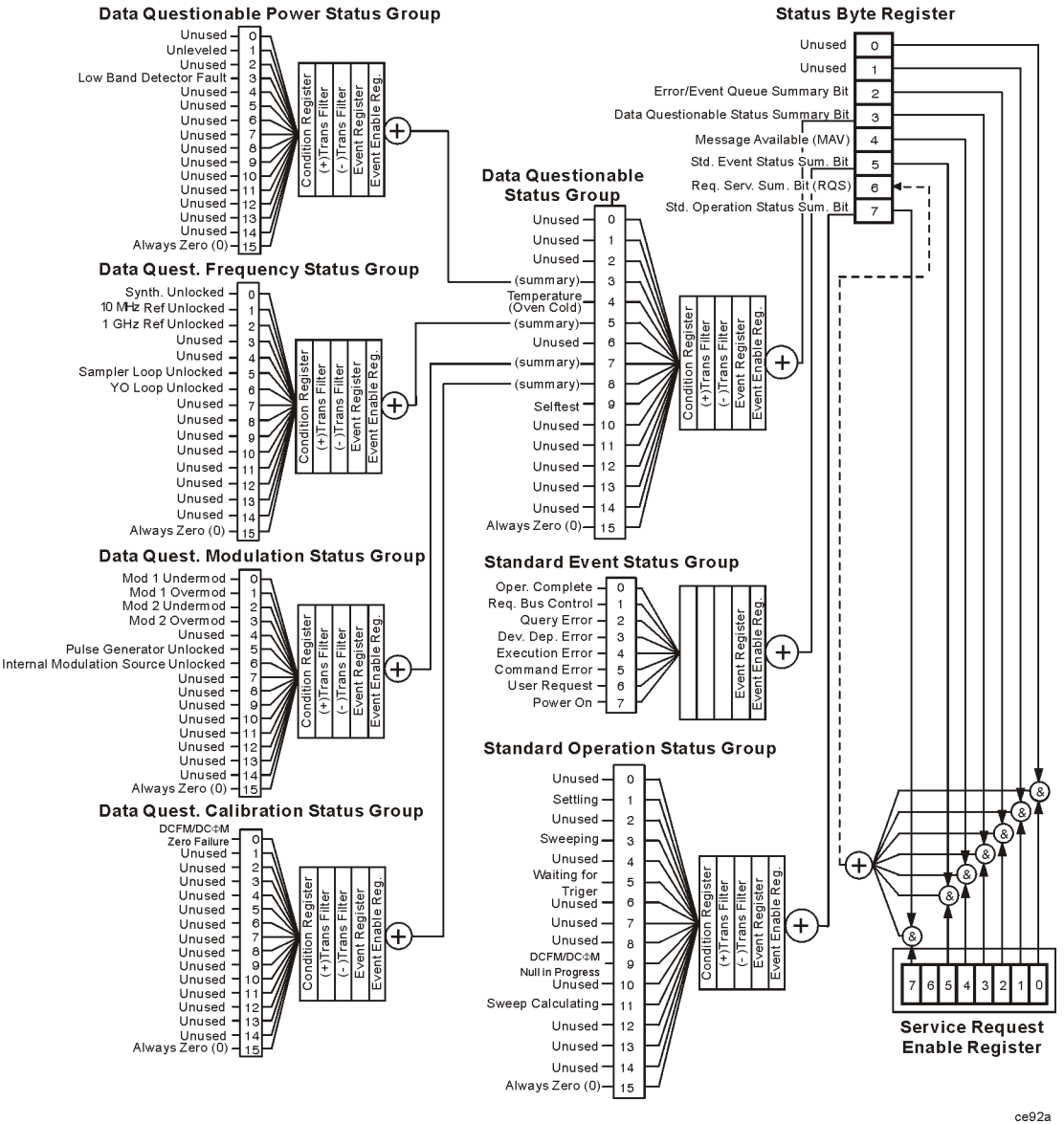
The signal generator’s instrument status system provides complete SCPI Standard data structures for reporting instrument status using the register model.

The SCPI register model of the status system has multiple registers that are arranged in a hierarchical order. The lower-priority status registers propagate their data to the higher-priority registers in the data structures by means of summary bits. The Status Byte Register is at the top of the hierarchy and contains the general status information for the signal generator’s events and conditions. All other individual registers are used to determine the specific events or conditions.

Figure 3-1 shows the signal generator’s status registers and their hierarchy.

IEEE 488.2 common commands (those beginning with *) access the higher-level summary registers. To access the information from specific registers, use the STATus commands.

Figure 3-1 The Overall Status Byte Register System



Status Register Bit Values

Each bit in a register is represented by a numerical value based on its location (see Table 3-1).

- To enable a particular bit, send its value with the command.
- To enable more than one bit, send the sum of all the bits that you are interested in.
- A query returns the sum of all bits that are true.

Example: Enable Bit 0 and Bit 6 of *ESE

1. Add the value of bit 0 (1) and the value of bit 6 (64).
2. Send the sum with the command: `*ESE 65`.

Example: STATus:OPERation:CONDition? Command Returns Decimal Value of 140

140 = 128 + 8 + 4

In this case bit 7 is true, bit 3 is true, and bit 2 is true.

Table 3-1 Status Register Bit Decimal Values

Decimal Value	Always 0	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
Bit Number	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**

NOTE Bit 15 is not used to report status and is therefore set to zero.

Accessing Status Register Information

1. Determine which register contains the bit that reports the condition.
2. Send the unique SCPI query that reads that register.
3. Examine the bit to see if the condition has changed.

Determining What to Monitor

You can monitor the following:

- current signal generator hardware and firmware status
- whether a particular condition (bit) has occurred
- when a particular condition (bit) changes

Monitoring Current Signal Generator Hardware and Firmware Status

You can query the condition registers, which continuously monitor status. These registers represent the current state of the signal generator. Bits in a condition register are updated in real time. When the condition monitored by a particular bit becomes true, the bit sets to 1. When the condition becomes false, the bit resets to 0.

Monitoring Whether a Condition (Bit) has Changed

Once you enable a bit with the event enable register, the signal generator monitors that particular bit. If the bit becomes true in the event register, it stays set until the event register is cleared. Querying the event register enables you to detect that this condition occurred even if the condition no longer exists. The event register can be cleared only by querying it or sending the *CLS command, which clears *all* event registers.

Monitoring When a Condition (Bit) Changes

Once you enable a bit, the signal generator monitors it for a change in its condition. The transition registers are preset to register positive transitions (a change going from 0 to 1). This can be changed so the selected bit is detected if it goes from true to false (negative transition), or if either transition occurs.

Deciding How to Monitor

You can use either of two methods to programmatically access the information in status registers (either method allows you to monitor one or more conditions).

- **The polling method**

  In the polling method, the signal generator has a passive role. It tells the controller that conditions have changed only when the controller asks the right question. This is accomplished by a program loop that continually sends a query.

  The polling method works well if you do not need to know about changes the moment they occur. Use polling on the following occasions:

  — when you use a programming language/development environment or I/O interface that does not support SRQ interrupts
  — when you want to write a simple, single-purpose program and don't want the added complexity of setting up an SRQ handler

- **The service request (SRQ) method**

  In the SRQ method (described in detail on page 107), the signal generator takes a more active role. It tells the controller when there has been a condition change without the controller asking.

  Use the SRQ method if you must know immediately when a condition changes. (To detect a change using the polling method, the program must repeatedly read the registers.) Use the SRQ method on the following occasions:

  — when you need time-critical notification of changes
  — when you are monitoring more than one device that supports SRQs
  — when you need to have the controller do something else while waiting
  — when you can't afford the performance penalty inherent to polling

Using the Service Request (SRQ) Method

The programming language, I/O interface, and programming environment must support SRQ interrupts (example: BASIC used with GPIB.) Using this method, you must do the following:

1. determine which bit monitors the condition
2. determine how that bit reports to the request service (RQS) bit of the status byte
3. send commands to enable the bit that monitors the condition and to enable the summary bits that report the condition to the RQS bit
4. enable the controller to respond to service requests

When the condition changes, the signal generator sets its RQS bit and asserts an SRQ. The controller is informed of the change as soon as it occurs. As a result, the time the controller would otherwise have used to monitor the condition can be used to perform other tasks. The program determines how the controller responds to the SRQ.

Generating a Service Request To use the SRQ method, you must understand how service requests are generated. The *SRE command sets the bits in the Service Request Enable Register, except bit 6 which is ignored. This enables the corresponding summary message bits in the Status Byte Register to set high (from 0 to 1) when there is a change in instrument status. When a Status Byte Register bit is set high, it will enable the setting (0 to 1) of the request service (RQS) bit (bit 6). Refer to Figure 3-1 on page 103 for a visual representation of this process.

This process is only initiated if both of the following conditions are true:

- The corresponding bit of the Service Request Enable Register is also set to 1.
- The signal generator does not have a service request pending.

  A service request is considered to be pending between the time the signal generator's SRQ process is initiated and the time the controller reads the status byte register.

NOTE Multiple Status Byte Register bits can assert an SRQ, however only one bit at a time can set the RQS bit. All bits that are asserting an SRQ will be read as part of the status byte when queried or serial polled.

The SRQ process asserts SRQ as true and sets the status byte's RQS bit to 1. Both actions are necessary to inform the controller that the signal generator requires service. Asserting SRQ only informs the controller that some device on the bus requires service. Setting the RQS bit allows the controller to determine which signal generator requires service.

If a program enables the controller to detect and respond to service requests, it should instruct the controller to perform a serial poll when SRQ is true. Each device on the bus returns the contents of its status byte register in response to this poll. The device whose RQS bit is set to 1 is the device that requested service.

NOTE When you read the signal generator's Status Byte Register with a serial poll, the RQS bit is reset to 0. Other bits in the register are not affected.

If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this, do the following:

1. Send the command `INITiate:CONTinuous OFF`.
2. Set/enable the status registers.
3. Restart the measurement (send INIT).

Status Register SCPI Commands

Most monitoring of signal generator conditions is done at the highest level, using the IEEE 488.2 common commands listed below. You can set and query individual status registers using the commands in the STATus subsystem.

*CLS (clear status) clears the Status Byte Register by emptying the error queue and clearing all the event registers.

*ESE, *ESE? (event status enable) sets and queries the bits in the Standard Event Enable Register which is part of the Standard Event Status Group.

*ESR? (event status register) queries and clears the Standard Event Status Register which is part of the Standard Event Status Group.

*OPC, *OPC? (operation complete) sets the Standard Event Status Register to zero so it can monitor the completion of all commands. The query stops any new commands from being processed until the current processing is complete, then returns a '1'.

*PSC, *PSC? (power-on state clear) sets the power-on state so that it clears the Service Request Enable Register, the Standard Event Status Enable Register, and device-specific event enable registers at power on. The query returns the flag setting from the *PSC command.

*SRE, *SRE? (service request enable) sets and queries the value of the Service Request Enable Register.

*STB? (status byte) queries the value of the status byte register without erasing its contents.

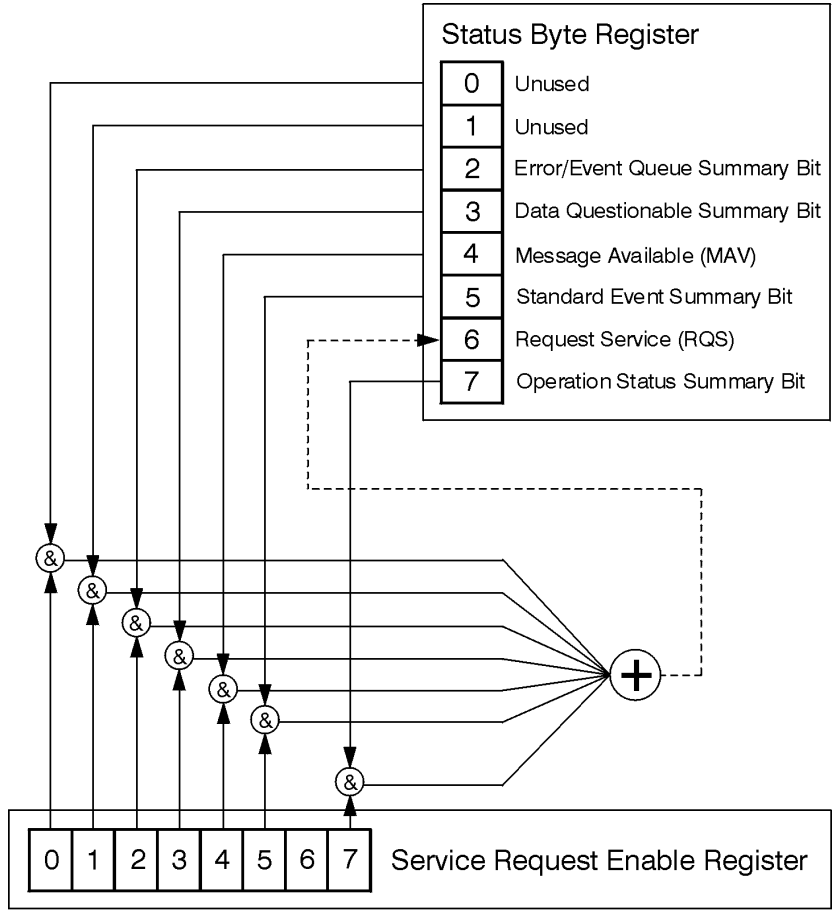
:STATus:PRESet presets all transition filters, non-IEEE 488.2 enable registers, and error/event queue enable registers. (Refer to Table 3-2.)

Table 3-2 Effects of :STATus:PRESet

Register	Value after :STATus:PRESet
:STATus:OPERation:ENABle	0
:STATus:OPERation:NTRansition	0
:STATus:OPERation:PTRransition	32767
:STATus:QUEStionable:CALibration:ENABle	32767
:STATus:QUEStionable:CALibration:NTRansition	32767
:STATus:QUEStionable:CALibration:PTRansition	32767
:STATus:QUEStionable:ENABle	0
:STATus:QUEStionable:NTRansition	0
:STATus:QUEStionable:PTRansition	32767
:STATus:QUEStionable:FREQuency:ENABle	32767
:STATus:QUEStionable:FREQuency:NTRansition	32767
:STATus:QUEStionable:FREQuency:PTRansition	32767
:STATus:QUEStionable:MODulation:ENABle	32767
:STATus:QUEStionable:MODulation:NTRansition	32767
:STATus:QUEStionable:MODulation:PTRansition	32767
:STATus:QUEStionable:POWer:ENABle	32767
:STATus:QUEStionable:POWer:NTRansition	32767
:STATus:QUEStionable:POWer:PTRansition	32767

Status Byte Group

The Status Byte Group includes the Status Byte Register and the Service Request Enable Register.



Status Byte Register

Table 3-3 Status Byte Register Bits

Bit	Description
0,1	**Unused**. These bits are always set to 0.
2	**Error/Event Queue Summary Bit**. A 1 in this bit position indicates that the SCPI error queue is not empty. The SCPI error queue contains at least one error message.
3	**Data Questionable Status Summary Bit**. A 1 in this bit position indicates that the Data Questionable summary bit has been set. The Data Questionable Event Register can then be read to determine the specific condition that caused this bit to be set.
4	**Message Available**. A 1 in this bit position indicates that the signal generator has data ready in the output queue. There are no lower status groups that provide input to this bit.
5	**Standard Event Status Summery Bit**. A 1 in this bit position indicates that the Standard Event summary bit has been set. The Standard Event Status Register can then be read to determine the specific event that caused this bit to be set.
6	**Request Service (RQS) Summary Bit**. A 1 in this bit position indicates that the signal generator has at least one reason to require service. This bit is also called the Master Summary Status bit (MSS). The individual bits in the Status Byte are individually ANDed with their corresponding service request enable register, then each individual bit value is ORed and input to this bit.
7	**Standard Operation Status Summary Bit**. A 1 in this bit position indicates that the Standard Operation summary bit has been set. The Standard Operation Event Register can then be read to determine the specific condition that caused this bit to be set.

Query: *STB?

Response: The *decimal* sum of the bits set to 1 including the MSS bit.

Example: The decimal value 136 is returned when the MSS bit is set low (0).

Decimal sum = 128 (bit 7) + 8 (bit 3)

The decimal value 200 is returned when the MSS bit is set high (1).

Decimal sum = 128 (bit 7) + 8 (bit 3) + 64 (MSS bit)

Service Request Enable Register

The Service Request Enable Register lets you choose which bits in the Status Byte Register triggers a service request

`*SRE <data>`	`<data>` is the sum of the decimal values of the bits you want to enable except bit 6. Bit 6 cannot be enabled.
Example:	Enable bits 7 and 5 to trigger a service request when either corresponding status group register summary bit sets to 1. Send the command `*SRE 160` (128 + 32).
Query:	`*SRE?`
Response:	The decimal value of the sum of the bits previously enabled with the `*SRE <data>` command.

Status Groups

The Standard Operation Status Group and the Data Questionable Status Group each consist of the following registers; the Standard Event Status Group is similar but does *not* have negative or positive transition filters.

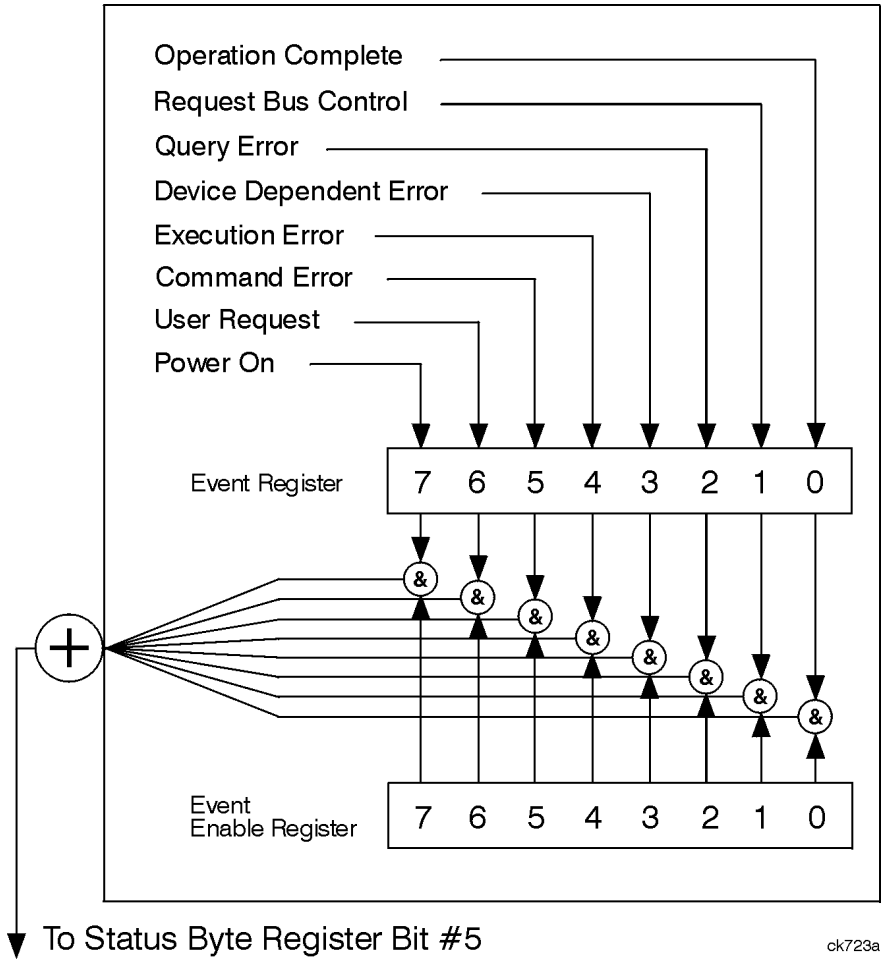
Condition Register	A condition register continuously monitors the hardware and firmware status of the signal generator. There is no latching or buffering for a condition register; it is updated in real time.
Negative Transition Filter	A negative transition filter specifies the bits in the condition register that will set corresponding bits in the event register when the condition bit changes from 1 to 0.
Positive Transition Filter	A positive transition filter specifies the bits in the condition register that will set corresponding bits in the event register when the condition bit changes from 0 to 1.
Event Register	An event register latches transition events from the condition register as specified by the positive and negative transition filters. Bits in the event register are latched, and once set, they remain set until cleared by either querying the register contents or sending the *CLS command.
Event Enable Register	An enable register specifies the bits in the event register that can generate a summary bit. The signal generator logically ANDs corresponding bits in the event and enable registers and ORs all the resulting bits to produce a summary bit. Summary bits are, in turn, used by the Status Byte Register.

In general, a status group is a set of related registers whose contents are programmed to produce status summary bits. In each status group, corresponding bits in the condition register are filtered by the negative and positive transition filters and stored in the event register. The contents of the event register are logically ANDed with the contents of the enable register and the result is logically ORed to produce a status summary bit in the Status

Byte Register.

Standard Event Status Group

The Standard Event Status Group is used to determine the specific event that set bit 5 in the Status Byte Register. This group consists of the Standard Event Status Register (an event register) and the Standard Event Status Enable Register.



Standard Event Status Register

Table 3-4 Standard Event Status Register Bits

Bit	Description
0	**Operation Complete**. A 1 in this bit position indicates that all pending signal generator operations were completed following execution of the *OPC command.
1	**Request Control**. This bit is always set to 0. (The signal generator does not request control.)
2	**Query Error**. A 1 in this bit position indicates that a query error has occurred. Query errors have SCPI error numbers from –499 to –400.
3	**Device Dependent Error**. A 1 in this bit position indicates that a device dependent error has occurred. Device dependent errors have SCPI error numbers from –399 to –300 and 1 to 32767.
4	**Execution Error**. A 1 in this bit position indicates that an execution error has occurred. Execution errors have SCPI error numbers from –299 to –200.
5	**Command Error**. A 1 in this bit position indicates that a command error has occurred. Command errors have SCPI error numbers from –199 to –100.
6	**User Request Key (Local)**. A 1 in this bit position indicates that the **Local** key has been pressed. This is true even if the signal generator is in local lockout mode.
7	**Power On**. A 1 in this bit position indicates that the signal generator has been turned off and then on.

Query: *ESR?

Response: The *decimal* sum of the bits set to 1

Example: The decimal value 136 is returned. The decimal sum = 128 (bit 7) + 8 (bit 3).

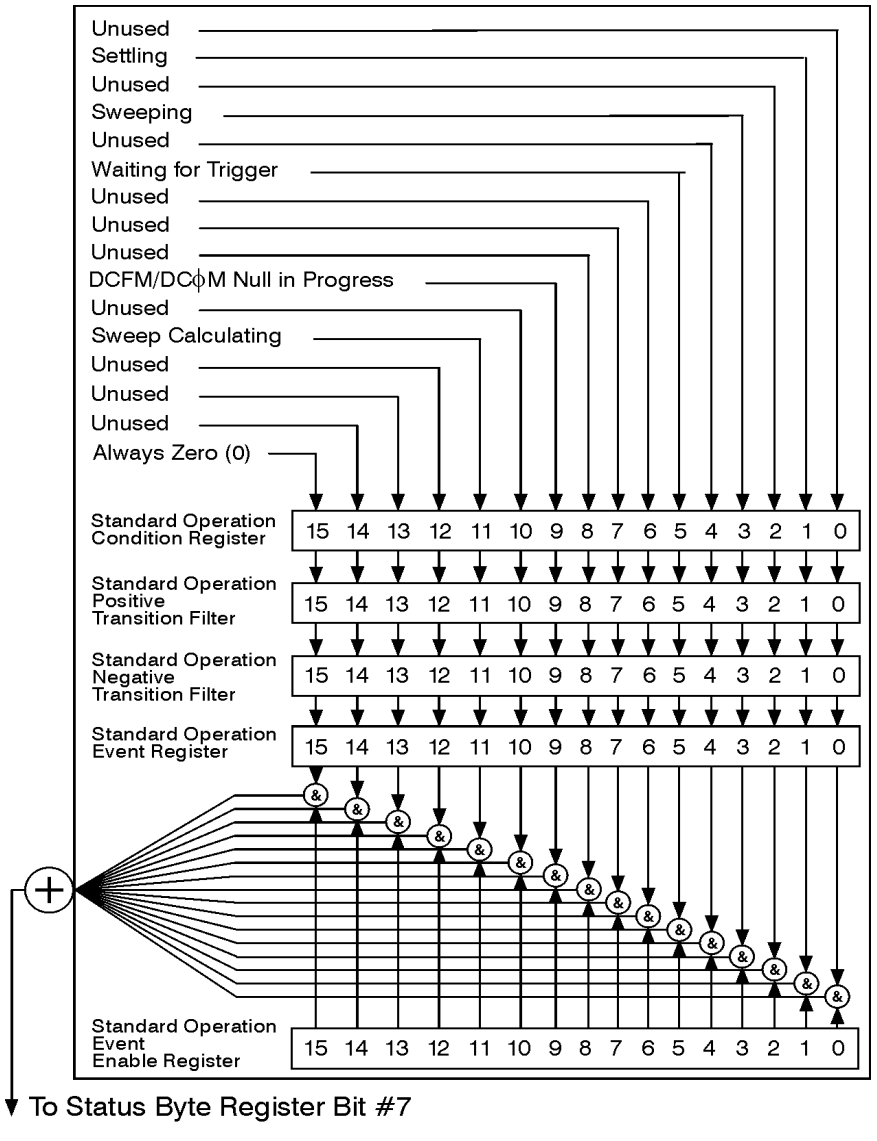
Standard Event Status Enable Register

The Standard Event Status Enable Register lets you choose which bits in the Standard Event Status Register set the summary bit (bit 5 of the Status Byte Register) to 1.

`*ESE <data>`	`<data>` is the sum of the decimal values of the bits you want to enable.
Example:	Enable bit 7 and bit 6 so that whenever either of those bits is set to 1, the Standard Event Status summary bit of the Status Byte Register is set to 1. Send the command `*ESE 192` (128 + 64).
Query:	`*ESE?`
Response:	Decimal value of the sum of the bits previously enabled with the `*ESE <data>` command.

Standard Operation Status Group

The Standard Operation Status Group is used to determine the specific event that set bit 7 in the Status Byte Register. This group consists of the Standard Operation Condition Register, the Standard Operation Transition Filters (negative and positive), the Standard Operation Event Register, and the Standard Operation Event Enable Register.



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Standard Operation Condition Register

The Standard Operation Condition Register continuously monitors the hardware and firmware status of the signal generator. Condition registers are read only.

Table 3-5 Standard Operation Condition Register Bits

Bit	Description
0	**Unused**. This bit is always set to 0.
1	**Settling**. A 1 in this bit position indicates that the signal generator is settling.
2	**Unused**. These bits are always set to 0.
3	**Sweeping**. A 1 in this bit position indicates that a sweep is in progress.
4	**Unused**. This bit is always set to 0.
5	**Waiting for Trigger**. A 1 in this bit position indicates that the source is in a "wait for trigger" state of the trigger model.
6,7,8	**Unused**. These bits are always set to 0.
9	**DCFM/DCϕM Null in Progress**. A 1 in this bit position indicates that the signal generator is currently performing a DCFM/DCΦM zero calibration.
10	**Unused**. This bit is always set to 0.
11	**Sweep Calculating**. A 1 in this bit position indicates that the signal generator is currently doing the necessary pre-sweep calculations.
12, 13, 14,	**Unused**. These bits are always set to 0.
15	**Always 0**.

Query: `STATus:OPERation:CONDition?`

Response: The *decimal* sum of the bits set to 1

Example: The decimal value 520 is returned. The decimal sum = 512 (bit 9) + 8 (bit 3).

Standard Operation Transition Filters (negative and positive)

The Standard Operation Transition Filters specify which types of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:OPERation:NTRansition <value>` (negative), or
`STATus:OPERation:PTRansition <value>` (positive), where
`<value>` is the sum of the decimal values of the bits you want to enable.

Queries: `STATus:OPERation:NTRansition?`
`STATus:OPERation:PTRansition?`

Standard Operation Event Register

The Standard Operation Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read only. Reading data from an event register clears the content of that register.

Query: `STATus:OPERation[:EVENt]?`

Standard Operation Event Enable Register

The Standard Operation Event Enable Register lets you choose which bits in the Standard Operation Event Register set the summary bit (bit 7 of the Status Byte Register) to 1

Command: `STATus:OPERation:ENABle <value>`, where
`<value>` is the sum of the decimal values of the bits you want to enable.

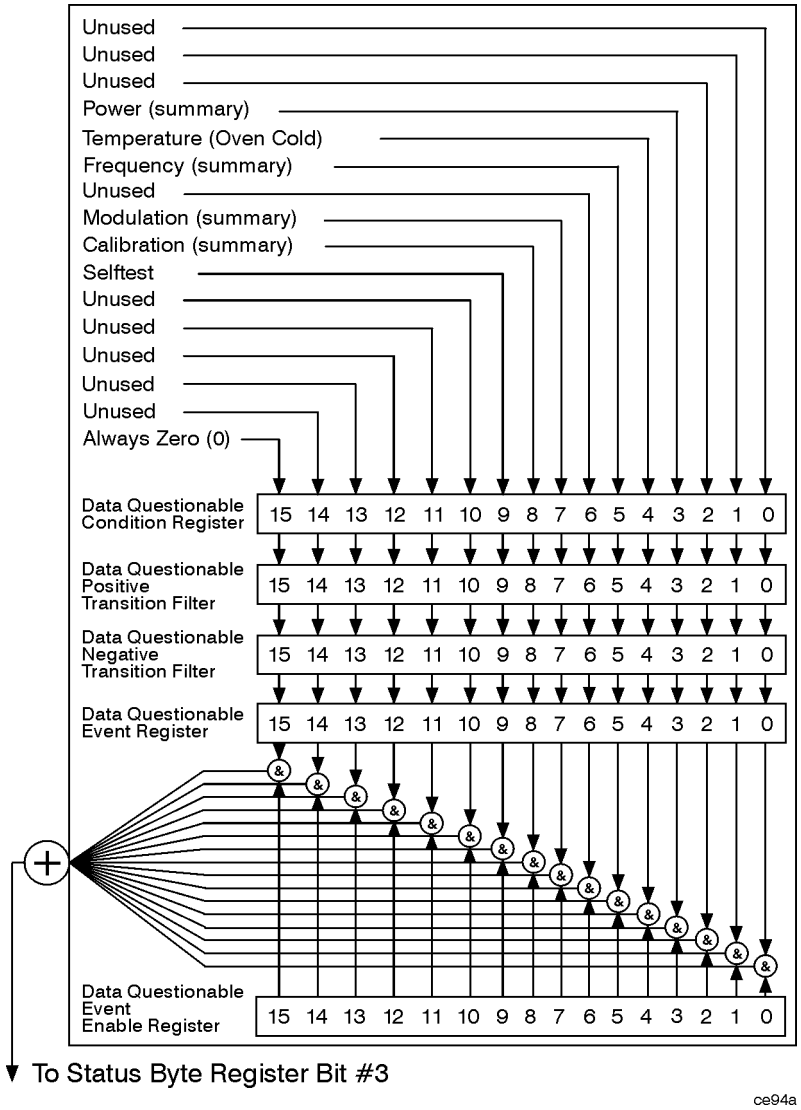
Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Standard Operation Status summary bit of the Status Byte Register is set to 1. Send the command `STAT:OPER:ENAB 520` (512 + 8).

Query: `STATus:OPERation:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:OPERation:ENABle <value>` command.

Data Questionable Status Group

The Data Questionable Status Group is used to determine the specific event that set bit 3 in the Status Byte Register. This group consists of the Data Questionable Condition Register, the Data Questionable Transition Filters (negative and positive), the Data Questionable Event Register, and the Data Questionable Event Enable Register.



Data Questionable Condition Register

The Data Questionable Condition Register continuously monitors the hardware and firmware status of the signal generator. Condition registers are read only.

Table 3-6 Data Questionable Condition Register Bits

Bit	Description
0, 1, 2	**Unused**. These bits are always set to 0.
3	**Power (summary)**. This is a summary bit taken from the QUEStionable:POWer register. A 1 in this bit position indicates that one of the following may have happened: The ALC (Automatic Leveling Control) is unable to maintain a leveled RF output power (i.e., ALC is UNLEVELED), or the reverse power protection circuit has been tripped.
4	**Temperature (OVEN COLD)**. A 1 in this bit position indicates that the internal reference oscillator (reference oven) is cold.
5	**Frequency (summary)**. This is a summary bit taken from the QUEStionable:FREQuency register. A 1 in this bit position indicates that one of the following may have happened: synthesizer PLL unlocked, 10 MHz reference VCO PLL unlocked, heterodyned VCO PLL unlocked, sampler, or YO loop unlocked. For more information, see the "Data Questionable Frequency Status Group" on page 127.
6	**Unused**. This bit is always set to 0.
7	**Modulation (summary)**. This is a summary bit taken from the QUEStionable:MODulation register. A 1 in this bit position indicates that one of the following may have happened: modulation source 1 underrange, modulation source 1 overrange, modulation source 2 underrange, modulation source 2 overrange, or modulation uncalibrated. See the Data Questionable Modulation Status Group for more information.
8	**Calibration (summary)**. This is a summary bit taken from the QUEStionable:CALibration register. A 1 in this bit position indicates that one of the following may have happened: an error has occurred in the DCFM/DCΦM zero calibration or an error has occurred in the I/Q calibration. See the Data Questionable Calibration Status Group for more information.
9	**Self Test**. A 1 in this bit position indicates that a self-test has failed during power-up. This bit can only be cleared by cycling the signal generator's line power. *CLS will not clear this bit.
10, 11, 12, 13, 14	**Unused**. These bits are always set to 0.
15	**Always 0**.

Query: `STATus:QUEStionable:CONDition?`

Response: The *decimal* sum of the bits set to 1

Example: The decimal value 520 is returned. The decimal sum = 512 (bit 9) + 8 (bit 3).

Data Questionable Transition Filters (negative and positive)

The Data Questionable Transition Filters specify which type of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:QUEStionable:NTRansition <value>` (negative), or
`STATus:QUEStionable:PTRansition <value>` (positive), where
`<value>` is the sum of the decimal values of the bits you want to enable.

Queries: `STATus:QUEStionable:NTRansition?`
`STATus:QUEStionable:PTRansition?`

Data Questionable Event Register

The Data Questionable Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register clears the content of that register.

Query: `STATus:QUEStionable[:EVENt]?`

Data Questionable Event Enable Register

The Data Questionable Event Enable Register lets you choose which bits in the Data Questionable Event Register set the summary bit (bit 3 of the Status Byte Register) to 1.

Command: `STATus:QUEStionable:ENABle <value>` command where `<value>` is the sum of the decimal values of the bits you want to enable.

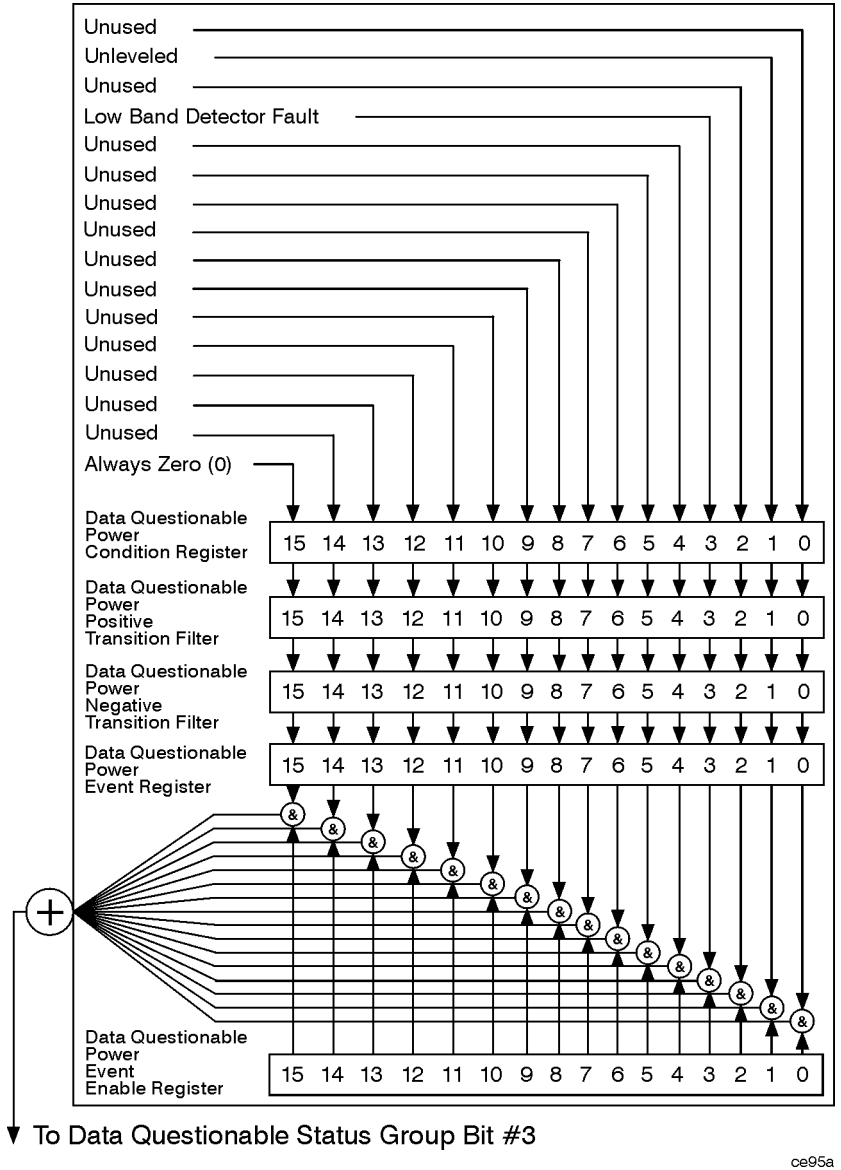
Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Data Questionable Status summary bit of the Status Byte Register is set to 1. Send the command `STAT:QUES:ENAB 520` (512 + 8).

Query: `STATus:QUEStionable:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:QUEStionable:ENABle <value>` command.

Data Questionable Power Status Group

The Data Questionable Power Status Group is used to determine the specific event that set bit 3 in the Data Questionable Condition Register. This group consists of the Data Questionable Power Condition Register, the Data Questionable Power Transition Filters (negative and positive), the Data Questionable Power Event Register, and the Data Questionable Power Event Enable Register.



Data Questionable Power Condition Register

The Data Questionable Power Condition Register continuously monitors the hardware and firmware status of the signal generator. Condition registers are read only.

Table 3-7 Data Questionable Power Condition Register Bits

Bit	Description
0	**Unused**. This bit is always set to 0.
1	**Unleveled**. A 1 in this bit indicates that the output leveling loop is unable to set the output power.
2	**Unused**. This bit is always set to 0.
3	**Low Band Detector Fault**. A 1 in this bit indicates that the low band coupler detector fault has caused an error in the power level below 2 GHz.
4–14	**Unused**. These bits are always set to 0.
15	**Always 0.**

Query: `STATus:QUEStionable:POWer:CONDition?`

Response: The *decimal* sum of the bits set to 1

Data Questionable Power Transition Filters (negative and positive)

The Data Questionable Power Transition Filters specify which type of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:QUEStionable:POWer:NTRansition <value>` (negative), or `STATus:QUEStionable:POWer:PTRansition <value>` (positive), where `<value>` is the sum of the decimal values of the bits you want to enable.

Queries: `STATus:QUEStionable:POWer:NTRansition?`
`STATus:QUEStionable:POWer:PTRansition?`

Data Questionable Power Event Register

The Data Questionable Power Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register clears the content of that register.

Query: `STATus:QUEStionable:POWer[:EVENt]?`

Data Questionable Power Event Enable Register

The Data Questionable Power Event Enable Register lets you choose which bits in the Data Questionable Power Event Register set the summary bit (bit 3 of the Data Questionable Condition Register) to 1.

Command: `STATus:QUEStionable:POWer:ENABle <value>` command where `<value>` is the sum of the decimal values of the bits you want to enable

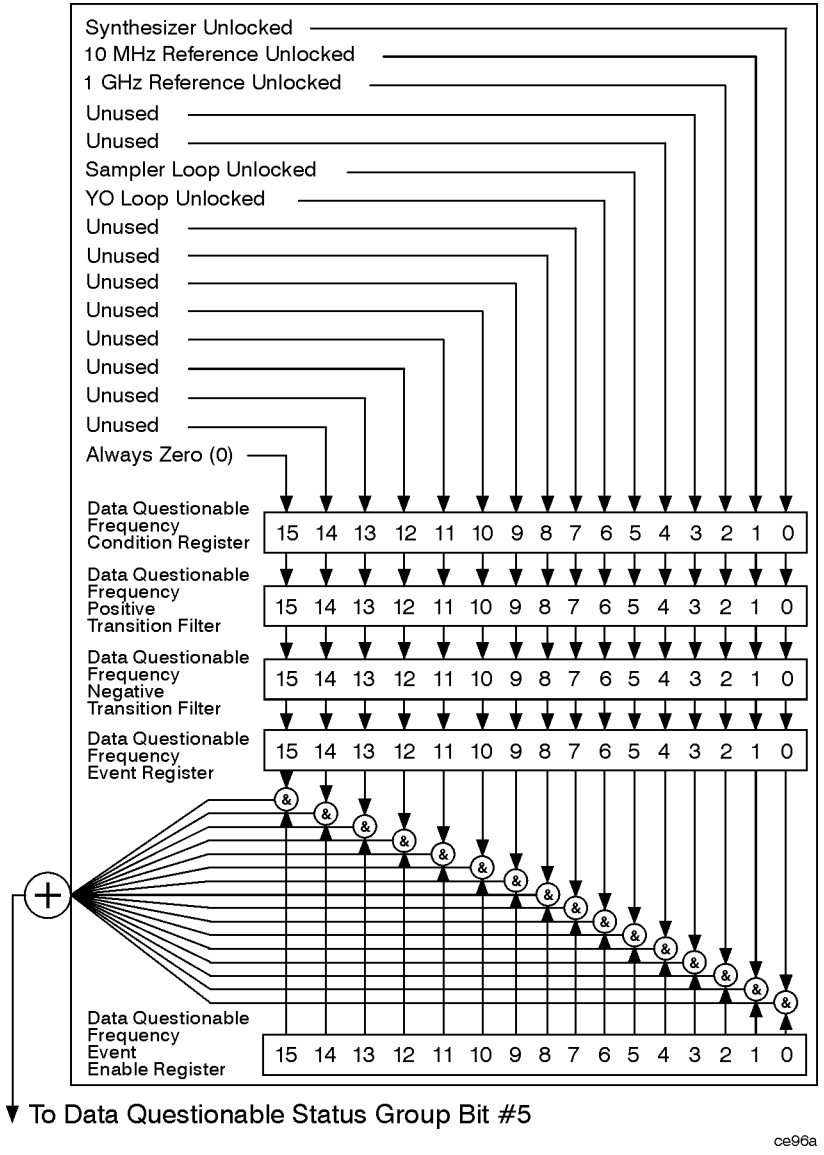
Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Data Questionable Power summary bit of the Data Questionable Condition Register is set to 1. Send the command `STAT:QUES:POW:ENAB 520` (512 + 8).

Query: `STATus:QUEStionable:POWer:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:QUEStionable:POWer:ENABle <value>` command.

Data Questionable Frequency Status Group

The Data Questionable Frequency Status Group is used to determine the specific event that set bit 5 in the Data Questionable Condition Register. This group consists of the Data Questionable Frequency Condition Register, the Data Questionable Frequency Transition Filters (negative and positive), the Data Questionable Frequency Event Register, and the Data Questionable Frequency Event Enable Register.



Data Questionable Frequency Condition Register

The Data Questionable Frequency Condition Register continuously monitors the hardware and firmware status of the signal generator. Condition registers are read-only.

Table 3-8 Data Questionable Frequency Condition Register Bits

Bit	Description
0	**Synthesizer Unlocked**. A 1 in this bit indicates that the synthesizer is unlocked.
1	**10 MHz Reference Unlocked**. A 1 in this bit indicates that the 10 MHz reference signal is unlocked.
2	**1 GHz Reference Unlocked**. A 1 in this bit indicates that the 1 GHz reference signal is unlocked.
3, 4	**Unused**. These bits are always set to 0.
5	**Sampler Loop Unlocked**. A 1 in this bit indicates that the sampler loop is unlocked.
6	**YO Loop Unlocked**. A 1 in this bit indicates that the YO loop is unlocked.
7–14	**Unused**. These bits are always set to 0.
15	**Always 0**.

Query: `STATus:QUEStionable:FREQuency:CONDition?`

Response: The *decimal* sum of the bits set to 1

Data Questionable Frequency Transition Filters (negative and positive)

Specifies which types of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:QUEStionable:FREQuency:NTRansition <value>` (negative) or `STATus:QUEStionable:FREQuency:PTRansition <value>` (positive) where `<value>` is the sum of the decimal values of the bits you want to enable.

Queries: `STATus:QUEStionable:FREQuency:NTRansition?`
`STATus:QUEStionable:FREQuency:PTRansition?`

Data Questionable Frequency Event Register

Latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register clears the content of that register.

Query: `STATus:QUEStionable:FREQuency[:EVENt]?`

Data Questionable Frequency Event Enable Register

Lets you choose which bits in the Data Questionable Frequency Event Register set the summary bit (bit 5 of the Data Questionable Condition Register) to 1.

Command: `STATus:QUEStionable:FREQuency:ENABle <value>`, where `<value>` is the sum of the decimal values of the bits you want to enable.

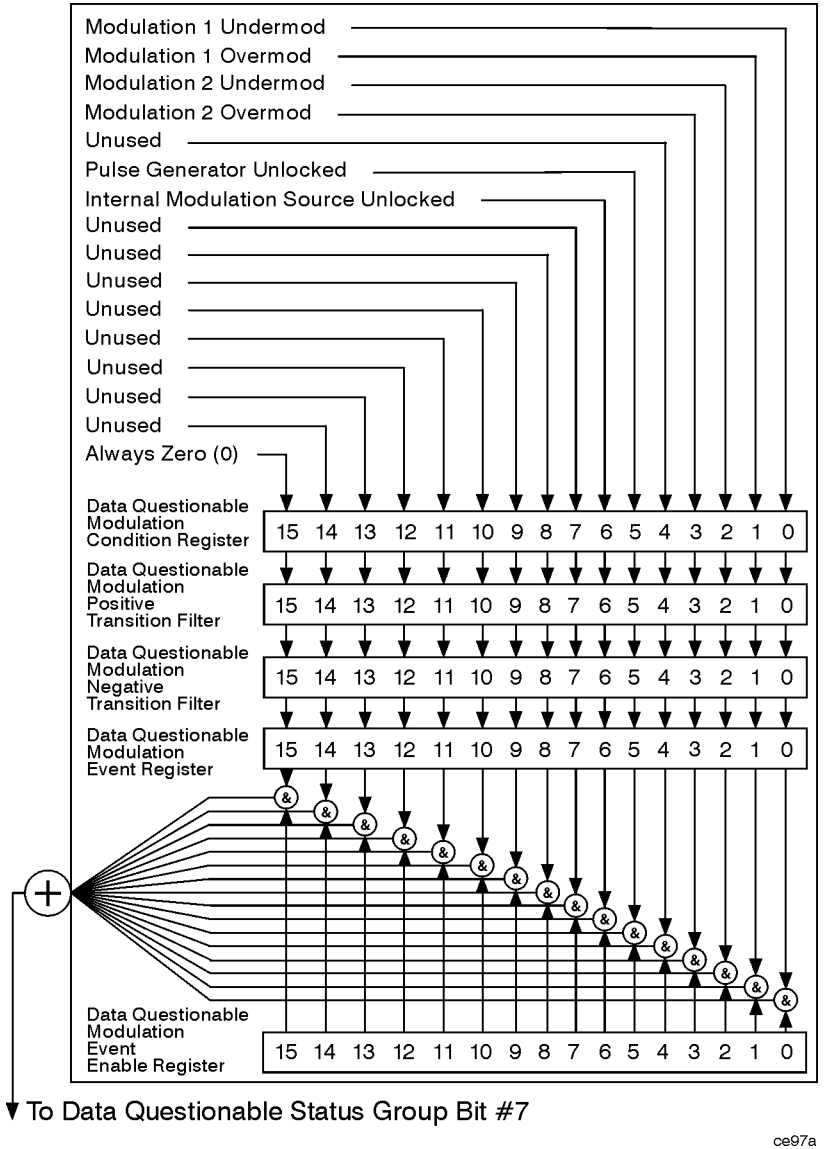
Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Data Questionable Frequency summary bit of the Data Questionable Condition Register is set to 1. Send the command `STAT:QUES:FREQ:ENAB 520` (512 + 8).

Query: `STATus:QUEStionable:FREQuency:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:QUEStionable:FREQuency:ENABle <value>` command.

Data Questionable Modulation Status Group

The Data Questionable Modulation Status Group is used to determine the specific event that set bit 7 in the Data Questionable Condition Register. This group consists of the Data Questionable Modulation Condition Register, the Data Questionable Modulation Transition Filters (negative and positive), the Data Questionable Modulation Event Register, and the Data Questionable Modulation Event Enable Register.



Data Questionable Modulation Condition Register

The Data Questionable Modulation Condition Register continuously monitors the hardware and firmware status of the signal generator. Condition registers are read-only.

Table 3-9 Data Questionable Modulation Condition Register Bits

Bit	Description
0	**Modulation 1 Undermod**. A 1 in this bit indicates that the External 1 input, ac coupling on, is less than 0.97 volts.
1	**Modulation 1 Overmod**. A 1 in this bit indicates that the External 1 input, ac coupling on, is more than 1.03 volts.
2	**Modulation 2 Undermod**. A 1 in this bit indicates that the External 2 input, ac coupling on, is less than 0.97 volts.
3	**Modulation 2 Overmod**. A 1 in this bit indicates that the External 2 input, ac coupling on, is more than 1.03 volts.
4	**Unused**. This bit is always set to 0.
5	**Pulse Generator Unlocked**. 1 in this bit indicates that the internal pulse generator clock is unlocked.
6	**Internal Modulation Source Unlocked**. A 1 in this bit indicates that the internal modulation source clock is unlocked.
7–14	**Unused**. These bits are always set to 0.
15	**Always 0**.

Query: `STATus:QUEStionable:MODulation:CONDition?`

Response: The *decimal* sum of the bits set to 1

Data Questionable Modulation Transition Filters (negative and positive)

The Data Questionable Modulation Transition Filters specify which type of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:QUEStionable:MODulation:NTRansition <value>` (negative), or `STATus:QUEStionable:MODulation:PTRansition <value>` (positive), where `<value>` is the sum of the decimal values of the bits you want to enable.

Queries:
```
STATus:QUEStionable:MODulation:NTRansition?
STATus:QUEStionable:MODulation:PTRansition?
```

Data Questionable Modulation Event Register

The Data Questionable Modulation Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register clears the content of that register.

Query: `STATus:QUEStionable:MODulation[:EVENt]?`

Data Questionable Modulation Event Enable Register

The Data Questionable Modulation Event Enable Register lets you choose which bits in the Data Questionable Modulation Event Register set the summary bit (bit 7 of the Data Questionable Condition Register) to 1.

Command: `STATus:QUEStionable:MODulation:ENABle <value>` command where `<value>` is the sum of the decimal values of the bits you want to enable.

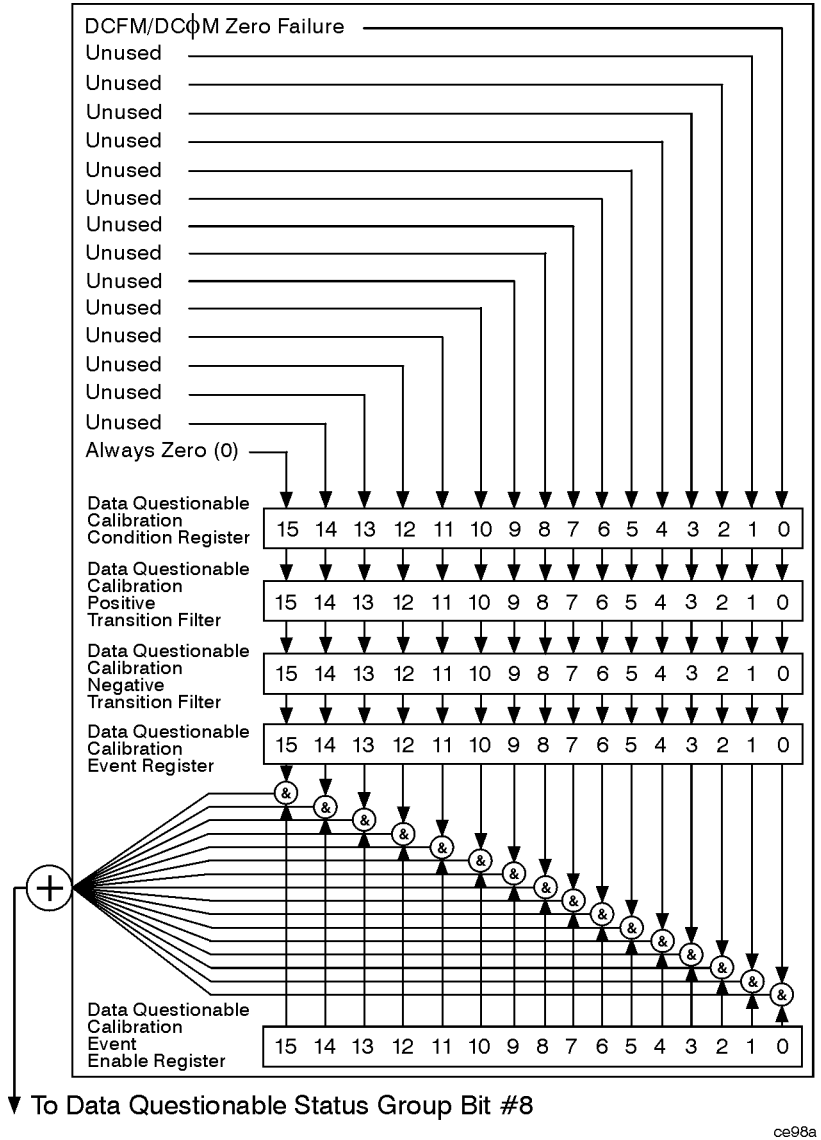
Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Data Questionable Modulation summary bit of the Data Questionable Condition Register is set to 1. Send the command `STAT:QUES:MOD:ENAB 520` (512 + 8).

Query: `STATus:QUEStionable:MODulation:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:QUEStionable:MODulation:ENABle <value>` command.

Data Questionable Calibration Status Group

The Data Questionable Calibration Status Group is used to determine the specific event that set bit 8 in the Data Questionable Condition Register. This group consists of the Data Questionable Calibration Condition Register, the Data Questionable Calibration Transition Filters (negative and positive), the Data Questionable Calibration Event Register, and the Data Questionable Calibration Event Enable Register.



Data Questionable Calibration Condition Register

The Data Questionable Calibration Condition Register continuously monitors the calibration status of the signal generator. Condition registers are read only.

Table 3-10 Data Questionable Calibration Condition Register Bits

Bit	Description
0	**DCFM/DCΦM Zero Failure**. A 1 in this bit indicates that the DCFM/DCΦM zero calibration routine has failed. This is a critical error. The output of the source has no validity until the condition of this bit is 0.
1–14	**Unused**. These bits are always set to 0.
15	**Always 0**.

Query: `STATus:QUEStionable:CALibration:CONDition?`

Response: The *decimal* sum of the bits set to 1

Data Questionable Calibration Transition Filters (negative and positive)

The Data Questionable Calibration Transition Filters specify which type of bit state changes in the condition register set corresponding bits in the event register. Changes can be positive (0 to 1) or negative (1 to 0).

Commands: `STATus:QUEStionable:CALibration:NTRansition <value>` (negative), or `STATus:QUEStionable:CALibration:PTRansition <value>` (positive), where `<value>` is the sum of the decimal values of the bits you want to enable.

Queries: `STATus:QUEStionable:CALibration:NTRansition?`
`STATus:QUEStionable:CALibration:PTRansition?`

Data Questionable Calibration Event Register

The Data Questionable Calibration Event Register latches transition events from the condition register as specified by the transition filters. Event registers are destructive read-only. Reading data from an event register clears the content of that register.

Query: `STATus:QUEStionable:CALibration[:EVENt]?`

Data Questionable Calibration Event Enable Register

The Data Questionable Calibration Event Enable Register lets you choose which bits in the Data Questionable Calibration Event Register set the summary bit (bit 8 of the Data Questionable Condition register) to 1.

Command: `STATus:QUEStionable:CALibration:ENABle <value>`, where `<value>` is the sum of the decimal values of the bits you want to enable.

Example: Enable bit 9 and bit 3 so that whenever either of those bits is set to 1, the Data Questionable Calibration summary bit of the Data Questionable Condition Register is set to 1. Send the command `STAT:QUES:CAL:ENAB 520` (512 + 8).

Query: `STATus:QUEStionable:CALibration:ENABle?`

Response: Decimal value of the sum of the bits previously enabled with the `STATus:QUEStionable:CALibration:ENABle <value>` command.

4 Command Reference

Command Reference Information

SCPI Command Listings

The Table of Contents lists the PSG SCPI commands without the parameters. The SCPI command subsystem name will generally have the first part of the command in parenthesis that is repeated in all commands within the subsystem. The title(s) beneath the subsystem name is the remaining command syntax. The following example demonstrates this listing:

Communication Subsystem (:SYSTem:COMMunicate)
:GPIB:ADDRess
:LAN:HOSTname

The following examples show the complete commands from the above Table of Contents listing:

:SYSTem:COMMunicate:GPIB:ADDRess

:SYSTem:COMMunicate:LAN:HOSTname

Softkey and Hardkey Cross Reference

The index is set up so applicable softkeys and hardkeys can be cross-referenced to the appropriate SCPI command. There are three headings in the index where the softkey or hardkey names can be found:

- individual softkey or hardkey name
- softkey or hardkey heading
- subsystem name

Supported Signal Generator Series

Within each command section there is a *Supported* heading. When “All” is shown next to this heading, this implies that all PSG series signal generators are supported by the SCPI command. Conversely, when individual PSG series such as PSG-A are shown next to the heading, only the listed series are supported by the command.

SCPI Basics

This section describes the general use of the Standard Commands for Programmable Instruments (SCPI) language for the PSG Family of signal generators. It is not intended to teach you everything about the SCPI language; the SCPI Consortium or IEEE can provide that level of detailed information. For a list of the specific commands available for the signal generator, refer to the Table of Contents.

For additional information, refer to the following publications:

- IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*. New York, NY, 1998.
- IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Command Commands for Use with ANSI/IEEE Standard 488.1-1987*. New York, NY, 1998.

Common Terms

The following terms are used throughout the remainder of this section:

Command	A command is an instruction in SCPI consisting of mnemonics (keywords), parameters (arguments), and punctuation. You combine commands to form messages that control instruments.
Controller	A controller is any device used to control the signal generator, for example a computer or another instrument.
Event Command	Some commands are events and cannot be queried. An event has no corresponding setting. It initiates an action at a particular time.
Program Message	A program message is a combination of one or more properly formatted commands. Program messages are sent by the controller to the signal generator.
Query	A query is a special type of command used to instruct the signal generator to make response data available to the controller. A query ends with a question mark. You can query any command value that you set.
Response Message	A response message is a collection of data in specific SCPI formats sent from the signal generator to the controller. Response messages tell the controller about the internal state of the signal generator.

Command Syntax

A typical command is made up of keywords prefixed with colons (:). The keywords are followed by parameters. The following is an example syntax statement:

```
[:SOURce]:POWer[:LEVel] MAXimum|MINimum
```

In the example above, the `[:LEVel]` portion of the command immediately follows the `:POWer` portion with no separating space. The portion following the `[:LEVel]`, `MINimum|MAXimum`, are the parameters (argument for the command statement). There is a separating space (white space) between the command and its parameter.

Additional conventions in syntax statements are shown in Table 4-1 and Table 4-2.

Table 4-1 Special Characters in Command Syntax

Characters	Meaning	Example
|	A vertical stroke between keywords or parameters indicates alterative choices. For parameters, the effect of the command varies depending on the choice.	`[:SOURce]:AM: MOD DEEP|NORMal` `DEEP` or `NORMal` are the choices.
[ ]	Square brackets indicate that the enclosed keywords or parameters are optional when composing the command. These implied keywords or parameters will be executed even if they are omitted.	`[:SOURce]:FREQuency[:CW]?` `SOURce` and `CW` are optional items.

< >	Angle brackets around a word (or words) indicate they are not to be used literally in the command. They represent the needed item.	`[:SOURce]:FREQuency: STARt <val><unit>`
		In this command, the words `<val>` and `<unit>` should be replaced by the actual frequency and unit.
		`:FREQuency:STARt 2.5GHZ`

{ }	Braces indicate that parameters can optionally be used in the command once, several times, or not at all.	`[:SOURce]:LIST: POWer <val>,{<val>}`
		a single power listing:
		`LIST:POWer 5`
		a series of power listings:
		`LIST:POWer 5,10,15,20`

Table 4-2 Command Syntax

Characters, Keywords, and Syntax	Example
Upper-case lettering indicates the minimum set of characters required for the command.	`[:SOURce]:FREQuency[:CW]?`, `FREQ` is the minimum requirement.
Lower-case lettering indicates the portion of the command that is optional; it can either be included with the upper-case portion of the command or omitted. This is the flexible format principle called forgiving listening. Refer to "Command Parameters and Responses" on page 144 for more information.	`:FREQuency` Either `:FREQ` , `:FREQuency`, or `:FREQUENCY` is correct.
When a colon is placed between two command mnemonics, it moves the current path down one level in the command tree. Refer to "Command Tree" on page 143 more information on command paths.	`:TRIGger:OUTPut:POLarity?` `TRIGger` is the root level keyword for this command.
If a command requires more than one parameter, you must separate adjacent parameters using a comma. Parameters are not part of the command path, so commas do not affect the path level.	`[:SOURce]:LIST:` `DWELl <val>,{<val>}`
A semicolon separates two commands in the same program message without changing the current path.	`:FREQ 2.5GHZ;:POW 10DBM`
White space characters, such as `<tab>` and `<space>`, are generally ignored as long as they do not occur within or between keywords. However, you must use white space to separate the command from the parameter. White space does not affect the current path.	`:FREQ uency` or `:POWer :LEVel` are not allowed. A `<space>` between `:LEVel` and `6.2` is mandatory. `:POWer:LEVel 6.2`

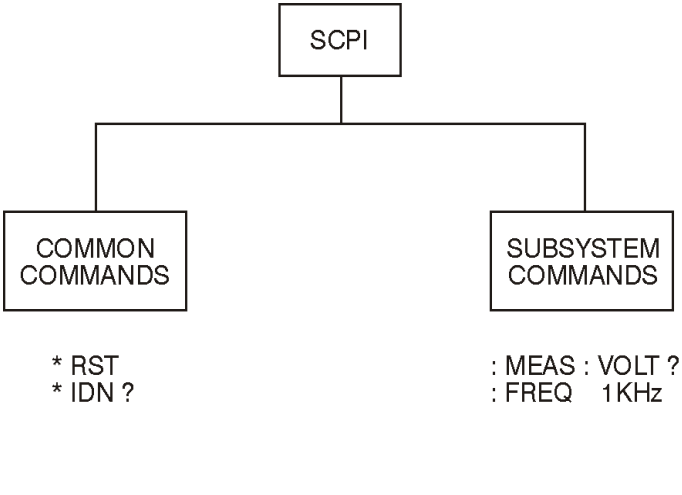
Command Types

Commands can be separated into two groups: common commands and subsystem commands. Figure 4-1, shows the separation of the two command groups.

Common commands are used to manage macros, status registers, synchronization, and data storage and are defined by IEEE 488.2. They are easy to recognize because they all begin with an asterisk. For example `*IDN?`, `*OPC`, and `*RST` are common commands. Common commands are not part of any subsystem and the signal generator interprets them in the same way, regardless of the current path setting.

Subsystem commands are distinguished by the colon (`:`). The colon is used at the beginning of a command statement and between keywords, as in `:FREQuency[:CW?]`. Each command subsystem is a set of commands that roughly correspond to a functional block inside the signal generator. For example, the power subsystem (`:POWer`) contains commands for power generation, while the status subsystem (`:STATus`)contains commands for controlling status registers.

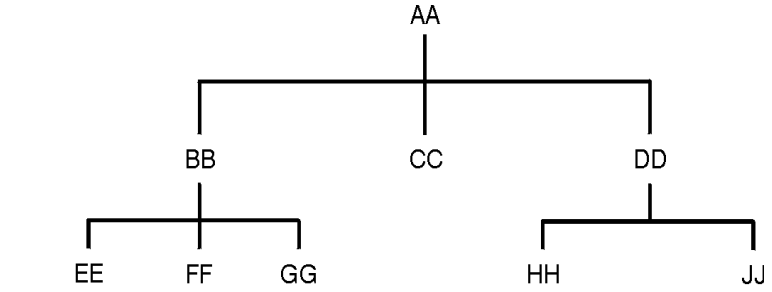
Figure 4-1 Command Types



Command Tree

Most programming tasks involve subsystem commands. SCPI uses a structure for subsystem commands similar to the file systems on most computers. In SCPI, this command structure is called a command tree and is shown in Figure 4-2.

Figure 4-2 Simplified Command Tree



ck710a

The command closest to the top is the root command, or simply “the root.” Notice that you must follow a particular path to reach lower level commands. In the following example, `:POWer` represents AA, `:ALC` represents BB, `:SOURce` represents GG. The complete command path is `:POWer:ALC:SOURce?` (:AA:BB:GG).

Paths Through the Command Tree

To access commands from different paths in the command tree, you must understand how the signal generator interprets commands. The parser, a part of the signal generator firmware, decodes each message sent to the signal generator. The parser breaks up the message into component commands using a set of rules to determine the command tree path used. The parser keeps track of the current path (the level in the command tree) and where it expects to find the next command statement. This is important because the same keyword may appear in different paths. The particular path is determined by the keyword(s) in the command statement.

A message terminator, such as a `<new line>` character, sets the current path to the root. Many programming languages have output statements that automatically send message terminators.

NOTE The current path is set to the root after the line-power is cycled or when *RST is sent.

Command Parameters and Responses

SCPI defines different data formats for use in program and response messages. It does this to accommodate the principle of forgiving listening and precise talking. For more information on program data types refer to IEEE 488.2.

Forgiving listening means the command and parameter formats are flexible.

For example, with the `:FREQuency:REFerence:STATe ON|OFF|1|0` command, the signal generator accepts `:FREQuency:REFerence:STATe ON`, `:FREQuency:REFerence:STATe 1`, `:FREQ:REF:STAT ON`, `:FREQ:REF:STAT 1` to turn on the source's frequency reference mode.

Each parameter type has one or more corresponding response data types. A setting that you program using a numeric parameter returns either real or integer response data when queried. Response data (data returned to the controller) is more concise and restricted and is called precise talking.

Precise talking means that the response format for a particular query is always the same.

For example, if you query the power state (`:POWer:ALC:STATe?`) when it is on, the response is always 1, regardless of whether you previously sent `:POWer:ALC:STATe 1` or `:POWer:ALC:STATe ON`.

Table 4-3 Parameter and Response Types

Parameter Types	Response Data Types
Numeric	Real, Integer
Extended Numeric	Real, Integer
Discrete	Discrete
Boolean	Numeric Boolean
String	String

Numeric Parameters

Numeric parameters are used in both common and subsystem commands. They accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation.

If a signal generator setting is programmed with a numeric parameter which can only assume a finite value, it automatically rounds any entered parameter which is greater or less than the finite value. For example, if a signal generator has a programmable output impedance of 50 or 75 ohms, and you specified 76.1 for the output impedance, the value is rounded to 75.

The following are examples of numeric parameters:

100	no decimal point required
100.	fractional digits optional
–1.23	leading signs allowed
4.56E<space>3	space allowed after the E in exponential
–7.89E–001	use either E or e in exponential
+256	leading plus sign allowed
.5	digits left of decimal point optional

Extended Numeric Parameters

Most subsystems use extended numeric parameters to specify physical quantities. Extended numeric parameters accept all numeric parameter values and other special values as well.

The following are examples of extended numeric parameters:

100	any simple numeric value
1.2GHZ	GHZ can be used for exponential (E009)
200MHZ	MHZ can be used for exponential (E006)
–100mV	negative 100 millivolts
10DEG	10 degrees

Extended numeric parameters also include the following special parameters:

DEFault	resets the parameter to its default value
UP	increments the parameter
DOWN	decrements the parameter
MINimum	sets the parameter to the smallest possible value
MAXimum	sets the parameter to the largest possible value

Discrete Parameters

Discrete parameters use mnemonics to represent each valid setting. They have a long and a short form, just like command mnemonics. You can mix upper and lower case letters for discrete parameters.

The following examples of discrete parameters are used with the command `:TRIGger[:SEQuence]:SOURce BUS|IMMediate|EXTernal`.

BUS	GPIB triggering
IMMediate	immediate trigger (free run)
EXTernal	external triggering

Although discrete parameters look like command keywords, do not confuse the two. In particular, be sure to use colons and spaces properly. Use a colon to separate command mnemonics from each other and a space to separate parameters from command mnemonics.

The following are examples of discrete parameters in commands:

```
TRIGger:SOURce BUS
TRIGger:SOURce IMMediate
TRIGger:SOURce EXTernal
```

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. The two-state boolean parameter has four arguments. The following list shows the arguments for the two-state boolean paramenter:

ON	boolean true, upper/lower case allowed
OFF	boolean false, upper/lower case allowed
1	boolean true
0	boolean false

String Parameters

String parameters allow ASCII strings to be sent as parameters. Single or double quotes are used as delimiters.

The following are examples of string parameters:

```
'This is valid'

"This is also valid"

'SO IS THIS'
```

Real Response Data

Real response data represent decimal numbers in either fixed decimal or scientific notation. Most high-level programming languages that support signal generator input/output (I/O) handle either decimal or scientific notation transparently.

The following are examples of real response data:

+4.000000E+010, –9.990000E+002

–9.990000E+002

+4.0000000000000E+010

+1

0

Integer Response Data

Integer response data are decimal representations of integer values including optional signs. Most status register related queries return integer response data.

The following are examples of integer response data:

0	signs are optional
+100	leading + allowed
–100	leading – allowed
256	never any decimal point

Discrete Response Data

Discrete response data are similar to discrete parameters. The main difference is that discrete response data only return the short form of a particular mnemonic, in all upper case letters.

The following are examples of discrete response data:

IMM

EXT

INT

NEG

Numeric Boolean Response Data

Boolean response data returns a binary numeric value of one or zero.

String Response Data

String response data are similar to string parameters. The main difference is that string response data returns double quotes, rather than single quotes. Embedded double quotes may be present in string response data. Embedded quotes appear as two adjacent double quotes with no characters between them.

The following are examples of string response data:

```
"This is a string"

"one double quote inside brackets: [""]"

"Hello!"
```

Program Messages

The following commands will be used to demonstrate the creation of program messages:

[:SOURce]:FREQuency:STARt	[:SOURce]:FREQuency:STOP
[:SOURce]:FREQuency[:CW]	[:SOURce]:POWer[:LEVel]:OFFSet

Example 1

```
:FREQuency:STARt 500MHZ;STOP 1000MHZ
```

This program message is correct and will not cause errors; STARt and STOP are at the same path level. It is equivalent to sending the following message:

```
FREQuency:STARt 500MHZ;FREQuency:STOP 1000MHZ
```

Example 2

```
:POWer 10DBM;:OFFSet 5DB
```

This program message will result in an error. The message makes use of the default POWer[:LEVel] node (root command). When using a default node, there is no change to the current path position. Since there is no command OFFSet at the root level, an error results.

The following example shows the correct syntax for this program message:

```
:POWer 10DBM;:POWer:OFFSet 5DB
```

Example 3

```
:POWer:OFFSet 5DB;POWer 10DBM
```

This program message results in a command error. The path is dropped one level at each colon. The first half of the message drops the command path to the lower level command OFFSet; POWer does not exist at this level.

The POWer 10DBM command is missing the leading colon and when sent, it causes confusion because the signal generator cannot find POWer at the POWer:OFFSet level. By adding the leading colon, the current path is reset to the root. The following shows the correct program message:

```
:POWer:OFFSet 5DB;:POWer 10DBM
```

Example 4

```
FREQ 500MHZ;POW 4DBM
```

In this example, the keyword short form is used. The program message is correct because it utilizes the default nodes of :FREQ[:CW] and :POW[:LEVel]. Since default nodes do not affect the current path, it is not necessary to use a leading colon before FREQ or POW.

File Name Variables

File name variables, such as "<file name>", represent two formats, "<file name>" and "<file name@file system>". The following shows the file name syntax for the two formats, but uses "FLATCAL" as the file name in place of the variable "<file name>":

Format 1 "FLATCAL"

Format 2 "FLATCAL@USERFLAT"

Format 2 uses the file system extension (@USERFLAT) as part of the file name syntax. Use Format 2 when the command does not specify the file system. This generally occurs in the Memory (:MEMory) or Mass Memory (:MMEMory) subsystems.

The following examples demonstrate a command where Format 1 applies:

Command Syntax with the file name variable

```
:MEMory:STORe:LIST "<file name>"
```

Command Syntax with the file name

```
:MEMory:STORe:LIST "SWEEP_1"
```

This command has :LIST in the command syntax. This denotes that "SWEEP_1" will be saved in the List file system as a list file type.

The following examples demonstrate a command where Format 2 applies:

Command Syntax with the file name variable

```
:MMEMory:COPY "<file name>","<file name>"
```

Command Syntax with the file name

```
:MMEMory:COPY "FLATCAL@USERFLAT","FLAT_2CAL@USERFLAT"
```

This command cannot distinguish which file system "FLATCAL" belongs to without the file system extension (@USERFLAT). If this command were executed without the extension, the file would not be copied.

Refer to Table 4-4 on page 185 for a listing of the file systems and types.

MSUS (Mass Storage Unit Specifier) Variable

The variable "<msus>" enables a command to be file system specific when working with user files. Some commands use it as the only command parameter, while others can use it in conjunction with a file name when a command is not file system specific. When used with a file name, it is similar to Format 2 in the "File Name Variables" on page 150. The difference is the file system specifier (msus) occupies its own variable and is not part of the file name syntax.

The following examples illustrate the usage of the variable "<msus>" when it is the only command parameter:

Command Syntax with the msus variable

```
:MMEMory:CATalog? "<msus>"
```

Command Syntax with the file system

```
:MMEMory:CATalog? "LIST:"
```

The variable "<msus>" is replaced with "LIST:". When the command is executed, the output displays only the files from the List file system.

The following examples illustrate the usage of the variable "<file name>" with the variable "<msus>":

Command Syntax with the file name and msus variable

```
:MMEMory:DELete[:NAME] "<file name>",["<msus>"]
```

Command Syntax with the file name and file system

```
:MMEMory:DELete:NAME "LIST_1","LIST:"
```

The command from the above example cannot discern which file system LIST_1 belongs to without a file system specifier and will not work without it. When the command is properly executed, LIST_1 is deleted from the List file system.

The following example shows the same command, but using Format 2 from the "File Name Variables" on page 150:

```
:MMEMory:DELete:NAME "LIST_1@LIST"
```

When a file name is a parameter for a command that is not file system specific, either format ("<file name>","<msus>" or "<file name@file system>") will work.

Refer to Table 4-4 on page 185 for a listing of the file systems and types.

Quote Usage with SCPI Commands

As a general rule, programming languages require that SCPI commands be enclosed in double quotes as shown in the following example:

```
":FM:EXTernal:IMPedance 600"
```

However, when a string is the parameter for a SCPI command, additional quotes or other delimiters may be required to identify the string. Your programming language may use two sets of double quotes, one set of single quotes, or back slashes with quotes to signify the string parameter. The following examples illustrate these different formats:

`"MEMory:LOAD:LIST ""myfile"""`	used in BASIC programming languages
`"MEMory:LOAD:LIST \"myfile\""`	used in C, C++, Java, and PERL
`"MEMory:LOAD:LIST 'myfile'"`	accepted by most programming languages

Consult your programming language reference manual to determine the correct format.

Binary, Decimal, Hexadecimal, and Octal Formats

Command values may be entered using a binary, decimal, hexadecimal, or octal format. When the binary, hexadecimal, or octal format is used, their values must be preceded with the proper identifier. The decimal format (default format) requires no identifier and the signal generator assumes this format when a numeric value is entered without one. The following list shows the identifiers for the formats that require them:

- #B identifies the number as a binary numeric value (base-2).
- #H identifies the number as a hexadecimal alphanumeric value (base-16).
- #Q identifies the number as a octal alphanumeric value (base-8).

The following are examples of SCPI command values and identifiers for the decimal value 45:

`#B101101`	binary equivalent
`#H2D`	hexadecimal equivalent
`#Q55`	octal equivalent

NOTE While the commands accept the different numeric formats, the queries will return all values in decimal.

The following example sets the RF output power to 10 dBm (or the equivalent value for the currently selected power unit, such as `DBUV` or `DBUVEMF`) using the hexadecimal value 000A:

```
:POW #H000A
```

A unit of measure, such as `DBM` or `mV`, will not work with the values when using a format other than decimal.

IEEE 488.2 Common Commands

*CLS

Supported All

*CLS

The Clear Status (CLS) command clears the Status Byte Register, the Data Questionable Event Register, the Standard Event Status Register, the Standard Operation Status Register and any other registers that are summarized in the status byte.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

*ESE

Supported All

*ESE <data>

The Standard Event Status Enable (ESE) command sets the Standard Event Status Enable Register.

The variable <data> represents the sum of the bits that will be enabled.

***RST** N/A

Range 0–255

Key Entry N/A

Remarks The setting enabled by this command is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset this register to zero.

Refer to "Standard Event Status Group" on page 114 and "Standard Event Status Enable Register" on page 116 for more information.

*ESE?

Supported All

*ESE?

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

***RST** N/A

Range N/A

Key Entry N/A

Remarks Refer to "Standard Event Status Group" on page 114 and "Standard Event Status Enable Register" on page 116 for more information.

*ESR?

Supported All

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

*ESR?

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

***RST** N/A

Range N/A

Key Entry N/A

Remarks Refer to "Standard Event Status Group" on page 114 and "Standard Event Status Register" on page 115 for more information.

*IDN?

Supported All

`*IDN?`

The Identification (IDN) query outputs an identifying string. The response will show the following information:

`<company name>, <model number>, <serial number>, <firmware revision>`

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks The identification information can be modified. Refer to ":SYSTem:IDN" on page 294 for more information.

*OPC

Supported All

`*OPC`

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

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

*OPC?

Supported All

*OPC?

The Operation Complete (OPC) query returns the ASCII character 1 when all pending operations have finished.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

*PSC

Supported All

*PSC ON|OFF|1|0

The Power-On Status Clear (PSC) command controls the automatic power-on clearing of the Service Request Enable Register, the Standard Event Status Enable Register, and device-specific event enable registers.

ON (1) This choice enables the power-on clearing of the listed registers.

OFF (0) This choice disables the clearing of the listed registers and they retain their status when a power-on condition occurs.

***RST** N/A

Choices ON OFF 1 0

Key Entry N/A

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

*PSC?

Supported All

*PSC?

The Power-On Status Clear (PSC) query returns the flag setting as enabled by the *PSC command.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

*RCL

Supported All

*RCL <reg>,<seq>

The Recall (RCL) command recalls the signal generator's state from the specified memory register <reg> of the specified sequence <seq>.

***RST** N/A

Range *Registers*: 0–99 *Sequences*: 0–9

Key Entry **RECALL Reg** **Select Seq:**

Remarks N/A

*RST

Supported All

*RST

The Reset (RST) command resets most signal generator functions to factory-defined conditions.

***RST** N/A

Range N/A

Key Entry N/A

Remarks Each command in this chapter shows the *RST value where the setting is affected.

*SAV

Supported All

*SAV <reg>,<seq>

The Save (SAV) command saves the state of the signal generator to the specified memory register <reg> of the specified sequence <seq>.

***RST** N/A

Range *Registers*: 0–99 *Sequences*: 0–9

Key Entry **Save Reg** **Save Seq[n] Reg[nn]**

Remarks N/A

*SRE

Supported All

*SRE <data>

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

The variable <val> is the decimal sum of the bits that will be enabled. Bit 6 (value 64) is ignored and cannot be set by this command.

***RST** N/A

Range 0–255

Key Entry N/A

Remarks Refer to "Generating a Service Request" on page 107, "Status Byte Group" on page 110, and "Service Request Enable Register" on page 112 for more information.

Entering values from 64 to 127 is equivalent to entering values from 0 to 63.

The setting enabled by this command is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset it to zero.

*SRE?

Supported All

*SRE?

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

***RST** N/A

Range 0–63 or 128–191

Key Entry N/A

Remarks Refer to "Status Byte Group" on page 110 and "Service Request Enable Register" on page 112 for more information.

*STB?

Supported All

*STB?

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

***RST** N/A

Range 0–255

Key Entry N/A

Remarks Refer to the "Status Byte Register" on page 111 for more information.

*TRG

Supported All

*TRG

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

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

*TST?

Supported All

*TST?

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

`0` This shows that all tests passed.

`1` This shows that one or more tests failed.

***RST** N/A

Range N/A

Key Entry **Run Complete Self Test**

Remarks N/A

*WAI

Supported All

*WAI

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

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

Calibration subsystem (:CALibration)

:DCFM

Supported PSG-A Series

`:CALibration:DCFM`

This command initiates a DCFM or DCΦM calibration depending on the currently active modulation. This calibration eliminates any dc or modulation offset of the carrier signal.

NOTE If the calibration is performed with a dc signal applied, any deviation provided by the dc signal will be removed and the new zero reference point will be at the applied dc level. The calibration will have to be performed again when the dc signal is disconnected to reset the carrier signal to the correct zero reference.

***RST** N/A

Range N/A

Key Entry **DCFM/DCΦM Cal**

Remarks Use this calibration for externally applied signals. While the calibration can also be performed for internally generated signals, dc offset is not a normal characteristic for them.

Communication Subsystem (:SYSTem:COMMunicate)

:GPIB:ADDRess

Supported All

```
:SYSTem:COMMunicate:GPIB:ADDRess <number>
:SYSTem:COMMunicate:GPIB:ADDRess?
```

This command sets the GPIB address of the signal generator.

***RST** N/A

Range 0–30

Key Entry **GPIB Address**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:LAN:HOSTname

Supported All

```
:SYSTem:COMMunicate:LAN:HOSTname "<string>"
:SYSTem:COMMunicate:LAN:HOSTname?
```

This command sets the LAN hostname for the signal generator.

***RST** N/A

Range N/A

Key Entry **Hostname**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:LAN:IP

Supported All

```
:SYSTem:COMMunicate:LAN:IP "<ipstring>"
:SYSTem:COMMunicate:LAN:IP?
```

This command sets the LAN IP address for the signal generator.

***RST** N/A

Range N/A

Key Entry **IP Address**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PMETer:ADDRess

Supported All

```
:SYSTem:COMMunicate:PMETer:ADDRess <0–30>
:SYSTem:COMMunicate:PMETer:ADDRess?
```

This command sets the address for a power meter that is controlled by the signal generator.

***RST** N/A

Range 0–30

Key Entry **Meter Address**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

The power meter is controlled only through a GPIB cable.

Ensure that the power meter address is different from the signal generator address.

:PMETer:CHANnel

Supported All

```
:SYSTem:COMMunicate:PMETer:CHANnel A|B
:SYSTem:COMMunicate:PMETer:CHANnel?
```

This command sets the measurement channel on the power meter that is controlled by the signal generator.

***RST** N/A

Choices A B

Key Entry **Meter Channel A B**

Remarks A single-channel power meter uses channel A and selecting channel B will have no effect.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

The power meter is controlled only through a GPIB cable.

:PMETer:IDN

Supported All

```
:SYSTem:COMMunicate:PMETer:IDN E4418B|E4419B|E4416A|E4417A
:SYSTem:COMMunicate:PMETer:IDN?
```

This command sets the model number of the power meter that is controlled by the signal generator.

***RST** N/A

Choices E4416A E4417A E4418B E4419B

Key Entry **Power Meter**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

The power meter is controlled only through a GPIB cable.

:PMETer:TIMEout

Supported All

```
:SYSTem:COMMunicate:PMETer:TIMEout <num>[<time suffix>]
:SYSTem:COMMunicate:PMETer:TIMEout?
```

This command sets the period of time which the signal generator will wait for a valid reading from the power meter.

The variable <num> has a resolution of 0.001.

***RST** N/A

Range 1mS–100S

Key Entry **Meter Timeout**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

The power meter is controlled only through a GPIB cable.

If a time-out occurs, the signal generator reports an error message.

:SERial:BAUD

Supported All

```
:SYSTem:COMMunicate:SERial:BAUD <number>
:SYSTem:COMMunicate:SERial:BAUD?
```

This command sets the baud rate for the rear panel RS-232 interface (AUXILIARY INTERFACE).

***RST** N/A

Choices <*number*>: 300 1200 2400 4800 9600 19200 38400 57600

Key Entry **RS-232 Baud Rate**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:SERial:ECHO

Supported All

```
:SYSTem:COMMunicate:SERial:ECHO ON|OFF|1|0
:SYSTem:COMMunicate:SERial:ECHO?
```

This command enables or disables the RS-232 echo.

***RST** N/A

Choices ON OFF

Key Entry **RS-232 ECHO Off On**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:SERial:RECeive:PACE

Supported All

```
:SYSTem:COMMunicate:SERial:RECeive:PACE XON|NONE
:SYSTem:COMMunicate:SERial:RECeive:PACE?
```

This command sets XON/XOFF handshaking when the signal generator is receiving data.

***RST** N/A

Choices XON NONE

Key Entry **Trans/Recv Pace None Xon**

Remarks The serial receive and serial transmit commands are coupled. Changing the choice for one will enable the same choice for the other. Refer to ":SERial:TRANsmit:PACE" on page 169 for the serial transmit command.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:SERial:RESet

Supported All

`:SYSTem:COMMunicate:SERial:RESet`

This event command resets the RS-232 buffer and will discard any unprocessed SCPI input received by the RS-232 port.

***RST** N/A

Range N/A

Key Entry **Reset RS-232**

Remarks N/A

:SERial:TOUT

Supported All

`:SYSTem:COMMunicate:SERial:TOUT <val>`
`:SYSTem:COMMunicate:SERial:TOUT?`

This command sets the value for the RS-232 serial port time-out. If further input is not received within the assigned time-out period while a SCPI command is being processed, the command is aborted and the input buffer is cleared.

The variable <val> is entered in units of seconds.

***RST** N/A

Range 10–60

Key Entry **RS-232 Timeout**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:SERial:TRANsmit:PACE

Supported All

```
:SYSTem:COMMunicate:SERial:TRANsmit:PACE XON|NONE
:SYSTem:COMMunicate:SERial:TRANsmit:PACE?
```

This command sets XON/XOFF handshaking when the signal generator is transmitting data.

***RST** N/A

Choices XON NONE

Key Entry **Trans/Recv Pace None Xon**

Remarks The serial receive and serial transmit commands are coupled. Changing the choice for one will enable the same choice for the other. Refer to ":SERial:RECeive:PACE" on page 167 for the serial receive command.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

Diagnostic Subsystem (:DIAGnostic)

[:CPU]:INFOrmation:BOARds

Supported All

`:DIAGnostic[:CPU]:INFOrmation:BOARds?`

This query returns a list of the installed boards in the signal generator. The information will be returned in the following format:

"<board name,part number,serial number,version number,status>"

This information format will repeat with as many iterations as the number of detected boards in the signal generator.

***RST** N/A

Range N/A

Key Entry **Installed Board Info**

Remarks N/A

[:CPU]:INFOrmation:CCOunt:ATTenuator

Supported All

`:DIAGnostic[:CPU]:INFOrmation:CCOunt:ATTenuator?`

This query returns the cumulative number of times that the attenuator has been switched.

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks N/A

[:CPU]:INFOrmation:CCOunt:PON

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:CCOunt:PON?
```

This query returns the cumulative number of times that the signal generator's line power has been cycled.

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks N/A

[:CPU]:INFOrmation:DISPlay:OTIMe

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:DISPlay:OTIMe?
```

This query returns the cumulative number of hours that the signal generator's display has been on.

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks N/A

[:CPU]:INFOrmation:OPTions

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:OPTions?
```

This query returns a list of internally installed signal generator options.

***RST** N/A

Range N/A

Key Entry **Options Info**

Remarks N/A

[:CPU]:INFOrmation:OPTions:DETail

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:OPTions:DETail?
```

This query returns the options that are installed along with the option revision and DSP version if applicable.

***RST** N/A

Range N/A

Key Entry **Options Info**

Remarks N/A

[:CPU]:INFOrmation:OTIMe

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:OTIMe?
```

This query returns the cumulative number of hours that the signal generator has been on.

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks N/A

[:CPU]:INFOrmation:REVision

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:REVision?
```

This query returns the revision, date, and time of the signal generator's main firmware.

***RST** N/A

Range N/A

Key Entry **Diagnostic Info**

Remarks N/A

[:CPU]:INFOrmation:SDATe

Supported All

```
:DIAGnostic[:CPU]:INFOrmation:SDATe?
```

This query returns the date and time of the signal generator's main firmware.

***RST** N/A

Range N/A

Key Entry Diagnostic Info

Remarks N/A

Display Subsystem (:DISPlay)

:BRIGhtness

Supported All

```
:DISPlay:BRIGhtness <value>
:DISPlay:BRIGhtness?
```

This command sets the display brightness. The brightness can be set to the minimum level (0.02), maximum level (1), or in between by using fractional numeric values (0.03–0.99).

***RST** N/A

Range 0.02–1

Key Entry **Brightness**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:CAPture

Supported All

```
:DISPlay:CAPTure
```

This event command enables the user to capture the current display and store it in the signal generator's memory.

***RST** N/A

Range N/A

Key Entry N/A

Remarks The display capture is stored as DISPLAY.BMP in the Binary file system. This file is overwritten with each subsequent display capture. The file can be down-loaded in the following manner:

1. Log on to the signal generator using ftp.
2. Change (cd) to the BIN directory.
3. Retrieve the file by using the get command.

:CONTrast

Supported All

```
:DISPlay:CONTrast <value>
:DISPlay:CONTrast?
```

This command sets the contrast of the of the signal generator's LCD display. The contrast can be set to the maximum level (1), minimum level (0), or in between by using fractional numeric values (0.001–0.999).

***RST** N/A

Range 0–1

Key Entry Display contrast hardkeys located below the display

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:INVerse

Supported All

```
:DISPlay:INVerse ON|OFF|1|0
:DISPlay:INVerse?
```

This command sets the display of the source to inverse video mode.

***RST** N/A

Choices ON OFF 1 0

Key Entry Inverse Video Off On

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:REMote

Supported All

```
:DISPlay:REMote ON|OFF|1|0
:DISPlay:REMote?
```

This command enables or disables the source's display updating when the signal generator is remotely controlled.

ON (1) This choice updates the signal generator display so you can see the settings as the commands are executed, however, this will degrade the signal generator speed.

OFF (0) This choice turns off the display updating while further optimizing the signal generator for speed.

***RST** N/A

Choices ON OFF 1 0

Key Entry **Update in Remote Off On**

Remarks The setting enabled by this command is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset it to zero.

[:WINDow][:STATe]

Supported All

```
:DISPlay[:WINDow][:STATe] ON|OFF|1|0
:DISPlay[:WINDow][:STATe]?
```

This command is used to either blank out (OFF or 0) the display screen or turn it on (ON or 1).

***RST** N/A

Choices ON OFF 1 0

Key Entry N/A

Remarks The setting enabled by this command is not affected by *RST. However, presetting the signal generator or cycling the power will turn the display on.

Memory Subsystem (:MEMory)

:CATalog:BINary

Supported All

```
:MEMory:CATalog:BINary?
```

This command outputs a list of the binary files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

***RST** N/A

Range N/A

Key Entry Binary

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:CATalog:LIST

Supported All

`:MEMory:CATalog:LIST?`

This command outputs a list of the list sweep files. The return data will be in the following form:

`<mem used>,<mem free>{,"<file listing>"}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

***RST** N/A

Range N/A

Key Entry List

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:CATalog:STATe

Supported All

`:MEMory:CATalog:STATe?`

This command outputs a list of the state files. The return data will be in the following form:

`<mem used>,<mem free>{,"<file listing>"}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

***RST** N/A

Range N/A

Key Entry State

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:CATalog:UFLT

Supported All

`:MEMory:CATalog:UFLT?`

This command outputs a list of the user flatness correction files. The return data will be in the following form:

`<mem used>,<mem free>{,"<file listing>"}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

***RST** N/A

Range N/A

Key Entry **User Flatness**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:CATalog[:ALL]

Supported All

`:MEMory:CATalog[:ALL]?`

This command outputs a list of all the files in the memory subsystem. The return data will be in the following form:

`<mem used>,<mem free>,"<file listing>"`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the memory subsystem. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

***RST** N/A

Range N/A

Key Entry **All**

Remarks Refer to Table 4-4 on page 185 for a listing of the file types and "File Name Variables" on page 150 for information on the file name syntax.

:COPY[:NAME]

Supported All

```
:MEMory:COPY[:NAME] "<file name>","<file name>"
```

This command makes a duplicate of the requested file.

***RST** N/A

Range N/A

Key Entry **Copy File**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:DATA

Supported All

```
:MEMory:DATA "<file name>",<datablock>
:MEMory:DATA? "<file name>"
```

This command loads <datablock> into the memory location "<file name>". The query returns the <datablock> associated with the "<file name>".

***RST** N/A

Range N/A

Key Entry N/A

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:DELete:ALL

Supported All

CAUTION Using this command deletes all user files including binary, list, state, and flatness correction files, and any saved setups which use the table editor. You cannot recover the files after sending this command.

`:MEMory:DELete:ALL`

This command clears the file system of all user files.

***RST** N/A

Range N/A

Key Entry **Delete All Files**

Remarks N/A

:DELete:BINary

Supported All

`:MEMory:DELete:BINary`

This command deletes all binary files.

***RST** N/A

Range N/A

Key Entry **Delete All Binary Files**

Remarks N/A

:DELete:LIST

Supported All

`:MEMory:DELete:LIST`

This command deletes all list files.

***RST** N/A

Range N/A

Key Entry **Delete All List Files**

Remarks N/A

:DELete:STATe

Supported All

`:MEMory:DELete:STATe`

This command deletes all state files.

***RST** N/A

Range N/A

Key Entry **Delete All State Files**

Remarks N/A

:DELete:UFLT

Supported All

`:MEMory:DELete:UFLT`

This command deletes all user flatness correction files.

***RST** N/A

Range N/A

Key Entry **Delete All UFLT Files**

Remarks N/A

:DELete[:NAME]

Supported All

`:MEMory:DELete[:NAME] "<file name>"`

This command clears the user file system of "<file name>".

***RST** N/A

Range N/A

Key Entry **Delete File**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:FREE[:ALL]

Supported All

`:MEMory:FREE[:ALL]?`

This command returns the number of bytes left in the user file system.

***RST** N/A

Range N/A

Key Entry **All**

Remarks N/A

:LOAD:LIST

Supported All

`:MEMory:LOAD:LIST "<file name>"`

This command loads a list sweep file.

***RST** N/A

Range N/A

Key Entry **Load From Selected File**

Remarks N/A

:MOVE

Supported All

```
:MEMory:MOVE "<src_file>","<dest_file>"
```

This command renames the requested file in the memory catalog.

***RST** N/A

Range N/A

Key Entry **Rename File**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:STATe:COMMent

Supported All

```
:MEMory:STATe:COMMent <reg_num>,<seq_num>,"<comment>"
:MEMory:STATe:COMMent? <reg_num>,<seq_num>
```

This command allows you to add a descriptive comment to the saved state <reg_num>,<seq_num>. Comments can be up to 55 characters long.

***RST** N/A

Range N/A

Key Entry **Add Comment To Seq[n] Reg[nn]**

Remarks N/A

:STORe:LIST

Supported All

```
:MEMory:STORe:LIST "<file name>"
```

This command stores the current list sweep data to a file.

***RST** N/A

Range N/A

Key Entry **Store To File**

Remarks N/A

Mass Memory Subsystem (:MMEMory)

:CATalog

Supported All

`:MMEMory:CATalog? "<msus>"`

This command outputs a list of the files from the specified file system.

The variable "<msus>" (mass storage unit specifier) represents "<file system>:". The file systems and types are shown in Table 4-4.

Table 4-4

File System	File Type
BINARY	BIN
LIST	LIST (sweep list file)
STATE	STAT
USERFLAT	UFLT (user flatness file)

The return data will be in the following form:

`<mem used>,<mem free>{,"<file listing>"}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the specified file system. Each file listing will be in the following format:

`"<file name,file type,file size>"`

***RST** N/A

Range N/A

Key Entry **Binary** **List** **State** **User Flatness**

Remarks Refer to "MSUS (Mass Storage Unit Specifier) Variable" on page 151 for information on the use of the "<msus>" variable.

:COPY

Supported All

```
:MMEMory:COPY "<file name>","<file name>"
```

This command makes a duplicate of the requested file.

***RST** N/A

Range N/A

Key Entry **Copy File**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:DATA

Supported All

```
:MMEMory:DATA "<file name>",<datablock>
:MMEMory:DATA? "<file name>"
```

This command loads <datablock> into the memory location "<file name>". The query returns the <datablock> associated with the "<file name>".

***RST** N/A

Range N/A

Key Entry N/A

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:DELete[:NAME]

Supported All

```
:MMEMory:DELete[:NAME] "<file name>",["<msus>"]
```

This command clears the user file system of "<file name>" with the option of specifying the file system separately.

The variable "<msus>" (mass storage unit specifier) represents "<file system>:". For a list of the file systems refer to Table 4-4 on page 185.

***RST** N/A

Range N/A

Key Entry **Delete File**

Remarks If the optional variable "<msus>" is omitted, the file name needs to include the file system extension. Refer to "File Name Variables" on page 150 and "MSUS (Mass Storage Unit Specifier) Variable" on page 151 for information on the use of the file variables.

:LOAD:LIST

Supported All

```
:MMEMory:LOAD:LIST "<file name>"
```

This command loads a list sweep file.

***RST** N/A

Range N/A

Key Entry **Load From Selected File**

Remarks N/A

:MOVE

Supported All

```
:MMEMory:MOVE "<src_file>","<dest_file>"
```

This command renames the requested file in the memory catalog.

***RST** N/A

Range N/A

Key Entry **Rename File**

Remarks Refer to "File Name Variables" on page 150 for information on the file name syntax.

:STORe:LIST

Supported All

```
:MMEMory:STORe:LIST "<file name>"
```

This command stores the current list sweep data to a file.

***RST** N/A

Range N/A

Key Entry **Store To File**

Remarks N/A

Output Subsystem(:OUTPut)

:MODulation[:STATe]

Supported PSG-A Series

```
:OUTPut:MODulation[:STATe] ON|OFF|1|0
:OUTPut:MODulation[:STATe]?
```

This command enables or disables the modulation of the RF output with the currently active modulation type(s).

***RST** 1

Choices ON OFF 1 0

Key Entry **Mod On/Off**

Remarks Most modulation types can be simultaneously enabled except FM with ΦM.

An annunciator on the signal generator is always displayed to indicate whether modulation is switched on or off.

[:STATe]

Supported All

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

This command enables or disables the RF output.

***RST** 0

Choices ON OFF 1 0

Key Entry **RF On/Off**

Remarks Although you can configure and engage various modulations, no signal is available at the RF OUTPUT connector until this command is executed.

An annunciator is always displayed on the signal generator to indicate whether the RF output is switched on or off.

Status Subsystem (:STATus)

:OPERation:CONDition

Supported All

```
:STATus:OPERation:CONDition?
```

This command returns the decimal sum of the bits for the registers that are set to one and are part of the Standard Operation Status Group. For example, if a sweep is in progress (bit 3), the value 8 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Standard Operation Condition Register" on page 118 for more information.

The data in this register is continuously updated and reflects current conditions.

:OPERation:ENABle

Supported All

```
:STATus:OPERation:ENABle <value>
:STATus:OPERation:ENABle?
```

This command determines what bits in the Standard Operation Event Register will set the Standard Operation Status Summary bit (bit 7) in the Status Byte Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Standard Operation Status Group" on page 117 and "Standard Operation Event Enable Register" on page 119 for more information.

:OPERation:NTRansition

Supported All

```
:STATus:OPERation:NTRansition <value>
:STATus:OPERation:NTRansition?
```

This command determines what bits in the Standard Operation Condition Register will set the corresponding bit in the Standard Operation Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Standard Operation Status Group" on page 117 for more information.

:OPERation:PTRansition

Supported All

```
:STATus:OPERation:PTRansition <value>
:STATus:OPERation:PTRansition?
```

This command determines what bits in the Standard Operation Condition Register will set the corresponding bit in the Standard Operation Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Standard Operation Status Group" on page 117 for more information.

:OPERation[:EVENt]

Supported All

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

`:STATus:OPERation[:EVENt]?`

This command returns the decimal sum of the bits in the Standard Operation Event Register. For example, if a sweep is in progress (bit 3), the value 8 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Standard Operation Status Group" on page 117 and "Standard Operation Event Register" on page 119 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

:PRESet

Supported All

`:STATus:PRESet`

This command presets all transition filters, enable registers, and error/event queue enable registers.

***RST** N/A

Range N/A

Key Entry N/A

Remarks Refer to Table 3-2 on page 109 for the status preset register values and types.

:QUEStionable:CALibration:CONDition

Supported PSG-A Series

```
:STATus:QUEStionable:CALibration:CONDition?
```

This command returns the decimal sum of the bits in the Data Questionable Calibration Condition Register. For example, if the DCFM or DCΦM zero calibration fails (bit 0), a value of 1 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Calibration Status Group" on page 133 and "Data Questionable Calibration Condition Register" on page 134 for more information.

The data in this register is continuously updated and reflects the current conditions.

:QUEStionable:CALibration:ENABle

Supported PSG-A Series

```
:STATus:QUEStionable:CALibration:ENABle <value>
:STATus:QUEStionable:CALibration:ENABle?
```

This command determines what bits in the Data Questionable Calibration Event Register will set the calibration summary bit (bit 8) in the Data Questionable Condition Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Calibration Status Group" on page 133 and "Data Questionable Calibration Event Enable Register" on page 135 for more information.

:QUEStionable:CALibration:NTRansition

Supported PSG-A Series

```
:STATus:QUEStionable:CALibration:NTRansition <value>
:STATus:QUEStionable:CALibration:NTRansition?
```

This command determines what bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Calibration Status Group" on page 133 for more information.

:QUEStionable:CALibration:PTRansition

Supported PSG-A Series

```
:STATus:QUEStionable:CALibration:PTRansition <value>
:STATus:QUEStionable:CALibration:PTRansition?
```

This command determines what bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Calibration Status Group" on page 133 for more information.

:QUEStionable:CALibration[:EVENt]

Supported PSG-A Series

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

`:STATus:QUEStionable:CALibration[:EVENt]?`

This command returns the decimal sum of the bits in the Data Questionable Calibration Event Register. For example, if the DCFM or DCΦM zero calibration has failed, bit 0 will return a value of 1.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Calibration Status Group" on page 133 and "Data Questionable Calibration Event Register" on page 134 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

:QUEStionable:CONDition

Supported All

`:STATus:QUEStionable:CONDition?`

This command returns the decimal sum of the bits in the Data Questionable Condition Register. For example, if the reference oscillator oven is cold (bit 4), a value of 16 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Status Group" on page 120 and "Data Questionable Condition Register" on page 121 for more information.

The data in this register is continuously updated and reflects current conditions.

:QUEStionable:ENABle

Supported All

```
:STATus:QUEStionable:ENABle <value>
:STATus:QUEStionable:ENABle?
```

This command determines what bits in the Data Questionable Event Register will set the Data Questionable Status Group Summary bit (bit 3) in the Status Byte Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Status Group" on page 120 and "Data Questionable Event Enable Register" on page 123 for more information.

:QUEStionable:FREQuency:CONDition

Supported All

```
:STATus:QUEStionable:FREQuency:CONDition?
```

This command returns the decimal sum of the bits in the Data Questionable Frequency Condition Register. For example, if the 1 GHz internal reference clock is unlocked (bit 2), a value of 4 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Frequency Status Group" on page 127 and "Data Questionable Frequency Condition Register" on page 128 for more information.

The data in this register is continuously updated and reflects current conditions.

:QUEStionable:FREQuency:ENABle

Supported All

```
:STATus:QUEStionable:FREQuency:ENABle <value>
:STATus:QUEStionable:FREQuency:ENABle?
```

This command determines what bits in the Data Questionable Frequency Event Register will set the frequency summary bit (bit 5) in the Data Questionable Condition Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Frequency Status Group" on page 127 and "Data Questionable Frequency Event Enable Register" on page 129 for more information.

:QUEStionable:FREQuency:NTRansition

Supported All

```
:STATus:QUEStionable:FREQuency:NTRansition <value>
:STATus:QUEStionable:FREQuency:NTRansition?
```

This command determines what bits in the Data Questionable Frequency Condition Register will set the corresponding bit in the Data Questionable Frequency Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Frequency Status Group" on page 127 for more information.

:QUEStionable:FREQuency:PTRansition

Supported All

```
:STATus:QUEStionable:FREQuency:PTRansition <value>
:STATus:QUEStionable:FREQuency:PTRansition?
```

This command determines what bits in the Data Questionable Frequency Condition Register will set the corresponding bit in the Data Questionable Frequency Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Frequency Status Group" on page 127 for more information.

:QUEStionable:FREQuency[:EVENt]

Supported All

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

`:STATus:QUEStionable:FREQuency[:EVENt]?`

This command returns the decimal sum of the bits in the Data Questionable Frequency Event Register. For example, if the 1 GHz internal reference clock is unlocked (bit 2), a value of 4 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Frequency Status Group" on page 127 and "Data Questionable Frequency Event Register" on page 129 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

:QUEStionable:MODulation:CONDition

Supported PSG-A Series

`:STATus:QUEStionable:MODulation:CONDition?`

This command returns the decimal sum of the bits in the Data Questionable Modulation Condition Register.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Modulation Status Group" on page 130 and "Data Questionable Modulation Condition Register" on page 131 for more information.

The data in this register is continuously updated and reflects current conditions.

:QUEStionable:MODulation:ENABle

Supported PSG-A Series

```
:STATus:QUEStionable:MODulation:ENABle <value>
:STATus:QUEStionable:MODulation:ENABle?
```

This command determines what bits in the Data Questionable Modulation Event Register will set the modulation summary bit (bit 7) in the Data Questionable Condition Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Modulation Status Group" on page 130 and "Data Questionable Modulation Event Enable Register" on page 132 for more information.

:QUEStionable:MODulation:NTRansition

Supported PSG-A Series

```
:STATus:QUEStionable:MODulation:NTRansition <value>
:STATus:QUEStionable:MODulation:NTRansition?
```

This command determines what bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Modulation Status Group" on page 130 for more information.

:QUEStionable:MODulation:PTRansition

Supported PSG-A Series

```
:STATus:QUEStionable:MODulation:PTRansition <value>
:STATus:QUEStionable:MODulation:PTRansition?
```

This command determines what bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Modulation Status Group" on page 130 for more information.

:QUEStionable:MODulation[:EVENt]

Supported PSG-A Series

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

`:STATus:QUEStionable:MODulation[:EVENt]?`

This command returns the decimal sum of the bits in the Data Questionable Modulation Event Register. For example, if EXT[1] with ac-coupling is selected and the modulation is enabled with no signal connected, a Modulation 1 Undermod condition exists (bit 0) and a value of 1 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Modulation Status Group" on page 130 and "Data Questionable Modulation Event Register" on page 132 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

:QUEStionable:NTRansition

Supported All

```
:STATus:QUEStionable:NTRansition <value>
:STATus:QUEStionable:NTRansition?
```

This command determines what bits in the Data Questionable Condition Register will set the corresponding bit in the Data Questionable Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Status Group" on page 120 and "Data Questionable Transition Filters (negative and positive)" on page 122 for more information.

:QUEStionable:POWer:CONDition

Supported All

```
:STATus:QUEStionable:POWer:CONDition?
```

This command returns the decimal sum of the bits in the Data Questionable Power Condition Register. For example, if the RF output signal is unleveled (bit 1), a value of 2 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Power Status Group" on page 124 and "Data Questionable Power Condition Register" on page 125 for more information.

The data in this register is continuously updated and reflects current conditions.

:QUEStionable:POWer:ENABle

Supported All

```
:STATus:QUEStionable:POWer:ENABle <value>
:STATus:QUEStionable:POWer:ENABle?
```

This command determines what bits in the Data Questionable Power Event Register will set the power summary bit (bit 3) in the Data Questionable Condition Register.

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Power Status Group" on page 124 and "Data Questionable Power Event Enable Register" on page 126 for more information.

:QUEStionable:POWer:NTRansition

Supported All

```
:STATus:QUEStionable:POWer:NTRansition <value>
:STATus:QUEStionable:POWer:NTRansition?
```

This command determines what bits in the Data Questionable Power Condition Register will set the corresponding bit in the Data Questionable Power Event Register when that bit has a negative transition (1 to 0).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to"Data Questionable Power Status Group" on page 124 for more information.

:QUEStionable:POWer:PTRansition

Supported All

```
:STATus:QUEStionable:POWer:PTRansition <value>
:STATus:QUEStionable:POWer:PTRansition?
```

This command determines what bits in the Data Questionable Power Condition Register will set the corresponding bit in the Data Questionable Power Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Power Status Group" on page 124 for more information.

:QUEStionable:POWer[:EVENt]

Supported All

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

`:STATus:QUEStionable:POWer[:EVENt]?`

This command returns the decimal sum of the bits in the Data Questionable Power Event Register. For example, if the RF output signal is unleveled (bit 1), a value of 2 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Power Status Group" on page 124 and "Data Questionable Power Event Register" on page 126 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

:QUEStionable:PTRansition

Supported All

```
:STATus:QUEStionable:PTRansition <value>
:STATus:QUEStionable:PTRansition?
```

This command determines what bits in the Data Questionable Condition Register will set the corresponding bit in the Data Questionable Event Register when that bit has a positive transition (0 to 1).

The variable <value> is the sum of the decimal values of the bits that you want to enable.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Status Group" on page 120 and "Data Questionable Transition Filters (negative and positive)" on page 122 for more information.

:QUEStionable[:EVENt]

Supported All

CAUTION This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

```
:STATus:QUEStionable[:EVENt]?
```

This command returns the decimal sum of the bits in the Data Questionable Event Register. For example, if the signal generator has just been connected to the line power and the reference oscillator oven is cold (bit 4), a value of 16 is returned.

***RST** N/A

Range 0–32767

Key Entry N/A

Remarks Refer to "Data Questionable Status Group" on page 120 and "Data Questionable Event Register" on page 122 for more information.

The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

System Subsystem (:SYSTem)

:CAPability

Supported All

`:SYSTem:CAPability?`

This command queries the signal generator's capabilities and outputs the appropriate specifiers:

`(RFSOURCE WITH((AM|FM|PULM|PM|LFO)&(FSSWEEP|FLIST)&(PSSWEEP|PLIST)&TRIGGER&REFERENCE))`

This is a list of the SCPI-defined basic functionality of the signal generator and the additional capabilities it has in parallel (a&b) and singularly (a|b).

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:ERRor[:NEXT]

Supported All

`:SYSTem:ERRor[:NEXT]?`

This command queries the signal generator's error queue and displays the error message when available. If there are no error messages, the query returns the following output:

```
+0,"No error"
```

When there is more than one error message, the query will need to be sent for each message.

***RST** N/A

Range N/A

Key Entry **Error Info** **View Next Error Message**

Remarks The error messages are erased after being queried.

:HELP:MODE

Supported All

```
:SYSTem:HELP:MODE SINGle|CONTinuous
:SYSTem:HELP:MODE?
```

This command sets the mode of the signal generator's help function.

SINGle	Help is provided only for the next key that you press.
CONTinuous	Help is continuously provided for the next key and subsequent keys you press. In addition, the key's function is executed.

Pressing the **Help** hardkey in either mode, while the help dialog box is displayed, will turn help off.

***RST** N/A

Choices SINGle CONTinuous

Key Entry **Help Mode Single Cont**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PON:TYPE

Supported All

```
:SYSTem:PON:TYPE PRESet|LAST
:SYSTem:PON:TYPE?
```

This command sets the defined conditions for the signal generator at power on.

PRESet This choice sets the conditions to factory- or user-defined as determined by the choice for the preset type. Refer to ":PRESet:TYPE" on page 212 for selecting the type of preset.

LAST This choice retains the settings at the time the signal generator was last powered down.

NOTE When LAST is selected, no signal generator interaction can occur for at least 3 seconds prior to cycling the power for the current settings to be saved.

***RST** N/A

Choices PRESet LAST

Key Entry **Power On Last Preset**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PRESet

Supported All

```
SYSTem:PRESet
```

This command returns the signal generator to a set of defined conditions. It is equivalent to pressing the front panel **Preset** hardkey.

***RST** N/A

Range N/A

Key Entry **Preset**

Remarks The defined conditions are either factory- or user-defined. Refer to ":PRESet:TYPE" on page 212 for selecting the type of defined conditions.

:PRESet:ALL

Supported All

`:SYSTem:PRESet:ALL`

This command sets all states of the signal generator back to their factory default settings, including states that are not normally affected by signal generator power-on, preset, or *RST.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:PRESet:PERSistent

Supported All

`:SYSTem:PRESet:PERSistent`

This command sets the states that are not affected by signal generator power-on, preset, or *RST to their factory default settings.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:PRESet:TYPE

Supported All

```
:SYSTem:PRESet:TYPE NORMal|USER
:SYSTem:PRESet:TYPE?
```

This command toggles the preset state between factory- and user-defined conditions.

***RST** N/A

Choices NORMal USER

Key Entry **Preset Normal User**

Remarks Refer to ":PRESet[:USER]:SAVE" for saving the USER choice preset settings.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PRESet[:USER]:SAVE

Supported All

```
:SYSTem:PRESet[:USER]:SAVE
```

This command saves your user-defined preset conditions to a state file.

***RST** N/A

Range N/A

Key Entry **Save User Preset**

Remarks Only one user-defined preset file can be saved. Subsequent saved user-defined preset files will overwrite the previously saved file.

:SSAVer:DELay

Supported All

```
:SYSTem:SSAVer:DELay <val>
:SYSTem:SSAVer:DELay?
```

This command sets the amount of time before the display light or display light and text is switched off. This will occur if there is no input via the front panel during the delay period.

The variable <val> is a whole number measured in hours.

***RST** N/A

Range 1–12

Key Entry **Screen Saver Delay:**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

Refer to ":SSAVer:MODE" on page 213 for selecting the screen saver mode.

:SSAVer:MODE

Supported All

```
:SYSTem:SSAVer:MODE LIGHt|TEXT
:SYSTem:SSAVer:MODE?
```

This command toggles the screen saver mode between light only or light and text.

LIGHT	This choice enables only the light to turn off during the screen saver operation while leaving the text visible on the darkened screen.
TEXT	This choice enables both the display light and text to turn off during the screen saver operation.

***RST** N/A

Choices LIGHt TEXT

Key Entry **Screen Saver Mode**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:SSAVer:STATe

Supported All

```
:SYSTem:SSAVer:STATe ON|OFF|1|0
:SYSTem:SSAVer:STATe?
```

This command enables or disables the display screen saver.

***RST** N/A

Choices ON OFF 1 0

Key Entry **Screen Saver Off On**

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:VERSion

Supported All

```
:SYSTem:VERSion?
```

This command returns the SCPI version number with which the signal generator complies.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

Trigger Subsystem

:ABORt

Supported All

```
:ABORt
```

This command causes the list or step sweep in progress to abort.

***RST** N/A

Range N/A

Key Entry N/A

Remarks If `INIT:CONT[:ALL]` is set to ON, the sweep will immediately re-initiate.

The pending operation flag affecting `*OPC`, `*OPC?`, and `*WAI` will undergo a transition once the sweep has been reset.

:INITiate:CONTinuous[:ALL]

Supported All

```
:INITiate:CONTinuous[:ALL] ON|OFF|1|0
:INITiate:CONTinuous[:ALL]?
```

This command selects either a continuous or single list or step sweep.

ON (1) This choice selects continuous sweep where, after the completion of the previous sweep, the current sweep will restart automatically or wait until the appropriate trigger source is received.

OFF (0) This choice selects a single sweep. Refer to ":INITiate[:IMMediate][:ALL]" on page 216 for single sweep triggering information.

***RST** 0

Choices ON OFF 1 0

Key Entry **Sweep Repeat Single Cont**

Remarks Execution of this command will not affect a sweep in progress.

:INITiate[:IMMediate][:ALL]

Supported All

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

This command arms or arms and starts a single list or step sweep.

The following list demonstrates the behavior of this command:

- arms a single sweep when BUS, EXTernal, or KEY is the trigger source selection
- arms and starts a single sweep when IMMediate is the trigger source selection

***RST** N/A

Range N/A

Key Entry **Single Sweep**

Remarks Refer to ":INITiate:CONTinuous[:ALL]" on page 215 for setting continuous or single sweep

This command is ignored if a sweep is in progress.

:TRIGger:OUTPut:POLarity

Supported All

```
:TRIGger:OUTPut:POLarity POSitive|NEGative
:TRIGger:OUTPut:POLarity?
```

This command sets the polarity of the TTL signal present at the TRIGGER OUT connector.

***RST** POS

Choices POSitive NEGative

Key Entry **Trigger Out Polarity Neg Pos**

Remarks The trigger out is asserted after the frequency and/or power is set while the sweep is waiting for its step trigger. In addition, the swept-sine sends a pulse to the TRIGGER OUT at the beginning of each sweep.

:TRIGger[:SEQuence]:SLOPe

Supported All

```
:TRIGger[:SEQuence]:SLOPe POSitive|NEGative
:TRIGger[:SEQuence]:SLOPe?
```

This command sets the polarity of the ramp or sawtooth waveform slope present at the TRIGGER IN connector that will trigger a list or step sweep.

***RST** POS

Choices POSitive NEGative

Key Entry **Trigger In Polarity Neg Pos**

Remarks N/A

:TRIGger[:SEQuence]:SOURce

Supported All

```
:TRIGger[:SEQuence]:SOURce BUS|IMMediate|EXTernal|KEY
:TRIGger[:SEQuence]:SOURce?
```

This command sets the sweep trigger source for a list or step sweep.

BUS — This choice enables GPIB triggering using the `*TRG` or `GET` command or LAN triggering using the `*TRG` command.

IMMediate — This choice enables immediate triggering of the sweep event.

EXTernal — This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.

KEY — This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks The wait for the BUS, EXTernal, or KEY trigger can be bypassed by sending the `:TRIGger[:SEQuence][:IMMediate]` command.

:TRIGger[:SEQuence][:IMMediate]

Supported All

`:TRIGger[:SEQuence][:IMMediate]`

This event command enables an armed list or step sweep to immediately start without the selected trigger occurring.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

Unit Subsystem (:UNIT)

:POWer

Supported All

```
:UNIT:POWer DBM|DBUV|DBUVEMF|V|VEMF
:UNIT:POWer?
```

This command terminates an amplitude value in the selected unit of measure.

***RST** DBM

Choices DBM DBUV DBUVEMF V VEMF

Key Entry **dBm dBuV dBuVemf mV uV mVemf uVemf**

Remarks All power values in this chapter are shown with DBM as the unit of measure. If a different unit of measure is selected, replace DBM with the newly selected unit whenever it is indicated for the value.

Amplitude Modulation Subsystem ([:SOURce])

:AM[1]|2...

Supported PSG-A Series

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

This prefix enables the selection of the AM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **AM Path 1 2** softkey.

AM[1] **AM Path 1 2** with 1 selected

AM2 **AM Path 1 2** with 2 selected

When just AM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses AM[1], only path one is affected. Consequently, when AM2 is selected, only path two is set up. However, the depth of the signals for the two paths can be coupled.

Depth coupling links the depth value of AM[1] to AM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPtsine is not the selection for the waveform type
- each path uses a different source (Internal 1, Internal 2, Ext1, or Ext2)

:AM:INTernal:FREQuency:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:AM:INTernal:FREQuency:STEP[:INCRement] <num>
[:SOURce]:AM:INTernal:FREQuency:STEP[:INCRement]?
```

This command sets the step increment for the amplitude modulation internal frequency.

The variable <num> sets the entered value in units of hertz.

***RST** N/A

Range 0.5–1E6

Key Entry Incr Set

Remarks The value set by this command is used with the UP and DOWN choices for the AM frequency setting. Refer to ":AM[1]|2:INTernal[1]|2:FREQuency" on page 226 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:AM:MODE

Supported PSG-A Series

```
[:SOURce]:AM:MODE DEEP|NORMal
[:SOURce]:AM:MODE?
```

This command sets the mode for the amplitude modulation.

DEEP This choice enables the amplitude modulation depth greater dynamic range with the ALC enabled. The minimum carrier amplitude with this choice is –10 dBm. DEEP has no specified parameters and emulates the amplitude modulation NORMal mode with the ALC disabled.

NORMal This choice maintains the amplitude modulation standard behavior and has specified parameters as outlined in the data sheet.

***RST** NORM

Choices DEEP NORMal

Key Entry **AM Mode Normal Deep**

Remarks The ALC will passively disable when the carrier amplitude is less than –10 dBm and DEEP is the AM mode.

DEEP is limited to repetitive AM and will not work with a dc modulation signal.

:AM[1]|2:EXTernal[1]|2:COUPling

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:EXTernal[1]|2:COUPling AC|DC
[:SOURce]:AM[1]|2:EXTernal[1]|2:COUPling?
```

This command sets the coupling for the amplitude modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Choices AC DC

Key Entry **Ext Coupling DC AC**

Remarks The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

:AM[1]|2:EXTernal[1]|2:IMPedance

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:EXTernal[1]|2:IMPedance <50|600>
[:SOURce]:AM[1]|2:EXTernal[1]|2:IMPedance?
```

This commands sets the impedance for the selected external input.

***RST** +5.00000000E+001

Choices 50 600

Key Entry **Ext Impedance 50 Ohm 600 Ohm**

Remarks N/A

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]:FREQuency:ALTernate <val><unit>
[:SOURce]:AM[1]|2:INTernal[1]:FREQuency:ALTernate?
```

This command sets the frequency for the alternate signal.

***RST** +4.00000000E+002

Range *Dual-Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

Key Entry **AM Tone 2 Rate** **AM Stop Rate**

Remarks The alternate signal frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

:AM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:
PERCent <val><unit>
[:SOURce]:AM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent?
```

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **AM Tone 2 Ampl Percent Of Peak**

Remarks Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

:AM[1]|2:INTernal[1]:SWEep:RATE

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]:SWEep:RATE <val><unit>
[:SOURce]:AM[1]|2:INTernal[1]:SWEep:RATE?
```

This command sets the sweep rate for the amplitude-modulated, swept-sine waveform.

The variable <val> has a minimum resolution of 0.5 hertz.

***RST** +4.00000000E+002

Range 0.5HZ–100kHZ

Key Entry **AM Sweep Rate**

Remarks Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

:AM[1]|2:INTernal[1]:SWEep:TRIGger

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]:SWEep:TRIGger BUS|IMMediate|EXTernal|KEY
[:SOURce]:AM[1]|2:INTernal[1]:SWEep:TRIGger?
```

This command sets the trigger source for the amplitude modulated swept-sine waveform.

BUS	This choice enables GPIB triggering using the *TRG or GET command or LAN triggering using the *TRG command.
IMMediate	This choice enables immediate triggering of the sweep event.
EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.
KEY	This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]|2:FREQuency <val><unit>|UP|DOWN
[:SOURce]:AM[1]|2:INTernal[1]|2:FREQuency?
```

This command sets the internal amplitude modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.00000000E+002

Range *Dual-Sine & Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

All Other Waveforms: 0.5HZ–100kHZ

Choices <val><unit> UP DOWN

Key Entry **AM Tone 1 Rate** **AM Start Rate** **AM Rate**

Remarks Refer to ":AM:INTernal:FREQuency:STEP[:INCRement]" on page 221 for setting the value associated with the UP and DOWN choices.

Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:NOISe GAUSsian|UNIForm
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:NOISe?
```

This commands sets the noise type when NOISe is the waveform choice.

***RST** UNIF

Choices GAUSsian UNIForm

Key Entry **Gaussian** **Uniform**

Remarks Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 227 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:RAMP POSitive|NEGative
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:RAMP?
```

This command sets the slope type for the ramp modulated waveform.

***RST** POS

Choices POSitive NEGative

Key Entry **Positive** **Negative**

Remarks Refer to ":AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe SINE|TRIangle|SQUare|
RAMP|NOISe|DUALsine|SWEPtsine
[:SOURce]:AM[1]|2:INTernal[1]|2:FUNCtion:SHAPe?
```

This command sets the AM waveform type.

***RST** SINE

Choices SINE TRIangle SQUare RAMP NOISe DUALsine SWEPtsine

Key Entry **Sine** **Triangle** **Square** **Ramp** **Noise** **Dual-Sine** **Swept-Sine**

Remarks The INTernal2 source selection does not support the DUALsine and SWEPtsine waveform choices.

:AM[1]|2:SOURce

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:SOURce INT[1]|INT2|EXT[1]|EXT2
[:SOURce]:AM[1]|2:SOURce?
```

This command sets the source to generate the amplitude modulation.

INT This choice selects internal source 1 or 2 to provide an ac-coupled signal.

EXT This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.

***RST** INT

Choices INT[1] INT2 EXT[1] EXT2

Key Entry **Internal 1 Internal 2 Ext1 Ext2**

Remarks A 1.0 V_p input is required for calibrated AM depth settings.

The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is > ±3% of 1 V_p.

:AM[1]|2:STATe

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:STATe ON|OFF|1|0
[:SOURce]:AM[1]|2:STATe?
```

This command enables or disables the amplitude modulation for the selected path.

***RST** 0

Choices ON OFF 1 0

Key Entry **AM Off On**

Remarks The RF carrier is modulated when you have set the signal generator's modulation state to ON, see ":MODulation[:STATe]" on page 189 for more information.

Whenever amplitude modulation is enabled, the AM annunciator is turned on in the display

The two paths for amplitude modulation can be simultaneously enabled. Refer to ":AM[1]|2..." on page 220 for more information.

:AM[1]|2:TYPE

Supported PSG-A Series

```
[:SOURce]:AM[1]|2:TYPE LINear|EXPonential
[:SOURce]:AM[1]|2:TYPE?
```

This command sets the measurement type and unit for the depth of the AM signal.

LINear This choice enables linear depth values in units of percent/volt.

EXPonential This choice enables exponential depth values in units of dB/volt.

***RST** LIN

Choices LINear EXPonential

Key Entry **AM Type LIN EXP**

Remarks N/A

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2[:DEPTh]:EXPonential <val><unit>
[:SOURce]:AM[1]|2[:DEPTh]:EXPonential?
```

This commands sets the depth of the AM signal in units of dB/volt.

***RST** +4.00000000E+001

Range 0.00–40.00DB

Key Entry **AM Depth**

Remarks EXPonential must be the current measurement choice for this command to have any affect. Refer to ":AM[1]|2:TYPE" for setting the AM measurement mode.

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

Supported PSG-A Series

```
[:SOURce]:AM[1]|2[:DEPTh][:LINear] <val><unit>|UP|DOWN
[:SOURce]:AM[1]|2[:DEPTh][:LINear]?
```

This commands sets the depth of the AM signal.

***RST** +1.00000000E-001

Range 0.0–100PCT

Choices <val> UP DOWN

Key Entry **AM Depth**

Remarks LINear must be the current measurement choice for this command to have any affect. Refer to ":AM[1]|2:TYPE" on page 229 for setting the AM measurement mode.

When the depth values are coupled, a change made to one path is applied to both. Refer to ":AM[1]|2[:DEPTh][:LINear]:TRACk" on page 231 for AM depth value coupling.

Refer to ":AM[:DEPTh]:STEP[:INCRement]" on page 232 for setting the value associated with the UP and DOWN choices.

:AM[1]|2[:DEPTh][:LINear]:TRACk

Supported PSG-A Series

```
[:SOURce]:AM[1]|2[:DEPTh][:LINear]:TRACk ON|OFF|1|0
[:SOURce]:AM[1]|2[:DEPTh][:LINear]:TRACk?
```

This command enables or disables the coupling of the AM depth values between the paths (AM[1] and AM2).

ON (1) This choice will link the depth value of AM[1] with AM2; AM2 will assume the AM[1] depth value. For example, if AM[1] depth is set to 15% and AM2 is set to 11%, enabling the depth tracking will cause the AM2 depth value to change to 15%. This applies regardless of the path (AM[1] or AM2) selected in this command

OFF (0) This choice disables the coupling and both paths will have independent depth values.

***RST** 0

Choices ON OFF 1 0

Key Entry **AM Depth Couple Off On**

Remarks When the depth values are coupled, a change made to one path is applied to both.

LINear must be the current unit of measure choice for this command to have any affect. Refer to ":AM[1]|2:TYPE" on page 229 for setting the AM measurement unit.

:AM[:DEPTh]:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:AM[:DEPTh]:STEP[:INCRement] <num>
[:SOURce]:AM[:DEPTh]:STEP[:INCRement]?
```

This command sets the depth increment value for the LINear measurement choice.

The variable <num> sets the increment value in units of percent.

***RST** N/A

Range 0.1–100

Key Entry Incr Set

Remarks Refer to ":AM[1]|2:TYPE" on page 229 for setting the AM measurement choice.

The value set by this command is used with the UP and DOWN choices for the AM linear depth command. Refer to ":AM[1]|2[:DEPTh][:LINear]" on page 230 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

Correction Subsystem ([:SOURce]:CORRection)

:FLATness?

Supported All

`[:SOURce]:CORRection:FLATness?`

This command queries the user flatness correction file for the frequency and amplitude values. The returned values will be in the following form:

<frequency>,<power correction>

The number of paired values returned will be the same as the number of correction flatness points.

***RST** N/A

Range N/A

Key Entry **Configure Cal Array**

Remarks N/A

:FLATness:LOAD

Supported All

`[:SOURce]:CORRection:FLATness:LOAD "<file name>"`

This command loads a user flatness correction file.

***RST** N/A

Range N/A

Key Entry **Load From Selected File**

Remarks N/A

:FLATness:PAIR

Supported All

```
[:SOURce]:CORRection:FLATness:
PAIR <freq>[<freq suffix>],<corr>[<corr suffix>]
```

This command sets a frequency and amplitude correction pair.

***RST** N/A

Range

20 GHz Models

Frequency: 100kHZ–20GHZ — *Correction* (Std.): –20 to 25DB

Correction (Opt. 1E1): –135 to 25DB

40 GHz Models

Frequency: 100kHZ–40GHZ — *Correction* (Std.): –20 to 25DB

Correction (Opt. 1E1): –135 to 25DB

Key Entry **Configure Cal Array**

Remarks The maximum number of points that can be entered is 1601.

:FLATness:POINts?

Supported All

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

This command queries the signal generator for the number of points in the user flatness correction file.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:FLATness:PRESet

Supported All

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

`[:SOURce]:CORRection:FLATness:PRESet`

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

***RST** N/A

Range N/A

Key Entry **Preset List**

Remarks N/A

:FLATness:STORe

Supported All

`[:SOURce]:CORRection:FLATness:STORe "<file name>"`

This command stores the current user flatness correction data to a file.

***RST** N/A

Range N/A

Key Entry **Store To File**

Remarks N/A

[:STATe]

Supported All

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

This command enables or disables the user flatness corrections.

***RST** 0

Choices ON OFF 1 0

Key Entry Flatness Off On

Remarks N/A

Frequency Subsystem ([:SOURce])

:FREQuency:FIXed

Supported All

```
[:SOURce]:FREQuency:FIXed <val><unit>
[:SOURce]:FREQuency:FIXed?
```

This command sets the RF output frequency.

***RST** *20 GHz Models*: +2.0000000000000E+10

40 GHz Models: +4.0000000000000E+10

Range *20 GHz Models*: 100kHZ–20GHZ *40 GHz Models*: 100kHZ–40GHZ

Key Entry **Frequency**

Remarks A frequency change may affect the current output power. Refer to ":POWer[:LEVel][:IMMediate][:AMPLitude]" on page 287 for the correct specified frequency and amplitude settings.

:FREQuency:MODE

Supported All

```
[:SOURce]:FREQuency:MODE CW|FIXed|LIST
[:SOURce]:FREQuency:MODE?
```

This command sets the frequency mode of the signal generator.

CW and FIXed — These choices are synonymous with one another and they let the signal generator operate at a fixed frequency. Refer to ":FREQuency[:CW]" on page 241 for setting the frequency.

LIST — This choice lets the currently selected sweep (LIST or STEP) frequency settings control the output frequency. Refer to ":LIST:TYPE" on page 260 for setting the sweep type.

***RST** CW

Choices CW FIXed LIST

Key Entry **Frequency** **Freq**

Remarks N/A

:FREQuency:MULTiplier

Supported All

```
[:SOURce]:FREQuency:MULTiplier <val>
[:SOURce]:FREQuency:MULTiplier?
```

This command sets the multiplier for the signal generator's carrier frequency.

***RST** +1

Range *Negative Values*: –1000 to –.001 *Positive Values*: .001–1000

Key Entry **Freq Multiplier**

Remarks For any multiplier other than one, the MULT indicator is shown in the frequency area of the display.

:FREQuency:OFFSet

Supported All

```
[:SOURce]:FREQuency:OFFSet <val><unit>
[:SOURce]:FREQuency:OFFSet?
```

This command sets the frequency offset.

***RST** +0.0000000000000E+00

Range *20 GHz Models*: 0HZ–20GHZ *40 GHz Models*: 0HZ–40GHZ

Key Entry **Freq Offset**

Remarks A frequency offset can be entered at any time during normal operation and when you are operating in frequency reference mode.

When an offset has been entered, the OFFS indicator is turned on in the frequency area of the display.

The frequency offset state is turned on when any non-zero value is entered; entering zero will turn it off. Refer to ":FREQuency:OFFSet:STATe" on page 239 for setting the offset state independent of entering offset values.

:FREQuency:OFFSet:STATe

Supported All

```
[:SOURce]:FREQuency:OFFSet:STATe ON|OFF|1|0
[:SOURce]:FREQuency:OFFSet:STATe?
```

This command enables or disables the offset frequency.

***RST** 0

Choices ON OFF 1 0

Key Entry **Freq Offset**

Remarks Entering OFF (0) will set the frequency offset to 0 Hz.

:FREQuency:REFerence

Supported All

```
[:SOURce]:FREQuency:REFerence <val><unit>
[:SOURce]:FREQuency:REFerence?
```

This command sets the output reference frequency.

***RST** +0.0000000000000E+00

Range *20 GHz Models*: 100kHZ–20GHZ *40 GHz Models*: 100kHZ–40GHZ

Key Entry **Freq Ref Set**

Remarks N/A

:FREQuency:REFerence:STATe

Supported All

```
[:SOURce]:FREQuency:REFerence:STATe ON|OFF|1|0
[:SOURce]:FREQuency:REFerence:STATe?
```

This command enables or disables the frequency reference mode.

***RST** 0

Choices ON OFF 1 0

Key Entry **Freq Ref Off On**

Remarks When the frequency reference mode is on, subsequent frequency parameters are set relative to the reference value.

:FREQuency:STARt

Supported All

```
[:SOURce]:FREQuency:STARt <val><unit>
[:SOURce]:FREQuency:STARt?
```

This command sets the frequency start point for a step sweep.

***RST** *20 GHz Models*: +2.0000000000000E+10

40 GHz Models: +4.0000000000000E+10

Range *20 GHz Models*: 100kHZ–20GHZ *40 GHz Models*: 100kHZ–40GHZ

Key Entry **Freq Start**

Remarks N/A

:FREQuency:STOP

Supported All

```
[:SOURce]:FREQuency:STOP <val><unit>
[:SOURce]:FREQuency:STOP?
```

This command sets the frequency stop point for a step sweep.

***RST** *20 GHz Models*: +2.0000000000000E+10

40 GHz Models: +4.0000000000000E+10

Range *20 GHz Models*: 100kHZ–20GHZ *40 GHz Models*: 100kHZ–40GHZ

Key Entry **Freq Stop**

Remarks N/A

:FREQuency[:CW]

Supported All

```
[:SOURce]:FREQuency[:CW] <val><unit>
[:SOURce]:FREQuency[:CW]?
```

This command sets the signal generator's output frequency for the CW and FIXed frequency modes.

***RST** *20 GHz Models*: +2.0000000000000E+10

40 GHz Models: +4.0000000000000E+10

Range *20 GHz Models*: 100kHZ–20GHZ *40 GHz Models*: 100kHZ–40GHZ

Key Entry **Frequency**

Remarks Refer to ":FREQuency:MODE" on page 237 for setting the frequency type.

:PHASe:REFerence

Supported All

```
[:SOURce]:PHASe:REFerence
```

This command sets the current output phase as a zero reference.

***RST** N/A

Range N/A

Key Entry **Phase Ref Set**

Remarks Subsequent phase adjustments are set relative to the new reference.

:PHASe[:ADJust]

Supported All

```
[:SOURce]:PHASe[:ADJust] <val><unit>
[:SOURce]:PHASe[:ADJust]?
```

This command adjusts the phase of the modulating signal.

The query will only return values in radians.

***RST** +0.00000000E+000

Range *Radians*: –3.14 to 3.14RAD *Degrees*: –180 to 179DEG

Key Entry **Adjust Phase**

Remarks N/A

:ROSCillator:SOURce

Supported All

```
[:SOURce]:ROSCillator:SOURce?
```

This command queries the source of the signal generator's reference oscillator. It returns either INT (internal) or EXT (external).

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:ROSCillator:SOURce:AUTO

Supported All except signal generators with Option UNJ

```
[:SOURce]:ROSCillator:SOURce:AUTO ON|OFF|1|0
[:SOURce]:ROSCillator:SOURce:AUTO?
```

This command enables or disables the ability of the signal generator to automatically select between the internal and an external reference oscillator.

ON (1) This choice enables the signal generator to detect when a valid reference signal is present at the 10 MHz IN connector and automatically switches from internal to external frequency reference.

OFF (0) This choice selects the internal reference oscillator and disables the switching capability between the internal and an external frequency reference.

***RST** 1

Choices ON OFF 1 0

Key Entry **Ref Oscillator Source Auto Off On**

Remarks N/A

Frequency Modulation Subsystem ([:SOURce])

:FM[1]|2...

Supported PSG-A Series

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

This prefix enables the selection of the FM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **FM Path 1 2** softkey.

FM[1] **FM Path 1 2** with 1 selected

FM2 **FM Path 1 2** with 2 selected

When just FM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses FM[1], only path one is affected. Consequently, when FM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of FM[1] to FM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPtsine is not the selection for the waveform type
- each path uses a different source (Internal 1, Internal 2, Ext1, or Ext2)
- FM2 must be set to a deviation less than FM[1]

:FM:INTernal:FREQuency:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:FM:INTernal:FREQuency:STEP[:INCRement] <num>
[:SOURce]:FM:INTernal:FREQuency:STEP[:INCRement]?
```

This command sets the step increment for the internal frequency modulation.

The variable <num> sets the entered value in units of hertz.

***RST** N/A

Range 0.5–1E6

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the FM frequency setting. Refer to ":FM[1]|2:INTernal[1]|2:FREQuency" on page 249 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:FM[1]|2:EXTernal[1]|2:COUPLing

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:EXTernal[1]|2:COUPling AC|DC
[:SOURce]:FM[1]|2:EXTernal[1]|2:COUPling?
```

This command sets the coupling for the frequency modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Choices AC DC

Key Entry **Ext Coupling DC AC**

Remarks The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

:FM[1]|2:EXTernal[1]|2:IMPedance

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:EXTernal[1]|2:IMPedance <50|600>
[:SOURce]:FM[1]|2:EXTernal[1]|2:IMPedance?
```

This command sets the input impedance for the selected external input.

***RST** +5.00000000E+001

Choices 50 600

Key Entry **Ext Impedance 50 Ohm 600 Ohm**

Remarks N/A

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

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]:FREQuency:ALTernate <val><unit>
[:SOURce]:FM[1]|2:INTernal[1]:FREQuency:ALTernate?
```

This command sets the frequency for the alternate signal.

***RST** +4.00000000E+002

Range *Dual-Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

Key Entry **FM Tone 2 Rate** **FM Stop Rate**

Remarks The alternate signal frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

:FM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:
PERCent <val><unit>
[:SOURce]:FM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent?
```

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **FM Tone 2 Ampl Percent Of Peak**

Remarks Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

:FM[1]|2:INTernal[1]:SWEep:RATE

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]:SWEep:RATE <val><unit>
[:SOURce]:FM[1]|2:INTernal[1]:SWEep:RATE?
```

This command sets the sweep rate for the swept-sine waveform.

The variable <val> has a minimum resolution of 0.5 hertz.

***RST** +4.00000000E+002

Range 0.5HZ–100kHZ

Key Entry **FM Sweep Rate**

Remarks Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

:FM[1]|2:INTernal[1]:SWEep:TRIGger

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]:SWEep:TRIGger BUS|IMMediate|EXTernal|KEY
[:SOURce]:FM[1]|2:INTernal[1]:SWEep:TRIGger?
```

This command sets the trigger source for the frequency modulated swept-sine waveform.

BUS	This choice enables GPIB triggering using the *TRG or GET command or LAN triggering using the *TRG command.
IMMediate	This choice enables immediate triggering of the sweep event.
EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.
KEY	This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]|2:FREQuency <val><unit>|UP|DOWN
[:SOURce]:FM[1]|2:INTernal[1]|2:FREQuency?
```

This command sets the internal frequency modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.00000000E+002

Range *Dual-Sine & Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ
All Other Waveforms: 0.5HZ–100kHZ

Choices <val><unit> UP DOWN

Key Entry **FM Tone 1 Rate** **FM Start Rate** **FM Rate**

Remarks Refer to ":FM:INTernal:FREQuency:STEP[:INCRement]" on page 245 for setting the value associated with the UP and DOWN choices.

Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

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

Supported PSG-A Series

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

This command sets the noise type when NOISe is the waveform choice.

***RST** UNIF

Choices GAUSsian UNIForm

Key Entry **Gaussian** **Uniform**

Remarks Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 250 for the waveform selection.

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

Supported PSG-A Series

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

This command sets either a positive or negative ramp as the internally modulated waveform.

***RST** POS

Choices POSitive NEGative

Key Entry **Positive** **Negative**

Remarks Refer to ":FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe SINE|TRIangle|SQUare|
RAMP|NOISe|DUALsine|SWEPtsine
[:SOURce]:FM[1]|2:INTernal[1]|2:FUNCtion:SHAPe?
```

This command sets the FM waveform type.

***RST** SINE

Choices SINE TRIangle SQUare RAMP NOISe DUALsine SWEPTsine

Key Entry **Sine** **Triangle** **Square** **Ramp** **Noise** **Dual-Sine** **Swept-Sine**

Remarks The INTernal2 source selection does not support the DUALsine and SWEPtsine waveform choices.

:FM[1]|2:SOURce

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:SOURce INT[1]|INT2|EXT1|EXT2
[:SOURce]:FM[1]|2:SOURce?
```

This command sets the source to generate the frequency modulation.

INT This choice selects internal source 1 or 2 to provide an ac-coupled signal.

EXT This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.

***RST** INT

Choices INT[1] INT2 EXT1 EXT2

Key Entry **Internal 1 Internal 2 Ext1 Ext2**

Remarks The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is > ±3% of 1 V_p.

:FM[1]|2:STATe

Supported PSG-A Series

```
[:SOURce]:FM[1]|2:STATe ON|OFF|1|0
[:SOURce]:FM[1]|2:STATe?
```

This command enables or disables the frequency modulation for the selected path.

***RST** 0

Choices ON OFF 1 0

Key Entry **FM Off On**

Remarks The RF carrier is modulated when you set the signal generator's modulation state to ON, see ":MODulation[:STATe]" on page 189 for more information.

Whenever frequency modulation is enabled, the FM annunciator is turned on in the display

The two paths for frequency modulation can be simultaneously enabled. Refer to ":FM[1]|2..." on page 244 for more information.

:FM[1]|2[:DEViation]

Supported PSG-A Series

```
[:SOURce]:FM[1]|2[:DEViation] <val><unit>
[:SOURce]:FM[1]|2[:DEViation]?
```

This command sets the frequency modulation deviation.

***RST** +1.00000000E+003

Range

Frequency	*Deviation*
100kHZ–250MHZ	0–1MHZ
> 250–500MHZ	0–500kHZ
> 500MHZ–1 GHZ	0–1MHZ
> 1–2GHZ	0–2MHZ
> 2–3.2GHZ	0–4MHZ
> 3.2–10GHZ	0–8MHZ
> 10–20GHZ	0–16MHZ
> 20–40GHZ	0–32MHZ

Key Entry **FM DEV**

Remarks If deviation tracking is ON, a change to the deviation value on one path will apply to both. Refer to ":FM[1]|2[:DEViation]:TRACk" on page 253 for more information and setting the deviation tracking.

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

Supported PSG-A Series

```
[:SOURce]:FM[1]|2[:DEViation]:TRACk ON|OFF|1|0
[:SOURce]:FM[1]|2[:DEViation]:TRACk?
```

This command enables or disables the deviation coupling between the paths (FM[1] and Fm2).

ON (1) This choice will link the deviation value of FM[1] with FM2; FM2 will assume the FM[1] deviation value. For example, if FM[1] deviation is set to 500 Hz and FM2 is set to 2 kHz, enabling the deviation tracking will cause the FM2 deviation value to change to 500 Hz. This applies regardless of the path (FM[1] or FM2) selected in this command

OFF (0) This choice disables the coupling and both paths will have independent deviation values.

***RST** 0

Choices ON OFF 1 0

Key Entry **FM Dev Couple Off On**

Remarks This command uses exact match tracking, not offset tracking.

List/Sweep subsystem ([:SOURce])

:LIST:DIRection

Supported All

```
[:SOURce]:LIST:DIRection UP|DOWN
[:SOURce]:LIST:DIRection?
```

This command sets the direction of a list or step sweep.

UP This choice enables a sweep in an ascending order:

- first to last point for a list sweep
- start to stop for a step sweep

DOWN This choice reverses the direction of the sweep.

***RST** UP

Choices UP DOWN

Key Entry **Sweep Direction Down Up**

Remarks N/A

:LIST:DWELl

Supported All

`[:SOURce]:LIST:DWELl <val>{,<val>}`
`[:SOURce]:LIST:DWELl?`

This command sets the dwell time for the current list sweep points.

The variable <val> is measured in units of seconds with a 0.001 resolution.

NOTE The dwell time (<val>) does not begin until the signal generator has settled for the current frequency and/or amplitude change. When the signal generator has settled, a trigger signal is transmitted through the rear panel SOURCE SETTLED OUTPUT connector.

***RST** N/A

Range 0.001–60

Key Entry N/A

Remarks Dwell time is used when IMMediate is the trigger source. Refer to ":LIST:TRIGger:SOURce" on page 259 for the trigger setting.

The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:LIST:DWELl:POINts

Supported All

`[:SOURce]:LIST:DWELl:POINts?`

This command queries the signal generator for the number of dwell points in the current list sweep file.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:LIST:DWELl:TYPE

Supported All

```
[:SOURce]:LIST:DWELl:TYPE LIST|STEP
[:SOURce]:LIST:DWELl:TYPE?
```

This command toggles the dwell time for the list sweep points between the values defined in the list sweep and the value for the step sweep.

LIST This choice selects the dwell times from the list sweep. Refer to ":LIST:DWELl" on page 255 for setting the list dwell points.

STEP This choice selects the dwell time from the step sweep. Refer to ":SWEep:DWELl" on page 262 for setting the step dwell.

***RST** LIST

Choices LIST STEP

Key Entry **Dwell Type List Step**

Remarks N/A

:LIST:FREQuency

Supported All

```
[:SOURce]:LIST:FREQuency <val>{,<val>}
[:SOURce]:LIST:FREQuency?
```

This command sets the frequency values for the current list sweep points.

The variable <val> is measured in units of hertz.

***RST** N/A

Range *20 GHz Models*: 100E3–20E9 *40 GHz Models*: 100E3–40E9

Key Entry N/A

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:LIST:FREQuency:POINts

Supported All

`[:SOURce]:LIST:FREQuency:POINts?`

This command queries the current list sweep file for the number of frequency points.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:LIST:MANual

Supported All

`[:SOURce]:LIST:MANual <val>`
`[:SOURce]:LIST:MANual?`

This command sets a list or step sweep point as the current sweep point controlling the frequency and power output.

***RST** N/A

Range 1–1601

Key Entry **Manual Point**

Remarks If list or step mode is controlling frequency and/or power, then the indexed point in the respective list(s) will be used.

Entering a value with this command will have no effect, unless MANual is the selected mode. Refer to ":LIST:MODE" on page 258 for setting the proper mode.

If the point selected is beyond the length of the longest enabled list, then the point will be set to the maximum possible point, and an error will be generated.

:LIST:MODE

Supported All

```
[:SOURce]:LIST:MODE AUTO|MANual
[:SOURce]:LIST:MODE?
```

This command sets the operating mode for the current list or step sweep.

AUTO This choice enables the selected sweep type to perform a sweep of all points.

MANual This choice enables you to select a sweep point which controls the frequency and/or amplitude according to the sweep type. Refer to ":LIST:MANual" on page 257 for selecting a sweep point

***RST** AUTO

Choices AUTO MANual

Key Entry **Manual Mode Off On**

Remarks N/A

:LIST:POWer

Supported All

```
[:SOURce]:LIST:POWer <val>{,<val>}
[:SOURce]:LIST:POWer?
```

This command sets the amplitude for the current list sweep points.

***RST** N/A

Range Refer to ":POWer[:LEVel][:IMMediate][:AMPLitude]" on page 287 for output power ranges.

Key Entry N/A

Remarks The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

During an amplitude sweep operation, signal generators with Option 1E1 protect the step attenuator by automatically switching to attenuator hold (OFF) mode. The amplitude sweep range is limited to 45 dB. The 45 dB sweep range can be moved by inputting different power levels.

:LIST:POWer:POINts

Supported All

`[:SOURce]:LIST:POWer:POINts?`

This command queries the number of power points in the current list sweep file.

***RST** N/A

Range N/A

Key Entry N/A

Remarks N/A

:LIST:TRIGger:SOURce

Supported All

`[:SOURce]:LIST:TRIGger:SOURce BUS|IMMediate|EXTernal|KEY`
`[:SOURce]:LIST:TRIGger:SOURce?`

This command sets the point trigger source for a list or step sweep event.

BUS — This choice enables GPIB triggering using the `*TRG` or `GET` command or LAN triggering using the `*TRG` command.

IMMediate — This choice enables immediate triggering of the sweep event.

EXTernal — This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.

KEY — This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks N/A

:LIST:TYPE

Supported All

```
[:SOURce]:LIST:TYPE LIST|STEP
[:SOURce]:LIST:TYPE?
```

This command toggles between the two types of sweep.

***RST** STEP

Choices LIST STEP

Key Entry **Sweep Type List Step**

Remarks N/A

:LIST:TYPE:LIST:INITialize:FSTep

Supported All

CAUTION The current list sweep data will be overwritten once this command is executed. If needed, save the current data. Refer to ":STORe:LIST" on page 184 for storing list sweep files.

```
[:SOURce]:LIST:TYPE:LIST:INITialize:FSTep
```

This command replaces the loaded list sweep data with the settings from the current step sweep data points.

***RST** N/A

Range N/A

Key Entry **Load List From Step Sweep**

Remarks You can have only one sweep list at a time.

:LIST:TYPE:LIST:INITialize:PRESet

Supported All

CAUTION The current list sweep data will be overwritten once this command is executed. If needed, save the current data. Refer to ":STORe:LIST" on page 188 for storing list sweep files.

`[:SOURce]:LIST:TYPE:LIST:INITialize:PRESet`

This command replaces the current list sweep data with a factory-defined file consisting of one point at a frequency, amplitude, and dwell time.

***RST** N/A

Range N/A

Key Entry **Preset List**

Remarks N/A

:SWEep:DWELl

Supported All

```
[:SOURce]:SWEep:DWELl <val>
[:SOURce]:SWEep:DWELl?
```

This command enables you to set the dwell time for a step sweep.

The variable <val> is measured in units of seconds with a 0.001 resolution.

NOTE The dwell time (<val>) does not begin until the signal generator has settled for the current frequency and/or amplitude change. When the signal generator has settled, a trigger signal is transmitted through the rear panel SOURCE SETTLED OUTPUT connector.

***RST** +2.00000000E–003

Range 0.001–60

Key Entry **Step Dwell**

Remarks Dwell time is used when the trigger source is set to IMMediate. Refer to ":LIST:TRIGger:SOURce" on page 259 for the trigger setting.

The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.

:SWEep:POINts

Supported All

```
[:SOURce]:SWEep:POINts <val>
[:SOURce]:SWEep:POINts?
```

This command enables you to define the number of points in a step sweep.

***RST** 2

Range 2–1601

Key Entry **# Points**

Remarks N/A

Low Frequency Output Subsystem ([:SOURce]:LFOutput)

:AMPLitude

Supported PSG-A Series

```
[:SOURce]:LFOutput:AMPLitude <val><unit>
[:SOURce]:LFOutput:AMPLitude?
```

This command sets the amplitude for the signal at the LF OUTPUT connector.

***RST** 0.00

Range 0.000VP–3.5VP

Key Entry **LF Out Amplitude Into 50 Ohms**

Remarks N/A

:FUNCtion[1]:FREQuency:ALTernate

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate <val><unit>
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate?
```

This command sets the frequency for the alternate LF output signal.

***RST** +4.00000000E+002

Range *Dual-Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

Key Entry **LF Out Tone 2 Freq** **LF Out Stop Freq**

Remarks The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:FUNCtion[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate:AMPLitude:
PERCent <val><unit>
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate:AMPLitude:PERCent?
```

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total LF output amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **LF Out Tone 2 Ampl % of Peak**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:FUNCtion[1]:SWEep:RATE

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]:SWEep:RATE <val><unit>
[:SOURce]:LFOutput:FUNCtion[1]:SWEep:RATE?
```

This command sets the sweep rate for an internally generated swept-sine signal at the LF output.

The variable <val> has a minimum resolution of 0.5 hertz.

***RST** +4.00000000E+002

Range 0.5HZ–100kHZ

Key Entry **LF Out Sweep Rate**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:FUNCtion[1]:SWEep:TRIGger

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]:SWEep:TRIGger BUS|IMMediate|EXTernal|KEY
[:SOURce]:LFOutput:FUNCtion[1]:SWEep:TRIGger?
```

This command sets the trigger source for the internally generated swept-sine waveform signal at the LF output.

BUS	This choice enables GPIB triggering using the *TRG or GET command or LAN triggering using the *TRG command.
IMMediate	This choice enables immediate triggering of the sweep event.
EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.
KEY	This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:FUNCtion[1]|2:FREQuency

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]|2:FREQuency <val><unit>
[:SOURce]:LFOutput:FUNCtion[1]|2:FREQuency?
```

This command sets the internal modulation frequency for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.00000000E+002

Range *Dual-Sine & Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ
All Other Waveforms: 0.5HZ–100kHZ

Key Entry **LF Out Tone 1 Freq** **LF Out Start Freq** **LF Out Freq**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" for selecting the waveform type.

:FUNCtion[1]|2:SHAPe

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]|2:SHAPe SINE|DUALsine|SWEPtsine|TRIangle|
SQUare|RAMP|NOISe|DC
[:SOURce]:LFOutput:FUNCtion[1]|2:SHAPe?
```

This command sets the waveform type for the generated signal at the LF output.

***RST** SINE

Choices SINE DUALsine SWEPTsine TRIangle SQUare RAMP NOISe DC

Key Entry **Sine** **Dual-Sine** **Swept-Sine** **Triangle** **Square** **Ramp** **NOISe** **DC**

Remarks FUNCtion2 does not support the DUALsine or the SWEPtsine waveforms.

:FUNCtion:NOISe

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]|2:SHAPe:NOISe UNIForm|GAUSsian
[:SOURce]:LFOutput:FUNCtion[1]|2:SHAPe:NOISe?
```

This command sets the noise type at the LF output when NOISe is the selected waveform.

***RST** UNIF

Choices UNIForm GAUSsian

Key Entry **Uniform** **Gaussian**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:FUNCtion[1]|2:SHAPe:RAMP

Supported PSG-A Series

```
[:SOURce]:LFOutput:FUNCtion[1]|2SHAPe:RAMP POSitive|NEGative
[:SOURce]:LFOutput:FUNCtion[1]|2SHAPe:RAMP?
```

This command sets the slope type for the ramp waveform at the LF output.

***RST** POS

Choices POSitive NEGative

Key Entry **Positive** **Negative**

Remarks Refer to ":FUNCtion[1]|2:SHAPe" on page 266 for selecting the waveform type.

:SOURce

Supported PSG-A Series

```
[:SOURce]:LFOutput:SOURce INT[1]|INT2|FUNCtion[1]|FUNCtion2
[:SOURce]:LFOutput:SOURce?
```

This command sets the low frequency source for the LF output.

INT	This choice enables you to output a signal where the frequency and shape of the signal is set by the internal source as it is being used by a modulation. For example, if the internal source is currently assigned to an AM path configuration and AM is turned on, the signal output at the LF OUTPUT connector will have the frequency and shape of the amplitude modulating signal.
FUNCtion	This choice enables the selection of an internal function generator.

***RST** INT

Choices INT[1] INT2 FUNCtion[1] FUNCtion2

Key Entry **Internal 1 Monitor** **Internal 2 Monitor** **Function Generator 1** **Function Generator 2**

Remarks Any active modulation using an internal source is turned off when FUNCtion[1] or FUNCtion2 is selected.

:STATe

Supported PSG-A Series

```
[:SOURce]:LFOutput:STATe ON|OFF|1|0
[:SOURce]:LFOutput:STATe?
```

This command enables or disables the low frequency output.

***RST** 0

Choices ON OFF 1 0

Key Entry **LF Out Off On**

Remarks N/A

Phase Modulation subsystem ([:SOURce])

:PM[1]|2...

Supported PSG-A Series

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

This prefix enables the selection of the ΦM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **ΦM Path 1 2** softkey.

PM[1] **ΦM Path 1 2** with 1 selected

PM2 **ΦM Path 1 2** with 2 selected

When just PM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses PM[1], only path one is affected. Consequently, when PM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of PM[1] to PM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPtsine is not the selection for the waveform type
- each path uses a different source (Internal 1, Internal 2, Ext1, or Ext2)
- PM2 must be set to a deviation less than or equal to PM[1]

:PM:INTernal:FREQuency:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:PM:INTernal:FREQuency:STEP[:INCRement] <num>
[:SOURce]:PM:INTernal:FREQuency:STEP[:INCRement]?
```

This command sets the step increment for the phase modulation internal frequency.

The variable <num> sets the entered value in units of hertz.

***RST** N/A

Range 0.5–1E6

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the ΦM frequency command. Refer to ":PM[1]|2:INTernal[1]|2:FREQuency" on page 274 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PM[1]|2:BANDwidth|BWIDth

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:BANDwidth|BWIDth NORMal|HIGH
[:SOURce]:PM[1]|2:BANDwidth|BWIDth?
```

This command toggles between normal phase modulation and high bandwidth phase modulation mode.

***RST** NORM

Choices NORMal HIGH

Key Entry **FM ΦM Normal High BW**

Remarks N/A

:PM[1]|2:EXTernal[1]|2:COUPling

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:EXTernal[1]|2:COUPling AC|DC
[:SOURce]:PM[1]|2:EXTernal[1]|2:COUPling?
```

This command sets the coupling for the phase modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Choices AC DC

Key Entry **Ext Coupling DC AC**

Remarks This command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

:PM[1]|2:EXTernal[1]|2:IMPedance

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:EXTernal[1]|2:IMPedance <50|600>
[:SOURce]:PM[1]|2:EXTernal[1]|2:IMPedance?
```

This command sets the input impedance for the selected external input.

***RST** +5.00000000E+001

Choices 50 600

Key Entry **Ext Impedance 50 Ohm 600 Ohm**

Remarks N/A

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

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALTernate <val><unit>
[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALTernate?
```

This command sets the frequency for the alternate signal.

***RST** +4.00000000E+002

Range *Dual-Sine*: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

Key Entry **ΦM Stop Rate** **ΦM Tone 2 Rate**

Remarks The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

:PM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:
PERCent <val><unit>
[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent?
```

This command sets the amplitude of the second tone for the dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **ΦM Tone 2 Ampl Percent of Peak**

Remarks Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

:PM[1]|2:INTernal[1]:SWEep:RATE

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]:SWEep:RATE <val><unit>
[:SOURce]:PM[1]|2:INTernal[1]:SWEep:RATE?
```

This command sets the sweep rate for a phase-modulated, swept-sine waveform.

The variable <val> has a minimum resolution of 0.5 hertz.

***RST** +4.00000000E+002

Range 0.5HZ–100kHZ

Key Entry **ΦM Sweep Rate**

Remarks Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

:PM[1]|2:INTernal[1]:SWEep:TRIGger

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]:SWEep:TRIGger BUS|IMMediate|EXTernal|KEY
[:SOURce]:PM[1]|2:INTernal[1]:SWEep:TRIGger?
```

This command sets the trigger source for the phase-modulated, swept-sine waveform.

BUS — This choice enables GPIB triggering using the *TRG or GET command or LAN triggering using the *TRG command.

IMMediate — This choice enables immediate triggering of the sweep event.

EXTernal — This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.

KEY — This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

***RST** IMM

Choices BUS IMMediate EXTernal KEY

Key Entry **Bus** **Free Run** **Ext** **Trigger Key**

Remarks Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

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

Supported. PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]|2:FREQuency <val><unit>|UP|DOWN
[:SOURce]:PM[1]|2:INTernal[1]|2:FREQuency?
```

This command sets the internal modulation frequency rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other wave forms

***RST** +4.00000000E+002

Range *Dual-Sine* & Sine: 0.5HZ–1MHZ *Swept-Sine*: 1HZ–1MHZ

All Other Waveforms: 0.5HZ–100kHZ

Choices <val><unit> UP DOWN

Key Entry **ΦM Tone 1 Rate** **ΦM Start Rate** **ΦM Rate**

Remarks Refer to ":PM:INTernal:FREQuency:STEP[:INCRement]" on page 270 for setting the value associated with the UP and DOWN choices.

Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:NOISe GAUSsian|UNIForm
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:NOISe?
```

This command sets the noise type when NOISe is the waveform choice.

***RST** UNIF

Choices GAUSsian UNIForm

Key Entry **Gaussian** **Uniform**

Remarks Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" on page 275 for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:RAMP POSitive|NEGative
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:RAMP?
```

This command specifies the slope type for the ramp-modulated waveform.

***RST** POS

Key Entry **Positive** **Negative**

Choices POSitive NEGative

Remarks Refer to ":PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe" for the waveform selection.

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

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe SINE|TRIangle|SQUare|
RAMP|NOISe|DUALsine|SWEPtsine
[:SOURce]:PM[1]|2:INTernal[1]|2:FUNCtion:SHAPe?
```

This command sets the phase modulation waveform type.

***RST** SINE

Choices SINE TRIangle SQUare RAMP NOISe DUALsine SWEPTsine

Key Entry **Sine** **Triangle** **Square** **Ramp** **Noise** **Dual-Sine** **Swept-Sine**

Remarks The INTernal2 source selection does not support the DUALsine and SWEPtsine waveform choices.

:PM[1]|2:SOURce

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:SOURce INT[1]|INT2|EXT1|EXT2
[:SOURce]:PM[1]|2:SOURce?
```

This command sets the source to generate the phase modulation.

INT This choice selects internal source 1 or 2 to provide an ac-coupled signal.

EXT This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.

***RST** INT

Choices INT[1] INT2 EXT1 EXT2

Key Entry **Internal 1** **Internal 2** **Ext1** **Ext2**

Remarks The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is > ±3% of 1 V_p.

:PM[1]|2:STATe

Supported PSG-A Series

```
[:SOURce]:PM[1]|2:STATe ON|OFF|1|0
[:SOURce]:PM[1]|2:STATe?
```

This command enables or disables the phase modulation for the selected path.

***RST** 0

Choices ON OFF 1 0

Key Entry **ΦM Off On**

Remarks The RF carrier is modulated when you set the signal generator's modulation state to ON, see ":MODulation[:STATe]" on page 189 for more information.

Whenever phase modulation is enabled, the ΦM annunciator is turned on in the display

The two paths for phase modulation can be simultaneously enabled. Refer to ":PM[1]|2..." on page 269 for more information.

:PM[1]|2[:DEViation]

Supported PSG-A Series

```
[:SOURce]:PM[1]|2[:DEViation] <val><unit>|UP|DOWN
[:SOURce]:PM[1]|2[:DEViation]?
```

This command sets the deviation of the phase modulation.

The variable <unit> will accept RAD (radians), PIRAD (pi-radians), and DEG (degrees); however, the query will only return values in radians.

***RST** +0.00000000E+000

Range

Frequency	*Normal Bandwidth*	*High Bandwidth*
100kHZ–250MHZ	0–10RAD	0–1RAD
> 250–500MHZ	0–5RAD	0–0.5RAD
> 500MHZ–1GHZ	0–10RAD	0–1RAD
> 1–2GHZ	0–20RAD	0–2RAD
> 2–3.2GHZ	0–40RAD	0–4RAD
> 3.2–10GHZ	0–80RAD	0–8RAD
> 10–20GHZ	0–160RAD	0–16RAD
> 20–40GHZ	0–320RAD	0–32RAD

Choices <val><unit> UP DOWN

Key Entry **ΦM Dev**

Remarks If deviation tracking is active, a change to the deviation value on one path will apply to both.

Refer to ":PM[:DEViation]:STEP[:INCRement]" on page 278 for setting the value associated with the UP and DOWN choices.

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

Supported PSG-A Series

```
[:SOURce]:PM[1]|2[:DEViation]:TRACk ON|OFF|1|0
[:SOURce]:PM[1]|2[:DEViation]:TRACk?
```

This command enables or disables the deviation coupling between the paths (PM[1] and PM2).

ON (1) This choice will link the deviation value of PM[1] with PM2; PM2 will assume the PM[1] deviation value. For example, if PM[1] deviation is set to 500 Hz and PM2 is set to 2 kHz, enabling the deviation tracking will cause the PM2 deviation value to change to 500 Hz. This applies regardless of the path (PM[1] or PM2) selected in this command.

OFF (0) This choice disables the coupling and both paths will have independent deviation values.

***RST** 0

Choices ON OFF 1 0

Key Entry **ΦM Dev Couple Off On**

Remarks This command uses exact match tracking, not offset tracking.

:PM[:DEViation]:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:PM[:DEViation]:STEP[:INCRement] <num>
[:SOURce]:PM[:DEViation]:STEP[:INCRement]?
```

This command sets the phase modulation deviation step increment.

The variable <num> sets the increment value in units of radians.

***RST** N/A

Range 0.001–1E3

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the ΦM deviation command. Refer to ":PM[1]|2[:DEViation]" on page 277 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

Power Subsystem ([:SOURce])

:POWer:ALC:BANDwidth|BWIDth

Supported All

```
[:SOURce]:POWer:ALC:BANDwidth|BWIDth <num>[<freq suffix>]
[:SOURce]:POWer:ALC:BANDwidth|BWIDth?
```

This command sets the bandwidth of the automatic leveling control (ALC) loop.

***RST** 100.0

Choices <*num*>[<*freq suffix*>]: 100HZ 1kHZ 10kHZ 100kHZ

Key Entry **100 Hz** **1 kHz** **10 kHz** **100 kHz**

Remarks N/A

:POWer:ALC:BANDwidth|BWIDth:AUTO

Supported All

```
[:SOURce]:POWer:ALC:BANDwidth|BWIDth:AUTO ON|OFF|1|0
[:SOURce]:POWer:ALC:BANDwidth|BWIDth:AUTO?
```

This command sets the state of the ALC automatic bandwidth capability.

***RST** 0

Choices ON OFF 1 0

Key Entry **Auto**

Remarks N/A

:POWer:ALC:LEVel

Supported All with Option 1E1

```
[:SOURce]:POWer:ALC:LEVel <value>DB
[:SOURce]:POWer:ALC:LEVel?
```

This command sets the ALC level when the attenuator hold is active.

***RST** +1.00000000E+000

Range –20 to 25

Key Entry **Set ALC Level**

Remarks Use this command when the automatic attenuation mode is set to OFF (0). Refer to ":POWer:ATTenuation:AUTO" on page 283 for choosing the attenuator mode.

:POWer:ALC:SEARch

Supported All

```
[:SOURce]:POWer:ALC:SEARch ON|OFF|1|0|ONCE
[:SOURce]:POWer:ALC:SEARch?
```

This command enables or disables the internal power search calibration.

ON (1) This choice executes the power search automatically with each change in RF frequency or power.

OFF (0) This choice disables the automatic power search routine.

ONCE This choice executes a single power search of the current RF output signal.

***RST** 0

Choices ON OFF 1 0 ONCE

Key Entry **Power Search Manual Auto Do Power Search**

Remarks Use this command when the ALC state is set to OFF (0). Refer to ":POWer:ALC[:STATe]" on page 282 for setting the ALC state.

If ON was previously selected, executing ONCE will cause OFF to be the current selection after the power search is completed.

:POWer:ALC:SOURce

Supported All

```
[:SOURce]:POWer:ALC:SOURce INTernal|DIODe|MMHead
[:SOURce]:POWer:ALC:SOURce?
```

This command enables you to select the ALC leveling source.

***RST** INT

Choices INTernal DIODe MMHead

Key Entry **Internal** **Ext Detector** **Source Module**

Remarks N/A

:POWer:ALC:SOURce:EXTernal:COUPling

Supported All

```
[:SOURce]:POWer:ALC:SOURce:EXTernal:COUPling <value>DB
[:SOURce]:POWer:ALC:SOURce:EXTernal:COUPling?
```

This command sets the external detector coupling factor.

***RST** +1.60000000E+001

Range –200 to 200

Key Entry **Ext Detector Coupling Factor**

Remarks Use this command when DIODe is the selected ALC leveling source. Refer to ":POWer:ALC:SOURce" for the source selection.

:POWer:ALC[:STATe]

Supported All

```
[:SOURce]:POWer:ALC[:STATe] ON|OFF|1|0
[:SOURce]:POWer:ALC[:STATe]?
```

This command enables or disables the automatic leveling control (ALC) circuit.

***RST** 1

Choices ON OFF 1 0

Key Entry **ALC Off On**

Remarks An alternative to setting the ALC to OFF (0), is to set the ALC to a narrow bandwidth.

The purpose of the ALC circuit is to hold output power at the desired level in spite of drift due to temperature and time.

:POWer:ATTenuation

Supported All with Option 1E1

```
[:SOURce]:POWer:ATTenuation <val><unit>
[:SOURce]:POWer:ATTenuation?
```

This command sets the amount of attenuation at the RF output.

***RST** +115

Choices *<val><unit>*: 0DB 5DB 15DB 25DB 35DB 45DB 55DB 65DB 75DB 85DB 95DB 105DB 115DB

Key Entry **Set Atten**

Remarks Use this command when the automatic attenuation mode is set to OFF (0). Refer to ":POWer:ATTenuation:AUTO" on page 283 for choosing the attenuator mode.

The output power is the ALC level minus the attenuator setting. Refer to ":POWer:ALC:LEVel" on page 280 for setting and determining the ALC level.

:POWer:ATTenuation:AUTO

Supported All with Option 1E1

```
[:SOURce]:POWer:ATTenuation:AUTO ON|OFF|1|0
[:SOURce]:POWer:ATTenuation:AUTO?
```

This command sets the state of the attenuator hold function.

ON (1) This choice enables the attenuators to operate normally.

OFF (0) This choice holds the attenuator at its current setting or at a selected value that will not change during power adjustments.

***RST** 1

Choices ON OFF 1 0

Key Entry **Atten Hold Off On**

Remarks Refer to ":POWer:ATTenuation" on page 282 for setting the attenuator value when OFF (0) is the choice.

The OFF (0) choice eliminates the power discontinuity normally associated with the attenuator switching during power adjustments.

During an amplitude sweep operation, signal generators with Option 1E1 protect the step attenuator by automatically switching to attenuator hold (OFF) mode. The amplitude sweep range is limited to 45 dB. The 45 dB sweep range can be moved by inputting different power levels.

:POWer:MODE

Supported All

```
[:SOURce]:POWer:MODE FIXed|LIST
[:SOURce]:POWer:MODE?
```

This command sets the signal generator's RF output power operating mode.

***RST** FIX

Choices FIXed LIST

Key Entry **Amplitude Ampl**

Remarks N/A

:POWer:REFerence

Supported All

```
[:SOURce]:POWer:REFerence <val><unit>
[:SOURce]:POWer:REFerence?
```

This command sets the current output power reference.

***RST** +0.00000000E+000

Range –400 to 300DBM

Key Entry **Ampl Ref Set**

Remarks The power reference range is affected by power offset.

:POWer:REFerence:STATe

Supported All

```
[:SOURce]:POWer:REFerence:STATe ON|OFF|1|0
[:SOURce]:POWer:REFerence:STATe?
```

This command enables or disables the RF output reference.

***RST** 0

Choices ON OFF 1 0

Key Entry **Ampl Ref Off On**

Remarks Once the reference state is ON, all subsequent output power settings are set relative to the reference value.

Amplitude offsets can be used with the amplitude reference mode.

:POWer:STARt

Supported All

```
[:SOURce]:POWer:STARt <val><unit>
[:SOURce]:POWer:STARt?
```

This command sets the amplitude of the first point in a step sweep.

***RST** –1.35000000E+002

Range Refer to ":POWer[:LEVel][:IMMediate][:AMPLitude]" on page 287 for output power ranges.

Key Entry **Ampl Start**

Remarks During an amplitude sweep operation, signal generators with Option 1E1 protect the step attenuator by automatically switching to attenuator hold (OFF) mode. The amplitude sweep range is limited to 45 dB and be moved around the whole power range by inputting a different power level.

:POWer:STOP

Supported All

```
[:SOURce]:POWer:STOP <val><unit>
[:SOURce]:POWer:STOP?
```

This command sets the amplitude of the last point in a step sweep.

***RST** –1.35000000E+002

Range Refer to ":POWer[:LEVel][:IMMediate][:AMPLitude]" on page 287 for output power ranges.

Key Entry **Ampl Stop**

Remarks During an amplitude sweep operation, signal generators with Option 1E1 protect the step attenuator by automatically switching to attenuator hold (OFF) mode. The amplitude sweep range is limited to 45 dB and be moved around the whole power range by inputting a different power level.

:POWer[:LEVel][:IMMediate]:OFFSet

Supported All

```
[:SOURce]:POWer[:LEVel][:IMMediate]:OFFSet <val><unit>
[:SOURce]:POWer[:LEVel][:IMMediate]:OFFSet?
```

This command sets the power offset value.

***RST** +0.00000000E+000

Range –200DB to 200DB

Key Entry **Ampl Offset**

Remarks This simulates a power level at a test point beyond the RF OUTPUT connector without changing the actual RF output power. The offset value only affects the displayed amplitude setting.

You can enter an amplitude offset any time in either normal operation or amplitude reference mode.

:POWer[:LEVel][:IMMediate][:AMPLitude]

Supported All

```
[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude] <val><unit>
[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]?
```

This command sets the RF output power.

***RST** –1.35000000E+002

Range

20 GHz Models: E8241A & E8251A

Frequency range	Standard	Option 1EA
250kHZ–3.2GHZ	–20 to 13DBM	–20 to 16DBM
> 3.2–20GHZ	–20 to 13DBM	–20 to 20DBM

With Option 1E1

Frequency range	Standard	Option 1EA
250kHZ–3.2GHZ	–135 to 11DBM	–135 to 15DBM
> 3.2–20GHZ	–135 to 11DBM	–135 to 18DBM

40 GHz Models: E8244A & E8254A

Frequency range	Standard	Option 1EA
250kHZ–3.2GHZ	–20 to 9DBM	–20 to 15DBM
> 3.2–20GHZ	–20 to 9DBM	–20 to 18DBM
> 20–40GHZ	–20 to 9DBM	–20 to 14DBM

With Option 1E1

Frequency range	Standard	Option 1EA
250kHZ–3.2GHZ	–135 to 7DBM	–135 to 14DBM
> 3.2–20GHZ	–135 to 7DBM	–135 to 16DBM
> 20–40GHZ	–135 to 7DBM	–135 to 12DBM

Key Entry Amplitude

Remarks The ranges for this command are specified values from the data sheet.

Pulse Modulation Subsystem ([:SOURce])

:PULM:INTernal[1]:DELay

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:DELay <num>[<time suffix>]|UP|DOWN
[:SOURce]:PULM:INTernal[1]:DELay?
```

This command sets the pulse delay of the internally generated pulse modulation source.

The optional variable [<time suffix>] accepts nS (nanoseconds) to S (seconds).

***RST** +0.00000000E+000

Range *Internal Free Run*: –(pulse period – 20 nS) to (pulse period – 20 nS)

Internal Triggered & Doublet: 70nS to (pulse period – 20 nS)

Choices <num>[<time suffix>] UP DOWN

Key Entry **Pulse Delay**

Remarks The range value is dependent on the value set for the pulse period. Refer to ":PULM:INTernal[1]:PERiod" on page 290 for pulse period settings.

Refer to ":PULM:INTernal[1]:DELay:STEP" on page 289 for setting the value associated with the UP and DOWN choices.

:PULM:INTernal[1]:DELay:STEP

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:DELay:STEP <num>[<time suffix>]
[:SOURce]:PULM:INTernal[1]:DELay:STEP?
```

This command sets the step increment for the pulse delay.

The optional variable [<time suffix>] accepts nS (nano-seconds) to S (seconds).

***RST** N/A

Range 10nS to (pulse period – 20 nS)

Key Entry N/A

Remarks The value set by this command is used with the UP and DOWN choices for the pulse modulation delay command. Refer to ":PULM:INTernal[1]:DELay" on page 288 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

:PULM:INTernal[1]:FREQuency

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:FREQuency <val><unit>
[:SOURce]:PULM:INTernal[1]:FREQuency?
```

This command sets the rate of the internal square wave pulse modulation source.

***RST** +4.00000000E+002

Range 0.1HZ–10MHZ

Key Entry **Pulse Rate**

Remarks This command is used when SQUare is the current pulse modulation type. Refer to ":PULM:SOURce:INTernal" on page 292 for the pulse modulation type selection.

:PULM:INTernal[1]:PERiod

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:PERiod <val><unit>|UP|DOWN
[:SOURce]:PULM:INTernal[1]:PERiod?
```

This command sets the period for the internally generated pulse modulation source.

***RST** +2.00000000E–006

Range 70nS–42S

Choices <val><unit> UP DOWN

Key Entry **Pulse Period**

Remarks If the entered value for the pulse period is equal to or less than the value for the pulse width, the pulse width changes to a value that is less than the pulse period.

Refer to ":PULM:INTernal[1]:PERiod:STEP[:INCRement]" for setting the value associated with the UP and DOWN choices.

:PULM:INTernal[1]:PERiod:STEP[:INCRement]

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:PERiod:STEP[:INCRement] <val><unit>
[:SOURce]:PULM:INTernal[1]:PERiod:STEP[:INCRement]?
```

This command sets the step increment for the internal pulse period.

***RST** +1.00000000E-006

Range 10nS–42S

Key Entry N/A

Remarks The value set by this command is used with the UP and DOWN choices for the pulse period command. Refer to ":PULM:INTernal[1]:PERiod" for more information.

:PULM:INTernal[1]:PWIDth

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:PWIDth <num>[<time suffix>]|UP|DOWN
[:SOURce]:PULM:INTernal[1]:PWIDth?
```

This command sets the pulse width for the internally generated pulse modulation source.

The optional variable [<time suffix>] accepts nS (nano-seconds) to S (seconds).

***RST** +1.00000000E–006

Range 10nS to (pulse period – 20 nS)

Choices <num>[<time suffix>] UP DOWN

Key Entry **Pulse Width**

Remarks If the entered value for the pulse width is equal to or greater than the value for the pulse period, the pulse width will change to a value that is less than the pulse period.

Refer to ":PULM:INTernal[1]:PWIDth:STEP" for setting the value associated with the UP and DOWN choices.

:PULM:INTernal[1]:PWIDth:STEP

Supported PSG-A Series

```
[:SOURce]:PULM:INTernal[1]:PWIDth:STEP <num>[<time suffix>]
[:SOURce]:PULM:INTernal[1]:PWIDth:STEP?
```

This command sets the step increment for the pulse width.

The optional variable [<time suffix>] accepts nS (nano-seconds) to S (seconds).

***RST** +1.00000000E–006

Range 10nS to (pulse period – 20 nS)

Key Entry N/A

Remarks The value set by this command is used by the UP and DOWN choices for the pulse width command. Refer to ":PULM:INTernal[1]:PWIDth" for more information.

:PULM:SOURce

Supported PSG-A Series

```
[:SOURce]:PULM:SOURce INTernal|EXTernal
[:SOURce]:PULM:SOURce?
```

This command sets the source for the pulse modulation.

***RST** INT

Choices INTernal EXTernal

Key Entry **Internal Square** **Int Free-Run** **Int Triggered** **Int Doublet** **Int Gated** **Ext Pulse**

Remarks N/A

:PULM:SOURce:INTernal

Supported PSG-A Series

```
[:SOURce]:PULM:SOURce:INTernal SQUare|FRUN|TRIGgered|DOUBlet|GATEd
[:SOURce]:PULM:SOURce:INTernal?
```

This command sets the type of internally generated pulse modulation.

***RST** FRUN

Choices SQUare FRUN TRIGgered DOUBlet GATEd

Key Entry **Internal Square** **Int Free-Run** **Int Triggered** **Int Doublet** **Int Gated**

Remarks N/A

:PULM:STATe

Supported PSG-A Series

```
[:SOURce]:PULM:STATe ON|OFF|1|0
[:SOURce]:PULM:STATe?
```

This command enables or disables pulse modulation for the selected path.

***RST** 0

Choices ON OFF 1 0

Key Entry Pulse Off On

Remarks When pulse modulation is enabled, the PULSE annunciator is shown in the display

SCPI Command Compatibility

:SYSTem:IDN

Supported All

`:SYSTem:IDN "<string>"`

This command modifies the identification string that the `*IDN?` query returns. Sending an empty string returns the query output to its factory shipped setting. The maximum string length is 72 characters.

***RST** N/A

Range N/A

Key Entry N/A

Remarks Modification of the `*IDN?` query output enables the PSG to identify itself as another signal generator when it is used as a backwards compatible replacement.

The display diagnostic information, shown by pressing the **Diagnostic Info** softkey, is not affected by this command.

8340B/41B Compatible Commands (firmware ≥ C.01.21)

The tables in this section provide the following:

Table 4-5 on page 296: a comprehensive list of 8340B/41B programming codes, listed in alphabetical order. The equivalent SCPI command sequence for each supported code is provided; codes that are *not* supported by the PSG family are indicated as such in the command column.

Table 4-6 on page 304: a list of the implemented 8340B/41B programming codes that set the active function. This table also indicates which codes are compatible with the RB command (knob), and lists the operation active (OA) query, the increment (up), and the decrement (down) SCPI commands.

NOTE Compatibility is provided for GPIB only; RS-232 and LAN are *not* supported.

Table 4-7 on page 306: information regarding the RM and RE status byte masks.

Table 4-8 on page 307 and Table 4-9 on page 308: information regarding the OS status bytes #1 and #2.

When using 8340B/41B programming codes, you can:

- set the PSG system language to 8340 for the current session.

  Utility > **GPIB/RS-232 LAN** > **Preset Language** > **8340B**

  or

  `:SYST:LANG "8340"`

- set the PSG system language to 8340 so that it does not reset with either preset or cycling power.

  Utility > **Power On/Preset** > **Preset Language** > **8340B**

  or

  `:SYST:PRESET:LANG "8340"`

- set the `*IDN?` response to any 8340-like response you prefer.

  Use the command :SYSTem:IDN on page 294.

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
A1	Leveling, internal	`POWer:ALC:SOURce INTernal`
A2[a]	Leveling, external diode detector	`POWer:ALC:SOURce DIODe` `POWer:ALC:SOURce:EXTernal:COUPling <val>DB`
A3	Leveling, power meter	*not supported*
AK	Amplitude marker	*not supported*
AL	Alternate state	*not supported*
AM0	Amplitude modulation off	`AM1:State OFF|0` `AM2:State OFF|0`

AM1[b]	Amplitude modulation on	`AM1:State OFF|0`
		`AM2:SOURce EXT[1]`
		`AM2:EXTernal[1]:COUPling DC`
		`AM2:Depth 100`
		`AM2:EXTernal[1]:IMPedance 600`
		`AM2:State ON|1`

AS	Select alternate state	*not supported*
AT	Set attenuator	`POWer:ATTenuation <val><unit>`
AU	Auto	*not supported*
BC	Change frequency band	*not supported*

CF	Center frequency (step sweep)	`FREQuency:MODE LIST`
		`POWer:MODE FIXED`
		`LIST:TYPE STEP`
		`INITiate:CONTinuous[:ALL] ON|1`
		`LIST:TRIGger:SOURce BUS`
		`FREQuency:STARt <val><unit>`
		`FREQuency:STOP <val><unit>`

CS	Clear both status bytes	`*CLS`
CW	Set CW frequency	`FREQuency:MODE CW` `FREQuency[:CW] <val><unit>`
DB	dB(m) terminator	`DB`

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence

DF	Delta frequency	`FREQuency:MODE LIST`
		`POWer:MODE FIXED`
		`LIST:TYPE STEP`
		`INITiate:CONTinuous[:ALL] ON|1`
		`LIST:TRIGger:SOURce BUS`
		`FREQuency:STARt <val><unit>`
		`FREQuency:STOP <val><unit>`

DN	Step down	*supported*, see Table 4-6 on page 304
DU0	Display off	`DISPlay[:WINDow][:STATe] OFF|0`
DU1	Display on	`DISPlay[:WINDow][:STATe] ON|1`
EF[c]	Entry display off	`DISPlay[:WINDow][:STATe] ON|1`
EK	Enable knob	*not supported*

FA	Start frequency (step sweep)	`FREQuency:MODE LIST`
		`POWer:MODE FIXED`
		`LIST:TYPE STEP`
		`INITiate:CONTinuous[:ALL] ON|1`
		`LIST:TRIGger:SOURce BUS`
		`FREQuency:STARt <val><unit>`

FB	Stop frequency (step sweep)	`FREQuency:MODE LIST`
		`POWer:MODE FIXED`
		`LIST:TYPE STEP`
		`INITiate:CONTinuous[:ALL] ON|1`
		`LIST:TRIGger:SOURce BUS`
		`FREQuency:STOP <val><unit>`

FM0	Frequency modulation off	`FM1:State OFF|0` `FM2:State OFF|0`

FM1[d]	Frequency modulation on	`FM1:State OFF|0`
		`FM2:SOURce EXT2`
		`FM2:EXTernal2:COUPling DC`
		`FM2:EXTernal2:IMPedance 600`
		`FM2:State ON|1`

FM1[e]	Frequency modulation sensitivity	`FM2[:DEViation] <val><unit>`
FP	Fast phaselock	*supported, but has no effect on PSG Family*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
GZ	GHz terminator	GHZ
HZ	Hz terminator	HZ
IF	Increment frequency	TRIGger[:SEQuence][:IMMediate] or FREQuency[:CW] UP
IL 123b	Input learn data	*not supported*
IP	Instrument preset	STATus:QUEStionable:POWer:NTRansition 0 STATus:QUEStionable:POWer:PTRansition 2 STATus:QUEStionable:POWer:ENABle 2 STATus:QUEStionable:FREQuency:NTRansition 0 STATus:QUEStionable:FREQuency:PTRansition 103 STATus:QUEStionable:FREQuency:ENABle 103 STATus:QUEStionable:MODulation:NTRansition 0 STATus:QUEStionable:MODulation:PTRansition 2 STATus:QUEStionable:MODulation:ENABle 2 STATus:QUEStionable:CALibration:NTRansition 0 STATus:QUEStionable:CALibration:PTRansition 0 STATus:QUEStionable:CALibration:ENABle 0 STATus:QUEStionable:NTRansition 0 STATus:QUEStionable:PTRansition 696 STATus:QUEStionable:ENABle 0 STATus:OPERation:NTRansition 10 STATus:OPERation:PTRansition 0 STATus:OPERation:ENABle 0 *ESE 0 *SRE 0 *CLS *RST FREQuency[:CW]:STEP[:INCRement] 1 GHz FREQuency:MULTiplier<saved multiplier> POWer[:LEVel][:IMMediate][:AMPLitude] 0 dB OUTput[:STATe] ON|1
KR	Keyboard release	*not supported*
KZ	kHz terminator	KHZ
M0	Marker off	*not supported*
M1	Marker 1 on	*not supported*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
M2	Marker 2 on	*not supported*
M3	Marker 3 on	*not supported*
M4	Marker 4 on	*not supported*
M5	Marker 5 on	*not supported*
MC	Marker to CF	*not supported*
MD	Marker delta	*not supported*
MO	Marker off	*not supported*
MP	Marker sweep M1-M2	*not supported*
MS	msec terminator	*not supported*
MZ	MHz terminator	`MHZ`
NA	Configure for network analyzer	*not supported*
OA	Output active parameter	see Table 4-6 on page 304
OB	Output next band frequency	*not supported*
OC	Output coupled parameters	*not supported*
OD	Output diagnostic values	*not supported*
OF	Output fault values	*supported, but no equivalent SCPI command sequence*
OI[f]	Output identification	`*IDN?`
OK	Output last lock frequency	*not supported*
OL	Output learn data	*not supported*
OM	Output mode data	*not supported*
OPAT	Output attenuator	*supported, but no equivalent SCPI command sequence*
OPCF	Output center frequency	*supported, but no equivalent SCPI command sequence*
OPCW	Output CW frequency	`FREQuency[:CW]?`
OPDF	Output delta frequency	*supported, but no equivalent SCPI command sequence*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
OPFA	Output start frequency	`FREQuency:START?`
OPFB	Output stop frequency	`FREQuency:STOP?`
OPFM1	Output FM sensitivity	`FM2[:DEViation]?`
OPPL	Output power level	`POWer[:LEVel][:IMMediate][:AMPLitude]?`
OPSF	Output frequency step size	`FREQuency[:CW]:STEP[:INCRement]?`
OPSL	Output power slope	*supported, but no equivalent SCPI command sequence*
OPSN	Output # points in stepped sweep	`SWEep:POINts?`
OR	Output internally measured power level	*not supported*
OS	Output status bytes	see Table 4-8 on page 307 and Table 4-9 on page 308
PL	Set power level	`POWer:ATTenuation:AUTO ON|1` `POWer[:LEVel][:IMMediate][:AMPLitude]<val><unit>`
PM0	Pulse modulation off	`PULM:STATe OFF|0`
PM1	Pulse modulation on	`PULM:SOURce EXTernalPULM:STATe ON|1`
PS	Power sweep	*not supported*
RB[g]	Remote rotary knob	see Table 4-6 on page 304
RC[h]	Recall instrument state	`*RCL <reg_num>[,<seq_num>]`
RE	Mask extended status byte	see Table 4-7 on page 306
RF0	RF output off	`OUTPut[:STATe] OFF|0`
RF1	RF output on	`OUTPut[:STATe] ON|1`
RM	Mask status byte	see Table 4-7 on page 306
RP0	RF peaking off	*command accepted; peaking not required for PSG Family*
RP1	RF peaking on	*command accepted; peaking not required for PSG Family*
RS	Reset sweep	*not supported*
S1	Sweep, continuous	*not supported*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
S2	Sweep, single	*not supported*
S3	Sweep, manual	*not supported*
SC	Seconds terminator	*not supported*
SF	Frequency step size	`FREQuency[:CW]:STEP[:INCRement] <val><unit>`
SG	Sweep, single	*not supported*
SH	Shift prefix	*not supported*
SHA1	Disable ALC, set power	*not supported*
SHA2	External source module leveling	*not supported*

SHA3	Directly control linear modulator circuit, bypassing ALC	`POWer:ATTenuatuion:AUTO OFF|0`
		`POWer:ALC[:STATe] OFF|0`
		`POWer:ALC:LEVel <val>DB`

SHAK	Immediate YTM peak	*command accepted; peaking not required for PSG Family*
SHAL	Retain multiplication factor on power on/off and preset	*supported, but no equivalent SCPI command sequence*
SHAM	Pulse modulation enhancement	*command accepted, but has no effect on PSG Family*
SHAZ	Leveling mode = external source module (mm head)	`POWer:ALC:SOURce MMHead` `POWer:ALC:LEVel <val>DB`
SHCF	Set frequency step size	`FREQuency[:CW]:STEP[:INCRement] <val><unit>`
SHCW	CW increment resolution	*not supported*
SHEF	Restore cal. const. access function	*not supported*
SHFA	Frequency multiplier	`FREQuency:MULTiplier <val>`
SHFB	Frequency offset	`FREQuency:OFFSet <val><unit>`
SHIP	Reset mult. factor to 1, and preset	*supported, but no equivalent SCPI command sequence*
SHM1	Diagnostic: M/N, 20/30 freq.	*not supported*
SHM2	Diagnostic: band, YO	*not supported*
SHM3	Diagnostic: VCO1, VCO2 freq.	*not supported*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
SHM4	Diagnostic: test/display results	*not supported*
SHM5	Diagnostics off	*not supported*
SHMO	All markers off	*not supported*
SHMP	Marker sweep, M1-M2	*not supported*
SHPL	Set power level step	`POWer[:LEVel][:Immediate][:AMPLitude]:STEP[:INCREment] <val>`
SHPM	Enable 8756A/57A compatibility	*not supported*

SHPS	Decouple attenuator and ALC (control ALC independently)	`POWer:ATTenuation:AUTO OFF|0`
		`POWer:ALC[:STATe] ON|1`
		`POWer:ALC:LEVel <val>DB`

SHRC	Remove save-lock	*not supported*
SHS1	Blank displays	*not supported*
SHS3	Display fault diagnostic	*not supported*
SHS10[c]	Disable display update	`Display[:WINDow][:STATe] OFF|0`
SHS11[i]	Re-enable display update	`Display[:WINDow][:STATe] ON|1`
SHSL[j]	Set attenuator from front panel	`POWer:ATTenuation <val><unit>`
SHST	Zoom function	*not supported*
SHSV	Lock save/recall	*not supported*
SHRF	Disable ALC, set power	*not supported*
SHRP	Tracking calibration	*command accepted, but has no effect on PSG Family*
SHT1	Test displays	*not supported*
SHT2	Bandcrossing penlift	*not supported*
SHT3	Display unlock indicators	*not supported*
SHGZ	IO channel	*not supported*
SHMZ	IO subchannel	*not supported*

Table 4-5 8340B/41B Programming Codes and Equivalent SCPI Sequences

Code	Description	Equivalent SCPI Command Sequence
SHKZ	Write to IO	*not supported*
SHHZ	Read from IO	*not supported*
SL0	Power slope off	`POWer:SLOPe:STATe OFF|0`
SL1	Power slope on	`POWer:SLOPe:STATe ON|1` `POWer:SLOPe <value>[DB/freqsuffix]`
SM	Sweep, manual	*not supported*
SN	Steps, maximum	`SWEep:POINts <val>`
SP	Set power step size	`POWer[:LEVel][:Immediate][:AMPLitude]:STEP[:INCREment] <val>`
ST	Sweep time	*not supported*
SV	Save instrument state	`*SAV <reg_num>[,<seq_num>]`
SW	Swap NA channels	*not supported*
T1	Trigger, free run	*not supported*
T1 b	Test GPIB	*not supported*
T2	Trigger, line	*not supported*
T3	Trigger, external	*not supported*
TL	Time line	*not supported*
TS	Take sweep	*not supported*
UP	Up step	see Table 4-6 on page 304

a. PSG family uses external detector coupling factor instead of reference voltage.
b. PSG family uses AM2 path and EXT 1 input.
c. Same as DU0 on page 297 for PSG family.
d. PSG family uses FM2 path and EXT 2 input.
e. *8340B/41B*: sensitivity values ≤1 MHz are set to 1 MHz;
sensitivity values >1 MHz are set to 10 MHz
PSG Family: sensitivity is set to specified value.
f. Refer to the ":SYSTem:IDN" command on page 294 to customize the string returned by `*IDN?` or `OI`.
g. RB command emulates knob motion on PSG family.
h. Saved under seq_num = 0, and note that RC 0 (recall last front panel settings) is not supported.
i. Same as DU1 on page 297 for PSG family.
j. Same as AT on page 296 for PSG family.

Table 4-6 Programming Codes that Set the Active Function; RB Compatibility; OA Query & UP/DN SCPI Commands

Code	Sets Active Function	Compatible with RB (knob)	Comp. with OA	Comp. with UP/DN	Equivalent SCPI Commands for OA Query and UP or Down

A2	✓		✓	✓	`POWer:ALC:SOURce:EXTernal:COUPling?`
					`POWer:ATTenuation UP`
					`POWer:ATTenuation DOWN`

AT	✓			✓	`POWer:ATTenuation UP` `POWer:ATTenuation DOWN`
CF	✓				*none*

CW	✓	✓	✓	✓	`FREQuency[:CW]?`
					`FREQuency[:CW] UP`
					`FREQuency[:CW] DOWN`

DF	✓				*none*
DN					*decrements active function by step value*
FA	✓		✓		`FREQuency:STARt?`
FB	✓		✓		`FREQuency:STOP?`
FM1	✓		✓		`FM2[:DEViation]?`

PL	✓	✓	✓	✓	`POWer[:LEVel][:IMMediate][:AMPLitude]?`
					`POWer[:LEVel][:IMMediate][:AMPLitude]UP`
					`POWer[:LEVel][:IMMediate][:AMPLitude]DOWN`

RC	✓				*none*
SF	✓	✓	✓		`FREQuency[:CW]:STEP[:INCRement]?`

SHA3	✓	✓	✓	✓	`POWer:ALC:LEVel?`
					`POWer:ATTenuatuion UP`
					`POWer:ATTenuatuion DOWN`

SHAZ	✓	✓	✓		`POWer:ALC:LEVel?`
SHCF	✓	✓	✓		`FREQuency[:CW]:STEP[:INCRement]?`
SHFA	✓	✓	✓		`FREQuency:MULTiplier?`
SHFB	✓	✓	✓		`FREQuency:OFFSet?`

Table 4-6 Programming Codes that Set the Active Function; RB Compatibility; OA Query & UP/DN SCPI Commands

Code	Sets Active Function	Compatible with RB (knob)	Comp. with OA	Comp. with UP/DN	Equivalent SCPI Commands for OA Query and UP or Down
SHPL	✓	✓	✓		`POWer[:LEVel][:Immediate][:AMPLitude]: STEP[:INCREment]?`

SHPS	✓	✓	✓	✓	`POWer:ALC:LEVel?`
					`POWer:ATTenuation UP`
					`POWer:ATTenuation DOWN`

SHSL	✓			✓	`POWer:ATTenuation UP` `POWer:ATTenuation DOWN`
SL1	✓				*none*
SN	✓	✓	✓		`SWEep:POINts?`
SP	✓	✓	✓		`POWer[:LEVel][:Immediate][:AMPLitude]: STEP[:INCREment]?`
SV	✓				*none*
UP					*increments active function by step value*

Table 4-7 8340 Status Byte Masks

Bit Number	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Decimal Value	128	64	32	16	8	4	2	1
RM Mask								
Function **SRQ on**	New frequencies *or* sweep time in effect	Request Service (RQS)	GPIB syntax error	End of sweep	RF settled	Change in extended status byte	Numeric entry completed (GPIB or front panel)	Any front panel key pressed
PSG Bit(s)	0	#6	#5	#3	#1	#3	0	0
Status Group			Std Event	Operation	Operation			
Register		Service Request Enable	Event Enable	Event Enable	Event Enable	Service Request Enable		
Notes: Enable/disable Bit #7 of Service Request Enable Register based on Operation Status Group Event Enable Register. Enable/disable Bit #5 of Service Request Enable Register based on Std. Event Status Group Event Enable Register.								
RE Mask								
Function	Fault indicator on	RF unleveled	Power failure	RF unlocked	Ext. Freq. Ref. selected	Oven cold	Over modulation	Self test failed
PSG Bit(s)	#5	#3	#7	#5	*Implemented* (condition only)	#4	#7	#9
Status Group								
Data Questionable	✓	✓		✓		✓	✓	✓
Standard Event			✓					
Register	Event Enable	Event Enable	Event Enable	Event Enable		Event Enable	Event Enable	Event Enable

Table 4-8 8340 OS Status Byte #1

Bit Number	7	6	5	4
Decimal Value	128	64	32	16
Function SRQ on	New frequencies *or* sweep time in effect	Request Service (RQS)	GPIB syntax error	End of sweep
PSG Bit(s) Status Group Register	0	#6 Status Byte	#5 Standard Event Event	#3 Operation Event—Negative transition

Bit Number	3	2	1	0
Decimal Value	8	4	2	1
Function SRQ on	RF settled	Change in extended status byte	Numeric entry completed (GPIB or front panel)	Any front panel key pressed
PSG Bit(s) Status Group Register	#1 Operation Event—Negative transition	*Implemented*	0	0

Table 4-9 OS Status Byte #2

Bit Number	7		6		5	4	
Decimal Value	128		64		32	16	
Function	Fault indicator on		RF unleveled		Power failure	RF unlocked	
PSG Bit(s)	#0—2 and #5—6	#5	#1	#3	#7[a]	#0—2 and #5—6	#5
Status Group	Data Questionable Frequency	Data Questionable (Summary)	Data Questionable Power	Data Questionable (Summary)	Std Event	Data Questionable Frequency	Data Questionable (Summary)
Register	Condition	Event— Pos. transition	Condition	Event— Pos. transition	Event	Condition	Event— Pos. transition

a. Cleared by IP

Bit Number	3	2	1		0
Decimal Value	8	4	2		1
Function	Ext. Freq. Ref. selected	Oven cold	Over modulation		Self test failed
PSG Bit(s)	*Implemented* (condition only)	#4	#1	#7	#9
Status Group		Data Questionable	Data Questionable Modulation	Data Questionable (Summary)	Data Questionable
Register		Condition	Condition	Event— Pos. transition	Event— Pos. transition

836xxB/L Compatible SCPI Commands

Table 4-10 is a comprehensive list of 836xxB/L SCPI commands arranged by subsystem. Commands that are supported by the PSG Family are identified, in addition to commands that are unsupported. Use the legend within the table to determine command compatibility.

Some of the PSG supported commands are a subset of the 836xxB/L commands. When this occurs, the syntax supported by the PSG is shown in addition to the syntax that is not supported.

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	**83620B & 83640B**	**83620L & 83640L**
IEEE Common Commands		
*CLS	Y	Y
*ESE <data>	Y	Y
*ESE?	Y	Y
*ESR?	Y	Y
*IDN?[a]	Y	Y
*LRN?	N	N
*OPC	Y	Y
*OPC?	Y	Y
*OPT?	N	N
*RCL <reg_num>	Y	Y
*RST	Y	Y
*SAV <reg_num>	Y	Y
*SRE <data>	Y	Y
*SRE?	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
*STB?	Y	Y
*TRG	Y	Y
*TST?	Y	Y
*WAI	Y	Y
Abort Subsystem		
:ABORt	Y	Y
Amplitude Modulation Subsystem		
:AM[:DEPTh] <num>[PCT]|MAXimum|MINimum|<num>DB	Y	
:AM[:DEPTh]? [MAXimum|MINimum]	Y	
:AM:INTernal:FREQuency <num>[<freq suffix>]|MAXimum| MINimum	Y	
:AM:INTernal:FREQuency? [MAXimum|MINimum]	Y	
:AM:INTernal:FUNCtion SINusoid|SQUare|TRIangle|RAMP|NOISe	Y	
:AM:INTernal:FUNCtion?	Y	
:AM:SOURce INTernal|EXTernal	Y	
:AM:SOURce?	Y	
:AM:MODE DEEP|NORMal	Y	
:AM:MODE?	Y	
:AM:STATe ON|OFF|1|0	Y	
:AM:STATe?	Y	
:AM:TYPE LINear|EXPonential	Y	
:AM:TYPE?	Y	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
Calibration Subsystem		
:CALibration:AM:AUTO ON|OFF|1|0	N	
:CALibration:AM:AUTO?	N	
:CALibration:AM[:EXECute]	N	
:CALibration:PEAKing:AUTO ON|OFF|1|0	N	N
:CALibration:PEAKing:AUTO?	N	N
:CALibration:PEAKing[:EXECute]	N	N
:CALibration:PMETer:DETector:INITiate? IDETector|DIODe	N	N
:CALibration:PMETer:DETector:NEXT? <num>[<lvl suffix>]	N	N
:CALibration:PMETer:FLATness:INITiate? USER|DIODe|PMETER| MMHead	N	N
:CALibration:PMETer:FLATness:NEXT? <value>[<lvl suffix>]	N	N
:CALibration:SPAN:AUTO ON|OFF|1|0	N	N
:CALibration:SPAN:AUTO?	N	N
:CALibration:SPAN[:EXECute]	N	N
:CALibration:TRACk	N	N
Correction Subsystem		
:CORRection:ARRay[i]{<value>[DB]}	N	N
:CORRection:ARRay[i]?	N	N
:CORRection:FLATness {<num>[freq suffix],<num>[DB]}2*801	N	N
:CORRection:FLATness?	Y	Y
:CORRection:SOURce[i] ARRay|FLATness	N	N
:CORRection:SOURce[i]?	N	N

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:CORRection:FLATness:POINts? [MAXimum|MINimum]	Y	Y
:CORRection[:STATe] ON|OFF|1|0	Y	Y
:CORRection[:STATe]?	Y	Y
Diagnostics Subsystem		
:DIAGnostics:ABUS? <value>	N	N
:DIAGnostics:ABUS:AVERage <value>	N	N
:DIAGnostics:ABUS:AVERage?	N	N
:DIAGnostics:ABUS:STATus?	N	N
:DIAGnostics:INSTrument:PMETer:ADDRess <value>	N	N
:DIAGnostics:INSTrument:PMETer:ADDRess?	N	N
:DIAGnostics:INSTrument:PRINter:ADDRess <value>	N	N
:DIAGnostics:INSTrument:PRINter:ADDRess?	N	N
:DIAGnostics:IORW <value>,<value>	N	N
:DIAGnostics:IORW? <value>	N	N
:DIAGnostics:OUTPut:FAULt?	N	N
:DIAGnostics:RESult?	N	N
:DIAGnostics:TEST:CONTinue	N	N
:DIAGnostics:TEST:DATA:DESC?	N	N
:DIAGnostics:TEST:DATA:MAXimum?	N	N
:DIAGnostics:TEST:DATA:MINimum?	N	N
:DIAGnostics:TEST:DATA:VALue?	N	N
:DIAGnostics:TEST:DISable {<num>}1*?|ALL	N	N

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:DIAGnostics:TEST:ENABle {<num>}1*?|ALL	N	N
:DIAGnostics:TEST[:EXECute] <value>	N	N
:DIAGnostics:TEST:LOG:SOURce ALL|FAIL	N	N
:DIAGnostics:TEST:LOG:SOURce?	N	N
:DIAGnostics:TEST:LOG[:STATe]?	N	N
:DIAGnostics:TEST:LOG[:STATe] ON|OFF|1|0	N	N
:DIAGnostics:TEST:LOOP ON|OFF|1|0	N	N
:DIAGnostics:TEST:LOOP?	N	N
:DIAGnostics:TEST:NAME? [<value>]	N	N
:DIAGnostics:TEST:POINts?	N	N
:DIAGnostics:TEST:RESult? [<value>]	N	N
:DIAGnostics:TINT? <value>	N	N
Display Subsystem		
:DISPlay[:STATe] ON|OFF|1|0	Y	Y
:DISPlay[:STATe]?	Y	Y
Frequency Modulation Subsystem		
:FM:COUPling AC|DC	Y	
:FM:COUPling?	Y	
:FM[:DEViation] <val><unit>|MAXimum|MINimum	Y	
:FM[:DEViation]? [MAXimum|MINimum]	Y	
:FM:FILTer:HPASs <num>[<freq suffix>]|MAXimum|MINimum	N	
:FM:FILTer:HPASs? [MAXimum|MINimum]	N	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:FM:INTernal:FREQuency <num>[<freq suffix>]|MAXimum| MINimum	Y	
:FM:INTernal:FREQuency? [MAXimum|MINimum]	Y	
:FM:INTernal:FUNCtion SINusoid|SQUare|TRIangle|RAMP|NOISe	Y	
:FM:INTernal:FUNCtion?	Y	
:FM:SOURce INTernal|EXTernal	Y	
:FM:SOURce?	Y	
:FM:SENSitivity <val><freq suffix/V>|MAXimum|MINimum	Y	
:FM:SENSitivity? [MAXimum|MINimum]	Y	
:FM:STATe ON|OFF|1|0	Y	
:FM:STATe?	Y	
Frequency Subsystem		
:FREQuency:CENTer <num>[<freq suffix>]|MAXimum|MINimum| UP|DOWN	Y	Y
:FREQuency:CENTer? [MAXimum|MINimum]	Y	Y
:FREQuency[:CW|:FIXed] <num>[<freq suffix>]|MAXimum| MINimum|UP|DOWN	Y	Y
:FREQuency[:CW]? [MAXimum|MINimum]	Y	Y
:FREQuency[:FIXed]? [MAXimum|MINimum]	Y	Y
:FREQuency[:CW]:AUTO ON|OFF|1|0	N	N
:FREQuency[:CW]:AUTO?	N	N
:FREQuency[:FIXed]:AUTO ON|OFF|1|0	N	N
:FREQuency[:FIXed]:AUTO?	N	N

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:FREQuency:MANual <num>[freq suffix]|MAXimum|MINimum|UP|DOWN	N	N
:FREQuency:MANual? [MAXimum|MINimum]	N	N
:FREQuency:MODE FIXed|CW|SWEep|LIST	Y	Y
:FREQuency:MODE?	Y	Y
:FREQuency:MULTiplier <num>|MAXimum|MINimum[b]	Y	Y
:FREQuency:MULTiplier? [MAXimum|MINimum]	Y	Y
:FREQuency:MULTiplier:STATe ON|OFF|1|0	N	N
:FREQuency:MULTiplier:STATe?	N	N
:FREQuency:OFFSet <num>|MAXimum|MINimum	Y	Y
:FREQuency:OFFSet? [MAXimum|MINimum]	Y	Y
:FREQuency:OFFSet:STATe ON|OFF|1|0	Y	Y
:FREQuency:OFFSet:STATe?	Y	Y
:FREQuency:SPAN <num>[<freq suffix>]|MAXimum|MINimum|UP|DOWN	Y	Y
:FREQuency:SPAN? [MAXimum|MINimum]	Y	Y
:FREQuency:STARt <num>[<freq suffix>]|MAXimum|MINimum|UP|DOWN	Y	Y
:FREQuency:STARt? [MAXimum|MINimum]	Y	Y
:FREQuency:STEP:AUTO ON|OFF|1|0	Y	Y
:FREQuency:STEP:AUTO?	Y	Y
:FREQuency:STEP[:INCRement] <num>[<freq suffix>]|MAXimum|MINimum	Y	Y
:FREQuency:STEP[:INCRement]?	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:FREQuency:STOP <num>[<freq suffix>]|MAXimum|MINimum|UP|DOWN	Y	Y
:FREQuency:STOP? [MAXimum|MINimum]	Y	Y
Initiate Subsystem		
:INITiate:CONTinuous ON|OFF|1|0	Y	Y
:INITiate:CONTinuous?	Y	Y
:INITiate[:IMMediate]	Y	Y
List Subsystem		
:LIST:DWELl {<num>[<time suffix>]|MAXimum|MINimum}	Y	Y
:LIST:DWELl? [MAXimum|MINimum]	Y	Y
:LIST:DWELl:POINts? [MAXimum|MINimum]	Y	Y
:LIST:FREQuency {<value>[<freq suffix>]|MAXimum|MINimum}	Y	Y
:LIST:FREQuency?	Y	Y
:LIST:FREQuency:POINts? [MAXimum|MINimum]	Y	Y
:LIST:MANual <num>	Y	Y
:LIST:MANual?	Y	Y
:LIST:MODE AUTO|MANual	Y	Y
:LIST:MODE?	Y	Y
:LIST[:POWer]:CORRection {<value>[DB]|MAXimum|MINimum}	N	N
:LIST[:POWer]:CORRection?	N	N
:LIST[:POWer]:CORRection:POINts? [MAXimum|MINimum]	N	N
:LIST:TRIGger:SOURce IMMediate|BUS|EXTernal	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:LIST:TRIGger:SOURce?	Y	Y
Marker Subsystem		
:MARKer[n]:AMPLitude[:STATe] ON|OFF|1|0	N	N
:MARKer[n]:AMPLitude[:STATe]?	N	N
:MARKer[n]:AMPLitude:VALue <value>[DB]|MAXimum|MINimum	N	N
:MARKer[n]:AMPLitude:VALue? [MAXimum|MINimum]	N	N
:MARKer[n]:AOFF	N	N
:MARKer[n]:DELTa? <value>,<value>	N	N
:MARKer[n]:FREQuency <value>[<freq suffix>]|MAXimum| MINimum	N	N
:MARKer[n]:FREQuency? [MAXimum|MINimum]	N	N
:MARKer[n]:MODE FREQuency|DELTa	N	N
:MARKer[n]:MODE?	N	N
:MARKer[n]:REFerence <n>	N	N
:MARKer[n]:REFerence?	N	N
:MARKer[n][:STATe] ON|OFF|1|0	N	N
:MARKer[n][:STATe]?	N	N
Measure Subsystem		
:MEASure:AM?	N	
:MEASure:FM?	N	
Modulation Subsystem		
:MODulation:OUTPut:SOURce AM|FM	N	
:MODulation:OUTPut:SOURce?	N	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:MODulation:OUTPut:STATe ON|OFF|1|0	Y	
:MODulation:OUTPut:STATe?	Y	
:MODulation:STATe?	Y	
Power Subsystem		
:POWer:ALC:BANDwidth|:BWIDth <value>[<freq suffix>]| MAXimum|MINimum	Y	Y
:POWer:ALC:BANDwidth?|:BWIDth? [MAXimum|MINimum]	Y	Y
:POWer:ALC:BANDwidth|:BWIDth:AUTO ON|OFF|1|0	Y	Y
:POWer:ALC:BANDwidth|:BWIDth:AUTO?	Y	Y
:POWer:ALC:CFACtor <value>[DB]|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:ALC:CFACtor? [MINimum|MAXimum]	Y	Y
:POWer:ALC:SOURce PMETer :POWer:ALC:SOURce INTernal|DIODe|MMHead	N Y	N Y
:POWer:ALC:SOURce?	Y	Y
:POWer:ALC[:STATe] ON|OFF|1|0	Y	Y
:POWer:ALC[:STATe]?	Y	Y
:POWer:AMPLifier:STATE ON|OFF|1|0	N	N
:POWer:AMPLifier:STATE?	N	N
:POWer:AMPLifier:STATE:AUTO ON|OFF|1|0	N	N
:POWer:AMPLifier:STATE:AUTO?	N	N
:POWer:ATTenuation <num>[DB]|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:ATTenuation? [MAXimum|MINimum]	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:POWer:ATTenuation:AUTO ON|OFF|1|0	Y	Y
:POWer:ATTenuation:AUTO?	Y	Y
:POWer:CENTer <num>[<lvl suffix>]|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:CENTer? [MAXimum|MINimum]	Y	Y
:POWer[:LEVel] <num>[<lvl suffix>]|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer[:LEVel]? [MAXimum|MINimum]	Y	Y
:POWer:MODE FIXed|SWEep	Y	Y
:POWer:MODE?	Y	Y
:POWer:OFFSet <num>[DB]|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:OFFSet? [MAXimum|MINimum]	Y	Y
:POWer:OFFSet:STATe ON|OFF|1|0	Y	Y
:POWer:OFFSet:STATe?	Y	Y
:POWer:RANGe <value>[<lvl suffix>]|MAXimum|MINimum|UP|DOWN	N	N
:POWer:RANGe?	N	N
:POWer:SEARch ON|OFF|1|0|ONCE	Y	Y
:POWer:SEARch?	Y	Y
:POWer:SLOPe <value>[DB/<freq suffix>]|MIN|MAX|UP|DOWN	Y	Y
:POWer:SLOPe? [MAXimum|MINimum]	Y	Y
:POWer:SLOPe:STATe ON|OFF|1|0	Y	Y
:POWer:SLOPe:STATe?	Y	Y
:POWer:SPAN <value>[DB]|MAXimum|MINimum|UP|DOWN	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:POWer:SPAN? [MAXimum|MINimum]	Y	Y
:POWer:STARt <val><unit>|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:STARt? [MAXimum|MINimum]	Y	Y
:POWer:STATe ON|OFF|1|0	Y	Y
:POWer:STATe?	Y	Y
:POWer:STEP:AUTO ON|OFF|1|0	Y	Y
:POWer:STEP:AUTO?	Y	Y
:POWer:STEP[:INCRement] <num>[DB]|MAXimum|MINimum	Y	Y
:POWer:STEP[:INCRement]? [MAXimum|MINimum]	Y	Y
:POWer:STOP <val><unit>|MAXimum|MINimum|UP|DOWN	Y	Y
:POWer:STOP? [MAXimum|MINimum]	Y	Y
Pulse Modulation Subsystem		
:PULM:EXTernal:DELay <value>[<time suffix>]|MAXimum| MINimum	N	
:PULM:EXTernal:DELay? [MAXimum|MINimum]	N	
:PULM:EXTernal:POLarity NORMal|INVerted	Y	
:PULM:EXTernal:POLarity?	Y	
:PULM:INTernal:FREQuency <num>[<freq suffix>]|MAXimum| MINimum	Y	
:PULM:INTernal:FREQuency? [MAXimum|MINimum]	Y	
:PULM:INTernal:GATE ON|OFF|1|0	N	
:PULM:INTernal:GATE?	N	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:PULM:INTernal:PERiod <num>[<time suffix>]|MAXimum| MINimum	Y	
:PULM:INTernal:PERiod? [MAXimum|MINimum]	Y	
:PULM:INTernal:TRIGger:SOURce INTernal|EXTernal	Y	
:PULM:INTernal:TRIGger:SOURce? [MAXimum|MINimum]	Y	
:PULM:INTernal:WIDTh <num>[<time suffix>]|MAXimum|MINimum	Y	
:PULM:INTernal:WIDTh? [MAXimum|MINimum]	Y	
:PULM:SLEW <value>[<time suffix>]|MAXimum|MINimum	N	
:PULM:SLEW? [MAXimum|MINimum]	N	
:PULM:SLEW:AUTO ON|OFF|1|0	N	
:PULM:SLEW:AUTO?	N	
:PULM:SOURce SCALar :PULM:SOURce INTernal|EXTernal	N Y	
:PULM:SOURce?	Y	
:PULM:STATe ON|OFF|1|0	Y	
:PULM:STATe?	Y	
Pulse Subsystem		
:PULSe:FREQuency <num>[<freq suffix>]|MAXimum|MINimum	Y	
:PULSe:FREQuency? [MAXimum|MINimum]	Y	
:PULSe:PERiod <num>[<time suffix>]|MAXimum|MINimum	Y	
:PULSe:PERiod? [MAXimum|MINimum]	Y	
:PULSe:WIDTh <num>[<time suffix>]|MAXimum|MINimum	Y	
:PULSe:WIDTh? [MAXimum|MINimum]	Y	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
Reference Oscillator Subsystem		
:ROSCillator:SOURce?	Y	Y
:ROSCillator:SOURce:AUTO ON|OFF|1|0	Y	Y
:ROSCillator:SOURce:AUTO?	Y	Y
:ROSCillator:SOURce INTernal|EXTernal|NONE	Y	Y
Status Subsystem		
:STATus:OPERation:CONDition?	Y	Y
:STATus:OPERation:ENABle <value>	Y	Y
:STATus:OPERation:ENABle?	Y	Y
:STATus:OPERation[:EVENt]?	Y	Y
:STATus:OPERation:NTRansition <value>	Y	Y
:STATus:OPERation:NTRansition?	Y	Y
:STATus:OPERation:PTRansition <value>	Y	Y
:STATus:OPERation:PTRansition?	Y	Y
:STATus:PRESet	Y	Y
:STATus:QUEStionable:CONDition?	Y	Y
:STATus:QUEStionable:ENABle <value>	Y	Y
:STATus:QUEStionable:ENABle?	Y	Y
:STATus:QUEStionable[:EVENt]?	Y	Y
:STATus:QUEStionable:NTRansition <value>	Y	Y
:STATus:QUEStionable:NTRansition?	Y	Y
:STATus:QUEStionable:PTRansition <value>	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:STATus:QUEStionable:PTRansition?	Y	Y
Sweep Subsystem		
:SWEep:CONTrol:STATe ON|OFF|1|0	N	N
:SWEep:CONTrol:STATe?	N	N
:SWEep:CONTrol:TYPE MASTer|SLAVe	N	N
:SWEep:CONTrol:TYPE?	N	N
:SWEep:DWELl <num>[<time suffix>]|MAXimum|MINimum	Y	Y
:SWEep:DWELl? [MAXimum|MINimum]	Y	Y
:SWEep:DWELl:AUTO ON|OFF|1|0	N	N
:SWEep:DWELl:AUTO?	N	N
:SWEep:GENeration STEPped|ANALog	N	N
:SWEep:GENeration?	N	N
:SWEep:MANual:POINt <num>|MAXimum|MINimum	Y	Y
:SWEep:MANual:POINt? [MAXimum|MINimum]	Y	Y
:SWEep:MANual[:RELative] <value>	N	N
:SWEep:MANual[:RELative]?	N	N
:SWEep:MARKer:STATe ON|OFF|1|0	N	N
:SWEep:MARKer:STATe?	N	N
:SWEep:MARKer:XFER	N	N
:SWEep:MODE AUTO|MANual	Y	Y
:SWEep:MODE?	Y	Y
:SWEep:POINts <num>|MAXimum|MINimum	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:SWEep:POINts? [MAXimum|MINimum]	Y	Y
:SWEep:STEP <value>[<freq suffix>]|MAXimum|MINimum	N	N
:SWEep:STEP? [MAXimum|MINimum]	N	N
:SWEep:TIME <value>[<time suffix>]|MAXimum|MINimum	N	N
:SWEep:TIME? [MAXimum|MINimum]	N	N
:SWEep:TIME:AUTO ON|OFF|1|0	N	N
:SWEep:TIME:AUTO?	N	N
:SWEep:TIME:LLIMit <value>[<time suffix>]|MAXimum|MINimum	N	N
:SWEep:TIME:LLIMit? [MAXimum|MINimum]	N	N
:SWEep:TRIGger:SOURce IMMediate|BUS|EXTernal	Y	Y
:SWEep:TRIGger:SOURce?	Y	Y
System Subsystem		
:SYSTem:ALTernate <value>|MAXimum|MINimum	N	N
:SYSTem:ALTernate? [MAXimum|MINimum]	N	N
:SYSTem:ALTernate:STATe ON|OFF|1|0	N	N
:SYSTem:ALTernate:STATe?	N	N
:SYSTem:COMMunicate:GPIB:ADDRess <number>	Y	Y
:SYSTem:DUMP:PRINter?	N	N
:SYSTem:ERRor?	Y	Y
:SYSTem:LANGuage CIIL|COMPatible :SYSTem:LANGuage SCPI	N Y	N Y
:SYSTem:MMHead:SELect:AUTO ON|OFF|1|0	Y	Y
:SYSTem:MMHead:SELect:AUTO?	Y	Y

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:SYSTem:MMHead:SELect FRONt|REAR|NONE[c]	Y	Y
:SYSTem:MMHead:SELect?	Y	Y
:SYSTem:PRESet[:EXECute]	Y	Y
:SYSTem:PRESet:SAVE	Y	Y
:SYSTem:PRESet:TYPE FACTory|USER	Y	Y
:SYSTem:PRESet:TYPE?	Y	Y
:SYSTem:SECurity:COUNt <value>[de]	Y	Y
:SYSTem:SECurity:COUNt? [MINimum|MAXimum]	Y	Y
:SYSTem:SECurity[:STATe] ON|OFF|1|0[e]	Y	Y
:SYSTem:SECurity[:STATe]?	Y	Y
:SYSTem:VERSion?	Y	Y
Trigger Subsystem		
:TRIGger[:IMMediate]	Y	Y
:TRIGger:ODELay <value>[time suffix]|MAXimum|MINimum	N	N
:TRIGger:ODELay? [MAXimum|MINimum]	N	N
:TRIGger:SOURce IMMediate|BUS|EXTernal	Y	Y
:TRIGger:SOURce?	Y	Y
Tsweep Subsystem		
:TSWeep	N	N
Unit Subsystem		
:UNIT:AM DB|PCT	N	
:UNIT:AM?	N	

Table 4-10 836xxB/L SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83620B & 83640B	83620L & 83640L
:UNIT:POWer {<lvl suffix>}	Y	Y
:UNIT:POWer?	Y	Y

a. The identification information can be modifed for the PSG to reflect the signal generator that is being replaced. Refer to ":SYSTem:IDN" on page 294 for more information.
b. A multiplier of zero is not allowed.
c. Since the PSG Family signal generators have no front panel millimeter head (source module) interface connector, the "FRONT" suffix defaults to the rear connector.
d. Flash memory allows only a limited number of "writes and erasures", excessive use of this command will reduce the memory lifetime.
e. This command can take several hours to execute because the PSG memory size is much larger than the HP 836xx memory.

8373xB and 8371xB Compatible SCPI Commands

Table 4-11 is a comprehensive list of 8373xB and 8371xB SCPI commands arranged by subsystem. Commands that are supported by the PSG Family are identified, in addition to commands that are unsupported. Use the legend within the table to determine command compatibility.

Some of the PSG supported commands are subsets of the 8373xB and 8371xB commands. When this occurs, the syntax supported by the PSG Family is shown in addition to the syntax that is not supported.

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	**83731B & 83732B**	**83711B & 83712B**
IEEE Common Commands		
*CLS	Y	Y
*DMC	N	N
*EMC	N	N
*EMC?	N	N
*ESE <data>	Y	Y
*ESE?	Y	Y
*ESR?	Y	Y
*GMC?	N	N
*IDN?[a]	Y	Y
*LMC?	N	N
*LRN?	N	N
*OPC	Y	Y
*OPC?	Y	Y
*OPT?	N	N

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
*PMC	N	N
*PSC	Y	Y
*PSC?	Y	Y
*RCL <reg_num>	Y	Y
*RMC	N	N
*RST	Y	Y
*SAV <reg_num>	Y	Y
*SRE <data>	Y	Y
*SRE?	Y	Y
*STB?	Y	Y
*TST?	Y	Y
*WAI	Y	Y
Abort Subsystem		
:ABORt	Y	
Amplitude Modulation Subsystem		
[:SOURce]:AM[:DEPTh] <val><unit>	Y	
[:SOURce]:AM[:DEPTh] <num>[<PCT>]|<num>DB	Y	
[:SOURce]:AM[:DEPTh]:STEP[:INCRement] incr|MINimum| MAXimum|DEFault	Y	
[:SOURce]:AM:INTernal:FREQuency <num>[<freq suffix>] incr| MINimum|MAXimum|DEFault	Y	
[:SOURce]:AM:INTernal:FREQuency:STEP[:INCRement]	Y	

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:AM:INTernal:FUNCtion SINusoid|SQUare|TRIangle| RAMP|NOISe|UNIForm|GAUSsian	Y	
[:SOURce]:AM:SENSitivity <val>|MIN|MAX|DEF	N	
[:SOURce]:AM:SOURce FEED [:SOURce]:AM:SOURce INTernal|EXTernal	N Y	
[:SOURce]:AM:SOURce?	Y	
[:SOURce]:AM:STATe ON|OFF	Y	
[:SOURce]:AM:STATe?	Y	
[:SOURce]:AM:TYPE LINear|EXPonential	Y	
[:SOURce]:AM:TYPE?	Y	
Display Subsystem		
:DISPlay[:WINDow][:STATe] ON|OFF|1|0	Y	Y
:DISPlay[:WINDow][:STATe]?	Y	Y
Initiate Subsystem		
:INITiate:CONTinuous ON|OFF|1|0	Y	
:INITiate:CONTinuous?	Y	
Correction Subsystem		
[:SOURce]:CORRection:FLATness[:DATA] <freq>,<corr.>,... <freq>,<corr.>	Y	Y
[:SOURce]:CORRection:FLATness:POINts <points>	Y	Y
[:SOURce]:CORRection[:STATe] ON|OFF	Y	Y
[:SOURce]:CORRection[:STATe]?	Y	Y
[:SOURce]:CORRection:CSET[:SELect] tableno	N	N

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:CORRection:CSET[:SELect]?	N	N
[:SOURce]:CORRection:CSET:STATe ON|OFF|1|0	N	N
[:SOURce]:CORRection:CSET:STATe?	N	N
Frequency Modulation Subsystem		
[:SOURce]:FM:COUPling AC|DC	Y	
[:SOURce]:FM:COUPling?	Y	
[:SOURce]:FM[:DEViation] <val><unit>	Y	
[:SOURce]:FM[:DEViation]:STEP[:INCRement] <val> [<freq suffix>]	Y	
[:SOURce]:FM:INTernal:FREQuency <num>[<freq suffix>]	Y	
[:SOURce]:FM:INTernal:FREQuency:STEP[:INCRement] incr| MINimum|MAXimum|DEFault	N	
[:SOURce]:FM:INTernal:FUNCtion SINusoid|SQUAre|TRIAngle| RAMP|UNIForm|GAUSsian	N	
[:SOURce]:FM:SENSitivity?	Y	
[:SOURce]:FM:SOURce FEED [:SOURce]:FM:SOURce INTernal|EXTernal	N Y	
[:SOURce]:FM:STATe ON|OFF|1|0	Y	
[:SOURce]:FM:STATe?	Y	
Frequency Subsystem		
[:SOURce]:FREQuency[:CW|:FIXed] <num>[<freq suffix>]|UP| DOWN|DEFault	Y	Y
[:SOURce]:FREQuency[:CW|:FIXed] [MAXimum|MINimum|DEFault]	Y	Y
[:SOURce]:FREQuency[:CW|:FIXed]:STEP <val><unit>	Y	Y

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:FREQuency[:CW|:FIXed]:STEP?	Y	Y
[:SOURce]:FREQuency:MULTiplier <val>|UP|DOWN|DEFault[b]	Y	Y
[:SOURce]:FREQuency:MULTiplier?	Y	Y
[:SOURce]:FREQuency:MULTiplier:STEP[:INCRement] incr| MINimum|MAXimum|DEFault	N	N
[:SOURce]:FREQuency:MULTiplier:STEP[:INCRement]?	N	N
Memory Subsystem		
:MEMory:CATalog[:ALL]?	Y	Y
:MEMory:CATalog:TABLe?	N	N
:MEMory:CATalog:MACRo	N	N
:MEMory:RAM:INITialize	N	N
:MEMory:TABLe:FREQuency freq,...freq|MINimum|MAXimum	N	N
:MEMory:TABLe:FREQuency? MINimum|MAXimum	N	N
:MEMory:TABLe:FREQuency:POINts?	N	N
:MEMory:TABLe:LOSS[:MAGNitude] cf,...cf|MINimum|MAXimum	N	N
:MEMory:TABLe:LOSS[:MAGNitude]?	N	N
:MEMory:TABLe:LOSS[:MAGNitude]:POINts?	N	N
:MEMory:TABLe:SELect tableno	N	N
:MEMory:TABLe:SELect?	N	N
Modulation Subsystem		
[:SOURce]:MODulation:AOFF	Y	
[:SOURce]:MODulation:STATe ON|OFF	N	

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:MODulation:STATe?	Y	
Output Subsystem		
:OUTPut:IMPedance?	N	N
:OUTPut:PROTection[:STATe] ON|OFF	N	N
:OUTPut:PROTection[:STATe]?	N	N
:OUTPut[:STATe] ON|OFF|1|0	Y	Y
:OUTPut[:STATe]?	Y	Y
Phase Modulation Subsystem		
[:SOURce]:PM:COUPling AC|DC	Y	
[:SOURce]:PM[:DEViation] <val><unit>	Y	
[:SOURce]:PM[:DEViation]:STEP[:INCRement]	Y	
[:SOURce]:PM:INTernal:FREQuency <val><unit>	Y	
[:SOURce]:PM:INTernal:FREQuency:STEP[:INCRement]	Y	
[:SOURce]:PM:INTernal:FUNCtion SINusoid|SQUare|TRIAngle| RAMP|UNIForm|GAUSsian	Y	
[:SOURce]:PM:RANGe AUTO|LOW|HIGH	Y	
[:SOURce]:PM:SENSitivity sens|MINimum|MAXimum|DEFault	N	
[:SOURce]:PM:SOURce FEED [:SOURce]:PM:SOURce INTernal|EXTernal	N Y	
[:SOURce]:PM:STATe ON|OFF|1|0	Y	
Power Subsystem		
[:SOURce]:POWer:ALC:PMETer pmeter|MINimum|MAXimum|DEFault	N	N
[:SOURce]:POWer:ALC:PMETer?	N	N

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:POWer:ALC:PMETer:STEP incr|MINimum|MAXimum| DEFault	N	N
[:SOURce]:POWer:ALC:PMETer:STEP?	N	N
[:SOURce]:POWer:ALC:SOURce PMETer [:SOURce]:POWer:ALC:SOURce INTernal|DIODe	N Y	N Y
[:SOURce]:POWer:ALC:SOURce?	Y	Y
[:SOURce]:POWer:ATTenuation:AUTO ONCE [:SOURce]:POWer:ATTenuation:AUTO ON|OFF	N Y	N Y
[:SOURce]:POWer:ATTenuation:AUTO?	Y	Y
[:SOURce]:POWer[:LEVel] ampl|MINimum|MAXimum|UP|DOWN| DEFault	Y	Y
[:SOURce]:POWer[:LEVel]?	Y	Y
[:SOURce]:POWer[:LEVel]:STEP incr|MINimum|MAXimum|DEFault	Y	Y
[:SOURce]:POWer[:LEVel]:STEP?	Y	Y
[:SOURce]:POWer:PROTection:STATe ON|OFF	N	N
[:SOURce]:POWer:PROTection:STATe?	N	N
Pulse Modulation Subsystem		
[:SOURce]:PULM:EXTernal:POLarity NORMal|INVerted	Y	
[:SOURce]:PULM:EXTernal:POLarity?	Y	
[:SOURce]:PULM:SOURce INTernal|EXTernal	Y	
[:SOURce]:PULM:SOURce?	Y	
[:SOURce]:PULM:STATe ON|OFF|1|0	Y	
[:SOURce]:PULM:STATe?	Y	

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
Pulse Subsystem		
[:SOURce]:PULSe:DELay delay|MINimum|MAXimum|UP|DOWN| DEFault	Y	
[:SOURce]:PULSe:DELay?	Y	
[:SOURce]:PULSe:DELay:STEP <num>[<time suffix>][DEFault]	Y	
[:SOURce]:PULSe:DELay:STEP? [DEFault]	Y	
[:SOURce]:PULSe:DOUBle[:STATE] ON|OFF	N	
[:SOURce]:PULSe:DOUBle[:STATE]?	N	
[:SOURce]:PULSe:FREQuency freq|MINimum|MAXimum|UP|DOWN| DEFault	Y	
[:SOURce]:PULSe:FREQuency?	Y	
[:SOURce]:PULSe:FREQuency:STEP freq|DEFault	Y	
[:SOURce]:PULSe:FREQuency:STEP? [MIN|MAX|DEF]	Y	
[:SOURce]:PULSe:PERiod <num>[<time suffix>]|UP|DOWN	Y	
[:SOURce]:PULSe:PERiod?	Y	
[:SOURce]:PULSe:PERiod:STEP <num>[<time suffix>]	Y	
[:SOURce]:PULSe:PERiod:STEP?	Y	
[:SOURce]:PULse:TRANSition[:LEADing] SLOW|MEDium|FAST	N	
[:SOURce]:PULSe:TRANsition[:LEADing]?	N	
[:SOURce]:PULSe:TRANsition:STATe ON|OFF	N	
[:SOURce]:PULSe:TRANsition:STATe?	N	
[:SOURce]:PULSe:WIDTh MAXimum|MINimum|UP|DOWN|DEFault	Y	
[:SOURce]:PULSe:WIDTh? [MAXimum|MINimum|DEFault]	Y	

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
[:SOURce]:PULSe:WIDTh:STEP <num>[<time suffix>]|DEFault	Y	
[:SOURce]:PULSe:WIDTh:STEP? [MINimum|MAXimum|DEFault]	Y	
Reference Oscillator Subsystem		
[:SOURce]:ROSCillator:SOURce?	Y	Y
Status Subsystem		
:STATus:OPERation:CONDition?	Y	Y
:STATus:OPERation:ENABle <value>	Y	Y
:STATus:OPERation:ENABle?	Y	Y
:STATus:OPERation[:EVENt]?	Y	Y
:STATus:OPERation:NTRansition <value>	Y	Y
:STATus:OPERation:NTRansition?	Y	Y
:STATus:OPERation:PTRansition <value>	Y	Y
:STATus:OPERation:PTRansition?	Y	Y
:STATus:PRESet	Y	Y
:STATus:QUEStionable:CONDition?	Y	Y
:STATus:QUEStionable:ENABle <value>	Y	Y
:STATus:QUEStionable:ENABle?	Y	Y
:STATus:QUEStionable[:EVENt]?	Y	Y
:STATus:QUEStionable:NTRansition <value>	Y	Y
:STATus:QUEStionable:NTRansition?	Y	Y
:STATus:QUEStionable:PTRansition <value>	Y	Y
:STATus:QUEStionable:PTRansition?	Y	Y

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
System Subsystem		
:SYSTem:COMMunicate:GPIB:ADDRess <number>	Y	Y
:SYSTem:COMMunicate:GPIB:ADDRess?	Y	Y
:SYSTem:COMMunicate:PMETer:ADDRess	Y	Y
:SYSTem:COMMunicate:PMETer:ADDRess?	Y	Y
:SYSTem:ERRor?	Y	Y
:SYSTem:KEY keycode|MINimum|MAXimum	N	N
:SYSTem:KEY?	N	N
:SYSTem:LANGuage "COMP=8673"|"COMPatibility=8673" :SYSTem:LANGuage "SCPI"	N Y	N Y
:SYSTem:LANGuage?	Y	Y
:SYSTem:PRESet	Y	Y
:SYSTem:VERSion?	Y	Y
Trigger Subsystem		
:TRIGger[:SEQuence|:STARt]:SOURce IMMediate|EXTernal	N	
:TRIGger[:SEQuence|:STARt]:SOURce?	N	
:TRIGger:SEQuence2:STOP:SOURce IMMediate|EXTernal	N	
:TRIGger:SEQuence2:STOP:SOURce?	N	
:TRIGger:SEQuence2:SLOPe	N	
Unit Subsystem		
:UNIT:FREQuency {<freq suffix>}	N	N
:UNIT:FREQuency?	N	N
:UNIT:POWer {<lvl suffix>}	Y	Y

Table 4-11 8373xB and 8371xB SCPI Commands

Y= Supported by PSG Family N= Not supported by PSG Family	83731B & 83732B	83711B & 83712B
:UNIT:POWer?	Y	Y
:UNIT:TIME	N	N
:UNIT:TIME?	N	N
:UNIT:VOLTage {<lvl suffix>}	N	N
:UNIT:VOLTage?	N	N

a. The identification information can be modifed for the PSG to reflect the signal generator that is being replaced. Refer to ":SYSTem:IDN" on page 294 for more information.
b. A multiplier of zero is not allowed.

C

D

Q

R