

SCPI Programming Manual

Series MG3702xA

RF/Microwave Signal Generators

Fast Switching Microwave Signal Generator

100 μ sec Switching Speed

10 MHz to 20 GHz

The Anritsu logo is located in the bottom right corner of the page. It consists of the word "Anritsu" in a bold, sans-serif font. The letter "A" is stylized with a diagonal slash through it. The logo is positioned above a horizontal line that spans the width of the page.

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Chapter 1 — General Information

1-1 About this Manual

This manual provides information for remote operation of the Series MG3702xA Synthesized High Performance Signal Generators using commands sent from an external controller via the IEEE-488 General Purpose Interface Bus (GPIB), USB, and Ethernet. It includes the following:

- A general description of the GPIB and the bus data transfer and control functions
- A listing of the IEEE-488 Interface Function Messages recognized by the signal generator with a description of its response
- A complete listing and description of all the Standard Commands for Programmable Instruments (SCPI) commands that can be used to control signal generator operation with examples of command usage
- A table of supported MG3690B commands and their SCPI equivalent

This manual is intended to be used in conjunction with the Series MG3702xA Synthesized Signal Generator Operation Manual, P/N: 10370-10370. Refer to that manual for general information about the MG3702xA, including equipment set up and front panel (manual mode) operating instructions.

1-2 Introduction

This chapter provides a general description of the GPIB and the bus data transfer and control functions. It also contains a listing of the MG3702xA's GPIB interface function subset capability and response to IEEE-488 interface function messages.

The GPIB information presented in this chapter is general in nature. For complete and specific information, refer to the following documents: ANSI/IEEE Std 488.1-1987 IEEE Standard Digital Interface for Programmable Instrumentation and ANSI/IEEE Std 488.2-1987 IEEE Standard Codes, Formats, Protocols and Common Commands. These documents precisely define the total specification of the mechanical and electrical interface, and of the data transfer and control protocols.

1-3 IEEE-488 Interface Bus Description

The IEEE-488 General Purpose Interface Bus (GPIB) is an instrumentation interface for integrating instruments, computers, printers, plotters, and other measurement devices into systems. The GPIB uses 16 signal lines to effect transfer of information between all devices connected to the bus.

The following requirements and restrictions apply to the GPIB:

- No more than 15 devices can be interconnected by one contiguous bus; however, an instrumentation system may contain more than one interface bus
- The maximum total cumulative cable length for one interface bus may not exceed twice the number of devices connected (in meters), or 20 meters—whichever is less
- A maximum data rate of 1 Mb/s across the interface on any signal line
- Each device on the interface bus must have a unique address, ranging from 00 to 30

The devices on the GPIB are connected in parallel, as shown in [Figure 1-1](#). The interface consists of 16 signal lines and 8 ground lines in a shielded cable. Eight of the signal lines are the data lines, DIO 1 through DIO 8. These data lines carry messages (data and commands), one byte at a time, among the GPIB devices. Three of the remaining lines are the handshake lines that control the transfer of message bytes between devices. The five remaining signal lines are referred to as interface management lines.

The following paragraphs provide an overview of the GPIB including a description of the functional elements, bus structure, bus data transfer process, interface management bus, device interface function requirements, and message types.

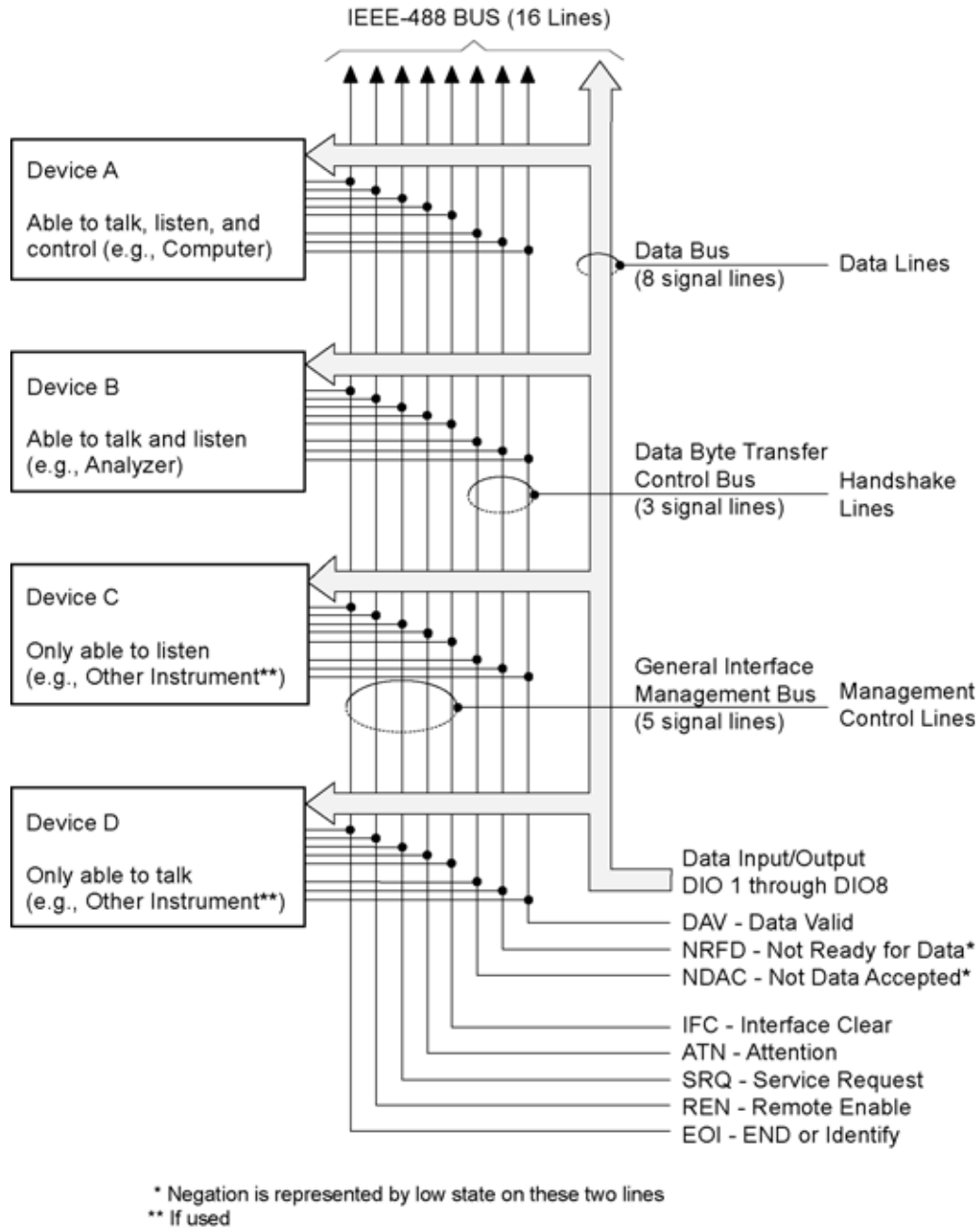


Figure 1-1. Interface Connection and GPIB Bus Structure

Functional Elements

Effective communications between devices on the GPIB requires three functional elements; a talker, a listener, and a controller. Each device on the GPIB is categorized as one of these elements depending on its current interface function and capabilities.

- **Talker:** A talker is a device capable of sending device-dependent data to another device on the bus when addressed to talk. Only one GPIB device at a time can be an active talker.
- **Listener:** A listener is a device capable of receiving device-dependent data from another device on the bus when addressed to listen. Any number of GPIB devices can be listeners simultaneously.
- **Controller:** A controller is a device, usually a computer, capable of managing the operation of the GPIB. Only one GPIB device at a time can be an active controller. The active controller manages the transfer of device-dependent data between GPIB devices by designating who will talk and who will listen.
- **System Controller:** The system controller is the device that always retains ultimate control of the GPIB. When the system is first powered-up, the system controller is the active controller and manages the GPIB. The system controller can pass control to a device, making it the new active controller. The new active controller, in turn, may pass control on to yet another device. Even if it is not the active controller, the system controller maintains control of the Interface Clear (IFC) and Remote Enable (REN) interface management lines and can thus take control of the GPIB at anytime.

Bus Structure

The GPIB uses 16 signal lines to carry data and commands between the devices connected to the bus. The interface signal lines are organized into three functional groups.

- Data Bus (8 lines)
- Data Byte Transfer Control Bus (3 lines)
- General Interface Management Bus (5 lines)

The signal lines in each of the three groups are designated according to function. [Table 1-1](#) lists these designations.

Table 1-1. Interface Bus Signal Line Designations

Bus Type	Signal Line Name	Function
Data Bus	DIO1–DIO8	Data Input/Output, 1 through 8
Data Byte Transfer Control Bus	DAV NRFD NDAC	Data Available Not Ready For Data Not Data Accepted
General Interface Management Bus	ATN IFC SRQ REN EOI	Attention Interface Clear Service Request Remote Enable End Or Identify

Data Bus Description

The data bus is the conduit for the transfer of data and commands between the devices on the GPIB. It contains eight bidirectional, active-low signal lines —DIO 1 through DIO 8. Data and commands are transferred over the data bus in byte-serial, bit-parallel form. This means that one byte of data (eight bits) is transferred over the bus at a time. DIO 1 represents the least-significant bit (LSB) in this byte and DIO 8 represents the most-significant bit (MSB). Bytes of data are normally formatted in seven-bit ASCII (American Standard Code for Information Interchange) code. The eighth (parity) bit is not used.

Each byte placed on the data bus represents either a command or a data byte. If the Attention (ATN) interface management line is TRUE while the data is transferred, then the data bus is carrying a bus command which is to be received by every GPIB device. If ATN is FALSE, then a data byte is being transferred and only the active listeners will receive that byte.

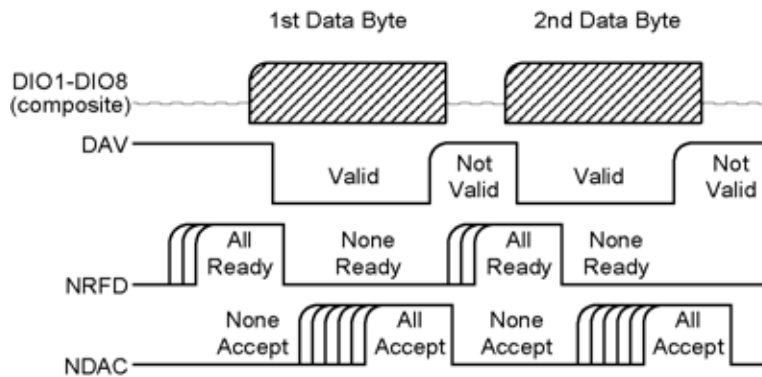


Figure 1-2. Typical GPIB Handshake Operation

Data Byte Transfer Control Bus Description

Control of the transfer of each byte of data on the data bus is accomplished by a technique called the “three-wire handshake”, which involves the three signal lines of the Data Byte Transfer Control Bus. This technique forces data transfers at the speed of the slowest listener, which ensures data integrity in multiple listener transfers. One line (DAV) is controlled by the talker, while the other two (NRFD and NDAC) are wired-OR lines shared by all active listeners. The handshake lines, like the other GPIB lines, are active low. The technique is described briefly in the following paragraphs and is depicted in [Figure 1-2](#). For further information, refer to ANSI/IEEE Std. 488.1.

DAV (Data Valid)

This line is controlled by the active talker. Before sending any data, the talker verifies that NDAC is TRUE (active low) which indicates that all listeners have accepted the previous data byte. The talker then places a byte on the data lines and waits until NRFD is FALSE (high) which indicates that all addressed listeners are ready to accept the information. When both NRFD and NDAC are in the proper state, the talker sets the DAV line TRUE (active low) to indicate that the data on the bus is valid (stable).

NRFD (Not Ready For Data)

This line is used by the listeners to inform the talker when they are ready to accept new data. The talker must wait for each listener to set the NRFD line FALSE (high) which they will do at their own rate. This assures that all devices that are to accept the data are ready to receive it.

NDAC (Not Data Accepted)

This line is also controlled by the listeners and is used to inform the talker that each device addressed to listen has accepted the data. Each device releases NDAC at its own rate, but NDAC will not go FALSE (high) until the slowest listener has accepted the data byte.

General Interface Management Bus Description

The general interface management bus is a group of five signal lines used to manage the flow of information across the GPIB. A description of the function of each of the individual control lines is provided below.

ATN (Attention)

The active controller uses the ATN line to define whether the information on the data bus is a command or is data. When ATN is TRUE (low), the bus is in the command mode and the data lines carry bus commands. When ATN is FALSE (high), the bus is in the data mode and the data lines carry device-dependent instructions or data.

EOI (End or Identify)

The EOI line is used to indicate the last byte of a multibyte data transfer. The talker sets the EOI line TRUE during the last data byte. The active controller also uses the EOI line in conjunction with the ATN line to initiate a parallel poll sequence.

IFC (Interface Clear)

Only the system controller uses this line. When IFC is TRUE (low), all devices on the bus are placed in a known, quiescent state (unaddressed to talk, unaddressed to listen, and service request idle).

REN (Remote Enable)

Only the system controller uses this line. When REN is set TRUE (low), the bus is in the remote mode and devices are addressed either to listen or to talk. When the bus is in remote and a device is addressed, it receives instructions from the GPIB rather than from its front panel. When REN is set FALSE (high), the bus and all devices return to local operation.

SRQ (Service Request)

The SRQ line is set TRUE (low) by any device requesting service by the active controller.

Device Interface Function Capability

An interface function is the GPIB system element which provides the basic operational facility through which a device can receive, process, and send messages. Each specific interface function may only send or receive a limited set of messages within particular classes of messages. As a result, a set of interface functions is necessary to achieve complete communications among devices on the GPIB. ANSI/IEEE Std 488.1 defines each of the interface functions along with its specific protocol.

ANSI/IEEE Std 488.2 specifies the minimum set of IEEE 488.1 interface capabilities that each GPIB device must have. This minimum set of interface functions assures that the device is able to send and receive data, request service, and respond to a device clear message. [Table 1-2](#) lists the interface function capability of the series MG3702xA signal generator.

Table 1-2. MG3702xA Interface Function Capability

Function Identifier	Function	MG3702xA Capability
AH1	Acceptor Handshake	Complete Capability
SH1	Source Handshake	Complete Capability
T6	Talker	No Talk Only (TON)
L4	Listener	No Listen Only (LON)
SR1	Service Request	Complete Capability
RL1	Remote/Local	Complete Capability
PP1	Parallel Poll	Complete Capability
DC1	Device Clear	Complete Capability
DT1	Device Trigger	Complete Capability
C0 C1 C2 C3 C28	Controller Capability Options: C0, No Capability C1, System Controller C2, Send IFC and Take Charge C3, Send REN C28, Send IF Messages	C0, No Capability
E2	Tri-State Drivers	Three-state bus drivers

Message Types

There are three types of information transmitted over the GPIB—interface function messages, device-specific commands, and data and instrument status messages.

Interface Function Messages

The controller manages the flow of information on the GPIB using interface function messages, usually called commands or command messages. Interface function messages perform such functions as initializing the bus, addressing and unaddressing devices, and setting device modes for remote or local operation.

There are two types of commands—multiline and uniline. Multiline commands are bytes sent by the active controller over the data bus (DIO1–DIO8) with ATN set TRUE. Uniline commands are signals carried by the individual interface management lines.

The user generally has control over these commands; however, the extent of user control depends on the implementation and varies with the specific GPIB interface hardware and software used with the external controller.

Device-Specific Commands

These commands are keywords or mnemonic codes sent by the external controller to control the setup and operation of the addressed device or instrument. The commands are normally unique to a particular instrument or class of instruments and are described in its documentation. Device-specific commands are transmitted over the data bus of the GPIB to the device in the form of ASCII strings containing one or more keywords or codes. They are decoded by the device's internal controller and cause the various instrument functions to be performed.

Data and Instrument Status Messages

These messages are sent by the device to the external controller via the GPIB. They contain measurement results, instrument status, or data files that the device transmits over the data bus in response to specific requests from the external controller. The contents of these messages are instrument specific and may be in the form of ASCII strings or binary data. In some cases data messages will be transmitted from the external controller to the device. For example, messages to load calibration data.

An SRQ (service request) is an interface function message sent from the device to the external controller to request service from the controller, usually due to some predetermined status condition or error. To send this message, the device sets the SRQ line of the General Interface Management Bus true, then sends a status byte on the data bus lines.

An SRQ interface function message is also sent by the device in response to a serial poll message from the controller, or upon receiving an Output Status Byte(s) command from the controller. The protocols associated with the SRQ functions are defined in the ANSI/IEEE Std 488.2 document.

The manner in which interface function messages and device-specific commands are invoked in programs is implementation specific for the GPIB interface used with the external controller. Even though both message types are represented by mnemonics, they are implemented and used in different ways.

Normally, the interface function messages are sent automatically by the GPIB driver software in response to invocation of a software function. For example, to send the IFC (Interface Clear) interface function message, one would call the `ibsic` function of the National Instruments software driver. On the other hand, the command `*RST` (Reset) is sent in a command string to the addressed device. In the case of the National Instruments example, this would be done by using the `ibwrt` function call.

1-4 MG3702xA GPIB Operation

All MG3702xA RF/Microwave Signal Generator functions, settings, and operating modes (except for power on/standby) are controllable using commands sent from an external controller via the GPIB. When in the remote (GPIB) mode, the signal generator functions as both a listener and a talker.

Setting GPIB Operating Parameters

The MG3702xA leaves the factory with the GPIB address value set to 5. A different address value can be entered using the Configure GPIB button. See [Section 1-5](#) to change the GPIB address value. The data delimiting terminator is carriage return (CR) only.

Response to GPIB Interface Function Messages

[Table 1-3](#) lists the GPIB interface function messages that the MG3702xA will recognize and respond to. With the exception of the Device Clear and Selected Device Clear messages, these messages affect only the operation of the MG3702xA GPIB interface. The signal generator's response for each message is indicated below. Interface function messages are transmitted on the GPIB data lines and interface management lines as either unaddressed or addressed to receive the commands. The manner in which these messages are invoked in programs is implementation dependent. For more programming information, refer to the documentation included with the GPIB interface used for the external controller and to the IEEE 488.1 specification.

Table 1-3. MG3702xA Response to GPIB Interface Function Messages

Interface Function Message	Addressed Command	MG3702xA Response
Device Clear (DCL) Selected Device Clear (SDC)	No Yes	Clears the input and output buffers and resets the parser.
Go To Local (GTL)	Yes	Returns the MG3702xA to local (front panel) control.
Group Execute Trigger (GET)	Yes	In step sweep, single trigger: triggers a sweep. In list sweep, manual trigger: triggers step to next index within start/stop index boundaries. In list sweep, single trigger: triggers a sweep.
Interface Clear (IFC)	No	Stops the MG3702xA GPIB interface from listening or talking. (The front panel controls are not cleared.)
Local Lockout (LLO)	No	Disables the front panel menu RETURN TO LOCAL soft-key.
Remote Enable (REN)	No	Places the MG3702xA under remote (GPIB) control when it has been addressed to listen.
Serial-Poll Enable (SPE)	No	Outputs the serial-poll status byte.
Serial-Poll Disable (SPD)	No	Disables the serial-poll function.
Parallel-Poll Configure (PPC)	Yes	Responds to a parallel-poll message (PPOLL) by setting assigned data bus line to the logical state (1,0) that indicates its correct SRQ status.
Parallel-Poll Unconfigure	No	Disables the parallel-poll function (PPU)

1-5 Remote Programming Setup and Interface

The MG3702xA provides automated signal generator operation via the GPIB, Ethernet, and USB remote interfaces. The following paragraphs provide information about the interface connections, cable requirements, and setting up the remote operating parameters.

GPIB Interface Connection and Setup

Interface between the signal generator and other devices on the GPIB is via a 24-wire interface cable. This cable uses connector shells having two connector faces. These double-faced connectors allow for the parallel connection of two or more cables to a single device. The only interconnection required for GPIB operation is between the signal generator and the controller. This interconnection is via a standard GPIB cable. The Anritsu part number for GPIB cables is:

- 2100-1, one meter long
- 2100-2, two meters long
- 2100-4, four meters long

The GPIB can accommodate up to 15 instruments at any one time. To achieve design performance on the bus, proper timing and voltage level relationships must be maintained. If either the cable length between separate instruments or the cumulative cable length between all instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. Cable length restrictions are as follows:

- No more than 15 instruments may be installed on the bus
- Total cumulative cable length (in meters) may not exceed two times the number of bus instruments or 20 meters—whichever is less

Note For low EMI applications, all cables should be a fully shielded type with well-grounded metal-shell connectors.

The default GPIB address is five. If a different GPIB address is desired, it can be set from the front panel using the **System** | Config. menus as follows:

1. Press the front panel main menu key labeled **System**. The System menu is displayed.

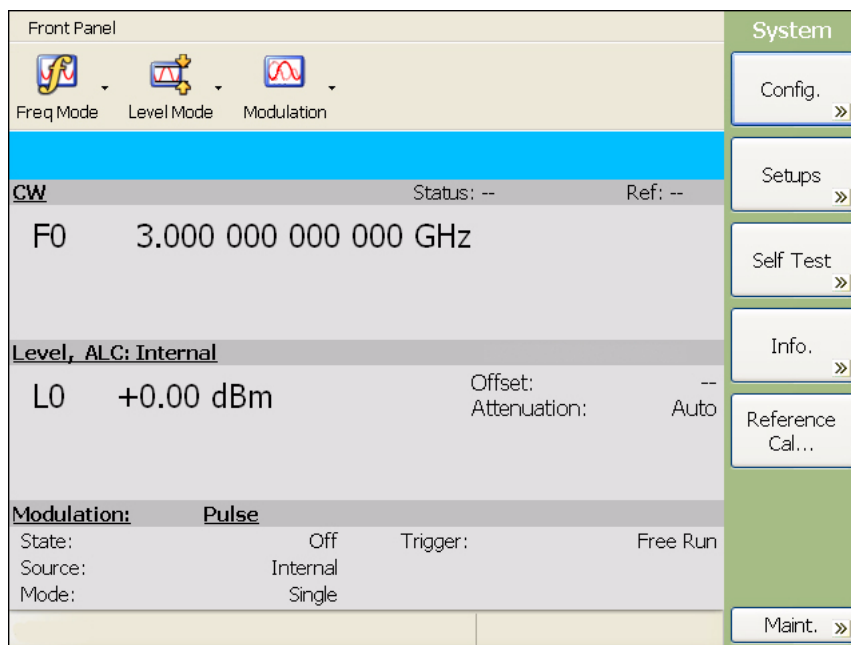


Figure 1-3. System Menu

2. Press the Config. soft key. The System Configuration menu (shown below) is displayed.

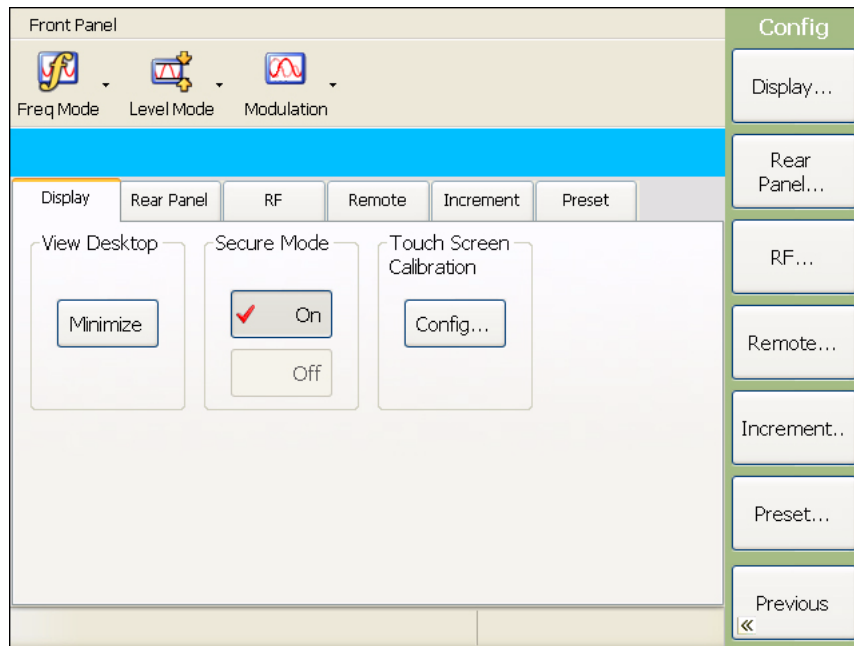


Figure 1-4. System Config Menu

3. From the System Configuration menu, select the Remote tab or press the Remote... menu button to show the remote configuration menu shown below.

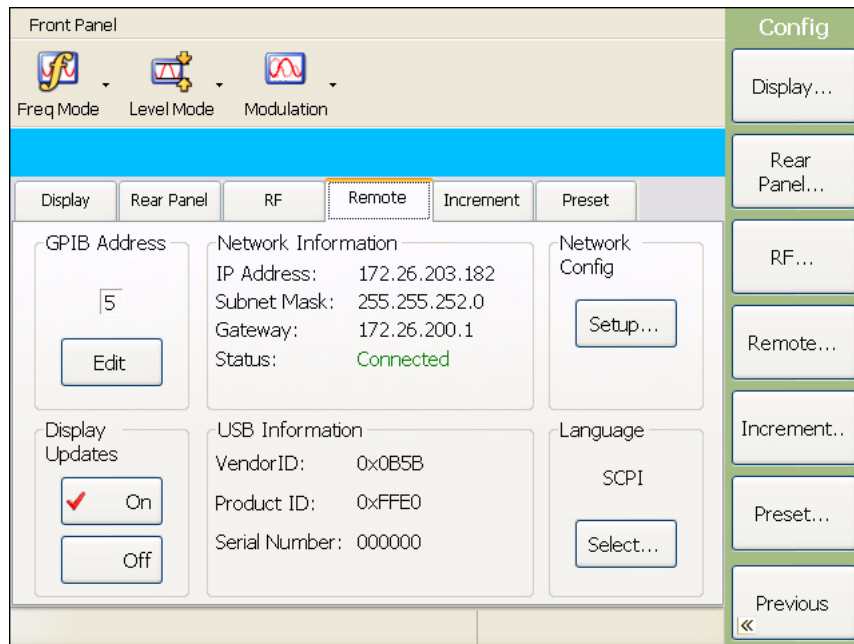


Figure 1-5. Remote Configuration Menu

- In the GPIB Address area, press the Edit button and enter a new address using the data entry keypad, then press the Enter terminator button. The entry must be between 0 and 30 to be recognized as a valid GPIB address.

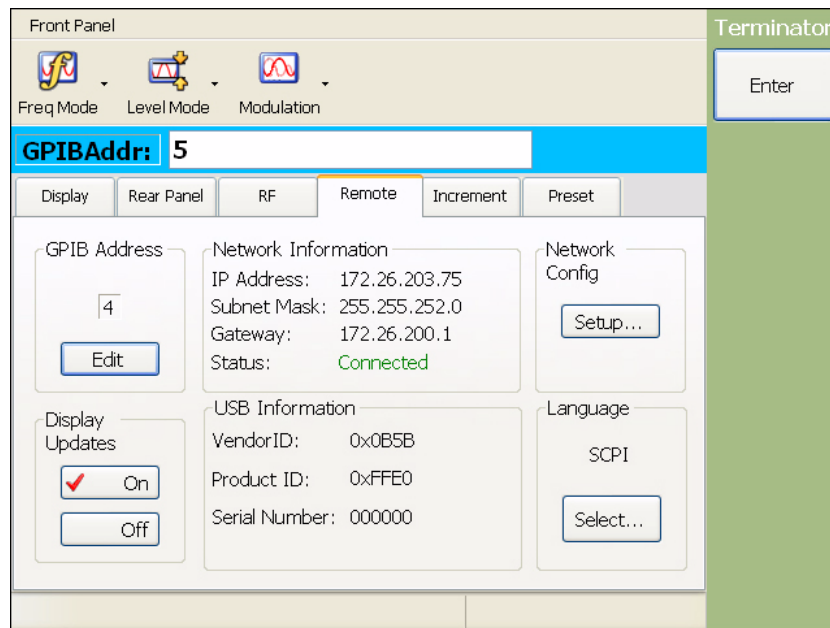


Figure 1-6. Entering a GPIB Address

The new GPIB address appears on the display when the Enter terminator is pressed.

Ethernet Interface Connection and Setup

The MG3702xA fully supports the IEEE-802.3 standard. Most MG3702xA front panel functions (except power on/off) can be remotely controlled via a network server and an Ethernet connection. The MG3702xA software supports the TCP/IP network protocol.

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

The TCP/IP setup requires the following:

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

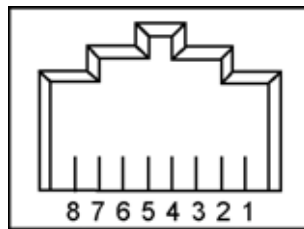
Because the MG3702xA runs under the Windows XP platform, this setup process can be automated by using easy to follow network setup wizards or manually configured.

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

The instrument can be remotely programmed using the VXI-11 protocol. The NI-VISA™ I/O library is used on the server side to facilitate the communications. The SCPI command set listed in the MG3702xA programming manual applies to LAN programming as well.

To run the following example, you must have NI-VISA 2.5 or later installed on the controller PC and you must select the VISA library (visa32.dll) as a reference in a Visual Basic project. Both the MG3702xA instrument and the host PC must be connected to the network.

Table 1-4. 8-pin Ethernet RJ45 Connector Pinout Diagram



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

TCP/IP connectivity requires setting up the parameters described at the beginning of this section. The following is a brief overview of how to set up a general LAN connection on the MG3702xA.

Note You may need to consult your network documentation or network administrator for assistance in configuring your network setup. Use of a keyboard and mouse is recommended for configuring the network.

The network setup menus can be accessed from the front panel using the **System** | Config. menus as follows:

1. Press the **System** front panel key. The System menu is displayed.

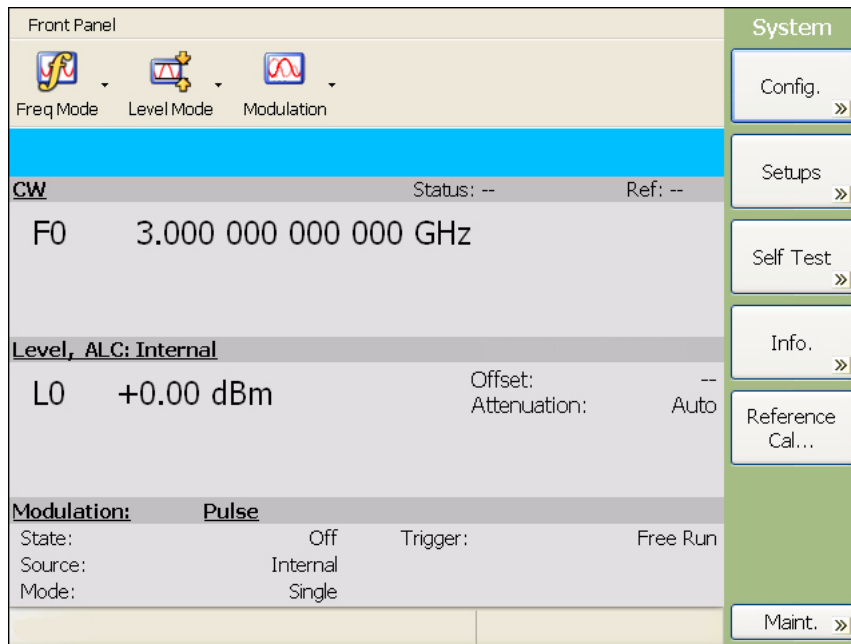


Figure 1-7. System Menu

2. Press the Config. soft key. The System Configuration menu (shown below) is displayed.

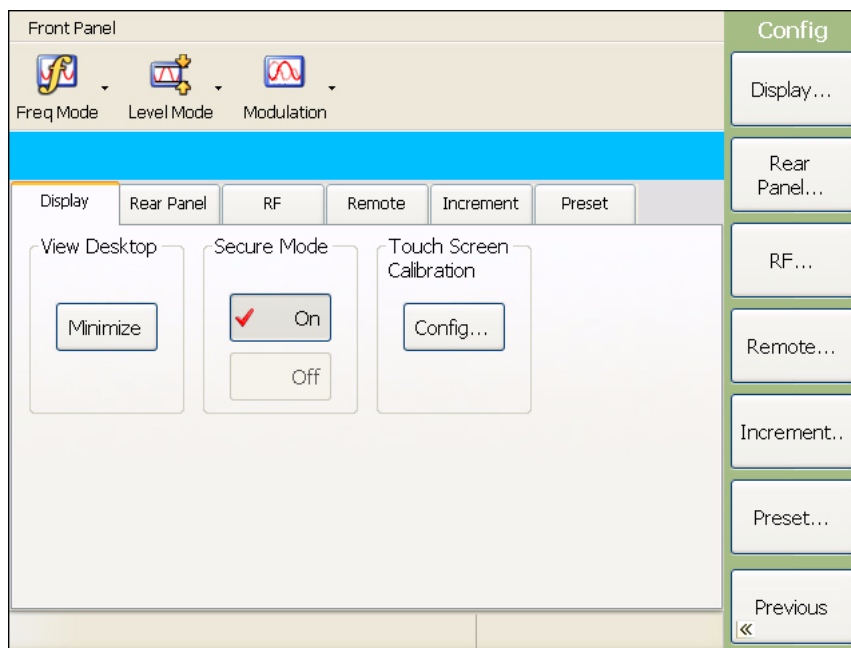


Figure 1-8. System Config Menu

- From the System Configuration menu, select the Remote tab to show the remote configuration menu shown below.

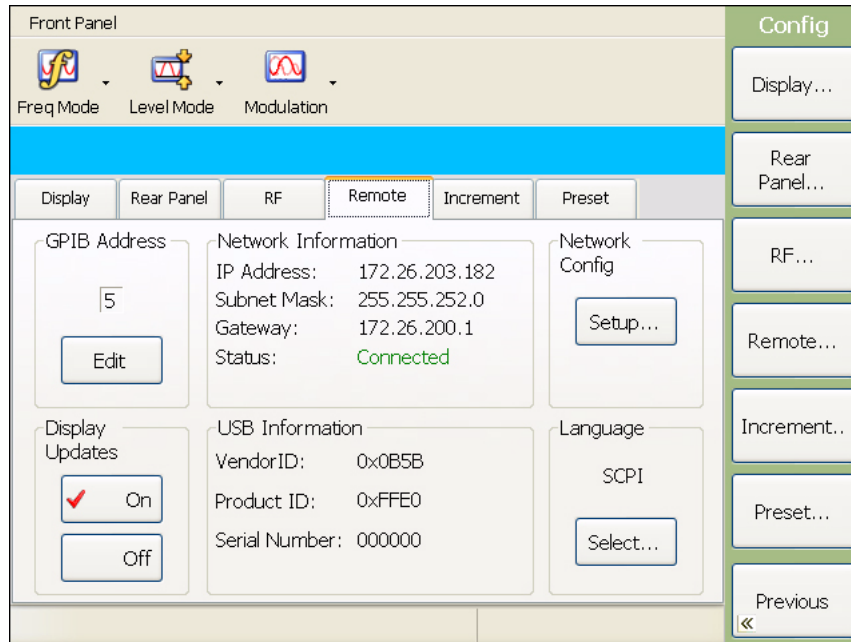


Figure 1-9. Remote Configuration Menu

- In the Network Config area, press the Setup... button to launch the Network Connections dialog below.

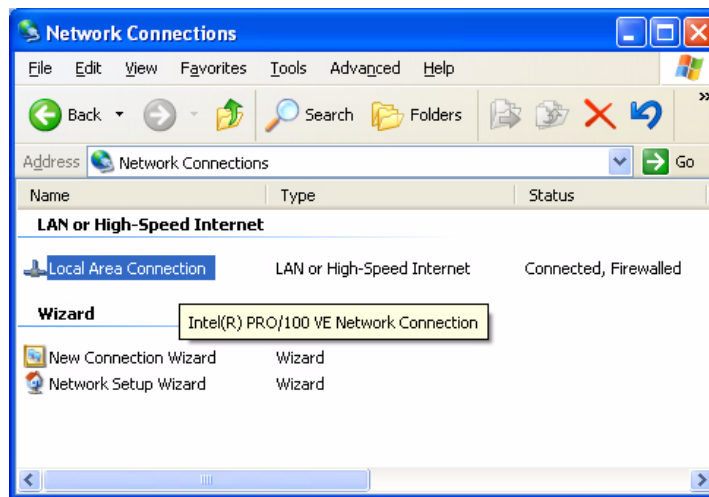


Figure 1-10. Network Connections

- From the Windows Network Connections window, the New Connection Wizard or the Network Setup Wizard can be launched, or the network connection can be manually configured by right clicking the Local Area Connection name in the Network Connections window (Figure 1-10) and select Properties from the pop-up dialog box. Refer to your network documentation or system administrator for information on configuring your network connection.

The following example describes a sample network configuration and verification that a VISA controller can see the resource. It also gives the programmer the resource string required to connect via the VISA API:

1. From the properties dialog (described above), select Internet Protocol (TCP/IP) and click on the Properties button.

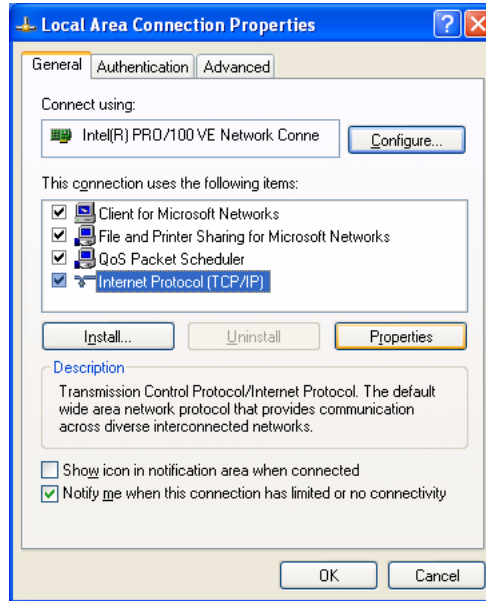


Figure 1-11. Local Area Connection Properties

2. In the Internet Protocol (TCP/IP) Properties dialog, manually configure the network connection with the following settings:

IP address: 192.168.1.105

Subnet mask: 255.255.255.0

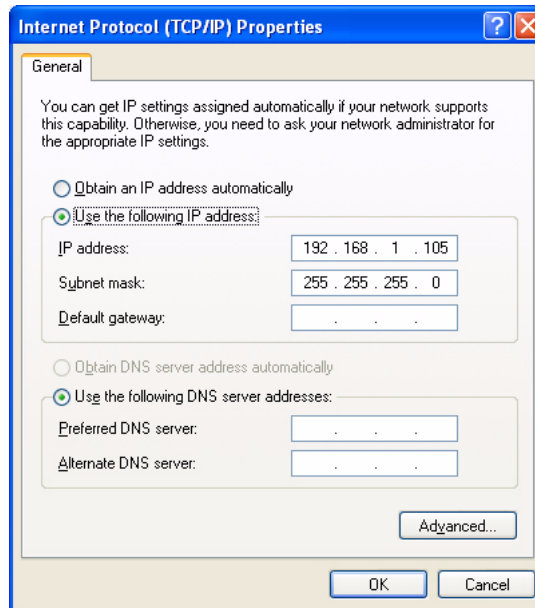


Figure 1-12. General Internet Protocol (TCP/IP) Properties

3. Press OK to close all open dialogs and reboot the instrument to connect to the network.
4. On the host machine, run NI MAX and expand Devices and Interfaces.
5. Expand VISA TCP/IP Resources and select TCPIP0::192.168.1.105::inst0::INSTR.

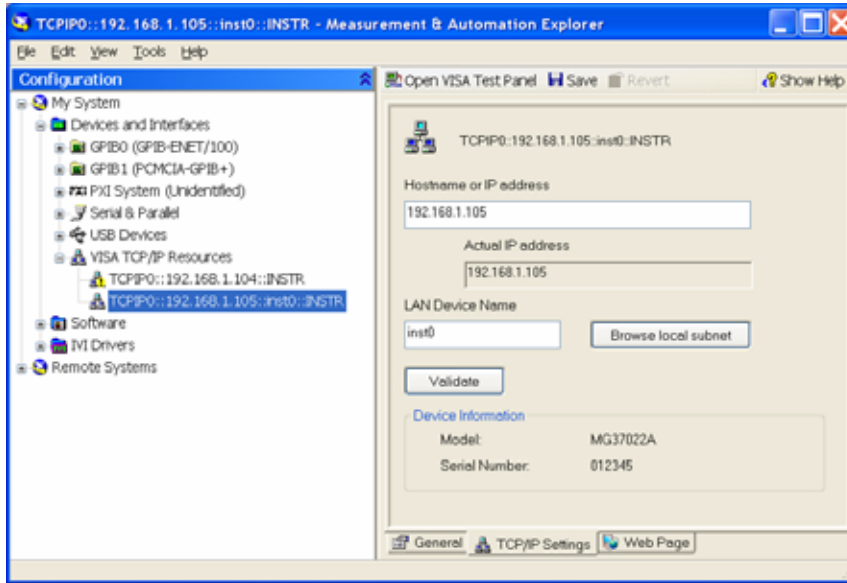


Figure 1-13. NI MAX TCP-IP Configuration

6. Right click TCPIP0::192.168.1.105::inst0::INSTR and open a VISA test panel.
7. Select the Basic I/O tab and execute the default *IDN? write, then execute a read.

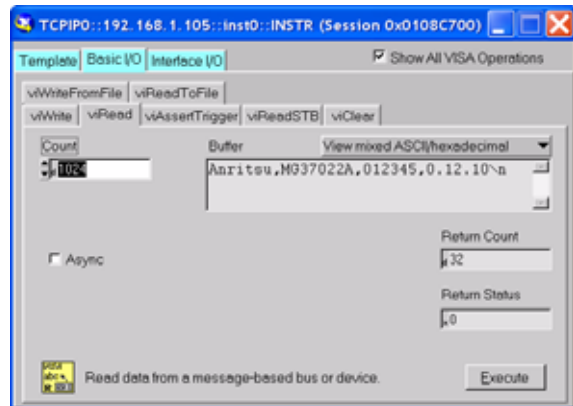
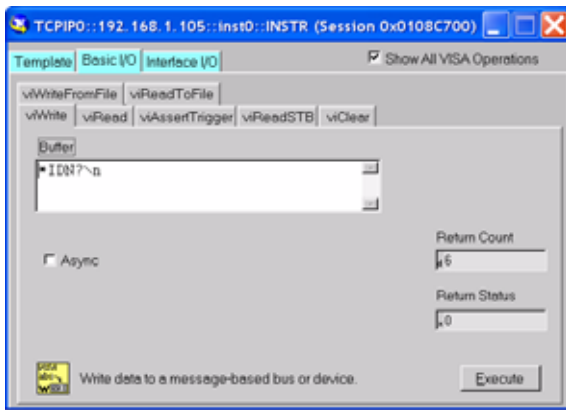


Figure 1-14. NI MAX TCP-IP Basic I/O Write/Read

USB Interface Connection and Setup

The Universal Serial Bus (USB) architecture is a high-performance networking standard that is considered “plug and play” compatible. The USB driver software is automatically detected and configured by the operating system of the devices that are connected to the bus. The MG3702xA conforms to the USB 2.0 standard, which supports data rates of up to 480 Mbps with the following restrictions:

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

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

1. Power on the MG3702xA and controller PC and wait for the systems to power up completely.
2. Connect the USB cable B connector to the MG3702xA rear panel device port.
3. Connect the USB cable A connector to the controller PC USB host port. The controller PC should indicate “New Hardware Found” if the combination of USB VID/PID/Serial Number has never been connected to this controller PC.



Figure 1-15. USB Found New Hardware Wizard

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



Figure 1-16. USB Found New Hardware Wizard

5. After the software installs, close the Wizard by clicking Finish.

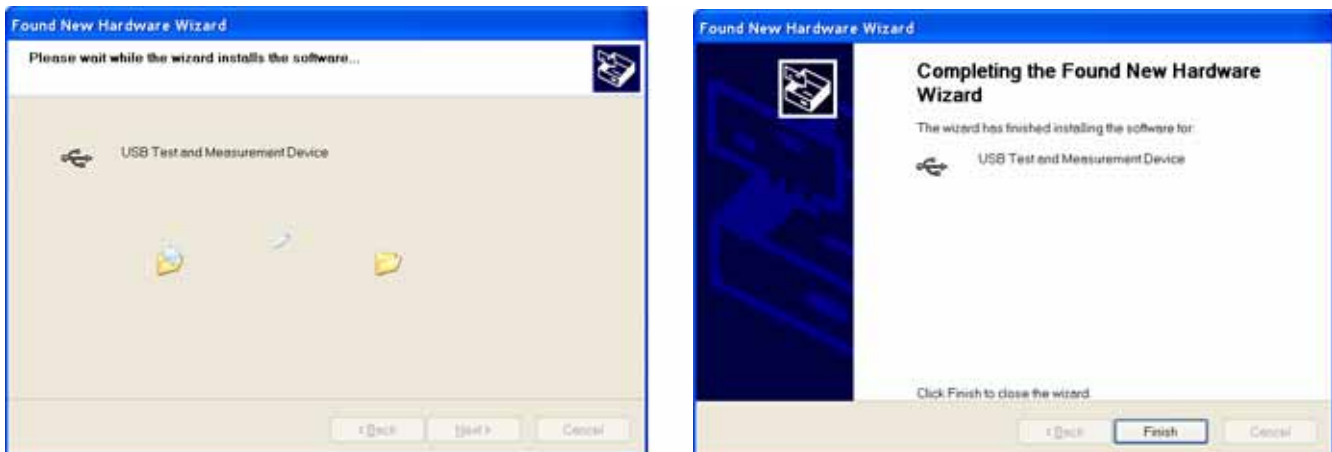


Figure 1-17. USB Found New Hardware Wizard

The following example describes the verification that a VISA controller can see the resource. It also gives the programmer the resource string required to connect via the VISA API:

1. On the controller PC, run NI MAX and expand Devices and Interfaces.

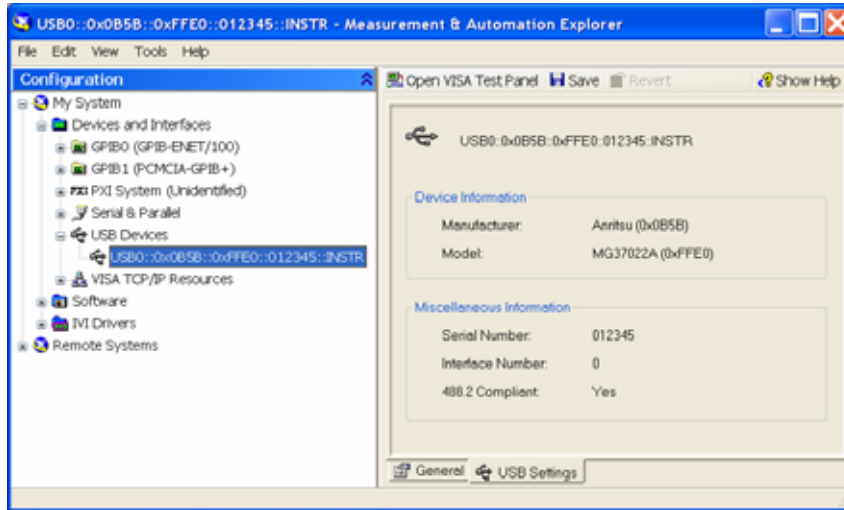


Figure 1-18. NI MAX USB Configuration

2. Expand USB Devices and select USB0::0x0B5B::0xFFE0::ssssss:INSTR. (ssssss = MG3702xA serial number)
3. Right click USB0::0x0B5B::0xFFE0::ssssss:INSTR and open a VISA test panel.
4. Select the Basic I/O tab and execute the default *IDN? write, then execute a read.

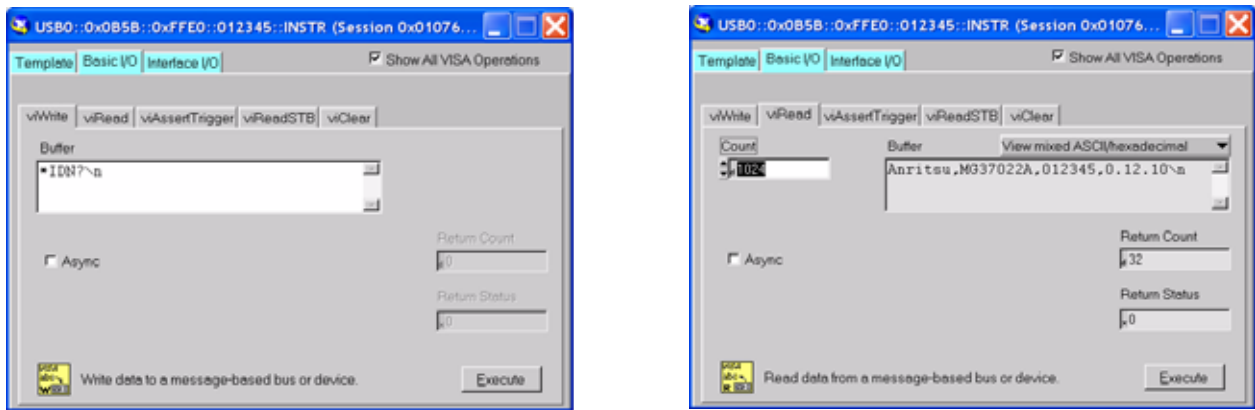


Figure 1-19. NI MAX USB Basic I/O Read/Write

Language Options

The MG3702xA has two language options for remote programming; Standard Commands for Programmable Instrumentation (SCPI) or MG3690B. From **System** | **Config.**, click on the Remote tabs then the Language Select button to change the programming language and press the Close button to confirm the selection..

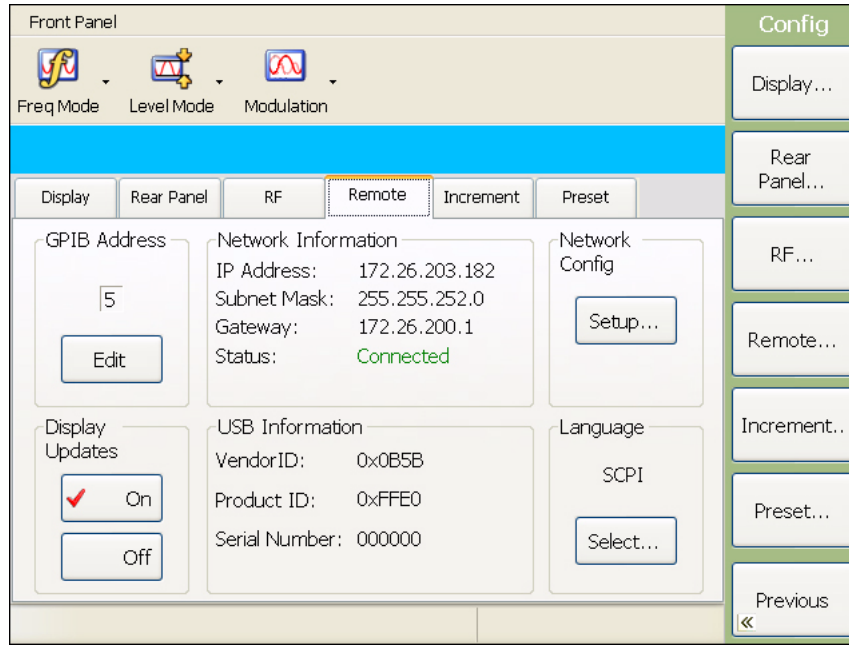


Figure 1-20. Remote Configuration Menu

Chapter 2 — Programming with SCPI

2-1 Introduction

This chapter provides an introduction to SCPI programming that includes descriptions of the command types, hierarchical command structure, data parameters, and notational conventions. Information on MG3702xA status system and trigger system programming is also provided.

2-2 Introduction to SCPI Programming

The Standard Commands for Programmable Instruments (SCPI) defines a set of standard programming commands for use by all SCPI compatible instruments. SCPI is intended to give the ATE user a consistent environment for program development. It does so by defining controller messages, instrument responses, and message formats for all SCPI compatible instruments. The IEEE-488 (GPIB) interface for the MG3702xA was designed to conform to the requirements of SCPI 1999.0. The set of SCPI commands implemented by the MG3702xA GPIB interface provides a comprehensive set of programming functions covering all the major functions of the MG3702xA signal generator.

SCPI Command Types

SCPI commands, which are also referred to as SCPI instructions, are messages to the instrument to perform specific tasks. The MG3702xA command set includes:

- “Common” commands (IEEE488.2 mandated commands)
- SCPI required commands
- SCPI optional commands (per SCPI 1993.0)
- SCPI compliant commands that are unique to the MG3702xA

Common Commands

The required common commands are IEEE-488.2 mandated commands that are defined in the IEEE-488.2 standard and must be implemented by all SCPI compatible instruments. These commands (see [Table 2-1](#) below) are identified by the asterisk (*) at the beginning of the command keyword. These commands are used to control instrument status registers, status reporting, synchronization, and other common functions. The common commands and their syntax are described in detail in [Section 3-2 “Common Commands” on page 3-1](#).

Table 2-1. GPIB Common Commands

*CLS	*IDN?	*SRE
*ESE	*OPC	*SRE?
*ESE?	*OPC?	*STB?
*ESR?	*RST	*TST?

Required and Optional SCPI Commands

The required SCPI commands are listed in the table below and are described in detail in [Section 3-2](#). The optional SCPI commands and MG3702xA unique commands comprise the remainder (major portion) of the MG3702xA command set described in [Chapter 3, “Programming Commands”](#). They control the majority of the programmable functions of the MG3702xA.

Table 2-2. SCPI Required Commands

:STATus :OPERation [:EVENT]? :CONDition? :ENABle :PRESet :QUEStionable [:EVENT]? :CONDition? :ENABle	:SYSTem :ERRor [:NEXT]? :VERSion?
---	--

Query Commands

All commands, unless specifically noted in the commands syntax descriptions, have a query form. As defined in IEEE-488.2, a query is a command with a question mark symbol appended (examples: *ESR? and :OUTPut?). When a query form of a command is received, the current setting associated with the command is placed in the output buffer. Query commands always return the short form of the parameter. For example, NORMal or INVerted is returned as NORM or INV. Boolean values are returned as 1 or 0, even when they can be set as on or off.

Command Names

Typical SCPI commands consist of one or more keywords, parameters, and punctuation. SCPI command keywords can be a mixture of upper and lower case characters. Except for common commands, each keyword has a long and a short form. In this manual, the long form is presented with the short form in upper case and the remainder in lower case. For example, the long form of the command keyword to control the instrument display is :DISPlay.

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

Some command keywords may have a numeric suffix to differentiate between multiple instrument features such as multiple pulse widths. For example, keywords :WIDTh2 (or :WIDT2).

As with any programming language, the exact command keywords and command syntax must be used. The syntax of the individual commands is described in detail in [Chapter 3, “Programming Commands”](#). Unrecognized versions of long form or short form commands, or improper syntax, will generate an error.

Hierarchical Command Structure

All SCPI commands, except the common commands, are organized in a hierarchical structure similar to the inverted tree file structure used in most computers. The SCPI standard refers to this structure as “the Command Tree.” The command keywords that correspond to the major instrument control functions are located at the top of the command tree. The command keywords for the MG3702xA SCPI command set are shown in the diagram below.

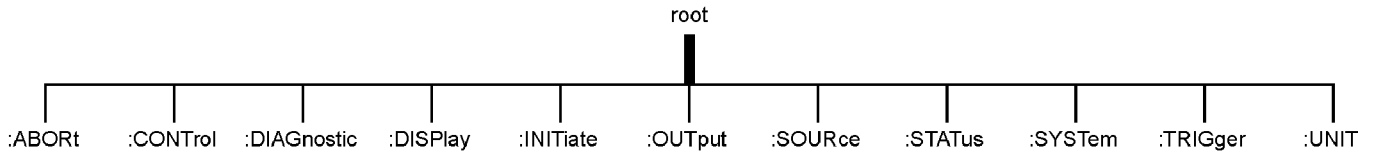


Figure 2-1. MG3702xA Partial SCPI Command Tree

All MG3702xA SCPI commands, except the :ABORt command, have one or more subcommands (keywords) associated with them to further define the instrument function to be controlled. The subcommand keywords may also have one or more associated subcommands (keywords). Each subcommand level adds another layer to the command tree. The command keyword and its associated subcommand keywords form a portion of the command tree called a command subsystem. The :CONTRol command subsystem is shown below.

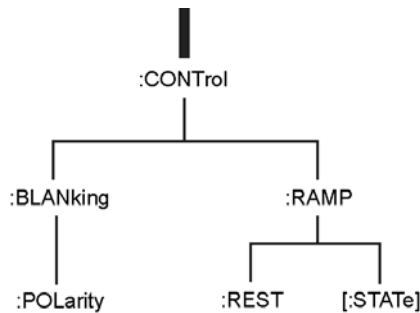


Figure 2-2. SCPI :CONTRol Subsystem

Data Parameters

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

The command descriptions in [Chapter 3, “Programming Commands”](#) specify the type of data parameter to be used with each command. The most commonly used parameter types are numeric, extended numeric, discrete, and Boolean.

Numeric

Numeric parameters comprise integer numbers, or any number in decimal or scientific notation and may include polarity signs. This includes <NR1>, <NR2>, and <NR3> numeric data as defined in [“Parameter Notations” on page 2-5](#). This type of numeric element is abbreviated as <NRf> throughout this document.

Extended Numeric

Extended numeric parameters include values such as MAXimum and MINimum.

Discrete

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

Boolean

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

Unit Suffixes

Unit suffixes are not required for data parameters, provided the values are scaled for the global default units. The MG3702xA SCPI default units are: Hz (Hertz) for frequency related parameters and S (seconds) for time related parameters. For example, the command below sets the MG3702xA output frequency to 3 GHz.

```
:SOURce:FREQuency:CW 3000000000
```

2-3 Notational Conventions

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

General Notations

The syntax conventions that are used for all SCPI command keywords and data parameter descriptions in this manual are described below:

Table 2-3. General Notations

:	A colon links command keywords together to form commands. The colon is not an actual part of the keyword, but is a signal to the SCPI interface parser. A colon must precede a root keyword immediately following a semicolon (see “Notational Examples” on page 2-5).
;	A semicolon separates commands if multiple commands are placed on a single program line (see “Notational Examples” on page 2-5).
[]	Square brackets enclose one or more optional parameters.
{ }	Braces enclose one or more parameters that may be included one or more times.
	A vertical bar indicates “or” and is used to separate alternative parameter options Example: ON OFF is the same as ON or OFF.
< >	Angle brackets enclose parameter descriptions.
::=	Means “is defined as” For example: <a>::=<c> indicates that <c> can replace <a>.
sp	Space, referred to as <i>white space</i> , must be used to separate keywords from their associated data parameters. It must not be used between keywords or inside keywords.
XXX	Indicates a root command name

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

Parameter Notations

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

Table 2-4. Parameter Notations

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

Notational Examples

The following is an example showing command syntax:

```
:FREQuency:START 10E6
```

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

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

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

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

Note	A semicolon used to join the commands and a leading colon used immediately after the semicolon.
-------------	---

2-4 Status System Programming

The MG3702xA status system consists of the following SCPI-defined status-reporting structures:

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

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

Status Group Registers

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

Condition Register

The condition register is continuously updated to reflect the current status of the MG3702xA. There is no latching or buffering for this register, it is updated in real time. Reading the contents of a condition register does not change its contents.

Transition Filter

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

Event Register

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

Enable Register

The enable register specifies the bits in the event register that can produce a summary bit. The MG3702xA logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are recorded in the Summary Status Byte. Enable registers are read-write. Querying an enable register does not affect it. The command :STATus:PRESet sets the Operation Status Enable register and the Questionable Status Enable register to all 0's.

Status Group Reporting

The state of certain MG3702xA hardware and operational events and conditions can be determined by programming the status system. Three lower status groups provide status information to the Summary Status Byte group. The Summary Status Byte group is used to determine the general nature of an event or condition and the other status groups are used to determine the specific nature of the event or condition.

Note	Programming commands for the status system, including examples of command usage, can be found in Chapter 3, "Programming Commands" .
-------------	--

The following paragraphs explain the information that is provided by each status group.

Summary Status Byte Group

The Summary Status Byte group, consisting of the Summary Status Byte Enable register and the Summary Status Byte, is used to determine the general nature of a MG3702xA event or condition. The bits in the Summary Status Byte provide the following:

Table 2-5. Summary Status Byte Group

Bit	Description
0, 1	Not Used. These bits are always set to 0.
2	Set to indicate the Error Queue contains data. The Error Query command can then be used to read the error message(s) from the queue.
3	Set to indicate the Questionable Status summary bit has been set. The Questionable Status Event register can then be read to determine the specific condition that caused the bit to be set.
4	Set to indicate that the MG3702xA has data ready in its output queue.
5	Set to indicate that the Standard Event Status summary bit has been set. The Standard Event Status register can then be read to determine the specific event that caused the bit to be set.
6	Set to indicate that the MG3702xA 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 ANDed with their corresponding Service Request Enable Register bits, then each bit value is ORed and input to this bit.
7	Set to indicate that the Operation Status summary bit has been set. The Operation Status Event register can then be read to determine the specific condition that caused the bit to be set.

Standard Event Status Group

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

Table 2-6. Standard Event Status Group

Bit	Description
0	Set to indicate that all pending MG3702xA operations were completed following execution of the “*OPC” command.
1	Not Used. The bit is always set to 0.
2	Set to indicate that a query error has occurred. Query errors have SCPI error codes from –499 to –400.
3	Set to indicate that a device-dependent error has occurred. Device-dependent errors have SCPI error codes from –399 to –300 and 1 to 32767.
4	Set to indicate that an execution error has occurred. Execution errors have SCPI error codes from –299 to –200.
5	Set to indicate that a command error has occurred. Command errors have SCPI error codes from –199 to –100.
6, 7	Not Used. The bits are always set to 0.

Operation Status Group

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

Table 2-7. Operation Status Group

Bit	Description
0–2	Not used. The bits are always set to 0.
3	Set to indicate that a sweep is in progress.
4	Not used. The bits are always set to 0.
5	Set to indicate that the MG3702xA is in an armed “wait for trigger” state.
6	Not used. The bit is always set to 0.
7	Not used. The bit is always set to 0.
8	Not used. The bit is always set to 0.
9	Set to indicate that MG3702xA self-test is in progress.
10–14	Not used. The bits are always set to 0.
*15	Always 0. *The use of Bit 15 is not allowed by SCPI.

Questionable Status Group

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

Table 2-8. Questionable Status Group

Bit	Description
0–2	Not used. The bits are always set to 0.
3	Set to indicate an RF unlevelled condition.
4	Not used. The bit is always set to 0.
5	Set to indicated the Questionable Frequency register’s summary bit.
6	Not used. The bit is always set to 0.
7	Not used. The bit is always set to 0.
8	Set to indicate a Calibration Error.
9	Set to indicate that self test failed.
10	Not used. The bit is always set to 0.
11	Not used. The bit is always set to 0.
12–14	Not used. The bits are always set to 0.
*15	Always 0. *The use of Bit 15 is not allowed by SCPI.

Questionable Frequency Register

The Questionable Frequency register provides the following:

Table 2-9. Questionable Frequency Register

Bit	Description
0	Set to indicate an RF unlocked condition.
1	Set to indicate that the coarse loop is in an unlocked condition.
2	Set to indicate that the output loop is in an unlocked condition.
3–14	Not used. The bit is always set to 0.
*15	Always 0. *The use of Bit 15 is not allowed by SCPI.

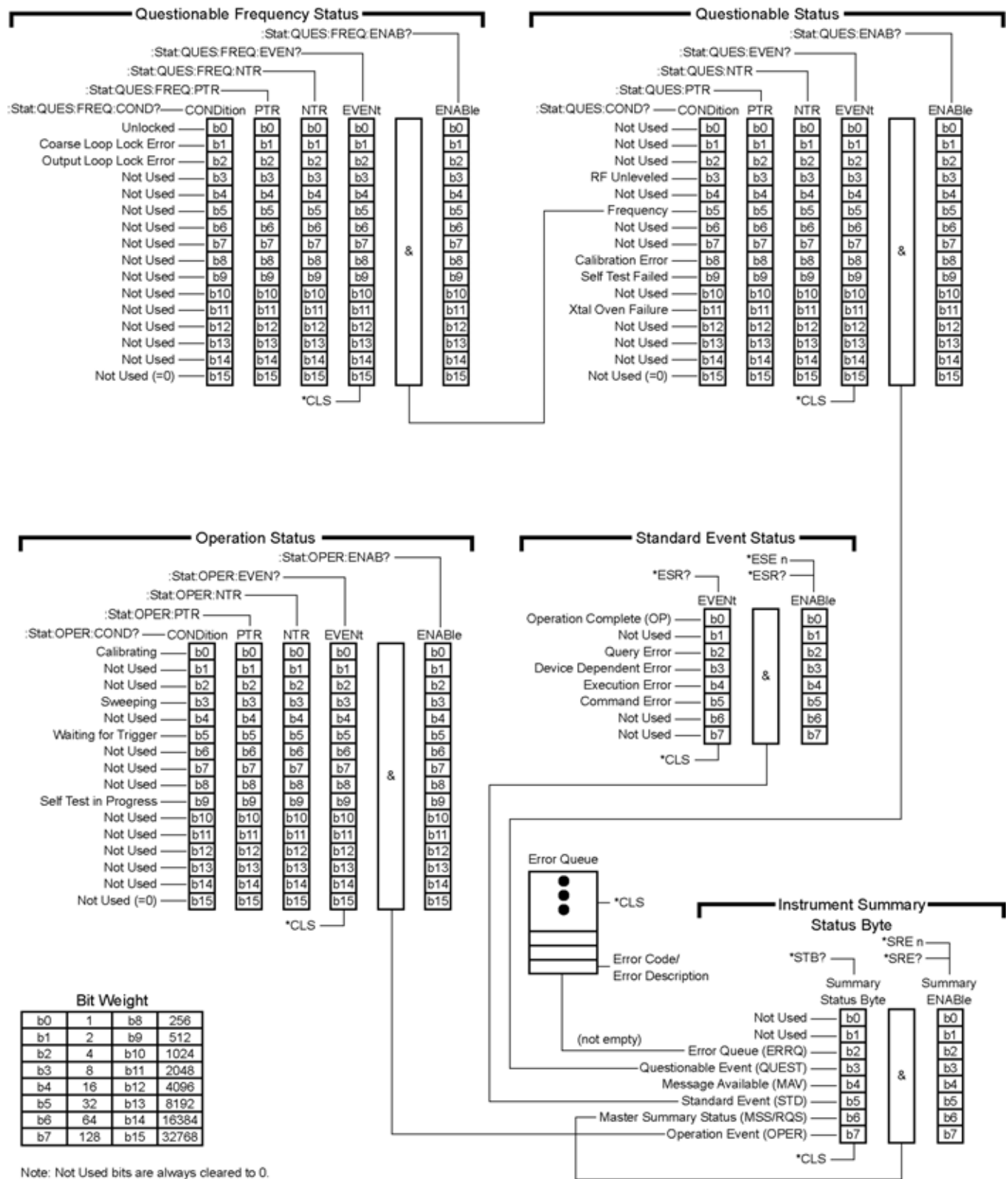


Figure 2-3. MG3702xA Status Reporting Structure

2-5 Trigger System Programming

The MG3702xA trigger system is used to synchronize signal generator actions with software trigger commands. The MG3702xA follows the layered trigger model used in SCPI instruments. The following paragraphs describe operation and programming of the signal generator trigger system. A sample structure and components of a trigger model are shown in [Figure 2-4](#).

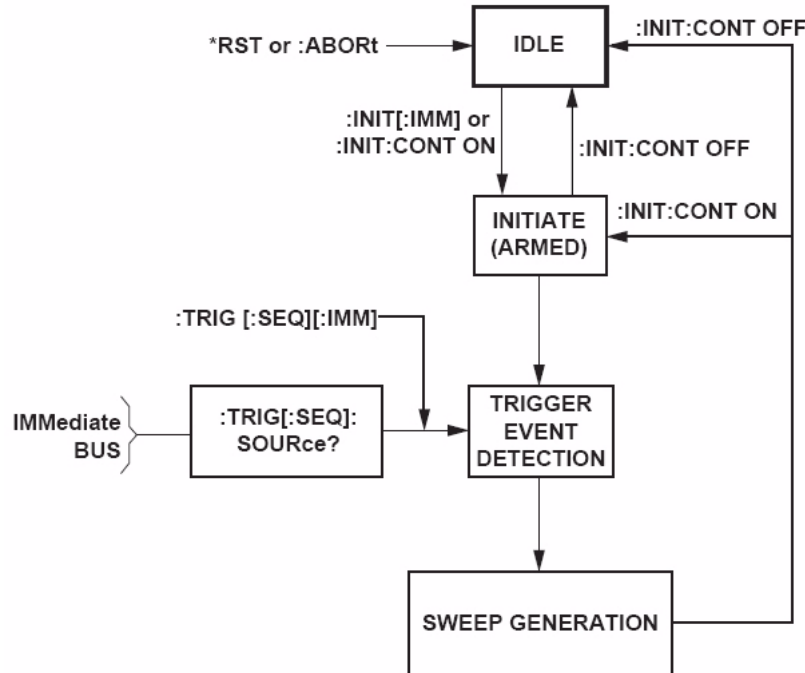


Figure 2-4. Sample Trigger Model

Trigger System Operation

Turning power on, or sending `*RST` or `:ABORT` forces the trigger system into the idle state. The trigger system remains in the idle state until it is initiated. Trigger system initiation can happen on a continuous basis (`:INITiate:CONTinuous ON`) or on a demand basis (`:INITiate:CONTinuous OFF`). When the command `:INITiate:CONTinuous` is set to OFF, the trigger system is initiated by the `:INITiate[:IMMEDIATE]` command. Note that `*RST` sets `:INITiate:CONTinuous` to OFF.

Once initiated, the trigger system enters an armed (wait for trigger) state. The trigger signal selected by the command `:TRIGger:SOURce` is examined until a TRUE condition is detected. The trigger signal selections are:

- IMMEDIATE trigger signal is always TRUE
- BUS trigger signal is either the GPIB <GET> (Group Execute Trigger) message or the `*TRG` command
- HOLD trigger signal is never TRUE

When a TRUE condition is detected, sweep generation of the selected sweep starts.

The command `:TRIGger[:IMMEDIATE]` provides a one-time override of the normal downward path in the trigger-event-detection state by forcing a TRUE trigger signal regardless of the setting for `:TRIGger:SOURce`.

Upon sweep completion, if `:INITiate:CONTinuous` is set OFF, the trigger system returns to the idle state. If `:INITiate:CONTinuous` is set to ON, the trigger system returns to the armed (wait for trigger) state.

Auto Trigger Mode

Setting the command `:INITiate:CONTinuous` to ON and the command `:TRIGger:SOURce` to `:IMMediate`, places the trigger system in an auto trigger mode. This causes continuous generation of the selected sweep.

ABORt

The `:ABORt` command resets any sweep in progress and immediately returns the trigger system to the idle state. Unlike `*RST`, `:ABORt` does not change the settings programmed by other commands.

Chapter 3 — Programming Commands

3-1 Introduction

This chapter contains information on all SCPI programming commands accepted and implemented by the MG3702xA RF/Microwave Signal Generators.

3-2 Common Commands

Common commands are used to control instrument status registers, status reporting, synchronization, data storage, and other common functions. All common commands are identified by the leading asterisk in the command word. The common commands are fully defined in IEEE-488.2.

Mandated Common Commands

The MG3702xA implements the following IEEE-488.2 mandated common commands:

***CLS (Clear Status Command)**

Clear the Status Byte, the Questionable Event Register, the Standard Event Status Register, the Operation Event Register, the Questionable Frequency Event register, the error queue, the OPC pending flag, and any other registers that are summarized in the Status Byte.

***ESE <nv> (Standard Event Status Enable Command)**

Sets the Standard Event Status Enable Register bits. The binary weighted <NR1> data parameter used with this command must have a value between 0 to 255. Refer to [“Status System Programming” on page 2-6](#).

***ESE? (Standard Event Status Enable Query)**

Returns the value of the Standard Event Status Enable Register in <NR1> format. Refer to [“Status System Programming” on page 2-6](#).

***ESR? (Standard Event Status Register Query)**

Returns the value of the Standard Event Status Register in <NR1> format. This command clears the Standard Event Status Register. Refer to [“Status System Programming” in Chapter 2](#).

***IDN? (Identification Query)**

This query returns an instrument identification string in IEEE-488.2 specified <NR1> format (four fields separated by commas). The fields are: <Manufacturer>, <Model>, <Serial #>, <Firmware revision level>; where the actual model number, serial number, and firmware version of the MG3702xA queried will be passed.

***OPC (Operation Complete Command)**

Enables the Operation Complete bit in the Standard Event Status Register after all pending operations are complete.

***OPC? (Operation Complete Query)**

Places an ASCII “1” in the Output Queue and sets the MAV bit true in the Status Byte when all pending operations are completed (per IEEE-488.2 section 12.5.3). Message is returned in <NR1> format.

***RCL (Recall Command)**

Recalls the MG3702xA to a pre-defined condition with all user programmable parameters set to a specific values. The recall is from a specified memory register <reg> in a specified sequence <seq>. This command does not affect the Output Queue, Status Byte Register, Standard Event Register, or calibration data.

***RST (Reset Command)**

Resets the MG3702xA to a pre-defined condition with all user programmable parameters set to their default values. These default parameter values are listed under each SCPI command in this manual. This command does not affect the Output Queue, Status Byte Register, Standard Event Register, or calibration data.

Note	This command clears the current front panel setup.
-------------	--

***SAV (Save Command)**

Saves all user programmable parameters. The save is to a specified memory register <reg> in a specified sequence <seq>. This command does not affect the Output Queue, Status Byte Register, Standard Event Register, or calibration data.

***SRE <nv> (Service Request Enable Command)**

Sets the Service Request Enable Register bits. The integer data parameter used with this command must have a value between 0 to 255. A zero value resets the register. Refer to [“Status System Programming” on page 2-6](#).

***SRE? (Service Request Enable Query)**

Returns the value of the Service Request Enable Register in <NR1> format. Bit 6 is always zero.

***STB? (Read Status Byte Query)**

Returns the content of the Status Byte Register (bits 0 through 5 and 7). Bit 6 is the Master Summary Status bit value. This command does not reset the status byte values.

***TST? (Self Test Query)**

Caution	MG3702xA self test requires RF output power to be on. Always disconnect sensitive equipment from the unit before performing a self-test.
----------------	--

Causes the MG3702xA to perform a full internal self test. Status messages that indicate self test results are placed in the error queue in the order that they occur. Bits in the status register are also affected. The command returns the number of errors placed in the error queue. 0 means the unit passed self test.

Optional Common Commands

The MG3702xA implements the following IEEE-488.2 optional common commands:

***OPT? (Option Identification Query)**

This command returns a string identifying any device options.

***TRG (Trigger Command)**

Triggers instrument if the :TRIGger:SOURce command data parameter is BUS (refer to the :INITiate and :TRIGger subsystem commands and to [“Trigger System Programming” on page 2-11](#)). Performs the same function as the Group Execute Trigger <GET> command defined in IEEE-488.1.

3-3 Subsystem Commands

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

The following information is provided for each subsystem command:

- The path from the subsystem root command
- The data parameters used as arguments for the command. This includes the parameter type, the available parameter choices, and the default parameter that is set by the `*RST` command
- A description of the purpose of the command
- The query form of the command (if applicable)
- An example of the use of the command
- Where necessary, notes are included to provide additional information about the command and its usage

3-4 :ABORt Command (Subsystem)

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

Table 3-1. :ABORt Command

Keyword	Parameter Form	Character Data or Units	Notes
:ABORt	none		no query

:ABORt

Parameters: None

Description: Forces the trigger system to the idle state. Any sweep in progress is aborted as soon as possible.

Query Form: None

Example: :ABORt

Sets MG3702xA trigger system to idle state.

Associated

Commands: :TRIGger and :INITiate

3-5 :CONTROL Subsystem

The :CONTROL subsystem sets the state of the rear panel retrace blanking and horizontal ramp outputs.

Table 3-2. :CONTROL Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:CONTROL	–		
:BLANKing	–		
:POLarity	<char>	NORMAL INVERTed	
:RAMP	–		
:REST	<char>	START STOP	
[:STATe]	<boolean>	ON OFF 1 0	

:CONTROL:BLANKing:POLarity

Parameters: NORMAL|INVERTed

Type: <char>

Default: NORMAL

Description: Sets the level of the rear panel Retrace Blanking and Bandswitch Blanking outputs during sweep retrace as follows:

NORMAL cause the blanking signal to be a +5 V level.

INVERTed causes the blanking signal to be a –5 V level.

Query Form: :CONTROL:BLANKing:POLarity?

Examples: :CONTROL:BLANKing:POLarity INVERTed

Sets a 5V level for the rear panel blanking signal output during sweep retrace.

:CONTROL:BLANKing:POLarity?

Requests the currently programmed level for the rear panel blanking signal output during sweep retrace.

:CONTROL:RAMP:REST

Parameters: START|STOP

Type: <char>

Default: STOP

Description: Sets the sweep rest point for the rear panel HORIZ OUT sweep ramp as follows:

START sets the sweep to rest at the bottom of the sweep ramp.

STOP sets the sweep to rest at the top of the sweep ramp.

Query Form: :CONTROL:RAMP:REST?

Examples: :CONTROL:RAMP:REST STOP

Sets the sweep to rest at the top of the sweep ramp.

:CONTROL:RAMP:REST?

Requests the currently programmed rest point for the sweep ramp.

:CONTRol:RAMP[:STATe]

Parameters: ON|OFF|1|0

Type: <boolean>

Default: OFF

Description: Turns the rear panel Horizontal output sweep ramp signal on or off (CW mode only).

Query Form: :CONTRol:RAMP[:STATe]?

Examples: :CONTRol:RAMP:STATe ON

Turns the rear panel Horizontal output sweep ramp signal on.

:CONTRol:RAMP:STATe?

Requests the currently programmed state of the Horizontal output sweep ramp signal.

3-6 :DIAGnostic Subsystem

The :DIAGnostic subsystem consists of the query command to read the instrument serial number and frequency information

Table 3-3. :DIAGnostic Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:DIAGnostic	–		
:SNUMber?	<char>		query only
:FREQuency?	<char>;<nv>	MIN MAX;MHz	query only
:OPTion?	<char>		query only

:DIAGnostic:SNUMber?

Return Parameters: serial number of the instrument

Type: <char>

Description: Returns the serial number of the instrument.

Example: :DIAGnostic:SNUMber?

:DIAGnostic:FREQuency?

Parameters: MIN|MAX;MHz

Type: <char>;<nv>

Description: Returns the high-end or low-end frequency value (in MHz) to the controller.

Example: :DIAGnostic:FREQuency? MIN

:DIAGnostic:OPTion?

Return Parameters: instrument option string

Type: <char>

Description: Returns the instrument option string to the controller.

Example: :DIAGnostic:OPTion?

3-7 :DISPlay Subsystem

The :DISPlay subsystem controls the display of the front panel data display.

Table 3-4. :DISPlay Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:DISPlay	–		
[:WINDow]	–		
:TEXT	–		
[:STATe]	<boolean>	OFF 0	
:REMote	<boolean>	ON OFF 1 0	

:DISPlay[:WINDow] :TEXT : [STATe]

Parameters: OFF|0

Type: <boolean>

Default: ON

Description: Controls the parameter display setting of the system. When set to OFF, the MG3702xA does not display the front panel parameter settings. This setting is the same as secure mode of operation. This command does not accept ON or 1. The only way to exit secure mode is by one of the reset or preset commands, or a front panel preset. The query form will return either 0 or 1, depending on the current setting.

Query Form: :DISPlay[:WINDow] :TEXT : STATe?

Example: :DISPlay[:WINDow] :TEXT : STATe OFF

Turns off the parameter display of the MG3702xA front panel data display.

:DISPlay:REMote

Parameters: ON|OFF|1|0

Type: <boolean>

Default: ON

Description: Controls the display update setting of the system when in remote mode. When set to OFF, the MG3702xA does not update the front panel display.

Query Form: :DISPlay:REMote?

Example: :DISPlay:REMote OFF

Turns off the display update of the MG3702xA front panel data display.

3-8 :INITiate Subsystem

The :INITiate subsystem controls the state of the MG3702xA trigger system. The subsystem commands and parameters are described below. The :INITiate commands, along with the :ABORt and :TRIGger commands, comprise the Trigger Group of commands.

Table 3-5. :INITiate Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:INITiate	–		
[:IMMediate]	none		no query
:CONTinuous	<boolean>	ON OFF 1 0	

:INITiate[:IMMediate]

Parameters: none

Description: Places the MG3702xA trigger system into the armed state from the idle state.

Query Form: None

Example: :INITiate:IMMediate

Sets MG3702xA trigger to the armed state.

Associated

Commands: :ABORt and :TRIGger

Note

When :INITiate is received by the MG3702xA, all sweep-related parameters are checked for compatibility and bounds. The system will not arm if any errors exist.

:INITiate:CONTinuous

Parameters: ON|OFF|1|0

Type: <boolean>

Default: OFF

Description: Continuously rearms the MG3702xA trigger system after completion of a triggered sweep.

Query Form: :INITiate:CONTinuous?

Examples: :INITiate:CONTinuous ON

Sets MG3702xA trigger to continuously armed state.

Refer to [Section 3-21, “Programming Examples” on page 3-41](#) for more in-depth examples.

Associated

Commands: :ABORt and TRIGger

Note

:INITiate:CONTinuous ON has the same action as :INITiate:IMMediate plus it sets an internal flag that causes the trigger system to rearm after completing a triggered action.

If :TRIGger:SOURce IMMediate, :INITiate will start a sweep if one is not already in progress. In this case, to abort and restart a sweep, send :ABORt;:INITiate.

3-9 :OUTPut Subsystem

The :OUTPut subsystem controls the MG3702xA RF output power. The commands are used to turn the RF output power on/off and to set the state of the RF output power during frequency changes in CW and step sweep modes and during sweep retrace.

Table 3-6. :OUTPut Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:OUTPut	—		
[:STATe]	<boolean>	ON OFF 1 0	
:PROTection	<boolean>	ON OFF 1 0	

:OUTPut [:STATe]

Parameters: ON | OFF | 1 | 0

Type: <boolean>

Default: ON (see note below)

Description: Turns MG3702xA RF output power on/off.

Query Form: :OUTPut [:STATe] ?

Example: :OUTPut :STATe ON

Turns MG3702xA RF output power on.

Note

The SCPI programming mode reset default for RF output power state is indicated as follows:

:SYSTEM:PRESet[1] — Default RF state is defined by the selected Preset file.
Default = ON or User defined.

:SYSTEM:PRESet2 — Default RF state is defined by the reset state configuration.

:SYSTEM:PRESet3 — Default RF state is user defined by the specified user file.

:SYSTEM:PRESet4 — Default RF state is ON.

*RST — Default RF state is OFF.

Refer to the MG3702xA Operation Manual for information on Preset configurations.

:OUTPut:PROTection

Parameters: ON | OFF | 1 | 0

Type: <boolean>

Default: ON

Description: ON causes the MG3702xA RF output to be turned off (blanked) during frequency changes. OFF leaves RF output turned on (unblanked).

Query Form: :OUTPut:PROTection?

Example: :OUTPut:PROTection OFF

Causes the MG3702xA RF output signal to be left on during frequency changes.

:OUTPut:PROTection?

Requests the currently programmed state of the MG3702xA RF output during frequency changes.

3-10 [:SOURce]:FREQUENCY Subsystem

The [:SOURce]:FREQUENCY command and its subcommands make up the Frequency subsystem within the :SOURce subsystem. These commands control the frequency characteristics of the MG3702xA.

Table 3-7. [:SOURce]:FREQUENCY Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:FREQUENCY	–		
[:CW :FIXed]	<nv>	frequency (in Hz) MIN MAX	
:MODE	<char>	CW FIXed SWEep[1] SWCW LIST	
:START	<nv>	frequency (in Hz) MIN	
:STOP	<nv>	frequency (in Hz) MAX	

[:SOURce] :FREQUENCY [:CW | :FIXed]

Parameters: frequency (in Hz) | MIN | MAX

Type: <nv>

Range: MIN to MAX (see notes below)

Default: 3 GHz

Description: Sets the RF output frequency of the MG3702xA to the value entered.

Query Form: [:SOURce] :FREQUENCY [:CW] ?

Examples: :SOURce:FREQUENCY:CW 3GHz or :FREQ 3GHz

Sets the RF output frequency to 3 GHz.

:SOURce:FREQUENCY:CW?

Requests the current value of the frequency parameter.

Keywords :CW and :FIXed are equivalent and may be used interchangeably; they are also optional and may be omitted.

Note

MIN ≤ frequency ≤ MAX; values for the MINimum and MAXimum frequencies for each MG3702xA model are option dependent. Refer to the MG3702xA technical datasheet, 11410-00429.

The query [:SOURce]:FREQUENCY:CW? MAX returns the upper frequency to which the particular model MG3702xA may be programmed. Similarly, the query [:SOURce]:FREQUENCY:CW? MIN returns the lower frequency limit.

[:SOURce] :FREQuency :MODE

Parameters: CW | FIXEd | SWEep[1] | SWCW | LIST

Type: <char>

Default: CW

Description: Specifies which command subsystem controls the MG3702xA frequency, as follows:

CW | FIXEd = [:SOURce]:FREQuency:CW | FIXEd

SWEep[1] = [:SOURce]:SWEep[1] (see notes)

SWCW = (see notes)

LIST = [:SOURce]:LIST (see notes)

:SWEep and :SWEep1 may be used interchangeably.

Query Form: [:SOURce] :FREQuency :MODE?

Examples: :SOURce :FREQuency :MODE CW

Specifies that the MG3702xA RF frequency output is to be controlled by [:SOURce]:FREQuency:CW | FIXEd commands.

:SOURce :FREQuency :MODE?

Requests the currently selected programming mode for frequency control.

Note

In SWEep[1] mode, frequency will be determined by programmed values for the :START and :STOP :FREQuency subsystem commands.

In LIST mode, frequency is determined by programmed values for :LIST:FREQuency.

Setting FIXEd returns CW upon query.

Setting SWCW sets CW and turns on CW Ramp, the same as the command statement :FREQuency:MODE CW;:CONTRol:RAMP ON. A query returns CW.

[:SOURce] :FREQuency :START

Parameters: frequency (in Hz) | MIN

Type: <nv>

Range: MIN to MAX (see notes)

Default: MIN

Description: Sets the start frequency for SWEep[1] to the value entered. (MIN is defined in the notes under [:SOURce]:FREQuency:CW | FIXEd).

Query Form: [:SOURce] :FREQuency :START?

Examples: :SOURce :FREQuency :START 2.5GHz

Sets the start frequency for SWEep[1] to 2.5 GHz.

:SOURce :FREQuency :START?

Requests the current value for SWEep[1] start frequency.

Note

Stepped Sweep Start Range = MIN to MAX where: MAX = MAX – 2 × minimum frequency step size

[:SOURce] :FREQuency :STOP

Parameters: frequency (in Hz) | MAX

Type: <nv>

Range: MIN to MAX (see notes)

Default: MAX

Description: Sets stop frequency for SWEep[1] to the value entered.
(MAX is defined in the notes under [:SOURce]:FREQuency:CW | FIXed).

Query Form: [:SOURce] :FREQuency :STOP?

Examples: :SOURce :FREQuency :STOP 15GHz

Sets the stop frequency (for SWEep[1] to 15 GHz.

:SOURce :FREQuency :STOP?

Requests the current value for SWEep[1] stop frequency.

Note Stepped Sweep Stop Range = MIN to MAX where MIN = MIN + 2 × minimum frequency step size

3-11 [:SOURce]:LIST Subsystem

The [:SOURce]:LIST command and its subcommands make up the List subsystem within the :SOURce subsystem. These commands control the list sweep functions of the MG3702xA.

Table 3-8. [:SOURce]:LIST Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:LIST	–		
:INDEX	<nv>	List index number MIN MAX	
:FREQUENCY	<nv>, <nv>	frequency (in Hz) MIN MAX	
:POINTS?	<NR1>	number of maximum points possible	query only
:MODE	<char>	AUTO MANual	
:POWER	<nv>, <nv>	power level (in dBm) MIN MAX	
:POINTS?	<NR1>	number of maximum points possible	query only
:DWEll	<nv>	dwelL time (in seconds) MIN MAX	
:START	<nv>	List index number MIN MAX	
:STOP	<nv>	List index number MIN MAX	
:Type	<char>	FREQUENCY FLEVel	

[:SOURce] :LIST :INDEX

Parameters: List index number | MIN | MAX

Type: <nv>

Range: 0 to 10000; MIN = 0; MAX= 10000

Default: 0

Description: Sets the index number of the list to the entered value.

Query Form: [:SOURce] :LIST :INDEX?

Examples: :SOURce:LIST:INDEX 122

Sets the list index number to 122.

:SOURce:LIST:INDEX?

Requests the currently programmed index value for the list.

[:SOURCE] :LIST:FREQUENCY

Parameter: frequency (in Hz) | MIN | MAX

Type: <nv>, <nv>

Range: MIN to MAX (see notes below)

Default: 3 GHz

Description: Sets the list frequencies of the list starting at the list index specified by :LIST:INDEX or at list index 0 if no list index is specified. Any number of frequencies can follow this command.

Query Form: [:SOURCE] :LIST:FREQUENCY?

Examples: :SOURCE:LIST:INDEX 122
:SOURCE:LIST:FREQUENCY 8GHz, 3.1GHz, 11GHz

Sets the list index to 122, then sets the frequency of list index 122 to 8 GHz, list index 123 to 3.1 GHz, and list index 124 to 11 GHz.

[:SOURCE] :LIST:INDEX 1235
[:SOURCE] :LIST:FREQUENCY?

Requests the frequency set at list index 1235.

Note MIN ≤ frequency ≤ MAX; values for the MINimum and MAXimum frequencies for each MG3702xA model are option dependent. Refer to the MG3702xA technical datasheet, 11410-00429.

[:SOURCE] :LIST:FREQUENCY:POINTS?

Return Parameters: number of frequency points

Type: <nv>

Description: Queries the maximum number of frequency points in the list. The maximum number of points is 10001 and is not settable.

Example: :SOURCE:LIST:FREQUENCY:POINTS?

[:SOURCE] :LIST:MODE

Parameters: AUTO | MANUal

Type: <char>

Description: Sets the triggering mode for a list sweep.

AUTO uses the triggering mode set by the TRIGGER:SOURCE command.

MANUal sets manual triggering mode (ignores the TRIG:SOURCE value).

Query Form: [:SOURCE] :LIST:MODE?

Examples: :SOURCE:LIST:MODE MANUal

Sets the list triggering mode to manual.

:SOURCE:LIST:MODE?

Requests the currently programmed list triggering mode.

[:SOURCE] :LIST :POWER

Parameters: power level (in dBm) | MIN | MAX

Type: <nv>, <nv>

Range: MIN to MAX (see notes below)

Default: 0 dBm

Description: Sets the list power levels of the list starting at the list index specified by :LIST:INDEX or at list index 0 if no list index is specified.

Query Form: [:SOURCE] :LIST :POWER?

Examples: :SOURCE:LIST:INDEX 122
:SOURCE:LIST:POWER 2dBm, 9dBm, 3dBm

Sets the list index to 122, then sets the power level of list index 122 to 2 dBm, list index 123 to 9 dBm, and list index 124 to 3 dBm.

:SOURCE:LIST:INDEX 1235
:SOURCE:LIST:POWER?

Requests the power level set at list index 1235.

Note

MIN ≤ power level ≤ MAX; values for MINimum and MAXimum power levels for each MG3702xA model are option dependent. Refer to the MG3702xA technical datasheet, 11410-00429.

[:SOURCE] :LIST :POWER :POINTS?

Return Parameters: number of power level points

Type: <NR1>

Description: Queries the maximum number of power level points in the list. The maximum number of points is 10001 and is not settable.

Example: :SOURCE:LIST:POWER:POINTS?

[:SOURCE] :LIST :DWELL

Parameters: dwell time (in seconds) | MIN | MAX

Type: <nv>

Range: 50 μs to 30 s

Default: 10 ms

Description: Sets the dwell time for each step in a sweep of the list to the value entered.

Query Form: [:SOURCE] :LIST :DWELL?

Examples: :SOURCE:LIST:DWELL 30ms

Sets the dwell time for each step in a sweep of the list to 30 ms.

:SOURCE:LIST:DWELL?

Requests the currently programmed value for the list sweep step dwell time.

[:SOURCE] :LIST :START

Parameters: List index number | MIN | MAX

Type: <nv>

Range: 0 to 10000; MIN = 0; MAX = 10000

Default: 0

Description: Sets list start index for a sweep of the list to the value entered.

Query Form: [:SOURCE] :LIST :START ?

Examples: :SOURCE :LIST :START 85

Sets the list start index for a sweep of the list to 85.

:SOURCE :LIST :START ?

Requests the currently programmed value for the list start index for a sweep of the list.

[:SOURCE] :LIST :STOP

Parameters: List index number | MIN | MAX

Type: <nv>

Range: 0 to 10000; MIN = 0; MAX = 10000

Default: 10000

Description: Sets list stop index for a sweep of the list to the value entered.

Query Form: [:SOURCE] :LIST :STOP ?

Examples: :SOURCE :LIST :STOP 1035

Sets the list stop index for a sweep of the list to 1035.

:SOURCE :LIST :STOP ?

Requests the currently programmed value for the list stop index for a sweep of the list.

[:SOURCE] :LIST :TYPE

Parameters: FREQUENCY | FLEVEL

Type: <char>

Description: Sets the list type to either frequency or frequency and level.

FREQUENCY list type uses a frequency only list with a constant power level.

FLEVEL uses a frequency and level pair list. Each index of the list must be programmed with the desired frequency and power.

Query Form: [:SOURCE] :LIST :TYPE ?

Examples: :SOURCE :LIST :TYPE FLEVEL

Sets the list type to frequency and level.

:SOURCE :LIST :TYPE ?

Requests the currently programmed list type.

3-12 [:SOURce]:PHASe Subsystem

The [:SOURce]:PHASe subsystem and commands control the phase offset characteristics of the MG3702xA.

Table 3-9. [:SOURce]:FREQuency Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:PHASe	–		
[:ADJust]	<arg>	DEG	
:DISPlay	<boolean>	ON OFF 1 0	
:REFeRence	none		no query

[:SOURce]:PHASe[:ADJust]

Parameters: offset value (in degrees)

Type: <arg>

Range: –360.0 DEG to 360.0 DEG

Default: 0.0 DEG

Description: Sets the RF output phase offset of the MG3702xA to the value entered. The phase offset parameter is a relative value compared to the current reference point.

Query Form: :PHASe[:ADJust]?

Examples: :PHASe[:ADJust] 180.5 DEG

Sets the RF output phase offset to 180.5°.

:PHASe[:ADJust]?

Requests the current value of the phase offset parameter.

[:SOURce]:PHASe:DISPlay

Parameters: ON|OFF|1|0

Type: <boolean>

Default: OFF

Description: Sets the phase offset parameter display on the CW menu on or off.

Query Form: :PHASe:DISPlay?

Examples: :PHASe:DISPlay ON

Sets the phase offset display to On.

:PHASe:DISPlay?

Requests the current phase offset display setting. Returns 0 or 1, depending on the current setting.

[:SOURce]:PHASe:REFeRence

Parameters: None

Description: This command is an event that sets the current phase offset reference point and display value of the MG3702xA to 0.0°.

Examples: :PHASe:REFeRence

Sets the current phase offset reference point and display value to 0.0°.

3-13 [:SOURce]:POWer Subsystem

The [:SOURce]:POWer commands control the RF power output level of the MG3702xA.

Table 3-10. [:SOURce]: POWer Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:POWer	–		
[:LEVel]	–		
[:IMMediate]	–		
[:AMPLitude]	<nv>	power level (in dBm) UP DOWN MIN MAX	
:ALC	–		
:SOURce	<char>	INTernal FIXed	
:ATTenuation	<nv>	attenuation (in dB) UP DOWN MIN MAX	
:AUTO	<boolean>	ON OFF 1 0	
:DISPlay	–		
:OFFSet	<NRf>	power level display offset (in dB)	
:STATe	<boolean>	ON OFF 1 0	

[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]

Parameters: power level (in dBm) | MIN | MAX

Type: <nv>

Range: MIN to MAX (see notes below)

Default: 0 dBm

Description: Sets the power level of the unswept RF output signal (see notes below).

Query Form: [:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]?

Examples: :SOURce:POWer:LEVel:IMMediate:AMPLitude 10dBm

Sets the RF output power level to +10 dBm.

:SOURce:POWer:LEVel:IMMediate:AMPLitude?

Requests the value currently programmed for the RF output power level.

:SOURce:POWer? MAX

Requests the maximum RF output power level value that can be programmed for the particular MG3702xA model.

Note

The MINimum and MAXimum RF output power levels that can be entered for each MG3702xA model are option dependent. Refer to the MG3702xA technical datasheet, 11410-00429. Note that these power levels are the limits of what can be entered, but do not guarantee leveled operation.

For units equipped with an attenuator (Option 2), changes in RF power output level >10 dB may change the attenuator setting (see the command [:SOURce]:POWer:ATTenuation:AUTO).

Use the related command :OUTPut[:STATe] ON|OFF to turn the MG3702xA RF power output on or off.

[:SOURce]:POWER:ALC:SOURce

Parameters: INTERNAL | FIXED

Type: <char>

Default: INTERNAL

Description: Selects whether the internal ALC loop controls the output power level.

FIXed places the instrument in a fixed gain power level mode (ALC off). RF output power is unlevelled; use the [:SOURce]:POWER[:LEVel][:IMMediate][:AMPLitude] command to set the output power to the desired level.

INTERNAL specifies the ALC feedback signal from the instrument's internal level detector.

Query Form: [:SOURce]:POWER:ALC:SOURce?

Examples: :SOURce:POWER:ALC:SOURce **FIXed**

Selects fixed gain level control.

:SOURce:POWER:ALC:SOURce?

Requests the currently programmed source of the feedback signal for the ALC.

[:SOURce]:POWER:ATTenuation

Parameters: attenuation (in dB) | UP | DOWN | MIN | MAX

Type: <nv>

Range: 0 to 110 dB

Default: 0 dB

Description: This command applies only to MG3702xAs equipped with an internal step attenuator (Option 2). This command sets the step attenuator (in 10 dB increments) throughout its range. This command decouples the step attenuator from the automatic leveling control (ALC) system (see the command :POWER:ATTenuation:AUTO OFF).

Query Form: [:SOURce]:POWER:ATTenuation?

Examples: :SOURce:POWER:ATTenuation 90

Sets the step attenuator setting to 90 dB.

:SOURce:POWER:ATTenuation?

Requests the currently programmed value for the step attenuator setting.

Note

Values entered for the <dB> parameter must be exact multiples of 10 db. Parameters UP and DOWN can be used to increase/decrease the step attenuator setting in 10 dB steps. MIN = 0dB attenuation, MAX = 90 dB attenuation.

[:SOURCE] :POWER :ATTenuation :AUTO

Parameters: ON | OFF | 1 | 0

Type: < boolean >

Default: ON

Description: This command applies only to MG3702xAs equipped with an internal step attenuator (Option 2). Setting to ON couples the step attenuator to the ALC system; setting to OFF decouples the step attenuator from the ALC system.

Query Form: [:SOURCE] :POWER :ATTenuation :AUTO?

Examples: :SOURCE :POWER :ATTenuation :AUTO ON

Couple the step attenuator to the ALC system.

:SOURCE :POWER :ATTenuation :AUTO?

Requests the currently programmed coupling state for the step attenuator.

Note

In MG3702xAs without a step attenuator, this command's value is always OFF.

Automatic attenuator coupling does not work in the fixed gain leveling mode:

:SOURCE :POWER :ALC :SOURCE FIXed

Leveling must be set to internal leveling mode for automatic attenuator coupling:

:SOURCE :POWER :ALC :SOURCE INTernal

[:SOURCE] :POWER :DISPlay :OFFSet

Parameters: power level display offset (in dB)

Type: < NRf >

Range: -200.00 dB to +200.00 dB

Default: 0 dB

Description: Sets the offset value for the power level display offset function (see :POWER :DISPlay :OFFSet :STATe).

Query Form: [:SOURCE] :POWER :DISPlay :OFFSet?

Examples: :SOURCE :POWER :DISPlay :OFFSet 3dB

Sets the power level display offset value to +3 dB.

:SOURCE :POWER :DISPlay :OFFSet?

Requests the current power level display offset value.

[:SOURCE]:POWER:DISPLAY:OFFSET:STATE

Parameters: ON|OFF|1|0

Type: <boolean>

Default: OFF

Description: Turns the power level display offset function on/off. When the function is turned on, the offset value, set by the command :POWER:DISPLAY:OFFSET <arg>, is added to the displayed RF output power level. A negative offset value decreases the displayed power level.

Query Form: [:SOURCE]:POWER:DISPLAY:OFFSET:STATE?

Examples: :SOURCE:POWER:DISPLAY:OFFSET:STATE ON

Turns on the power level display offset function.

:SOURCE:POWER:DISPLAY:OFFSET:STATE?

Requests the current state of the power level display offset function.

3-14 [:SOURce]:PULM Subsystem

The [:SOURce]:PULM command and its subcommands make up the Pulse Modulation subsystem within the :SOURce subsystem. These commands control the pulse modulation function of the MG3702xA.

Table 3-11. [:SOURce]:PULM Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:PULM	–		
:INTernal	–		
:FREQuency	<NRf>	frequency (in Hz)	
:POLarity	<char>	NORMAL INVerted	
:SOURce	<char>	INTernal EXTernal	
:STATe	<boolean>	ON OFF 1 0	

[:SOURce] :PULM :INTernal :FREQuency

Parameters: frequency (in Hz)

Type: <NRf>

Range: 0.1 Hz to 33.333 MHz

Default: 100 kHz

Description: Sets the pulse repetition frequency (PRF) of the internal pulse generator to the value entered.

Query Form: [:SOURce] :PULM :INTernal :FREQuency?

Examples: :SOURce :PULM :INTernal :FREQuency 50kHz

Sets the internal PRF to 50 kHz.

:SOURce :PULM :INTernal :FREQuency?

Requests the value currently programmed for the internal PRF.

[:SOURce] :PULM :POLarity

Parameters: NORMAL | INVerted

Type: <char>

Default: NORMAL

Description: Selects the polarity of the signal that turns the RF on during pulse modulation, as follows:

NORMAL specifies positive-true operation; a TTL-high level will turn on the RF output signal

INVerted specifies negative-true operation; a TTL-low level will turn on the RF output signal

Query Form: [:SOURce] :PULM :POLarity?

Examples: :SOURce :PULM :POLarity INVerted

Selects a negative true (TTL-low level) signal to turn the RF on during pulse modulation.

[:SOURce] :PULM :POLarity?

Requests the currently programmed signal polarity that will turn the RF on during pulse modulation.

[:SOURCE] :PULM :SOURCE

Parameters: INTernal | EXTernal

Type: <char>

Default: INTernal

Description: Selects the pulse modulation signal source, as follows:
INTernal selects the signal from the internal pulse generator
EXTernal selects the rear panel external pulse input

Query Form: [:SOURCE] :PULM :SOURCE?

Examples: :SOURCE:PULM:SOURCE EXTernal

Selects the rear panel pulse input as the pulse modulation signal source.

:SOURCE:PULM:SOURCE?

Requests the currently programmed pulse modulation signal source.

[:SOURCE] :PULM :STATE

Parameters: ON | OFF | 1 | 0

Type: <boolean>

Default: ON

Description: Turns the MG3702xA pulse modulation function on/off.

Query Form: [:SOURCE] :PULM :STATE?

Examples: :SOURCE:PULM:STATE ON

Turns on the MG3702xA pulse modulation function.

:SOURCE:PULM:STATE?

Requests the currently programmed state of the pulse modulation function.

3-15 [:SOURce]:PULSe Subsystem

The [:SOURce]:PULSe command and its subcommands make up the Pulse subsystem within the [:SOURce] subsystem. These commands control the internal pulse generation function of the MG3702xA.

Table 3-12. [:SOURce]:PULSe Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:PULSe	–		
:COUNT	<NR1>	number of pulses	
:DELay[1 2 3 4]	<NRf>	pulse delay (in seconds)	
:PERiod	<NRf>	pulse period (in seconds)	
:WIDTh[1 2 3 4]	<NRf>	pulse width (in seconds)	

[:SOURce] :PULSe :COUNT

Parameters: number of pulses

Type: <NR1>

Range: 1 to 4

Default: 1

Description: Sets the number of pulses generated by the internal pulse generator for each period of the pulsed waveform.

Query Form: [:SOURce] :PULSe :COUNT?

Examples: :SOURce:PULSe:COUNT 2

Sets the number of pulses per pulse period to 2.

:SOURce:PULSe:COUNT?

Requests the currently programmed number of pulses per pulse period.

[:SOURce] :PULSe :DELay { 1 | 2 | 3 | 4 }

Parameters: Pulse delay (in seconds)

Type: <NRf>

Range: 0 to 10 s

Default: 0 s for delay 1 and 2.000 μ s for delay 2, 3, and 4.

Description: Sets the pulse delay for the selected pulse delay (n) to the value entered, where $n = 1 | 2 | 3 | 4$. The pulse Period, pulse Widths (W), and pulse Delays (D) must be set to conform as follows:

$$D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq \text{Period} - 20 \text{ ns.}$$

Query Form: [:SOURce] :PULSe :DELay [1 | 2 | 3 | 4]?

Examples: :SOURce:PULSe:DELay2 200US

Set the pulse 2 delay to 200 μ s.

:SOURce:PULSe:DELay3?

Requests the currently programmed pulse 3 delay.

[:SOURce]:PULSe:PERiod

Parameters: Pulse period (in seconds)

Type: <NRf>

Range: 30 ns to 10 s

Default: 10.000 μ s

Description: Sets the pulse period of the internal pulse generator to the value entered. The pulse period range is determined by the pulse generator clock rate. The pulse Period, pulse Widths (W), and pulse Delays (D) must be set to conform as follows:
 $D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq \text{Period} - 20 \text{ ns.}$

Query Form: [:SOURce]:PULSe:PERiod?

Examples: :SOURce:PULSe:PERiod 50MS

Set the pulse period to 50 ms.

:SOURce:PULSe:PERiod?

Requests the currently programmed pulse period.

[:SOURce]:PULSe:WIDTh{1 | 2 | 3 | 4}

Parameters: pulse width (in seconds)

Type: <NRf>

Range: 10 ns to 10 s

Default: 1.000 μ s

Description: Sets the pulse width for the selected pulse width (n) to the value entered, where $n = 1 | 2 | 3 | 4$. The pulse Period, pulse Widths (W), and pulse Delays (D) must be set to conform as follows:
 $D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq \text{Period} - 20 \text{ ns.}$

Query Form: [:SOURce]:PULSe:WIDTh[1 | 2 | 3 | 4]?

Examples: :SOURce:PULSe:WIDTh1 250US

Sets the width of pulse 1 to 250 μ s.

:SOURce:PULSe:WIDTh2?

Requests the currently programmed width of pulse 2.

3-16 [:SOURce]:ROSCillator Subsystem

The [:SOURce]:ROSCillator command and its subcommands comprise the Reference Oscillator subsystem within the [:SOURce] subsystem. These commands control the reference oscillator function of the MG3702xA.

Table 3-13. [:SOURce]:ROSCillator Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:ROSCillator	–		
:SOURce?	<char>	INT EXT	query only

[:SOURce]:ROSCillator:SOURce?

Return Parameters: INT|EXT

Type: <char>

Description: Returns the current setting for the reference oscillator source of the instrument.

Example: :SOURce:ROSCillator:SOURce?

Returns the current reference oscillator source setting.

3-17 [:SOURce]:SWEep Subsystem

The [:SOURce]:SWEep command and its subcommands comprise the Sweep subsystem within the :SOURce subsystem. These commands control the sweep function of the MG3702xA.

Table 3-14. [:SOURce]:SWEep Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
[:SOURce]	–		
:SWEep[1]	–		
:DWELl	<nv>	dwel time (in seconds) MIN MAX	
:GENeration	<char>	STEPped	
:POINTs	<nv>	number of points MIN MAX	
:FREQuency	–		
:STEP	<nv>	frequency (in Hz) MIN MAX	

[:SOURce] :SWEep [1] :DWELl

Parameters: dwell time (in seconds) | MIN | MAX

Type: <nv>

Range: 50 μ s to 30 s

Default: 10 ms

Description: Sets the dwell time for each step in a stepped frequency sweep to the value entered.

Query Form: [:SOURce] :SWEep [1] :DWELl ?

Examples: :SOURce :SWEep :DWELl 100ms

Sets the dwell time for each step in the sweep to 100 milliseconds.

:SOURce :SWEep :DWELl ?

Requests the currently programmed value for sweep step dwell time.

Note	:SWEep1 (or :SWEep) signifies frequency sweep. The value entered for dwell time cannot be less than :TIME / :POINTs. When encountered, the command :SWEep:DWELl <param> command sets :SWEep:DWELl:AUTO to off.
-------------	--

[:SOURce] :SWEep [1] :GENeration

Parameters: STEPped

Type: <char>

Default: STEPped

Description: Selects stepped frequency sweep.

Query Form: [:SOURce] :SWEep [1] :GENeration ?

Examples: :SOURce :SWEep :GENeration STEPped

Sets SWEep1 for stepped frequency sweep.

:SOURce :SWEep :GENeration ?

Requests the currently programmed frequency sweep mode.

Note	:SWEep1 (or :SWEep) signifies frequency sweep.
-------------	--

[:SOURce] :SWEep[1] :POINTs

Parameters: number of points | MIN | MAX

Type: <nv>

Range: 2 to 10,001 (MAXimum) for Stepped Frequency sweeps

Default: 10,001 for SWEep[1].

Description: Sets the number of points in each sweep in the stepped frequency sweep to the valued entered.

Query Form: [:SOURce] :SWEep[1] :POINTs?

Examples: :SOURce:SWEep:POINTs 500

Sets the number of points for SWEep1 to 500.

:SOURce:SWEep:POINTs?

Requests the currently programmed value for points/sweep of SWEep[1].

:SWEep1 (or :SWEep) signifies frequency sweep. :POINTs and :STEP are coupled values. Entering the value for one will cause the other to be recalculated, per the formula below:

Note :POINTs = (:SPAN / :STEP)+1

An execution error will be generated if the :POINTs value entered results in a step size of less than 0.001 Hz for a stepped frequency sweep.

[:SOURce] :SWEep[1] :FREQuency :STEP

Parameters: frequency (in Hz) | MIN | MAX

Type: <nv>

Range: See notes below.

Default: (MAX – MIN)/10,000

Description: Sets the step size for each step in SWEep[1] (frequency) linear stepped sweep to the value entered.

Query Form: [:SOURce] :SWEep[1] :FREQuency :STEP?

Examples: :SOURce:SWEep:FREQuency:STEP 5GHz

Sets the step size for each step in the linear stepped frequency sweep to 5 GHz.

:SOURce:SWEep:FREQuency:STEP?

Requests the currently programmed step size for each step in the linear stepped frequency sweep.

:SWEep1 (or :SWEep) signifies frequency sweep. :POINTs and :STEP are coupled values. Entering the value for one will cause the other to be recalculated; see notes under :SWEep:POINTs command.

Note The maximum frequency sweep step size is equal to the maximum frequency span for the particular MG3702xA model / (minimum points – 1). For the models with Option 4, the minimum step size is 0.001 Hz and the maximum step size is 19,990,000,000 Hz.

3-18 :STATus Subsystem

The :STATus subsystem controls the SCPI-defined status-reporting structures of the MG3702xA.

Table 3-15. :STATus Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:STATus	–		
:OPERation	–		
[:EVENT]?	<NR1>	event register contents	query only
:CONDition?	<NR1>	condition register contents	query only
:ENABle	<NRf>	mask	
:PTRansition	<NRf>	mask	
:NTRansition	<NRf>	mask	
:PRESet	none		no query
:QUEStionable	–		
[:EVENT]?	<NR1>	event register contents	query only
:CONDition?	<NR1>	condition register contents	query only
:ENABle	<NRf>	mask	
:FREQuency	–		
[:EVENT]?	<NR1>	event register contents	query only
:CONDition?	<NR1>	condition register contents	query only
:ENABle	<NRf>	mask	
:PTRansition	<NRf>	mask	
:NTRansition	<NRf>	mask	
:PTRansition	<NRf>	mask	
:NTRansition	<NRf>	mask	

:STATus:OPERation[:EVENT]?

Return Parameters: event register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Operation Event register. When executed, this command clears the Operation Event register.

Example: :STATus:OPERation:EVENT?

Requests that the contents of the Operation Event register be returned.

:STATus:OPERation:CONDition?

Return Parameters: condition register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Operation Condition register. When executed, this command does not clear the Operation Condition register.

Example: :STATus:OPERation:CONDition?

Requests that the contents of the Operation Condition register be returned.

:STATus:OPERation:ENABle

Parameters: mask

Type: <NRf>

Range: 0 to 32767 (bit 15 is always zero)

Default: 0 (all zeros)

Description: Sets the bits of the Operation Enable register associated with the Operation Event register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:OPERation:ENABle?

Examples: :STATus:OPERation:ENABle 8

Sets the MG3702xA Operation Enable register to a value of 8. (This will unmask the Sweeping status bit).

:STATus:OPERation:ENABle?

Requests the current value of the MG3702xA Operation Enable register.

:STATus:OPERation:PTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767 (bit 15 is always zero)

Default: 32767 (all ones)

Description: Sets the bits of the positive transition filter for the Operation Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:OPERation:PTRansition?

Examples: :STATus:OPERation:PTRansition 512

Sets the MG3702xA Positive Transition Filter for the Operation Condition register to a value of 512. When the filter detects a False to True transition in bit 9 of the Operation Condition register, indicating that MG3702xA self-test is in progress, bit 9 of the Operation Event register will be set to 1.

:STATus:OPERation:PTRansition?

Requests the current value of the MG3702xA Positive Transition Filter for the Operation Condition register.

:STATus:OPERation:NTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767 (bit 15 is always zero)

Default: 0 (all zeros)

Description: Sets the bits of the negative transition filter for the Operation Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:OPERation:NTRansition?

Examples: :STATus:OPERation:NTRansition 8

Sets the MG3702xA Negative Transition Filter for the Operation Condition register to a value of 8. When the filter detects a True to False transition in bit 3 of the Operation Condition register, indicating that the MG3702xA is finished sweeping, bit 3 of the Operation Event register will be set to 1.

:STATus:OPERation:PTRansition?

Requests the current value of the MG3702xA Negative Transition Filter for the Operation Condition register.

:STATus:PRESet

Parameters: None

Description: This command is an event that configures the SCPI and device-dependent status reporting structures so that device-dependent events are summarized and reported. This command performs the following functions:

Sets the Operation Enable register to all zeros.

Sets the Operation Positive Transition Filter to all ones.

Sets the Operation Negative Transition Filter to all zeros.

Sets the Questionable Enable Register to all zeros.

Sets the Questionable Positive Transition Filter to all ones.

Sets the Questionable Negative Transition Filter to all zeros.

Sets the Questionable Frequency PTR and Enable to 0x7FFE (32766). This keeps the unlocked bit from generating an event on the first frequency change and will only cause an event at the user's request.

Query Form: None

Example: :STATus:PRESet

Configure the status reporting structures for device-dependent event reporting.

:STATus:QUESTionable[:EVENT]?

Return Parameters: event register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Questionable Event register. When executed, this command clears the Questionable Event register.

Example: :STATus:QUESTionable:EVENT?

Requests that the contents of the Questionable Event register be returned.

:STATus:QUESTionable:CONDition?

Return Parameters: condition register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Questionable Condition register. When executed, this command does not clear the Questionable Condition register.

Example: :STATus:QUESTionable:CONDition?

Requests that the contents of the Questionable Condition register be returned.

:STATus:QUESTionable:ENABLE

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 0 (all zeros)

Description: Sets the bits of the Questionable Enable register associated with the Questionable Event register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:QUESTionable:ENABLE?

Examples: :STATus:QUESTionable:ENABLE 32

Sets the MG3702xA Questionable Enable register to a value of 32. (This will unmask the Lock Error or RF Unlocked status bit).

:STATus:QUESTionable:ENABLE?

Requests the current value of the MG3702xA Questionable Enable register.

:STATus:QUESTionable:FREQuency[:EVENT]?

Return Parameters: event register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Questionable Frequency Event register. When executed, this command clears the Questionable Frequency Event register.

Example: :STATus:QUESTionable:FREQuency:EVENT?

Requests that the contents of the Questionable Frequency Event register be returned.

:STATus:QUESTionable:FREQuency:CONDition?

Return Parameters: condition register contents

Type: <NR1>

Description: Returns the contents of the MG3702xA Questionable Frequency Condition register. When executed, this command does not clear the Questionable Frequency Condition register.

Example: :STATus:QUESTionable:FREQuency:CONDition?

Requests that the contents of the Questionable Frequency Condition register be returned.

:STATus:QUESTionable:FREQuency:ENABle

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 0 (all zeros)

Description: Sets the bits of the Questionable Frequency Enable register associated with the Questionable Frequency Event register to the binary weighted integer value specified by the mask parameter. The Questionable Frequency bits are:

bit 0 = Unlocked

bit 1 = Coarse Loop Lock Error

bit 2 = Output Loop Lock Error

Query Form: :STATus:QUESTionable:FREQuency:ENABle?

Examples: :STATus:QUESTionable:FREQuency:ENABle 6

Sets the MG3702xA Questionable Frequency Enable register to a value of 6. (This will unmask the Lock Error or RF Unlocked status bit).

:STATus:QUESTionable:FREQuency:ENABle?

Requests the current value of the MG3702xA Questionable Frequency Enable register.

:STATus:QUESTionable:FREQuency:PTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 32766

Description: Sets the bits of the positive transition filter for the Questionable Frequency Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:QUESTionable:FREQuency:PTRansition?

Examples: :STATus:QUESTionable:FREQuency:PTRansition 1

Sets the MG3702xA Positive Transition Filter for the Questionable Frequency Condition register to a value of 1. When the filter detects a False to True transition in bit 0 of the Questionable Frequency Condition register, indicating that the MG3702xA goes unlocked, bit 0 of the Questionable Frequency Event register will be set to 1.

:STATus:QUESTionable:FREQuency:PTRansition?

Requests the current value of the MG3702xA Positive Transition Filter for the Questionable Frequency Condition register.

:STATus:QUESTionable:FREQuency:NTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 0 (all zeros)

Description: Sets the bits of the negative transition filter for the Questionable Frequency Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:QUESTionable:FREQuency:NTRansition?

Examples: :STATus:QUESTionable:FREQuency:NTRansition 1

Sets the MG3702xA Negative Transition Filter for the Questionable Frequency Condition register to a value of 1. When the filter detects a True to False transition in bit 0 of the Questionable Frequency Condition register, indicating that the MG3702xA is no longer unlocked, bit 0 of the Questionable Frequency Event register will be set to 1.

:STATus:QUESTionable:FREQuency:PTRansition?

Requests the current value of the MG3702xA Negative Transition Filter for the Questionable Frequency Condition register.

:STATus:QUESTionable:PTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 32767 (all ones)

Description: Sets the bits of the positive transition filter for the Questionable Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:QUESTionable:PTRansition?

Examples: :STATus:QUESTionable:PTRansition 512

Sets the MG3702xA Positive Transition Filter for the Questionable Condition register to a value of 512. When the filter detects a False to True transition in bit 9 of the Questionable Condition register, indicating that MG3702xA self test failed, bit 9 of the Questionable Event register will be set to 1.

:STATus:QUESTionable:PTRansition

Requests the current value of the MG3702xA Positive Transition Filter for the Questionable Condition register.

:STATus:QUESTionable:NTRansition

Parameters: mask

Type: <NRf>

Range: 0 to 32767

Default: 0 (all zeros)

Description: Sets the bits of the negative transition filter for the Questionable Condition register to the binary weighted integer value specified by the mask parameter.

Query Form: :STATus:QUESTionable:NTRansition?

Examples: :STATus:QUESTionable:NTRansition 8

Sets the MG3702xA Negative Transition Filter for the Questionable Condition register to a value of 8. When the filter detects a True to False transition in bit 3 of the Questionable Condition register, indicating that the RF is no longer unlevelled, bit 3 of the Questionable Event register will be set to 1.

:STATus:QUESTionable:PTRansition?

Requests the current value of the MG3702xA Negative Transition Filter for the Questionable Condition register.

3-19 :SYSTem Subsystem

The :SYSTem subsystem commands are used to implement functions that are not related to MG3702xA performance.

Table 3-16. :SYSTem Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:SYSTem	–		
:COMMunicate	–		
:GPIB	–		
[:SELF]	–		
:ADDRess	<nv>	GPIB address	
:ERRor	–		
[NEXT]?	<nv>		query only
:PON	–		
:TYPE	<char>	LAST or PRESet	
:PRESet[1]	none		no query
:PRESet2	none		no query
:PRESet3	none		no query
:PRESet4	none		no query
:PRESet	none		no query
RF	<boolean>	ON OFF 1 0	
TYPE	<char>	Default or USER	
:VERSion?	none		query only

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

Parameters: GPIB address

Type: <nv>

Range: 0 to 30

Default: 5

Description: Sets the MG3702xA GPIB address.

Query Form: :SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

Example: :SYSTem:COMMunicate:GPIB[:SELF]:ADDRess 6

Sets the MG3702xA GPIB address to six.

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

Returns the current GPIB address.

:SYSTEM:ERROR[:NEXT]?

Return Parameters: Integer error number

Type: <nv>

Description: The :SYSTEM:ERROR[:NEXT]? query command is a request for the next entry in the instrument's error queue. Error messages in the queue contain an integer in the range [-32768, 32768] denoting an error code and associated descriptive text. Refer to [Chapter 4, "Error Messages"](#) for more information about error messages and a list of possible returned error integers.

Example: :SYSTEM:ERROR:NEXT?

Requests the next entry in the instrument's error queue.

Note	*CLS will clear the error queue.
-------------	----------------------------------

:SYSTEM:PON:TYPE

Parameters: LAST or PRESet

Type: <char>

Description: This is the power on preset of the MG3702xA parameters. This is the same as pressing the instrument front panel **Preset** button.

This command has one parameter, set as either LAST or PRESet.

LAST = At power on the instrument setup will be read from the setup file that was saved at the previous power down.

PRESet = At power on the instrument setup is controlled by the preset type setting, either default or user.

The preset settings are changed via the system configuration (Default or User as is described in the operation manual).

Query Form: :SYSTEM:PON:TYPE?

Example: :SYSTEM:PON:TYPE LAST

Sets all user programmable MG3702xA parameters at power will be read from the setup file that was saved at the previous power down.

:SYSTEM:PRESet{1}

Parameters: None

Description: Sets user programmable MG3702xA parameters to the preset state that is currently configured in the instrument. This is the same as pressing the instrument front panel **Preset** button; the instrument response depends on the preset settings of the instrument. The preset settings are changed via the system configuration (Default or User as is described in the operation manual).

Query Form: None

Example: :SYSTEM:PRESet

Sets all user programmable MG3702xA parameters to the preset state that is currently configured in the instrument (Default or User as is described in the operation manual).

:SYSTEM:PRESet2

Parameters: None

Description: This command presets the MG3702xA to the default preset setup.

Query Form: None

Example: :SYSTEM:PRESet2

Sets all user programmable MG3702xA parameters to the factory default values.

:SYSTEM:PRESet3

Parameters: <filename>

Type: <arg>

Description: This command presets the MG3702xA to the specified user preset setup. The filename must exist or an execution error results.

Query Form: None

Example: :SYSTEM:PRESet3 user1

Sets all user programmable MG3702xA parameters to the specified user preset values.

:SYSTEM:PRESet4

Parameters: None

Description: This command issues a master reset of the MG3702xA. A master reset performs a default preset and defaults additional items that survive a preset or *RST. The current list is:

- GPIB address setting
- Master Reset GPIB address setting
- Remote display updates setting
- Power on setup settings
- Preset setup settings
- Preset user filename
- RF preset state

Query Form: None

Example: :SYSTEM:PRESet4

Sets all user programmable MG3702xA parameters to the master reset values.

:SYSTEM:PRESet:RF

Parameters: ON|OFF|1|0

Type: <boolean>

Description: This command has one parameter, either 0 or OFF or 1 or ON.

0 = A default preset will come up with RF off.

1 = A default preset will come up with RF on.

Query Form: :SYSTEM:PRESet:RF?

Example: :SYSTEM:PRESet:RF 1

A default preset will come up with RF on.

Note This applies only when the preset type is default.
--

:SYSTEM:PRESet:TYPE

Parameters: DEFault or USER

Type: <char>

Description: This command has one parameter, either DEFault or USER.

DEFault means that on a front panel preset (or remote preset1) the instrument setup will use default settings.

USER means the instrument setup will be set to the current user defined preset setup.

Query Form: :SYSTEM:PRESet:TYPE?

Example: :SYSTEM:PRESet:TYPE USER

The instrument setup will be set to the current user defined preset.

:SYSTEM:PRESet:TYPE?

Requests the current preset type.

:SYSTEM:VERSion?

Return Parameters: SCPI version

Description: Returns the SCPI version number that the instrument software complies with.

Example: :SYSTEM:VERSion?

Requests the SCPI version number that the instrument software complies with.
For example, 1999.0

Note

The query response shall have the form YYYY.V where "YYYY" represent the year-version (for example, 1999) and "V" represents the approved revision number for that year.

3-20 :TRIGger Subsystem

The :TRIGger subsystem commands are used to control the sweep triggering functions of the MG3702xA. The :TRIGger command, along with the :ABORT and :INITiate commands, comprise the Trigger Group of commands.

Table 3-17. [:SOURce]:TRIGger Subsystem

Keyword	Parameter Form	Character Data or Units	Notes
:TRIGger	–		
[:IMMediate]	none		no query
:SOURce	<char>	BUS IMMediate HOLD EXTernal	
:SEQuence3	–		
:SLOPe	<char>	POSitive NEGative	
:TYPE	<char>	FREerun GATed TRIGgered	

:TRIGger[:IMMediate]

Parameters: None

Description: Causes the previously selected sweep to be triggered immediately if the trigger system is in an armed state due to a previous :INITiate:IMMediate command.

Query Form: None

Example: :TRIGger:IMMediate

Triggers selected sweep immediately if MG3702xA is in trigger armed state.

Associated

Commands: :ABORT and :INITiate

:TRIGger :SOURce

Parameters: BUS | IMMediate | HOLD | EXTernal

Type: <char>

Default: BUS

Description: Selects the trigger source for the previously selected sweep as follows:

BUS The source is the Group Execute Trigger command from the GPIB. The trigger will occur when either a <GET> or *TRG command is received.

IMMediate The trigger signal is always true.

HOLD Do not trigger on any sweep.

EXTernal The source is set to the rear panel trigger input.

Query Form: :TRIGger:SOURce?

Examples: :TRIGger:SOURce IMMediate

Selects the trigger signal to be true.

:TRIGger:SOURce?

Requests the currently programmed sweep trigger source.

Note

Only one trigger source can be specified at a time, and all others will be ignored. Sending :TRIGger:SOURce IMM;INITiate:CONTinuous ON places the selected sweep in auto trigger mode.

:TRIGger:SEQuence3:SLOPe

Parameters: POSitive | NEGative

Type: <char>

Default: POSitive

Description: Selects whether the internal pulse generator is triggered on the rising edge (POSitive) or falling edge (NEGative) of the external trigger signal.

Query Form: :TRIGger:SEQuence3:SLOPe?

Example: :TRIGger:SEQuence3:SLOPe NEGative

Select triggering of the internal pulse generator on the falling edge of the external trigger signal.

Note

:SEQuence3 is the trigger sequence for the internal pulse generation function of the MG3702xA (see the [:SOURce]:PULSe subsystem commands). The command :TRIGger:SEQuence3:SLOPe POSitive|NEGative only affects the triggering of the internal pulse generator when :TRIGger:SEQuence3:TYPE is set to GATed, or TRIGgered.

:TRIGger:SEQuence3:TYPE

Parameters: FREerun | GATed | TRIGgered

Type: <char>

Default: FREerun

Description: Selects the mode of triggering the internal pulse generator. The selections are:
 FREerun – the pulse generator produces pulses at the internal PRF.
 GATed – an external pulse gates the internal pulse generator on and off. When gated on, the pulse generator produces a single pulse at the internal PRF.
 TRIGgered – the pulse generator is triggered by an external trigger signal to produce pulses.

Query Form: :TRIGger:SEQuence3:TYPE?

Example: :TRIGger:SEQuence3:TYPE TRIGgered

Selects triggering of the pulse generator by an external trigger signal.

Note

Only one mode of triggering can be specified at a time and all others will be ignored. The :GATed triggering mode is available in single pulse ([:SOURce]:PULSe:COUNT 1) mode only.

3-21 Programming Examples

The following examples provide sample C# source code that set up both a manually bus triggered single sweep and an automatic continuous sweep of the MG3702xA instrument through GPIB control.

Bus Triggered Sweep Example

```
//*****
private void BusTriggerSweepButton_Click(object sender, EventArgs e)
{
    String UsbResourceName = "USB0::0x0B5B::0xFFE0::012345::INSTR";
    String TcpIpResourceName = "TCPIP0::192.168.1.105::inst0::INSTR";
    String GpibResourceName = "GPIB1::5::INSTR";
    NationalInstruments.VisaNS.MessageBasedSession mbSession = null;
    try
    {
        mbSession =
            (MessageBasedSession)ResourceManager.GetLocalManager().Open(GpibResourceName);
        mbSession.Write("TRIGger:SOURce BUS");
        mbSession.Write("INITiate:CONTinuous OFF");
        mbSession.Write("FREQuency:MODE SWEEp1");
        mbSession.Write("FREQuency:STARt 3 GHz");
        mbSession.Write("FREQuency:STOP 4 GHz");
        mbSession.Write("SWEep1:POINts 101");
        mbSession.Write("SWEep1:DWELl 1 ms");
        for(int i = 0; i < 100; i++)
        {
            mbSession.Write("INITiate");
            mbSession.Write("*TRG");
            // Wait for end of sweep.
            // Hard coding >100ms delay for this sweep setup.
            // Could use sweeping status bit instead.
            Thread.Sleep(200);
        }
    }
    catch (Exception ex)
    {
        MessageBox.Show(ex.Message);
    }
    finally
    {
        if (mbSession != null)
        {
            mbSession.Dispose();
        }
    }
}
//*****
```

Auto Trigger Sweep Example

```
//*****
private void AutoTriggerSweepButton_Click(object sender, EventArgs e)
{
    String UsbResourceName = "USB0::0x0B5B::0xFFE0::012345::INSTR";
    String TcpIpResourceName = "TCPIP0::192.168.1.105::inst0::INSTR";
    String GpibResourceName = "GPIB1::5::INSTR";
    NationalInstruments.VisaNS.MessageBasedSession mbSession = null;

    try
    {
        mbSession =
            (MessageBasedSession)ResourceManager.GetLocalManager().Open(GpibResourceName);
        mbSession.Write("INITiate:CONTinuous OFF");
        mbSession.Write("TRIGger:SOURce IMMEDIATE");
        mbSession.Write("FREQuency:MODE SWEEp1");
        mbSession.Write("FREQuency:STARt 3 GHZ");
        mbSession.Write("FREQuency:STOP 4 GHZ");
        mbSession.Write("SWEep1:POINts 101");
        mbSession.Write("SWEep1:DWELL 1 ms");
        mbSession.Write("INITiate:CONTinuous ON");
        // Delay to allow some sweeps to occur.
        Thread.Sleep(3000);
        // Stop sweeping
        mbSession.Write("INITiate:CONTinuous OFF");
        mbSession.Write("ABORt");
    }
    catch (Exception ex)
    {
        MessageBox.Show(ex.Message);
    }
    finally
    {
        if (mbSession != null)
        {
            mbSession.Dispose();
        }
    }
}
//*****
```


Chapter 4 — Error Messages

4-1 Introduction

This chapter lists and describes each of the error messages related to MG3702xA signal generator operation. In addition, it provides information about the error message elements, the error query command, the error queue, and the classes of error messages.

The `:SYSTEM:ERROR?` query command is a request for the next entry in the instrument's error queue. Error messages in the queue contain an integer in the range `[-32768, 32768]` denoting an error code and associated descriptive text. Negative codes are reserved by the SCPI standard and defined first in this chapter. Positive error codes are instrument-dependent. An error code value of zero indicates that no error has occurred.

The `:SYSTEM:ERROR?` query command is required of all SCPI implementations. The instrument responds to the `:SYSTEM:ERROR?` query command with an error message in the following format:

```
<error code>,"<error description>;<device-dependent info>"
```

The `<error code>` is a unique error descriptor. Certain standard error codes are described in this chapter. The `<error description>` is a short description of the error, (optionally) followed by further information about the error. Short descriptions of the standard error codes are given in this chapter. The `<device-dependent information>` part of the response may contain information which will allow the user to determine the exact error and context.

The maximum string length of `<error description>` plus `<device-dependent information>` is 255 characters. The `<error description>` shall be sent exactly as indicated in this chapter including case.

4-2 Error Messages Error Queue

As errors are detected, error messages are placed in a queue. This queue is first in, first out and can hold a maximum of 20 messages. If the queue overflows, the last error message in the queue is replaced with the error message:

```
-350, "Queue overflow"
```

Any time the queue overflows, the least recent error messages remain in the queue, and the most recent error message is discarded. Reading an error message from the head of the queue removes that error message from the queue, and opens a position at the tail of the queue for a new error message, if one is subsequently detected. When all error messages have been read from the queue, further error queries shall return:

```
0, "No error"
```

The error queue shall be cleared when any of the following occur (IEEE 488.2, section 11.4.3.4):

- Upon power up
- Upon receipt of a `*CLS` command
- Upon reading the last error message from the queue

4-3 Error Codes

The system-defined error codes are chosen on an enumerated ("1 of N") basis. The SCPI-defined error codes and the `<error description>` portions of the query response are listed here. The first error described in each class (for example: `-100`, `-200`, `-300`, `-400`) is a "generic" error. In selecting the proper error code to report, more specific error codes are preferred, and the generic error is used if the others are inappropriate.

No Error Messages

When no error messages have been reported or all error messages have been read from the queue, further error queries shall return:

0, No Error

This message indicates that the device has no errors. The queue is completely empty. Every error in the queue has been read or the queue was purposely cleared by power on, *CLS, etc.

Command Errors

An <error code> in the range [-199, -100] indicates that an IEEE 488.2 syntax error has been detected by the instrument's parser. The occurrence of any error in this class should cause the command error bit (bit 5) in the standard event status register to be set. One of the following events has occurred:

- An IEEE 488.2 syntax error has been detected by the parser. That is, a controller-to-device message is received which is in violation of the IEEE 488.2 standard. Possible violations include a data element which violates the device listening formats or whose type is unacceptable to the device
- An unrecognized header was received. Unrecognized headers include incorrect device-specific headers and incorrect or unimplemented IEEE 488.2 common commands
- A Group Execute Trigger (GET) was entered into the input buffer inside of an IEEE 488.2<Program Message>

Events that generate command errors shall not generate execution errors, device-specific errors, or query errors; see the other error definitions in this chapter.

Table 4-1. Command Errors

Error	Message	Description
-100	Command error	Generic command error.
-102	Syntax error	An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.

Execution Error

An <error code> in the range [-299,-200] indicates that an error has been detected by the instrument's execution control block. The occurrence of any error in this class should cause the execution error bit (bit 4) of the standard event status register to be set. One of the following events has occurred:

- A <Program Data> element following a header was evaluated by the device as outside its legal input range or is otherwise inconsistent with the device's capability
- A valid program message could not be properly executed due to some device condition

Execution errors shall be reported by the device after rounding and expression evaluation operations have taken place. Rounding a numeric data element, for example, shall not be reported as an execution error. Events that generate execution errors shall not generate command errors, device-specific errors, or query errors; see the other error definitions in this chapter.

Table 4-2. Execution Error

Error	Message	Description
-200	execution error	This is a generic syntax error for devices that cannot detect more specific errors. This code indicates only that an execution error as defined in IEEE 488.2, 11.5.1.1.5 has occurred.

Device-specific Errors

An <error code> in the range [-399,-300] or [1, 32767] indicates that the instrument has detected an error which is not a command error, a query error, or an execution error; some device operations did not properly complete, possibly due to an abnormal hardware or firmware condition. These codes are also used for self test response errors. The occurrence of any error in this class should cause the device-specific error bit (bit 3) in the standard event status register to be set. The meaning of positive error codes is device-dependent and may be enumerated or bit mapped; the <error message> string for positive error codes is not defined by SCPI and is available to the device designer. Note that the string is not optional; if the designer does not wish to implement a string for a particular error, the null string should be sent (for example, 42, " "). The occurrence of any error in this class should cause the device-specific error bit (bit 3) in the standard event status register to be set. Events that generate device-specific errors shall not generate command errors, execution errors, or query errors; see the other error definitions in this chapter.

Table 4-3. Device-specific Errors

Error	Message	Description
-300	Device-specific error	This is the generic device-dependent error for devices that cannot detect more specific errors. This code indicates only that a Device-Dependent Error as defined in IEEE 488.2, 11.5.1.1.6 has occurred.
-350	Queue overflow	A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.

Query Error

An <error code> in the range [-499,-400] indicates that the output queue control of the instrument has detected a problem with the message exchange protocol described in IEEE 488.2, Chapter 6. The occurrence of any error in this class should cause the query error bit (bit 2) in the standard event status register to be set. These errors correspond to message exchange protocol errors described in IEEE 488.2, Section 6.5. One of the following is true:

- An attempt is being made to read data from the output queue when no output is either present or pending
- Data in the output queue has been lost

Events that generate query errors shall not generate command errors, execution errors, or device-specific errors; see the other error definitions in this chapter.

Table 4-4. Query Error

Error	Message	Description
-400	Query error	This is the generic query error for devices that cannot detect more specific errors. This code indicates only that a Query Error as defined in IEEE 488.2, 11.5.1.1.7 and 6.3 has occurred.

Self Test Errors

An <error code> in the range [100, 199] indicates that a failure has occurred during instrument self test. The error messages are placed in the error queue in the order they occur.

Table 4-5. Self Test Errors

Error	Message	Description
100	Failed: DVM ground offset	Indicates self test failed because of a calibration-related problem.
101	Failed: DVM +10V ref.	Indicates self test failed because of either a calibration-related problem or a defective +10 Volt reference.
102	Failed: DVM -10V ref.	Indicates self test failed because of either a calibration-related problem or a defective -10 Volt reference.
108	Not ready: Crystal oven cold	Indicates that the 100 MHz crystal oven has not reached operating temperature. The MG3702xA is still operable, but frequency accuracy and stability may be degraded.
109	Not locked: Ext 10MHZ	Indicates that the reference loop is not phase locked to the external 10 MHz reference. The reference loop may phase lock to the internal 100 MHz time base; consequently, the MG3702xA would continue to operate normally.
121	Failed: Unleveled indicator	Indicates a failure of the leveled detector circuitry. The MG3702xA is still operable, but a warning message will not appear when the RF output is unleveled.
122	Failed: Level reference	Indicates a failure of the level reference circuitry. Use caution and always determine the output power level when operating the MG3702xA in this condition.
144	Failed: RF was off when self test started	Indicates that some tests were not performed because the RF output was selected Off when the self test was started.
148	Failed: Pulse reference oscillator	Indicates a failure of the pulse generator 100 MHz oscillator reference circuitry. The pulse generator may or may not operate.
160	Failed: Core synthesizer	Indicates a lock error while verifying coarse loop and output loop lock for VCO frequencies.
161	Failed: DDS range	Indicates that the fine loop frequency is not set correctly.
162	Failed: Modulator drive	Indicates that the modulator drive voltage is out of range or is incorrect.
163	Failed: Power supply voltage	Indicates that the digital power supply voltages are not in tolerance.
164	Failed: Power supply current	Indicates that the current draw on the internal 15 V, 5 V, 3.3 V or 1.5 V power supply is out of tolerance.
165	Failed: Synth. RAM data bus	Indicates a failure while testing the data bus for the A8 PCB RAM.
166	Failed: Synth. RAM address bus	Indicates a failure while testing the address bus for the A8 PCB RAM.
167	Failed: Synth. RAM device	Indicates a failure while the testing A8 PCB RAM device.
168	Failed: ALC RAM data bus	Indicates a failure while testing the data bus for the A6 PCB RAM.
169	Failed: ALC RAM address bus	Indicates a failure while testing the address bus for the A6 PCB RAM.

Table 4-5. Self Test Errors

Error	Message	Description
170	Failed: ALC RAM device	Indicates a failure while testing A6 PCB RAM device.
171	Failed: Processor battery	Indicates that the battery voltage on the A2 PCB is out of tolerance.
172	Failed: ALC	Indicates that the A6 loop amp voltage is out of tolerance at a level of at least 3 db lower than the rated tolerance of 12 db.
199	Self Test Complete	Indicates that the self test routine is complete.

Appendix A — SCPI Command Reference

This appendix contains a complete list of programming commands.

*CLS (Clear Status Command)	3-1
*ESE <nv> (Standard Event Status Enable Command)	3-1
*ESE? (Standard Event Status Enable Query)	3-1
*ESR? (Standard Event Status Register Query)	3-1
*IDN? (Identification Query)	3-1
*OPC (Operation Complete Command)	3-1
*OPC? (Operation Complete Query)	3-1
*RCL (Recall Command)	3-2
*RST (Reset Command)	3-2
*SAV (Save Command)	3-2
*SRE <nv> (Service Request Enable Command)	3-2
*SRE? (Service Request Enable Query)	3-2
*STB? (Read Status Byte Query)	3-2
*TST? (Self Test Query)	3-2
*OPT? (Option Identification Query)	3-2
*TRG (Trigger Command)	3-2
:ABORt	3-4
:CONTRol:BLANKing:POLarity	3-5
:CONTRol:RAMP:REST	3-5
:CONTRol:RAMP[:STATe]	3-6
:DIAGnostic:SNUMber?	3-6
:DIAGnostic:FREQUency?	3-6
:DIAGnostic:OPTion?	3-6
:DISPlay[:WINDow]:TEXT[:STATe]	3-7
:DISPlay:REMote	3-7
:INITiate[:IMMEDIATE]	3-8
:INITiate:CONTInuous	3-8
:OUTPut[:STATe]	3-9
:OUTPut:PROTection	3-9
[:SOURce]:FREQUency[:CW]:FIXed]	3-10
[:SOURce]:FREQUency:MODE	3-11
[:SOURce]:FREQUency:STARt	3-11
[:SOURce]:FREQUency:STOP	3-12
[:SOURce]:LIST:INDex	3-13
[:SOURce]:LIST:FREQUency	3-14
[:SOURce]:LIST:FREQUency:POINts?	3-14
[:SOURce]:LIST:MODE	3-14
[:SOURce]:LIST:POWer	3-15
[:SOURce]:LIST:POWer:POINts?	3-15
[:SOURce]:LIST:DWELl	3-15
[:SOURce]:LIST:STARt	3-16
[:SOURce]:LIST:STOP	3-16
[:SOURce]:LIST:TYPE	3-16
[:SOURce]:PHASe[:ADJusT]	3-17

[:SOURce]:PHASe:DISPlay	3-17
[:SOURce]:PHASe:REFerence	3-17
[:SOURce]:POWER[:LEVel][:IMMEdiate][:AMPLitude]	3-18
[:SOURce]:POWER:ALC:SOURce	3-19
[:SOURce]:POWER:ATTenuation	3-19
[:SOURce]:POWER:ATTenuation:AUTO	3-20
[:SOURce]:POWER:DISPlay:OFFSet	3-20
[:SOURce]:POWER:DISPlay:OFFSet:STATe	3-21
[:SOURce]:PULM:INTernal:FREQuency	3-22
[:SOURce]:PULM:POLarity	3-22
[:SOURce]:PULM:SOURce	3-23
[:SOURce]:PULM:STATe	3-23
[:SOURce]:PULSe:COUNt	3-24
[:SOURce]:PULSe:DELAy{ 1 2 3 4}	3-24
[:SOURce]:PULSe:PERiod	3-25
[:SOURce]:PULSe:WIDTh{ 1 2 3 4}	3-25
[:SOURce]:ROSCillator:SOURce?	3-26
[:SOURce]:SWEep[1]:DWELl	3-27
[:SOURce]:SWEep[1]:GENeration	3-27
[:SOURce]:SWEep[1]:POINts	3-28
[:SOURce]:SWEep[1]:FREQuency:STEP	3-28
:STATus:OPERation[:EVENT]?	3-29
:STATus:OPERation:CONDition?	3-29
:STATus:OPERation:ENABle	3-30
:STATus:OPERation:PTRansition	3-30
:STATus:OPERation:NTRansition	3-31
:STATus:PRESet	3-31
:STATus:QUEStionable[:EVENT]?	3-31
:STATus:QUEStionable:CONDition?	3-32
:STATus:QUEStionable:ENABle	3-32
:STATus:QUEStionable:FREQuency[:EVENT]?	3-32
:STATus:QUEStionable:FREQuency:CONDition?	3-32
:STATus:QUEStionable:FREQuency:ENABle	3-33
:STATus:QUEStionable:FREQuency:PTRansition	3-33
:STATus:QUEStionable:FREQuency:NTRansition	3-34
:STATus:QUEStionable:PTRansition	3-34
:STATus:QUEStionable:NTRansition	3-35
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess	3-36
:SYSTem:ERRor[:NEXT]?	3-37
:SYSTem:PON:TYPE	3-37
:SYSTem:PRESet{ 1 }	3-37
:SYSTem:PRESet2	3-38
:SYSTem:PRESet3	3-38
:SYSTem:PRESet4	3-38
:SYSTem:PRESet:RF	3-38
:SYSTem:PRESet:TYPE	3-39
:SYSTem:VERSion?	3-39
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:TRIGger:SOURce.....	3-40
:TRIGger:SEQuence3:SLOPe.....	3-41
:TRIGger:SEQuence3:TYPE.....	3-41

Appendix B — Programming with MG3690B Compatibility

B-1 Introduction

This chapter provides a cross reference between remote programming with MG3690B compatibility commands and MG3702xA SCPI commands. [Table B-1](#) lists all available MG3690B commands and their SCPI equivalent. Only the MG3690xB commands listed are supported in the MG3702xA.

See [“Remote Programming Setup and Interface” on page 1-9](#) step 5 for information on switching between SCPI language or MG3690B language for remote programming.

Note	<p>The MG37020A implements a strict 488.2 parser.</p> <p>As a comparison, the MG3690B parser would accept a commands such as F13GH (all together without spaces), this same command will fail on the MG37020A in MG3690B compatibility mode.</p> <p>The command would need to be sent as F1 3GH (with a space between the command F1 and the parameter 3GH).</p> <p>The MG37020A will recognize the following MG3690B commands but not necessarily recognize the MG3690B syntax.</p>
-------------	--

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (1 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
MG369x Configuration			
BPN	Selects –3.3V for retrace and bandswitch blanking outputs.	:CONTRol:BLANKing:POLarity INVerse	3-5
BPP	Selects +3.3V for retrace and bandswitch blanking outputs.	:CONTRol:BLANKing:POLarity NORMal	3-5
RC1	Selects RF to be on during frequency switching in CW, step sweep, and list sweep modes.	:OUTPut:PROTection OFF	3-9
RCO	Selects RF to be off during frequency switching in CW, step sweep, and list sweep modes.	:OUTPut:PROTection ON	3-9
RO0	Selects RF to be on at reset.	:SYSTem:PRESet:RF ON	3-38
RO1	Selects RF to be off at reset.	:SYSTem:PRESet:RF OFF	3-38
RR0	Sets sweep ramp rest to 0V	:CONTRol:RAMP:REST START	3-5
RR1	Sets sweep ramp rest to 10V	:CONTRol:RAMP:REST STOP	3-5
RT0	Selects RF to be off during retrace.	:OUTPut:PROTection:RETRace ON	3-9
RT1	Selects RF to be on during retrace.	:OUTPut:PROTection:RETRace OFF	3-9

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (2 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
MG369x CW Frequency			
CF0	Sets CW mode at F0 and opens the F0 parameter.	[:SOURce]:FREQuency:MODE CW	3-11
CFx (x = 1 to 9)	Sets CW mode at Fx and opens the Fx parameter.	No SCPI equivalent	
CS0	Turns off the CW ramp.	:CONTRol:RAMP[:STATe] OFF	3-6
CS1	Turns on the CW ramp.	:CONTRol:RAMP[:STATe] ON	3-6
F0	F0 opens the F0 parameter.	[:SOURce]:FREQuency[:CW]:FIXed]	3-10
Fx (x = 1 to 9)	Fx opens the Fx parameter.	No SCPI equivalent	
OF0	Returns the F0 frequency value (in MHz) to the controller.	[:SOURce]:FREQuency[:CW]:FIXed]	3-10
MG369x Frequency Sweep			
OSD	Returns the step sweep dwell time (in ms) to the controller.	[:SOURce]:SWEep[1]:DWELI?	3-27
SDT	Opens the step sweep dwell time parameter.	[:SOURce]:SWEep[1]:DWELI	3-27
SNS	Opens the step sweep number of steps parameter.	[:SOURce]:SWEep[1]:POINts	3-28
SSP	Selects linear step sweep.	[:SOURce]:FREQuency:MODE SWEep[1]	3-11
MG369x List Sweep			
ELIxxxx	Sets list index to xxxx.	[:SOURce]:LIST:INDEx	3-13
LDT	Opens the list sweep dwell time parameter.	[:SOURce]:LIST:DWELI	3-15
LF	Sets list frequencies starting at the list index.	[:SOURce]:LIST:FREQuency [,]...	3-14
LIBxxxx	Sets the list start index to xxxx.	[:SOURce]:LIST:START	3-16
LIExxxx	Sets the list stop index to xxxx.	[:SOURce]:LIST:STOP	3-16
LP	Sets list power levels starting at the list index.	[:SOURce]:LIST:POWER [,]...	3-15
LST	Places the MG369XB in list sweep mode.	[:SOURce]:FREQuency:MODE LIST	3-11
D1	Opens the internal pulse delay1 parameter.	[:SOURce]:PULSe:DELay{1 2 3 4}	3-24
D2	Opens the internal pulse delay2 parameter.		
D3	Opens the internal pulse delay3 parameter.		
D4	Opens the internal pulse delay4 parameter.		
EP0	Selects TTL-low to turn RF on during pulse modulation.	[:SOURce]:PULM:POLarity INVerted	3-22

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (3 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
EP1	Selects TTL-high to turn RF on during pulse modulation.	[:SOURce]:PULM:POLarity NORMAL	3-22
IP	Turns on internal pulse modulation.	[:SOURce]:PULM:STATe ON	3-23
OD1	Returns the internal pulse delay1 value (in μ s) to the controller.	[:SOURce]:PULSe:DELay{1 2 3 4}?	3-24
OD2	Returns the internal pulse delay2 value (in μ s) to the controller.		
OD3	Returns the internal pulse delay3 value (in μ s) to the controller.		
OD4	Returns the internal pulse delay4 value (in μ s) to the controller.		
OPP	Returns the internal pulse period value (in μ s) to the controller.	[:SOURce]:PULSe:PERiod?	3-25
OPR	Returns the internal pulse frequency (in MHz) to the controller.	[:SOURce]:PULM:INTernal:FREQUency?	3-22
OW1	Returns the internal pulse width1 value (in μ s) to the controller.	[:SOURce]:PULSe:WIDTh{1 2 3 4}?	3-25
OW2	Returns the internal pulse width2 value (in μ s) to the controller.		
OW3	Returns the internal pulse width3 value (in μ s) to the controller.		
OW4	Returns the internal pulse width4 value (in μ s) to the controller.		
P0	Turns off the internal or external pulse modulation function (This is the default mode).	[:SOURce]:PULM:STATe OFF	3-23
PER	Opens the internal pulse period parameter.	[:SOURce]:PULSe:PERiod	3-25
PMDx	Selects the internal pulse mode.	[:SOURce]:PULSe:COUNt	3-24
PR	Opens the internal pulse frequency parameter.	[:SOURce]:PULM:INTernal:FREQUency	3-22
PTF	Selects internal pulse triggering on the falling edge of an external input.	:TRIGger:SEQUence3:SLOPe NEGative	3-41
PTGx	Selects the internal pulse trigger. PTG1 (Free Run), PTG2 (Gated), PTG4 (Triggered) are supported. MG3702xA delay1 is always active. Therefore the delay1 parameter must be set to 0 to achieve no delay in PTG1 (Free Run) and PTG4 (Triggered) trigger modes.	:TRIGger:SEQUence3:TYPE	3-41
PTR	Selects internal pulse triggering on the rising edge of an external input.	:TRIGger:SEQUence3:SLOPe POSitive	3-41

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (4 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
SW1	Turns on internal 400 Hz square wave pulse modulation.	[:SOURce]:PULM:INTernal:FREQuency 400 PULSe:WIDTh 1.25ms PULM:STATe ON Other commands needed if different from default values. PULSe:COUNt 1 PULSe:DELay 0 PULM:SOURce INTernal TRIGger:SEQuence3:TYPE FREerun	3-22
SW2	Turns on internal 1 kHz square wave pulse modulation (Same as SQP).	[:SOURce]:PULM:INTernal:FREQuency 1000 [:SOURce]:PULSe:WIDTh{1 2 3 4} 0.0005 [:SOURce]:PULM:STATe ON Other commands needed if different from default values. [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULSe:DELay{1 2 3 4} 0 [:SOURce]:PULM:SOURce INTernal :TRIGger:SEQuence3:TYPE FREerun	3-22
SW3	Turns on internal 7.8125 kHz square wave pulse modulation.	[:SOURce]:PULM:INTernal:FREQuency 7812.5 [:SOURce]:PULSe:WIDTh{1 2 3 4} 0.000064 [:SOURce]:PULM:STATe ON Other commands needed if different from default values. [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULSe:DELay{1 2 3 4} 0 [:SOURce]:PULM:SOURce INTernal :TRIGger:SEQuence3:TYPE FREerun	3-22
SW4	Turns on internal 27.8 kHz square wave pulse modulation.	[:SOURce]:PULM:INTernal:FREQuency 27800 [:SOURce]:PULSe:WIDTh{1 2 3 4} 0.00001798 [:SOURce]:PULM:STATe ON Other commands needed if different from default values. [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULSe:DELay{1 2 3 4} 0 [:SOURce]:PULM:SOURce INTernal :TRIGger:SEQuence3:TYPE FREerun	3-22
W1	Opens the internal pulse width 1 parameter.	[:SOURce]:PULSe:WIDTh{1 2 3 4}	3-25
W2	Opens the internal pulse width 2 parameter.		
W3	Opens the internal pulse width 3 parameter.		
W4	Opens the internal pulse width 4 parameter.		
XP	Turns on the external pulse modulation function. Disables the internal pulse modulation function, if previously programmed.	[:SOURce]:PULM:SOURce EXTernal [:SOURce]:PULM:STATe ON	3-23

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (5 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
MG369x Power			
ATTxx	Sets the step attenuator value to xx (times 10 dB). Turns on decoupled mode.	[:SOURce]:POWer:ATTenuation	3-19
LO0	LO0 Turns off the level offset function.	[:SOURce]:POWer:DISPlay:OFFSet:STATe OFF	3-21
LO1	LO1 Turns on the level offset function.	[:SOURce]:POWer:DISPlay:OFFSet:STATe ON	3-21
LOS	LOS Opens the level offset parameter.	[:SOURce]:POWer:DISPlay:OFFSet	3-20
OL0	Returns the L0 power level value to the controller.	[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]?	3-18
OLO	OLO Returns the level offset power value to the controller.	[:SOURce]:POWer:DISPlay:OFFSet?	3-20
RF0	RF0 Turns off the RF output.	:OUTPut[:STATe] OFF	3-9
RF1	RF1 Turns on the RF output.	:OUTPut[:STATe] ON	3-9
XL0	XL0 Opens the L0 parameter.	[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]	3-18
MG369x Power Leveling			
AT0	Deselects ALC step attenuator decoupling.	[:SOURce]:POWer:ATTenuation:AUTO ON	3-20
AT1	Selects ALC step attenuator decoupling.	[:SOURce]:POWer:ATTenuation:AUTO OFF	3-20
IL1	Selects internal leveling of output power.	[:SOURce]:POWer:ALC:SOURce INTernal	3-19
LV0	Turns off leveling of the output power. (Fixed gain)	[:SOURce]:POWer:ALC:SOURce FIXed[1]	3-19
LV1	Turns off leveling of the output power. (Auto fixed gain)	[:SOURce]:POWer:ALC:SOURce FIXed2	3-19
MG369x Status			
CSB	Clears all GPIB status bytes.	*CLS (Clear Status Command)	3-1
MG369x System			
DS0	Turns on the secure mode.	:DISPlay[:WINDow]:TEXT[:STATe] OFF	3-7
DS1	Turns off the secure mode.	:DISPlay[:WINDow]:TEXT[:STATe] ON	3-7
OFH	Returns the high-end frequency value (in MHz) to the controller.	:DIAGnostic:FREQuency? MAX	3-6
OFL	Returns the low-end frequency value (in MHz) to the controller.	:DIAGnostic:FREQuency? MIN	3-6

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (6 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
MG369x Trigger			
AUT	AUT Selects automatic sweep triggering. Other setup needed: LIST:MODE AUTO (if in List mode)	:TRIGger:SOURce IMMEDIATE :INITiate:CONTInuous ON	3-40
EXT	EXT Selects single sweep triggering. Other setup needed: LIST:MODE AUTO (if in List mode)	:TRIGger:SOURce BUS :INITiate:CONTInuous ON	3-40
GTF	Execute a fast-frequency-switching step on receipt of a GET.	In LIST frequency mode, manual trigger, a GET will step to the next index between start (LIST:STARt) and stop (LIST:STOP) indicies. Triggering past the stop index will wrap to the start index.	3-16
GTS	Execute a TRS (trigger single sweep) command on receipt of a GET.	:TRIGger:SOURce :INITiate[:IMMEDIATE] *TRG (Trigger Command)	3-40
HWT	HWT Selects external sweep trigger. Other setup needed: LIST:MODE AUTO (if in List mode)	:TRIGger:SOURce EXTernal :INITiate:CONTInuous ON	3-40
MNT	Selects manual trigger (only available in list mode).	[:SOURce]:LIST:MODE MANual	3-14
RSS	Resets a sweep if in progress.	:ABORT	3-4
TRG	Triggers a single sweep.	*TRG (Trigger Command) or :TRIGger[:IMMEDIATE]	3-2 3-40
Y	Equivalent to a Group Execute Trigger (GET).	*TRG (Trigger Command) or :TRIGger[:IMMEDIATE]	3-2 3-40
RF Signal Generator Interface			
L0	Sets RF output power level to L0. Opens L0 parameter.	[:SOURce]:POWER[:LEVel][:IMMEDIATE][:AMPLitude]	3-18
OPT	Returns the name of the internal pulse trigger to the controller.	:TRIGger:SEQuence3:TYPE?	3-41
OSS	Returns the step sweep number-of-steps to the controller.	[:SOURce]:SWEep[1]:POINts?	3-28
PMD1	Selects the internal pulse single mode.	[:SOURce]:PULSe:COUNt 1	3-24
PMD2	Selects the internal pulse doublet mode.	[:SOURce]:PULSe:COUNt 2	3-24
PTG1	PTG1 (Free Run)	:TRIGger:SEQuence3:TYPE FREerun	3-41
PTG2	PTG2 (Gated)	:TRIGger:SEQuence3:TYPE GATed	3-41
PTG4	PTG4 (Triggered) MG37020A delay1 is always active. Therefore the delay1 parameter must be set to 0 to achieve no delay in PTG1 (Free Run) and PTG4 (Triggered) trigger modes.	:TRIGger:SEQuence3:TYPE TRIGgered	3-41

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (7 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
PTG5	PTG5 (Triggered with delay) MG37020A delay1 is always active. Therefore the delay1 parameter must be set to 0 to achieve no delay in PTG1 (Free Run) and PTG4 (Triggered) trigger modes.	:TRIGger:SEQuence3:TYPE TRIGgered	3-41
Miscellaneous			
*IDN?	Requests device identification.	*IDN? (Identification Query)	3-1
ADD	Opens the GPIB address parameter.	:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess	3-36
ADR	GPIB address terminator.	:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess	3-36
DPT	Internal triggered pulse with delay. MG3690B Internal single pulse, trigger with delay mode. Delay is always active, so this is just triggered mode.	:TRIGger:SEQuence3:TYPE TRIGgered [:SOURce]:PULM:SOURce INTernal [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULM:STATe ON	3-41
EL0	Inhibits updating of the ESB2 bit 4, RF Unlocked	:STATus:QUEStionable:FREQuency:ENABLE	3-33
EL1	Enables updating of the ESB2 bit 4, RF Unlocked	:STATus:QUEStionable:FREQuency:ENABLE	3-33
ES0	Inhibits end-of-sweep SRQ generation, Primary bit 1	:STATus:OPERation:ENABLE	3-30
ES1	Enables end-of-sweep SRQ generation, Primary bit 1	:STATus:OPERation:ENABLE	3-29
GP	Sets the internal gated pulse on.	:TRIGger:SEQuence3:TYPE GATe [:SOURce]:PULM:SOURce INTernal [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULM:STATe ON	3-41
LE0	Inhibits lock error SRQ generation, primary bit 3	:STATus:QUEStionable:FREQuency:ENABLE	3-33
LE1	Enables lock error SRQ generation, primary bit 3	:STATus:QUEStionable:FREQuency:ENABLE	3-33
LS0	Inhibits updating of the ESB1 bit 3, RF locked.	:STATus:QUEStionable:FREQuency:ENABLE	3-33
LS1	Enables updating of the ESB1 bit 3, RF locked.	:STATus:QUEStionable:FREQuency:ENABLE	3-33
MR	Performs a master reset of the instrument by setting all of the instrument parameters to factory default.	:SYSTem:PRESet4	3-38
ODP	Returns the internal pulse delay1 value (in ms) to the controller (Same as OD1).	[:SOURce]:PULSe:DELay{1 2 3 4}?	3-24
OMD	Returns the name of the internal pulse mode to the controller.	[:SOURce]:PULSe:COUNt?	3-24

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (8 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
OO	Returns the instrument option string to the controller.	:DIAGnostic:OPTion?	3-6
OP5	Returns the internal or external pulse polarity ("HIGH", "LOW") to the controller.	[:SOURce]:PULM:POLarity?	3-22
OPC	Returns the internal pulse clock rate (in MHz) to the controller.	The MG37020A implements one pulse clock rate, 100MHz.	
OPO	Returns the phase offset value (in degrees) to the controller.	[:SOURce]:PHASe[:ADJust]?	3-17
OPW	Returns the internal pulse width1 value (in s) to the controller (Same as OW1).	[:SOURce]:PULSe:WIDTh{1 2 3 4}?	3-25
OSM	Returns the primary SRQ mask byte to the controller.	*SRE <nv> (Service Request Enable Command)	3-2
OSR	Returns the self-test results (6 binary bytes) to the controller.	:SYSTem:ERRor[:NEXT]?	3-37
OVN	Returns the ROM version number to the controller.	:SYSTem:VERSIon?	3-39
PDY	Opens the internal pulse delay1 parameter (Same as D1).	[:SOURce]:PULSe:DELay{1 2 3 4}	3-24
PSO	Opens the phase offset parameter.	[:SOURce]:PHASe[:ADJust]	3-17
PSZ	Zeros the phase offset display.	[:SOURce]:PHASe[:ADJust] 0	3-17
PW	Opens the internal pulse width1 parameter (Same as W1).	[:SOURce]:PULSe:WIDTh{1 2 3 4}	3-25
RSN(m)	Recalls the instrument setup stored in internal setup memory location m.	*RCL (Recall Command)	3-2
RST	Resets the MG369XB to its default settings.	:SYSTem:PRESet2	3-38
SE0	Inhibits Syntax Error SRQ generation, Primary bit 5	*ESE <nv> (Standard Event Status Enable Command)	3-1
SE1	Enables Syntax Error SRQ generation, Primary bit 5	*ESE <nv> (Standard Event Status Enable Command)	3-1
SNR	Enter the instrument serial number.	:DIAGnostic:SNUMber?	3-6
SQP	Turns on internal 1 kHz square wave pulse modulation.	[:SOURce]:PULM:INTernal:FREQUency 1000 [:SOURce]:PULSe:WIDTh{1 2 3 4}PULSe:WIDTh 0.0005 [:SOURce]:PULM:STATe ON Other commands needed if different from default values. [:SOURce]:PULSe:COUNt 1 [:SOURce]:PULSe:DELay{1 2 3 4} 0 [:SOURce]:PULM:SOURce INTernal :TRIGger:SEQUence3:TYPE FREerun	3-22
SSN(m)	Saves the current instrument setup to internal setup memory location m.	*SAV (Save Command)	3-2

Table B-1. MG3690B to MG3702xA SCPI Command Cross Reference (9 of 9)

MG3690xB Command	Description	MG3702xA SCPI Equivalent	Page
SW0	Turns off the internal or external pulse modulation function (Same as P0).	<code>[:SOURce]:PULM:STATe OFF</code>	3-23
TEX	Sets sweep trigger to external (same as HWT).	<code>:TRIGger:SOURce EXTernal</code> <code>:INITiate:CONTInuous ON</code>	3-40
TRS	Triggers a single sweep.	<code>*TRG (Trigger Command)</code> or <code>:TRIGger[:IMMediate]</code>	3-2
TST	Starts an instrument self-test (returns P or F).	<code>*TST? (Self Test Query)</code>	3-2
UL0	Inhibits RF unleveled SRQ generation, Primary bit 2	<code>:STATus:QUEStionable:ENABLE</code>	3-31
UL1	Enables RF unleveled SRQ generation, Primary bit 2	<code>:STATus:QUEStionable:ENABLE</code>	3-32
ZL(x)	Loads a CW frequency into a table at location x.	<code>[:SOURce]:LIST:FREQUency [,]...</code>	3-14

Terminators

DB	Decibel (dB) data terminator.	dB
DG	Degree data terminator (for Phase offset).	DEGree
DM	dBm data terminator.	dBm
GH	GHz data terminator.	GHz
HZ	Hz data terminator.	Hz
KH	kHz data terminator.	kHz
MH	MHz data terminator.	MHz
MS	Milliseconds (ms) data terminator.	ms
NS	Nanoseconds (ns) data terminator.	ns
SEC	Seconds data terminator.	sec
US	Microsecond (μ s) data terminator.	us

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