Operation Manual

Series MG3702xA
RF/Microwave Signal Generators

Fast Switching Microwave Signal Generator
100 µsec Switching Speed
10 MHz to 20 GHz

Anritsu

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DECLARATION OF CONFORMITY

Manufacturer's Name: ANRITSU COMPANY

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

declares that the product specified below:

Product Name: Fast Switching Microwave Signal Generator

Model Number: MG3702XA

conforms to the requirement of:

EMC Directive: 2004/108/EC
Low Voltage Directive: 2006/95/EC

Electromagnetic Compatibility: EN61326-1:2006

Emissions: EN55011:2009 +A1:2010 Group 1 Class A

Immunity:		
	EN 61000-4-2:2009	4 kV CD, 8 kV AD
	EN 61000-4-3:2006 +A2:2010	3 V/m
	EN 61000-4-4:2004	0.5 kV S-L, 1 kV P-L
	EN 61000-4-5:2006	0.5 kV L-L, 1 kV L-E
	EN 61000-4-6: 2009	3 V
	EN 61000-4-11: 2004	100% @ 20 ms

Electrical Safety Requirement:

Product Safety: EN 61010-1:2010

Eric McLean, Corporate Quality Director

Morgan Hill, CA

9 Sept 2013
Date

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$$\mathsf{C}\,\mathsf{E}$$

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Anritsu affixes the C-tick marking onto its conforming products in accordance with the electromagnetic compliance regulations of Australia and New Zealand in order to indicate that these products conform to the EMC regulations of Australia and New Zealand.

◐N274

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产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	✕	○	✕	✕	○	○
机壳、支架 (Chassis)	✕	○	✕	✕	○	○
LCD	✕	✕	✕	✕	○	○
其他（电缆、风扇、 连接器等） (Appended goods)	✕	○	✕	✕	○	○
○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。 ✕：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。						

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Equipment marked with the Crossed-out Wheelie Bin symbol complies with the European Parliament and Council Directive 2002/96/EC (the "WEEE Directive") in the European Union.

For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

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Chapter 4—Instrument Operation

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

Symbols Used in Manuals

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

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

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

Safety Symbols Used on Equipment and in Manuals

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

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

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

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

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

These indicate that the marked part should be recycled.

For Safety

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

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

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

Warning ⚠ CAUTION >18 kg HEAVY WEIGHT	Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.
	Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

Chapter 1 — General Information

1-1 About this Guide

This manual provides general information, installation, and operating information for the Anritsu series MG3702xA synthesized signal generator. Throughout this manual, the terms MG3702xA, signal generator, and synthesizer will be used interchangeably to refer to the instrument. Manual organization is shown in the table of contents.

1-2 Introduction

This chapter contains general information about the series MG3702xA signal generators. It includes a general description of the instrument and information on its identification number, related manuals, options, and performance specifications. A listing of recommended test equipment is also provided.

1-3 Contacting Anritsu

To contact Anritsu, please visit:

http://www.anritsu.com/contact.asp

From here, you can select the latest sales, service and support contact information in your country or region, provide online feedback, complete a "Talk to Anritsu" form to get your questions answered, or obtain other services offered by Anritsu.

Updated product information can be found on your product page:

http://www.anritsu.com/en-us/products-solutions/products/mg37020a.aspx

On this web page, you can select various tabs for more information about your instrument. Included is a "Library" tab which contains links to all the latest technical documentation related to this instrument.

1-4 Related Manuals

This is one of a two manual set that consists of this operation manual and a programming manual. Updated manuals are available for download from the product web page mentioned above, or by entering your model number into the search window on the Anritsu home page:

 http://www.anritsu.com.

SCPI Programming Manual

The Series MG3702xA Synthesized Signal Generators SCPI Programming Manual (PN 10370-10371) provides information for remote operation of the signal generator with product specific SCPI commands sent from an external controller via the IEEE-488 General Purpose Interface Bus (GPIB), Ethernet, or USB network. It contains a general description of the SCPI programming language, GPIB data transfer and control functions, a complete listing and description of all MG3702xA SCPI product specific commands, and several programming examples.

1-5 Typographic Conventions

The typographic conventions used throughout this manual are as follows:

The front panel function keys are identified by using bold san serif text, for example: **Frequency**.

Menus and Menu buttons found in the graphical user interface are identified by using san serif text, for example: Edit F1.

Instrument status and warning messages are shown as they appear on the display, for example: CW Ramp.

Sequential menu sequences are presented as a string of actions separated with a vertical pipe, for example: Press **Frequency** | Edit Frequency.

1-6   Instrument Description

The series MG3702xA synthesized signal generators are microprocessor-based, synthesized signal sources with high resolution phase-lock capability. They generate both discrete CW frequencies and broad (full range) and narrow band step sweeps across the frequency range of 2 GHz to 20 GHz. Options are available to extend the low end of the frequency range to 10 MHz. All functions of the signal generator are fully controllable locally from the front panel or remotely (except for power on/standby) via the IEEE-488 General Purpose Interface Bus (GPIB), Ethernet, or USB network ports. A complete instrument description with performance specifications can be found in the MG3702xA technical data sheet, Anritsu part number: 11410-00429.

Identification Number

All Anritsu instruments are assigned a unique six-digit ID number, such as "020312". The ID number is imprinted on a decal that is affixed to the rear panel of the unit. Special-order instrument configurations also have an additional special number tag attached to the rear panel of the unit, such as SM1234.

When ordering parts or corresponding with Anritsu Customer Service, please use the correct serial number with reference to the specific instrument's model number (for example, model MG3702xA synthesized signal generator, serial number: 020312).

1-7   Recommended Test Equipment

Table 1-1 lists the recommended test equipment for performing the series MG3702xA synthesized signal generator operation verification tests in Chapter 5, "Operation Verification".

Table 1-1.   Recommended Test Equipment

Equipment	Critical Specification	Recommended Manufacturer/Model
Frequency Counter or	Range: 0.01 GHz to 40 GHz Input Z: 50 Ω Resolution: 1 Hz Other: External Time Base or Input	Anritsu Model MF2414
Frequency Counter with Cable Kit and External Mixer	Range: 0.01 GHz to 20 GHz Input Z: 50 Ω Resolution: 1 Hz Other: External Time Base or Input	EIP Microwave, Inc. Models 538B, 548B, or 578B
Power Meter with Power Sensor	Level Range: –30 dBm to +20 dBm (1 µW to 100 mW) Frequency Range: 0.01 GHz to 20 GHz	Anritsu Models ML2437A or ML2438A with Power Sensor: MA2474A
Fixed Attenuator	Frequency Range: DC to 65 GHz Max Input Power: >+23 dBm Attenuation: 10 dB	Anritsu Model 41KC-10
Special AUX I/O Interface Cable	25-pin parallel connector (DB25-M) with shielded BNC connections to pins 1 and 3	Anritsu Part Number: 806-97

1-8   Operating System Integrity

The Microsoft® Windows® XP operating system on the MG3702xA is configured for optimum signal generator performance when the instrument leaves the factory. To maintain the system's operating integrity, follow proper Windows shutdown procedures and do *NOT* modify the operating system configuration, the firewall settings, the system registry, the hard disk drive partitions, or the Anritsu user accounts. All screen shots in this manual are shown in the standard Windows XP theme.

Antivirus Protection

The MG3702xA is tested with most common antivirus software, but stability is not guaranteed with all antivirus software. Anritsu recommends connecting the instrument only to a secure network. The user assumes the responsibility to provide virus protection because this is not supplied with the instrument. Contact your network administrator for information about your network security and antivirus protection policies.

Windows Updates

Not all Microsoft updates are compatible with the MG3702xA and may affect the performance of the signal generator, if installed. Therefore, Anritsu recommends not installing Microsoft updates. Ensure that the Windows update feature of the Windows operating system remains off. Consult Anritsu customer service for procedures on how to safeguard the instrument from undesired conditions that could result from Windows updates.

Chapter 2 — Preparation for Use

2-1   Introduction

Preparation for use consists of inspecting the shipment, installing the instrument into a suitable operating location, and connecting the signal generator to a suitable power source. The following paragraphs provide these procedures along with information about power requirements, warm-up times, and the operating environment. Figure 2-1 illustrates the basic outer dimensions of the instrument.

This chapter also provides information on storage, shipment, and remote programming connection and set up.

2-2   Operating Environment

Before installing the MG3702xA in its operating environment, ensure that all airflow passages at the sides and rear of the instrument are clear. Proper ventilation is of particular importance whenever the unit is being rack mounted. Keep the cooling fan filters clean so that the ventilation holes are not obstructed. A blocked fan filter can cause the instrument to overheat and shut down. The MG3702xA can be operated within the following environmental limits:

- **Temperature:** 0 °C to 50 °C
- **Humidity:** 5% to 95% relative at 40 °C
- **Altitude:** Up to 4600 meters

2-3   Unpacking the Product

Initial Inspection

Inspect the shipping container for damage. Retain the shipping container or cushioning material if they are damaged until the contents of the shipment have been checked against the packing list and the signal generator has been checked for specified operation. If the shipment is incomplete or if the signal generator is damaged mechanically or electrically, notify your local sales representative or Anritsu Customer Service. If either the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as Anritsu. Keep the shipping materials for the carrier's inspection.
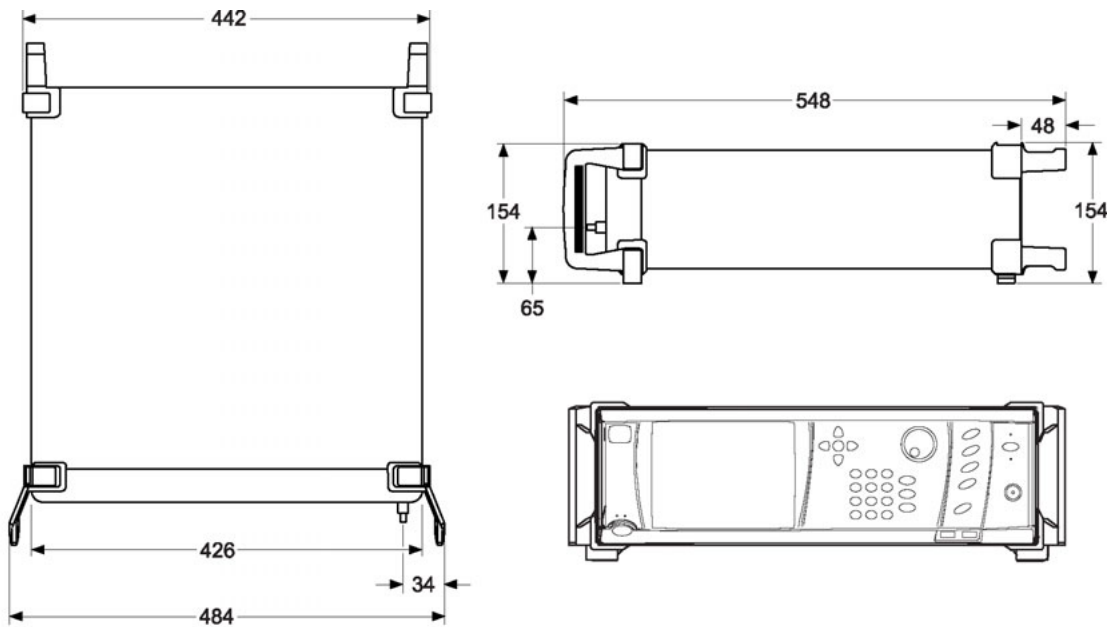
Standard Configuration
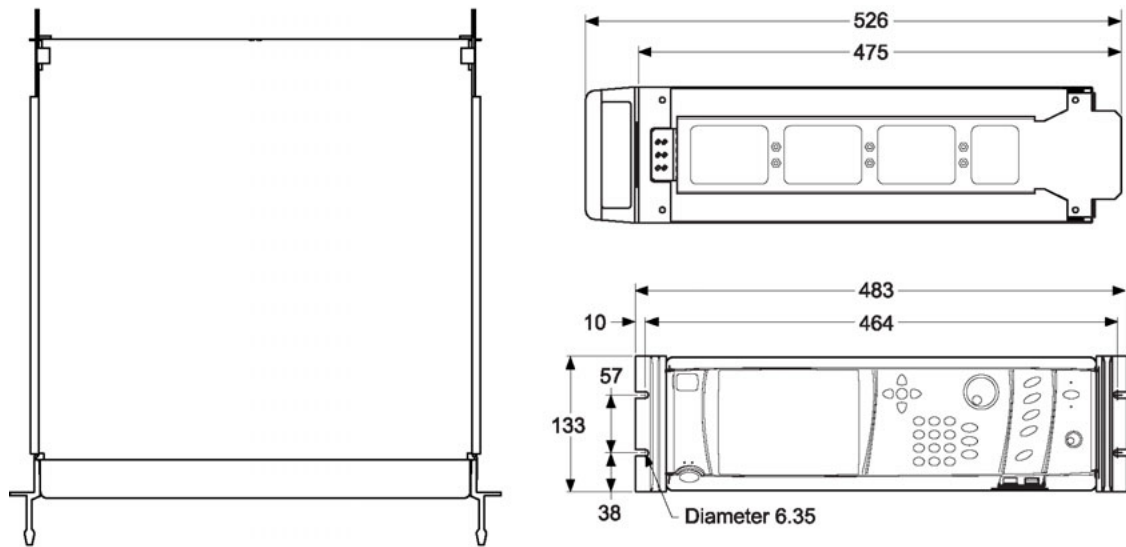
Dimension in mm

Rack Mount Configuration

Figure 2-1.   MG3702xA Outline Dimensions

2-4   Rack Mount Assembly (Option 1)

The rack mounting kit (Option 1) contains a set of track slides, mounting ears, and front panel handles for mounting the signal generator in a standard equipment rack. The following procedure provides instructions for installing the rack mounting hardware on the instrument. The rack mounting kit uses the same inner assembly without the slide. This procedure may also be used for installing the rack mount assembly with slides. Refer to Figure 2-2 and Figure 2-3 during this procedure.

1. Disconnect the power cord and any other cables from the instrument.

2. Using a Phillips screwdriver, remove the screws and the front handle assemblies from the instrument. (For instruments not having front handles, remove the screws and the front top and bottom feet from the instrument.) Retain the screws.

3. Remove the four feet from the rear of the instrument. Retain the screws.
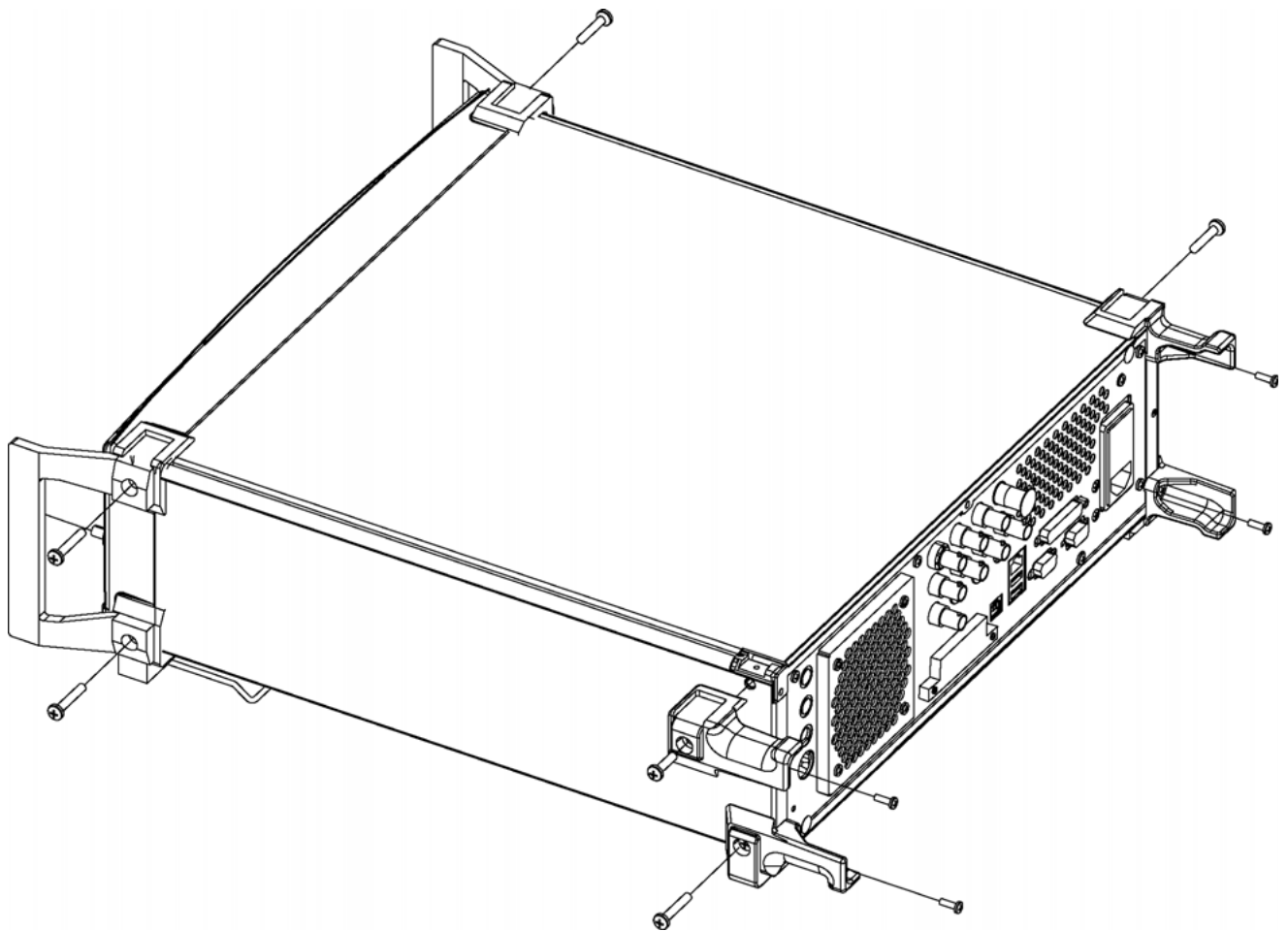
Figure 2-2.   Front Handle and Feet Removal

Note	The screws with green heads have metric threads. When it becomes necessary to replace any of these screws, always use the exact replacement green-headed screws to avoid damage to the instrument. Anritsu PN: 905-8 (long) or Anritsu PN: Z-951102 (short).

4. Remove the inner slide assemblies from the outer slide assemblies.

5. Place the left side inner slide assembly onto the instrument case with the handle towards the front of the instrument as shown in Figure 2-3.

6. Insert two green-headed screws through the holes in the slide assembly behind the handle and into the metric tapped holes in the side of the instrument.

7. Insert two green-headed screws through the holes near the rear of the slide assembly and into the metric tapped holes in the side of the instrument.

8. Insert the two SAE threaded screws (removed from the feet) through the tabs on the rear of the slide assembly and into the rear panel of the instrument.

9. Using the Phillips screwdriver, tighten all screws holding the left side slide assembly to the instrument chassis.
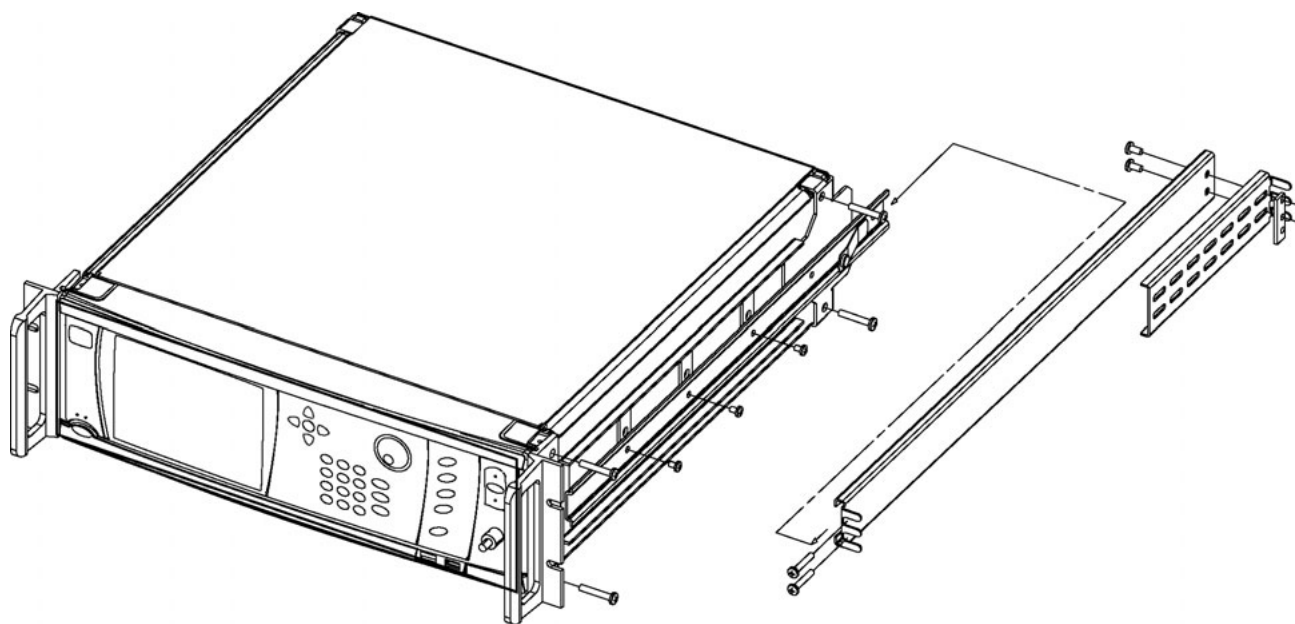
Figure 2-3. Rack Mounting Hardware Installation

10. Place the right side inner slide assembly onto the instrument case with the handle towards the front of the instrument.

11. Insert two green-headed screws through the holes in the slide assembly behind the handle and into the metric tapped holes in the side of the instrument.

12. Insert two green-headed screws through the holes near the rear of the slide assembly and into the metric tapped holes in the side of the instrument.

13. Insert the two SAE threaded screws (removed from the feet) through the 90 tabs on the rear of the slide assembly and into the rear panel of the instrument.

14. Using the Phillips screwdriver, tighten all screws holding the right side slide assembly to the instrument chassis.

15. Using the appropriate hardware, install the outer slide assemblies onto the equipment rack.

16. Lift the signal generator into position. Align the inner and outer slide assemblies and slide the instrument into the rack. Realign the hardware as needed for smooth operation.

2-5   Power Requirements

The signal generator accepts 85 to 264 Vac, 48 to 440 Hz, single-phase power. Power consumption is 250 VA maximum. The signal generator is intended for Installation Category (Over Voltage Category) II. To connect the MG3702xA to the power source, plug the female end of the power cable into the input line voltage receptacle on the rear panel as shown in Figure 2-4. Then plug the male end of the power cord into a three-wire power line outlet. Turn on the rear panel power switch. This automatically places the signal generator in operation (front panel Operate LED on).

Warning	
⏚	When supplying power to this equipment, always use a three-wire power cable connected to a three-wire power line outlet. If power is supplied without grounding the equipment in this manner, there is a risk of receiving a severe or fatal electric shock.
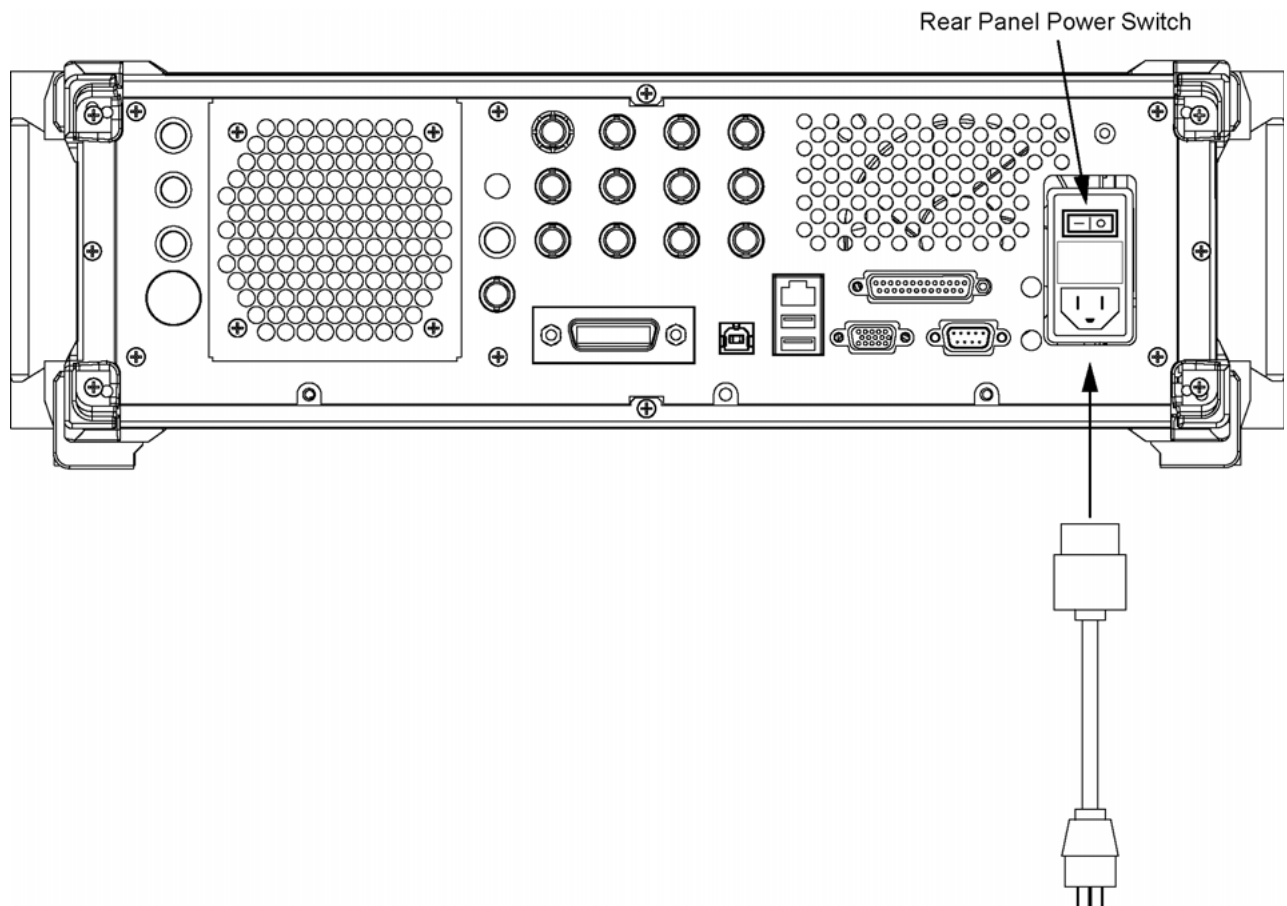
Figure 2-4.   Signal Generator Rear Panel Showing Power Connection

2-6   Power On Procedure

Connect the MG3702xA to the power source by plugging the female end of the power cable into the input line voltage receptacle on the rear panel (Figure 2-4), and then plug the male end of the power cord into a three-wire power line outlet. Turn on the rear panel power switch. This automatically places the signal generator into operation (front panel green Operate LED on). During power on and power down, the orange LED blinks for five to ten seconds. **Do not** interrupt power to the instrument or operate the line switch when the orange Standby LED is blinking. The instrument will not change its power up or power down state when the orange Standby LED is blinking.

Standby Mode

Whenever the signal generator is not being used, it should be left connected to the power source and placed in standby mode. This keeps the internal time base frequency reference at operating temperature. On the front panel, press and hold the **Line** key for at least 1/2 second to switch the MG3702xA from Operate (green LED on) to Standby mode (orange LED on). The **Line** key must be held down for at least 1/2 second to prevent accidental power-off of the unit.

Note	During standby operation, the fan runs continuously.

Warm-up Time

After placing the MG3702xA into operation mode, allow 30 minutes of warm-up time to ensure stable operation.

From a cold start (0°C), the signal generator requires approximately 120 hours (5 days) of warm up to achieve specified frequency stability with aging.

Note	Instruments disconnected from ac power for more than 72 hours require 30 days to return to specified aging.

2-7   Preparation for Storage/Shipment

The following paragraphs give instructions for preparing the MG3702xA for storage or shipment.

Preparation for Storage

Preparing the signal generator for storage consists of cleaning the unit, packing the inside with moisture absorbing desiccant crystals, and storing the unit in a temperature environment that is maintained between $-40\ ^\circ$C and $+75\ ^\circ$C.

Preparation for Shipment

To provide maximum protection against damage in transit, the signal generator should be repackaged in the original shipping container. If this container is no longer available and the unit is being returned to Anritsu for repair, advise Anritsu Customer Service; they will send a new shipping container free of charge. In the event neither of these two options is possible, instructions for packaging and shipment are given below:

- **Use a Suitable Container:** Obtain a corrugated cardboard carton with a 125 kg test strength. This carton should have inside dimensions of no less than 15 cm larger than the unit dimensions to allow for cushioning (refer to Figure 2-1 on page 2-2).
- **Protect the Instrument:** Surround the unit with polyethylene sheeting to protect the finish.
- **Cushion the Instrument:** Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the unit. Provide at least three inches of dunnage on all sides.
- **Seal the Container:** Seal the carton by using either shipping tape or an industrial stapler.
- **Address the Container:** If the instrument is being returned to Anritsu for service, mark the address of the appropriate Anritsu service center (www.anritsu.com/contact.asp/) and your return address on the carton in one or more prominent locations.

2-8   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 numbers for GPIB cables are:

- 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.
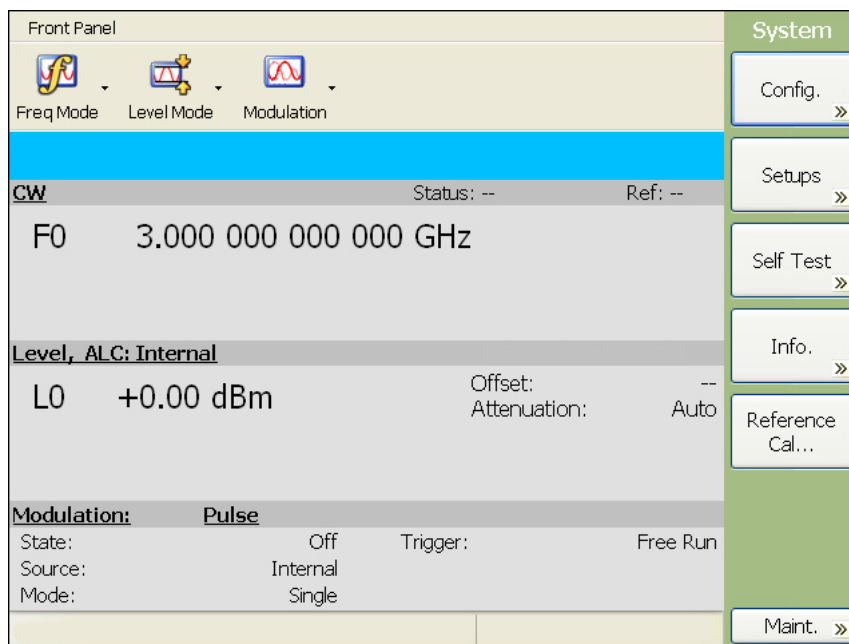
Figure 2-5.   System Menu

2. Press the Config. soft key. The System Configuration menu (shown below) is displayed.
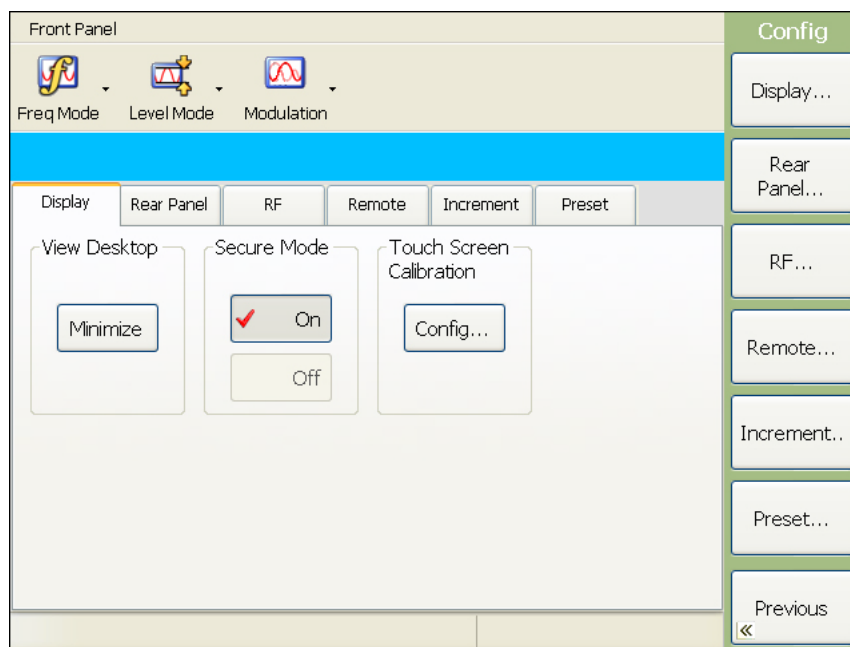
Figure 2-6.   System Config Menu

3. From the System Configuration menu, select the Remote tab or press the Remote... menu button to show the remote configuration menu shown below.
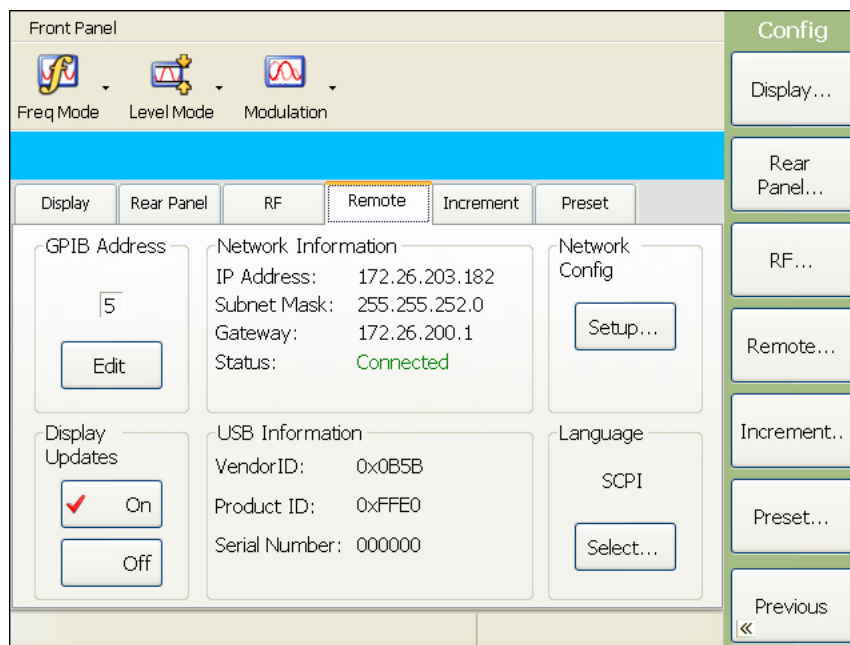
Figure 2-7.   Remote Configuration Menu

4. 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.
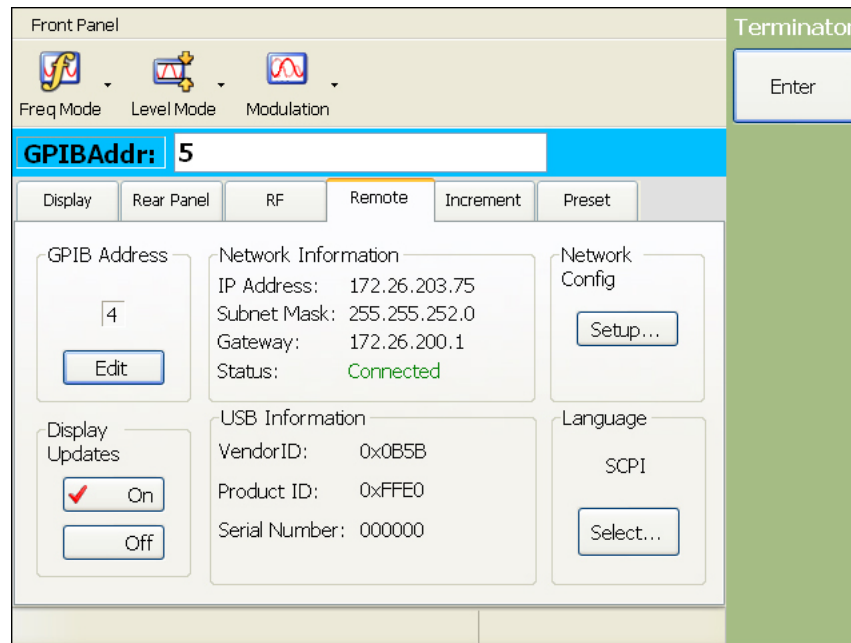
Figure 2-8.   Entering a GPIB Address

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 manually configured or automated using the network setup wizards.

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. Pinout diagram is shown in Table 2-1.

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 or MG3690B command sets 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 2-1.   8-pin Ethernet RJ45 Connector Pinout Diagram
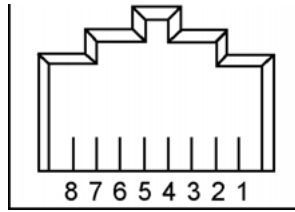
Pin	Name	Description	Wire Color
1	TX+	Transmit data (> +3 volts)	White/Orange
2	TX–	Transmit data (< –3 volts)	Orange
3	RX+	Receive data (< –3 volts)	White/Green
4	–	Not used (common mode termination)	Blue
5	–	Not used (common mode termination)	White/Blue
6	RX–	Receive data (< –3 volts)	Green
7	–	Not used (common mode termination)	White/Brown
8	–	Not used (common mode termination)	Brown

TCP/IP connectivity requires setting up the parameters 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.
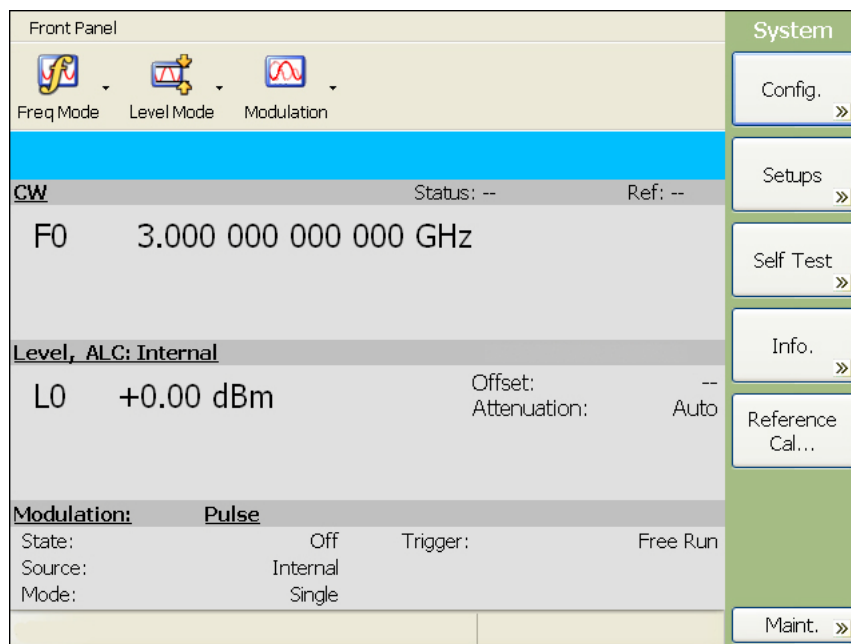
Figure 2-9.   System Menu

2. Press the Config. soft key. The System Configuration menu (shown below) is displayed.
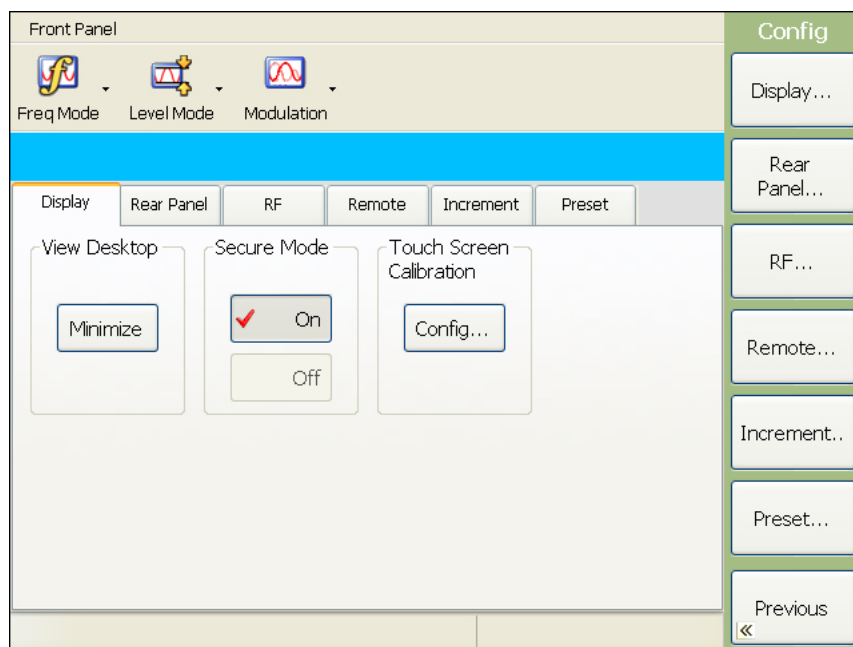
Figure 2-10. System Config Menu

3. From the System Configuration menu, select the Remote tab to show the remote configuration menu shown below.
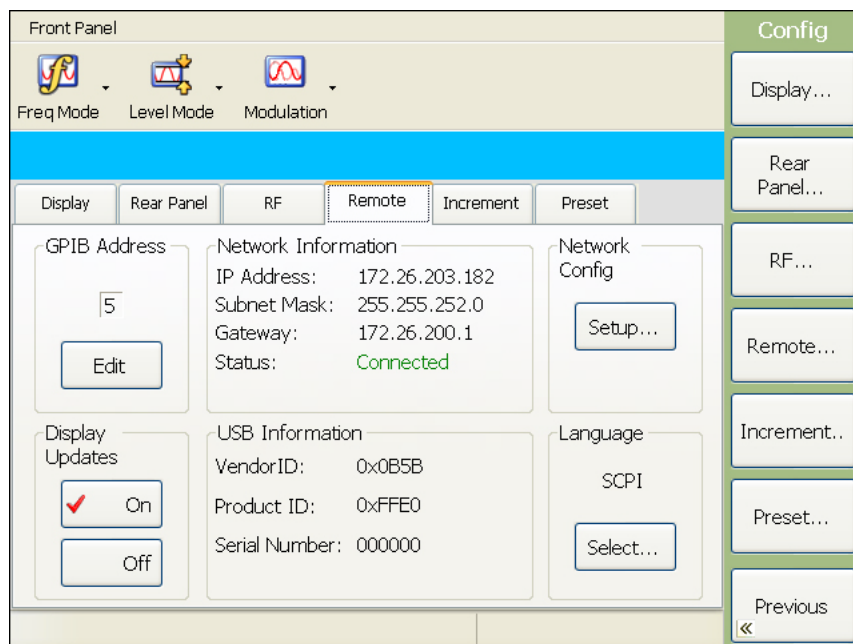
Figure 2-11. Remote Configuration Menu

4. In the Network Config area, press the Setup... button to launch the Network Connections dialog below.
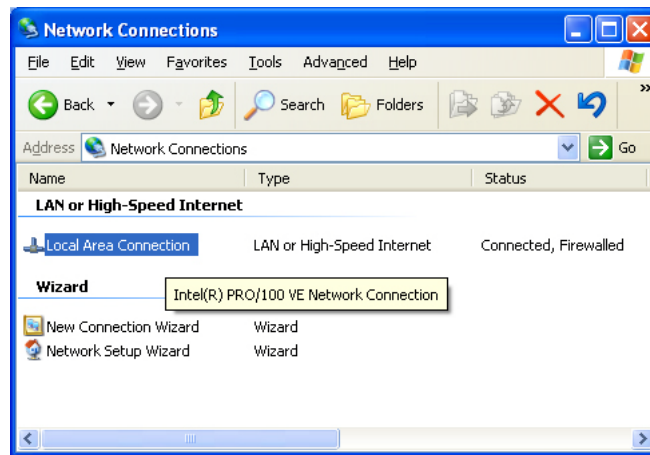
Figure 2-12. Network Connections

5. 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 2-12) 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 MG3702A. 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.
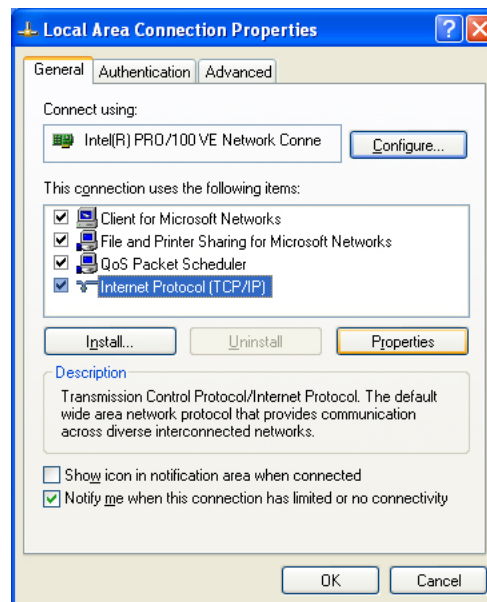
Figure 2-13. Local Area Connection Properties

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
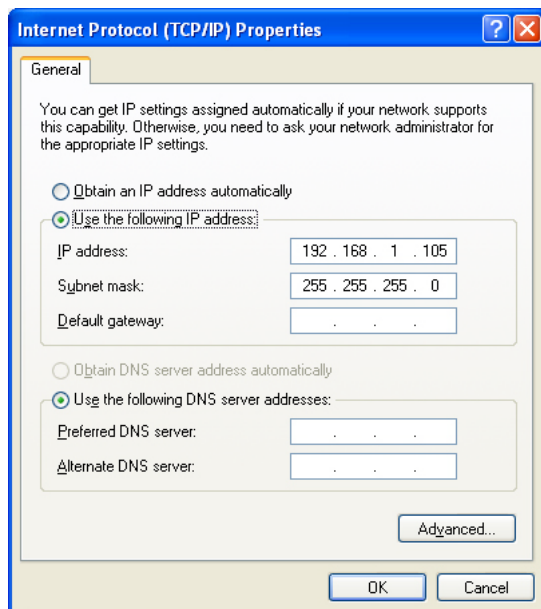
Figure 2-14. General Internet Protocol (TCP/IP) Properties

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.
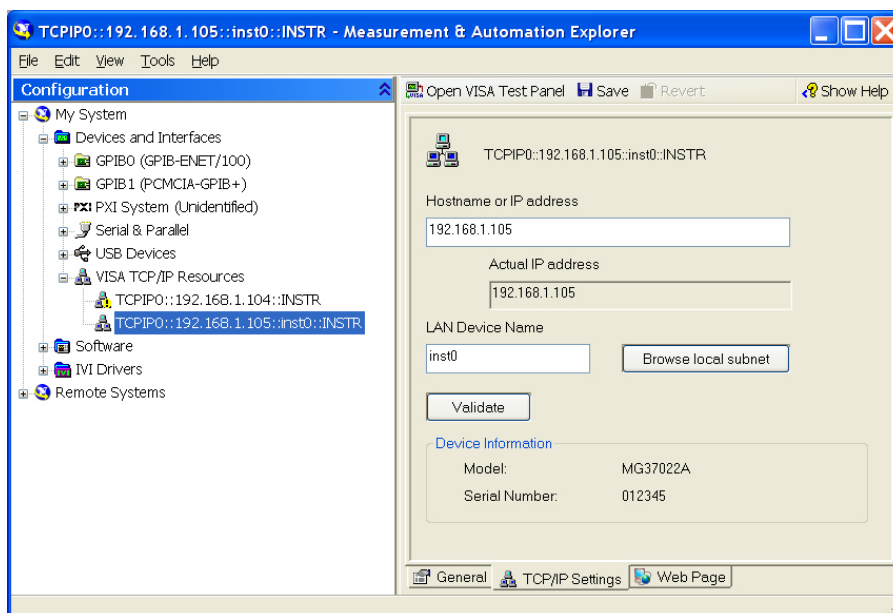
Figure 2-15. NI MAX TCP-IP Configuration

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.
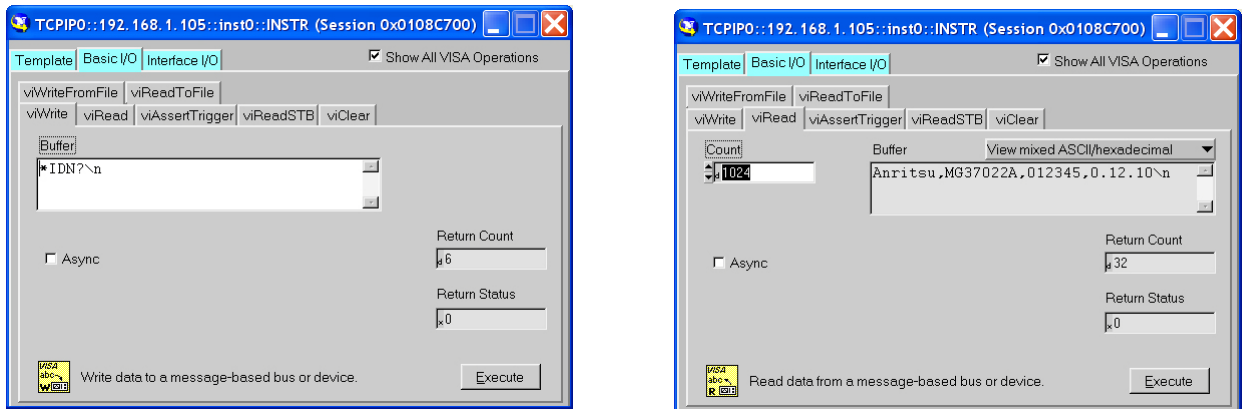
Figure 2-16. NI MAX TCP-IP Basic I/O Write/Read

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 2-17. USB Found New Hardware Wizard

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

Figure 2-18. USB Found New Hardware Wizard

5. After the software installs, close the Wizard by clicking Finish.
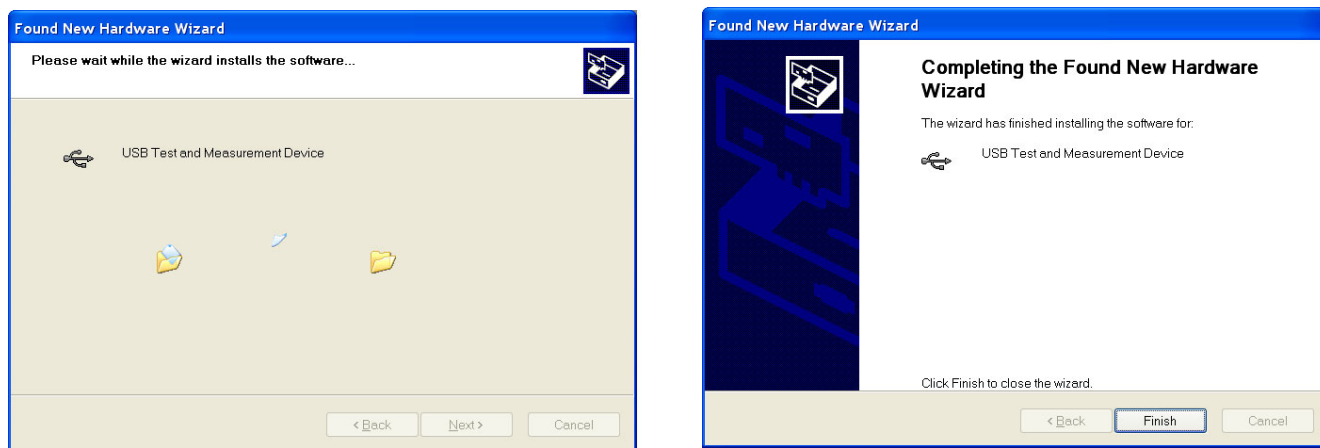
Figure 2-19. USB Found New Hardware Wizard

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.
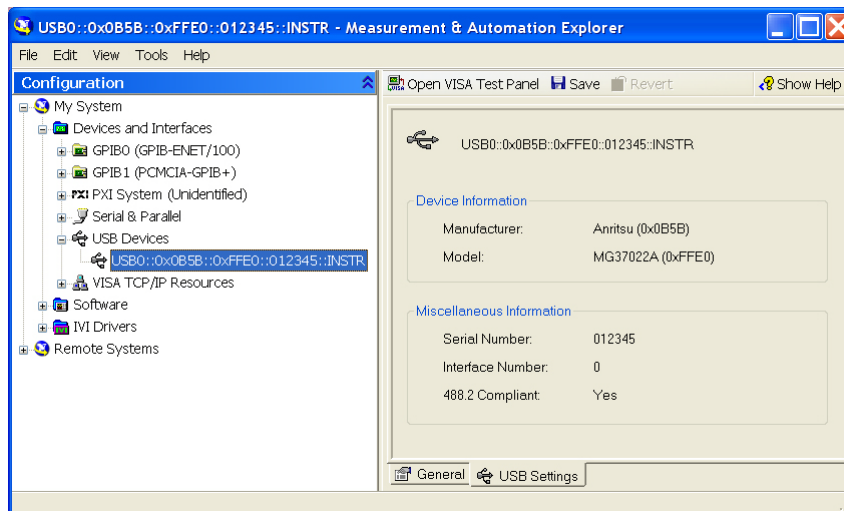
Figure 2-20. NI MAX USB Configuration

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.
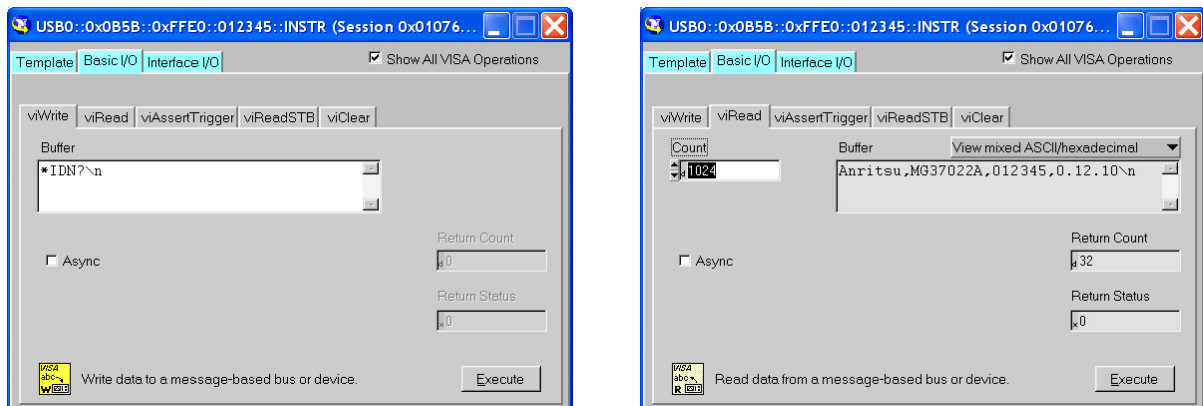
**Figure 2-21.** NI MAX USB Basic I/O Read/Write

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. More information about programming in SCPI and the SCPI equivalents to MG3690B programming commands is available in the MG3702xA programming manual, PN: 10370-10371.
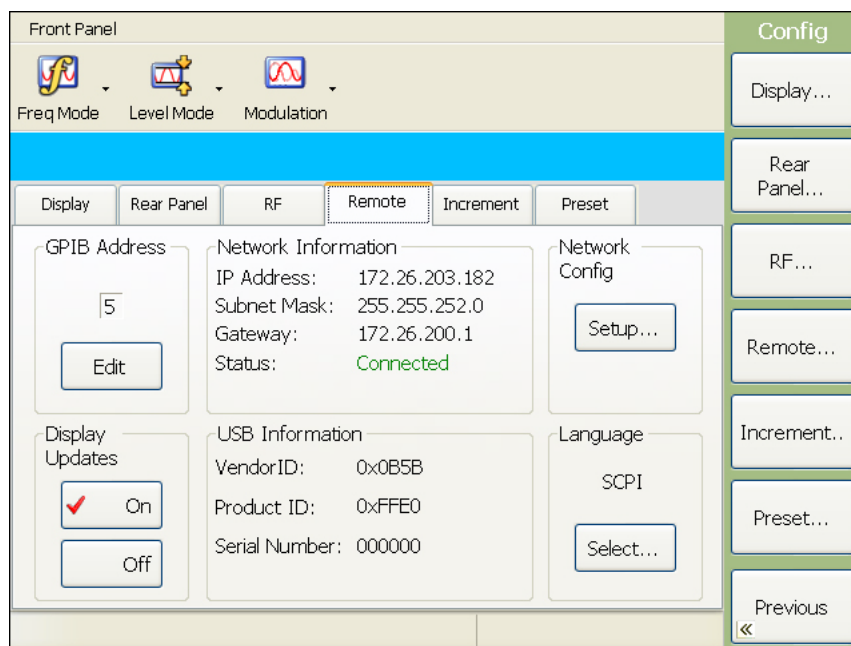
Figure 2-22. Remote Configuration Menu

Chapter 3 — Instrument Overview

3-1   Introduction

This chapter provides information and instructions on operating the series MG3702xA synthesized signal generator using the front panel controls. It contains illustrations of the front panel, graphical user interface, and data entry area that identify and describe all of the front panel controls.

3-2   Front Panel Layout

The MG3702xA front panel is divided into two main areas—the Graphical User Interface (GUI) and the data entry area. The following sections provide a brief description of the front panel controls and data entry areas shown in Figure 3-1. Detailed descriptions of the GUI are contained in Section 3-5.
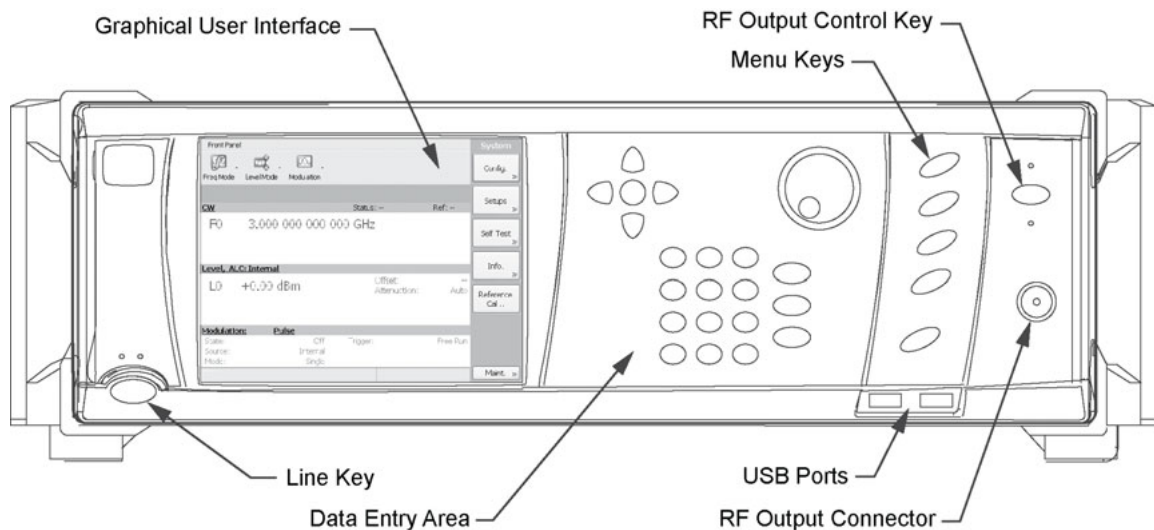
Figure 3-1.   MG3702xA Front Panel Overview

- **Line Key:** The line key provides for turning the signal generator on and off. Standby (off) is indicated by an orange LED; Operate (on) is indicated by a green LED.
- **Graphical User Interface Overview:** The graphical user interface provides information about the current status of the MG3702xA in a menu display format. This information includes the operating mode of the instrument and the value of the active frequency and power level parameters. The display functions as a touch-screen interface to provide access to graphical button controls and additional sub-menus.
- **Front Panel Menu Keys:** Menu keys provide for selecting the operating mode, parameters, and configuration of the signal generator.
- **Data Entry Area:** The data entry area consists of data entry keys and controls for changing parameter values.
- **RF Output Control Key:** The RF output control key turns the RF output power on and off. Output Off is indicated by a orange LED; Output On by a green LED.
- **RF Output Connector:** The RF output connector provides an RF output from a 50 Ω source

Important Notes About the RF Output Connector

Caution	To avoid connector damage or inaccurate measurements, before making any connections, review document 10100-00031-Connector Care Reference.
	Torque Requirements:
	K (2.92 mm) Connector - Torque to 0.9 N·m (8 lbf·in) using Anritsu Model 01-201 5/16 in Torque End Wrench and Anritsu Model 01-204 - 8 mm (5/16 in) Open End Wrench
	V (1.85 mm) Connector - Torque to 0.9 N·m (8 lbf·in) using Anritsu Model 01-201 5/16 in Torque End Wrench and Anritsu Model 01-204 - 8 mm (5/16 in) Open End Wrench

Note	To prevent power losses due to an impedance mismatch, the mating connector and cable should also be rated at 50 Ω.

3-3   Front Panel Menu Keys

The front panel menu hard-keys are positioned to the far right of the data display and do not change their function. Each menu key selects a top-level menu display. The menus keys provide access to set up the operating mode and configuration of the instrument. The menu keys are identified throughout this manual by using bold text, for example, **Frequency**. A brief functional description of each menu follows.
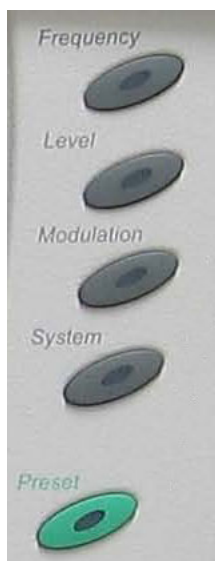
Frequency: Accesses the Frequency menu. Refer to Section 4-5, Section 4-6, and Section 4-7 for information on selecting the available frequency control options.

Level: Accesses the Level menu. Refer to Section 4-8 for information on selecting the available level control options.

Modulation: Accesses the Modulation menu (Pulse) when the option is installed. Refer to Section 4-11 for information on selecting the available modulation control options.

System: Accesses the System menu. This menu provides access to menus that let you:

> Reset the instrument to factory-selected default values
> Configure the front panel, rear panel, RF, and GPIB
> Save or recall instrument setups
> Disable front panel data display
> Perform instrument self-tests
> Perform a reference oscillator calibration

Refer to Section 4-9 for information on selecting the available system configuration options.

Preset: This key presets the instrument. Refer to "Configuring Preset Conditions" on page 4-34 for information on selecting and saving the available preset options.

Figure 3-2.   Main Menu Keys

3-4   Data Entry Area

The value of a selected MG3702xA parameter can be changed using the rotary data knob, cursor control keys, or data entry keys. The data entry area is identified in Figure 3-3 and described in the following paragraphs.

Figure 3-3.   Data Entry Area

Cursor Control Keys

In general, this diamond-shaped key cluster controls the movement of the cursor on the display. When a parameter is opened for editing, a cursor appears just before the open parameter. Each time the left or right key is pressed, the cursor moves left or right by one digit. The up or down key can then be used to increase or decrease the value of the parameter. The unit size of the increase or decrease that occurs each time a key is pressed is determined by the cursor position.

The **Select** key has no function.

Rotary Data Knob

The rotary knob can be used to change the value of a parameter that is open for editing. The cursor is moved just before the open parameter using the left and right cursor control keys. Then, by slowly turning the knob clockwise or counterclockwise the value of the parameter is increased or decreased by the unit size. The unit size is determined by the cursor placement.

Data Entry Keys

The numeric keypad provides for direct entry of numerical values. The **+/−** key changes the sign of the numerical value during data entry. The **Clr →|** key clears the parameter entry field when a parameter is open for editing. The ← key is used to correct keypad data entry errors by deleting the last number, "**−**", or decimal point entered. The **Enter** key enters the value that is currently displayed in the parameter entry field.

3-5 Graphical User Interface Overview

The Graphical User Interface (GUI) is a touch-screen, liquid-crystal display (LCD). Information is presented on the LCD in the form of menu displays with interactive soft button controls. These buttons either select a menu to be displayed or control a function on the current menu display. Figure 3-4 shows the format of the menu display and identifies some common display elements. The paragraphs that follow provide general descriptions of the menus and display additional controls that you may encounter.
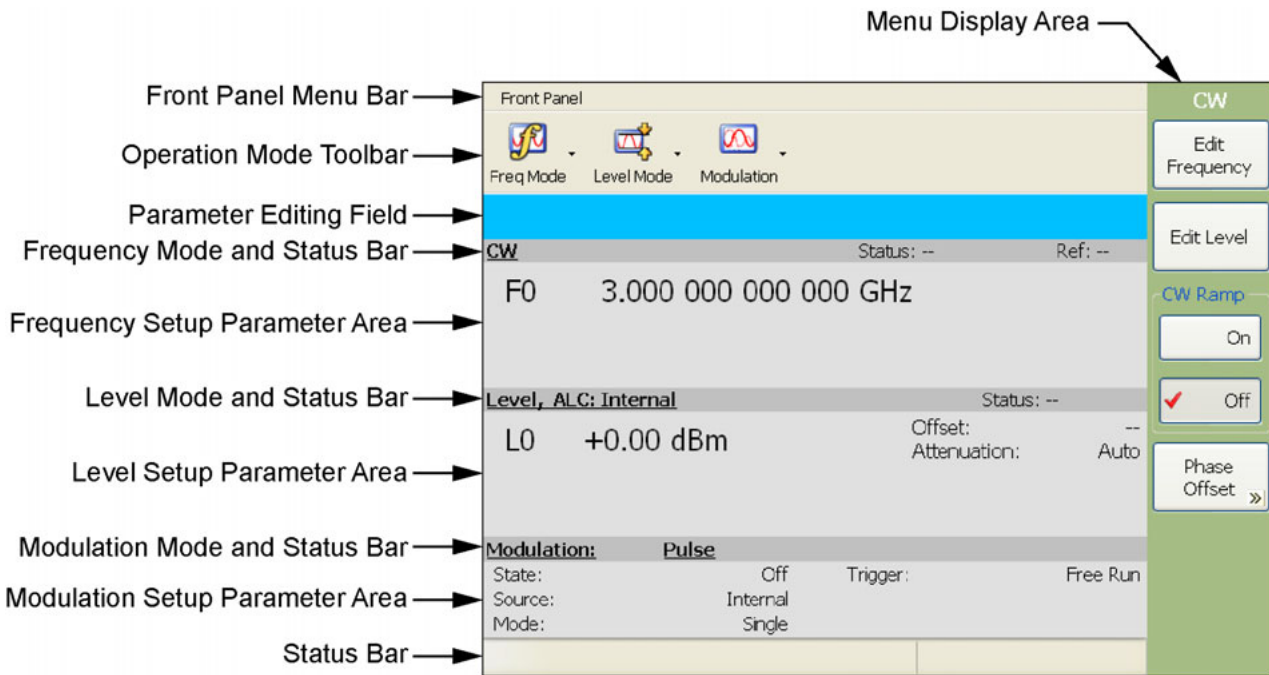
Figure 3-4. GUI Overview

Operating Mode Toolbar

The operating mode toolbar provides access to various operating modes of the instrument.
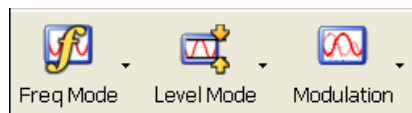
Figure 3-5. Operating Mode Toolbar

- **Freq Mode:** Sets the instrument to CW mode, Step Sweep mode, or List Sweep mode.
- **Level Mode:** Selects the Level menu.
- **Modulation:** Selects the Pulse menu.

Menu Display Area

The menu display area shows the menu content that is relevant to the currently selected operating mode and menu selection. These menus provide access to button controls and additional menus that are related to the currently selected function of the instrument. When additional menus are available, a double right arrow (>>) or ellipsis (…) is shown on the menu button. To access these controls or menus, press the button with a finger or click with a mouse.

Status Bars and Parameter Areas

Three shaded status bars identify each of the three parameters area. The currently selected mode of operation and status information for each operation is displayed in this status bar as follows:

Frequency Setup Parameter Area: The current frequency mode (CW, Step Sweep, or List Sweep) appears on the left side of the status bar. The frequency status (locked or unlocked) and reference source are displayed on the right side of the status bar. The current CW frequency in GHz, the start and stop frequencies of the current frequency sweep range (in GHz), the current list index and frequency, or the start and stop indexes for the list sweep are displayed on the left side of the setup parameters area. In the step and list sweep modes, additional sweep setup parameters (dwell, step size, number of steps, and trigger mode setting) appear on the right side of the parameters area.

Step Sweep		Status: --	Ref: --
F1	10.000 000 000 MHz	Dwell:	10.000 ms
		Step Size:	3.999 MHz
F2	40.000 000 000 000 GHz	Num Steps:	10 000
		Trigger:	Auto

Figure 3-6.   Frequency Status Bar and Setup Parameters Area

Level Setup Parameter Area: The current power level mode appears on the left side of the status bar. The level status (Level or Unleveled) is displayed on the right side of the status bar.

The current power level in dBm is displayed on the left side of the parameters area. Additional leveling parameters (level offset and attenuation) appear on the right side of the parameters area.

Level, ALC: Internal		Status: --
L0	+0.00 dBm	Offset: --
		Attenuation: Auto

Figure 3-7.   Level Status Bar and Setup Parameters Area

Modulation Setup Parameter Area: Pulse modulation status appears on the status bar. Additional modulation setup parameters (state, source, mode, and trigger) appear on the parameters area.

Modulation:	Pulse		
State:	Off	Trigger:	Free Run
Source:	Internal		
Mode:	Single		

Figure 3-8.   Modulation Status Bar and Setup Parameters Area

Parameter Editing Field

The blue parameter editing field is used to edit most parameters such as frequency, level, and GPIB address. When a parameter is not actively selected for editing, the field is solid blue. Below is an example of several parameters being edited.

Figure 3-9.   Parameter Editing Fields

When the parameter edit field is active, a new value can be directly keyed in or incremented by using the up/down cursor keys or the rotary knob to change the value. When using the cursor keys or rotary knob to edit the parameter, the left/right cursor keys can be used to move the digit being edited left or right. When keying in a new value, the entire value must be entered and terminated with an appropriate termination key as described below.

Termination Buttons

Termination buttons are used to terminate data entries. Termination buttons are located on the right side of the menu display area when a parameter editing field is open and data is being entered. If the entered value is outside of the allowable range of the open parameter, an error message is displayed. The Frequency, Power Level, Time, and Enter termination buttons are shown below:
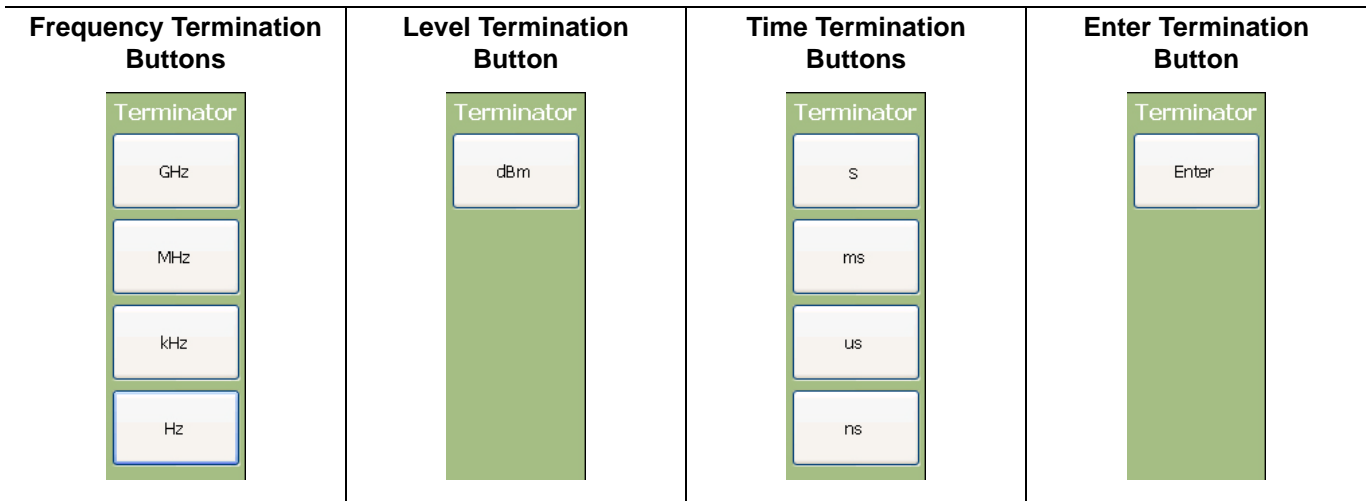

Figure 3-10. Termination Buttons

3-6 Front Panel Menus

This section provides a comprehensive collection of front panel menus and displays. Each illustration is accompanied with a description of the functions available in the particular display. Additional navigation options may also be described; however, this section does not provide operational concepts or task examples. For details on specific operations and instrument setups, refer to Chapter 4, "Instrument Operation".

Quick Reference

Table 3-1 through Table 3-4 provide a summary of the MG3702xA menu illustrations and descriptions.

Table 3-1. Frequency Menus

Top-level Menu	Menu	Page
Continuous-Wave CW Menus	CW Menu	3-9
	Phase Menu	3-9
Step Sweep Menus	Step Sweep Menu	3-10
	Step Setup Menu	3-10
List Sweep Menus	List Sweep Menu	3-11
	List Setup Menu	3-11
	List Type Menu	3-11
	List Edit Menu (Frequency List Type)	3-12
	List Edit Menu (Frequency + Level List Type)	3-12

Table 3-2. Level Menus

Top-level Menu	Menu	Page
Level Menus	Level Menu	3-13
	Level Menu (More)	3-13
	Leveling Menu	3-14
	Attenuation Menu	3-14

Table 3-3. Modulation Menus

Top-level Menu	Menu	Page
Pulse Modulation Menus	Internal Pulse Modulation Menu	3-15
	Internal Pulse Modulation Menu (More)	3-15
	Pulse Modulation Mode Menu	3-15
	Pulse Modulation Trigger Menu	3-16
	External Pulse Modulation Menu	3-16

Table 3-4.   System Menus

Top-level Menu	Menu	Page
System Menu	System Menu	3-17
Configuration Menus	Display Menu	3-17
	Rear Panel Menu	3-17
	RF Menu	3-18
	Remote Menu	3-18
	Increment Menu	3-18
	Preset Menu	3-19
	Preset Select Menu	3-19
Setups Menus	Setups Menu	3-20
	Save Setup Menu	3-20
	Select File Name Menu	3-20
	Recall Setup Menu	3-21
	Save to Last Dialog Box	3-21
Self Test Menus	Self Test Menu	3-22
	Self Test Status Log	3-22
	Frequency Self Tests	3-22
	Level Self Tests	3-23
	Modulation Self Tests	3-23
	Utility Self Tests	3-23
	Selected Self Test Log	3-24
Info Menus	Info Menu	3-25
	System Information Dialog Boxes	3-25
	Error Log Menu	3-26
	Error Details Dialog Box	3-26
Reference Cal Menu	Reference Cal... Menu	3-26
Maintenance Menu	Maintenance Menu	3-27
Remote Menus	Remote Menu	3-27

Frequency Menus
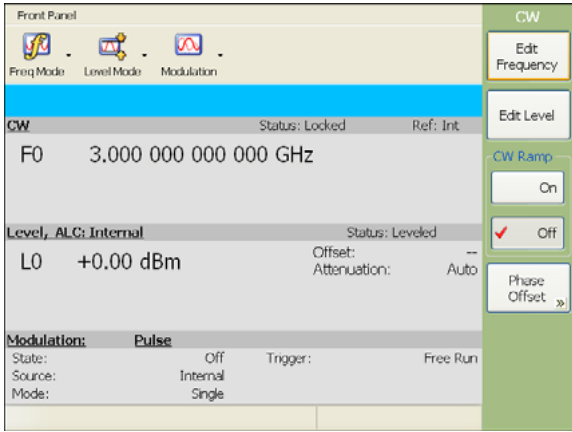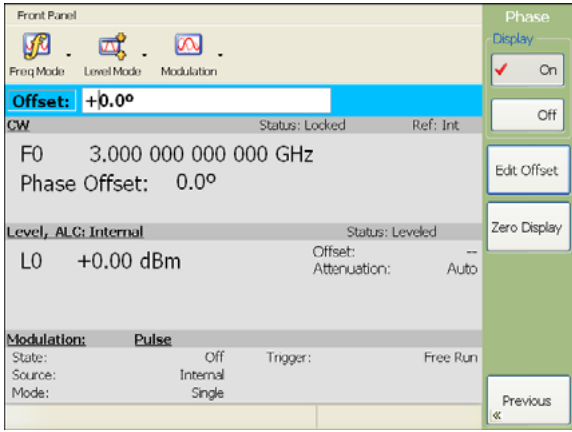
CW Menus

CW Menu	
	Edit Frequency: Opens the CW frequency parameter field.
	Edit Level: Opens the level parameter field.
	CW Ramp: Toggles the rear panel CW Ramp On or Off.
	Phase Offset>>: Opens the Phase Menu.
Phase Menu	
	Display: Select the phase offset display On or Off.
	Edit Offset: Opens the Offset parameter field.
	Zero Display: Sets the Phase Offset display to zero (0.0) degrees.
	Refer to "Editing the Current Phase Offset Value" on page 4-10 for more information.
	<<Previous: Returns to the CW Menu.

Figure 3-11. CW Menus
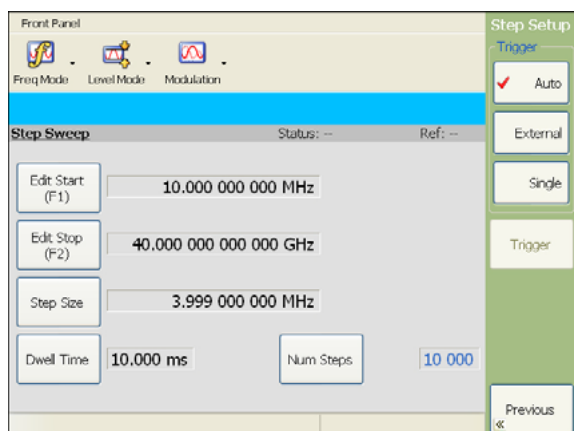
Step Sweep Menus
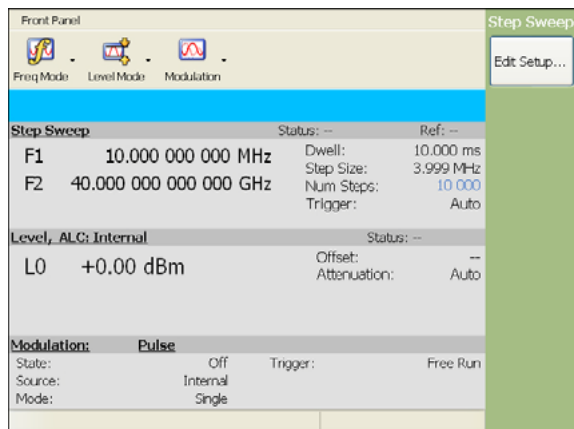
Step Sweep Menu	
	Edit Setup: Opens the Step Setup Menu.

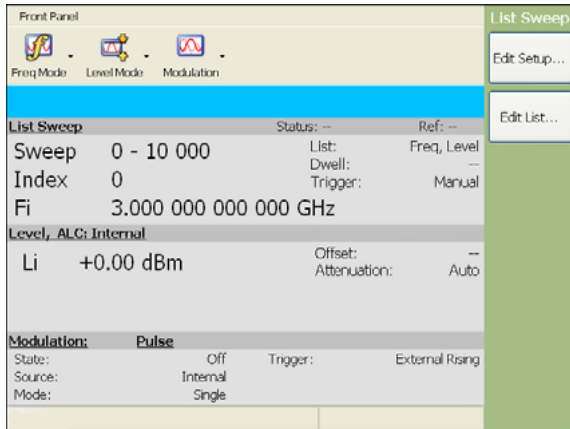| **Step Setup Menu**	
	Auto: Sets sweep triggering to Auto.
	External: Sets sweep triggering to External.
	Single: Sets sweep triggering to Single.
	Trigger: When in single sweep, triggers a new sweep.
	Edit Start (F1): Opens the start frequency parameter field.
	Edit Stop (F2): Opens the stop frequency parameter field.
	Step Size: Opens the step size parameter field. A blue number in this field indicates that the value was changed to accommodate a coupled setting, such as Num Steps.
	Num Steps: Opens the number of steps parameter field. A blue number in this field indicates that the value was changed to accommodate a coupled setting, such as Step Size.
	Dwell Time: Opens the dwell time edit parameter field. Dwell time specifies the time spent at each frequency.
	<<Previous: Returns to the Step Sweep Menu.

Figure 3-12. Step Sweep Menus
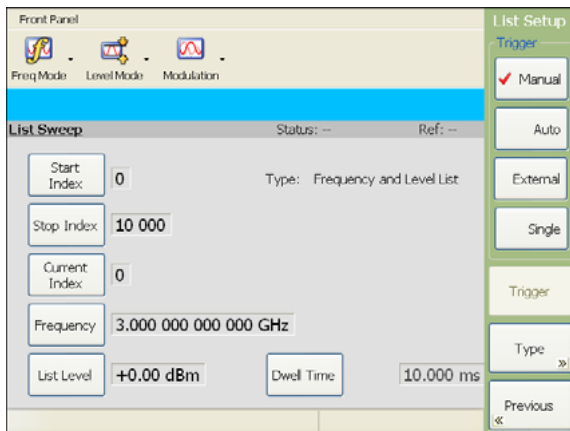
List Sweep Menus

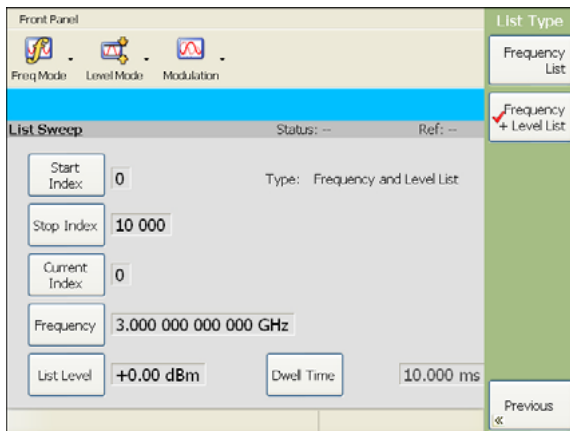| **List Sweep Menu**	
	Edit Setup: Opens the List Setup Menu. **Edit List:** Depending on the list type, opens the List Edit Menu (Frequency List Type) or List Edit Menu (Frequency + Level List Type).
List Setup Menu	
	Manual: Sets sweep triggering to Manual. **Auto:** Sets sweep triggering to Auto. **External:** Sets sweep triggering to External. **Single:** Sets sweep triggering to Single. **Trigger:** When in single sweep, triggers a new sweep. **Type>>:** Opens the List Type Menu. **<<Previous:** Returns to the List Sweep Menu. See the List Type Menu below for a description of the list sweep setup controls.
List Type Menu	
	Frequency List: Selects a frequency list with a fixed level for each list index. **Frequency + Level List:** Selects a frequency list with an adjustable level for each list index. **Start Index:** Opens the start index parameter field. **Stop Index:** Opens the stop index parameter field. **Current Index:** Opens the current index parameter field. **Frequency:** Opens the frequency parameter field. **Fixed Level** or **List Level:** Opens the level parameter field. **Previous:** Opens the List Setup Menu.

Figure 3-13. List Sweep Menus
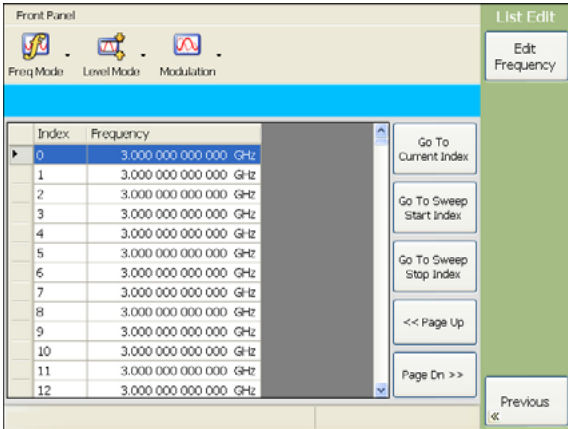
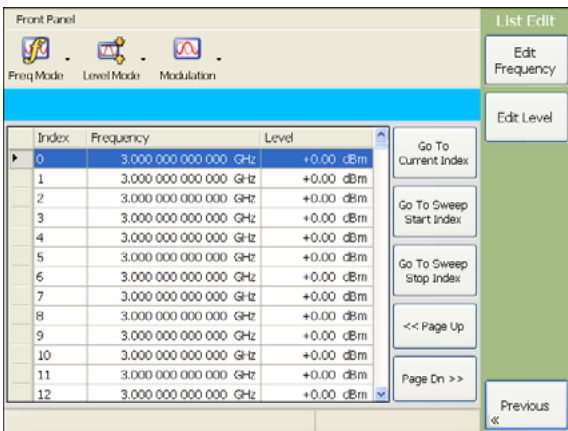| List Edit Menu (Frequency List Type)	
	Edit Frequency: Opens the selected index frequency parameter field.
	Go To Current Index: Moves the selection to the currently set frequency.
	Go To Sweep Start Index: Moves the selection to the start index position.
	Go To Sweep Stop Index: Moves the selection to the stop index position.
	Page Up: Displays the previous page of index values.
	Page Down: Displays the next page of index values.
	<<Previous: Returns to the List Sweep Menu.
List Edit Menu (Frequency + Level List Type)	
	Edit Frequency: Opens the selected index frequency parameter field.
	Edit Level: Opens the selected index level parameter field.
	Go To Current Index: Moves the selection to the currently set frequency.
	Go To Sweep Start Index: Moves the selection to the start index position.
	Go To Sweep Stop Index: Moves the selection to the stop index position.
	Page Up: Displays the previous page of index values.
	Page Down: Displays the next page of index values.
	<<Previous: Returns to the List Sweep Menu.

Figure 3-13. List Sweep Menus

Level Menus

Level Menu
(CW & Step Sweep Freq. Mode)
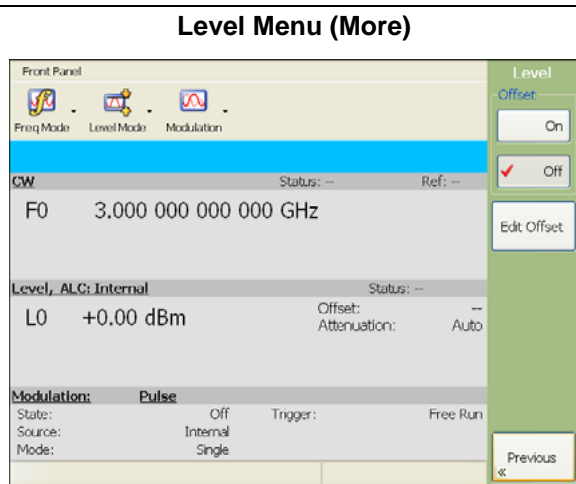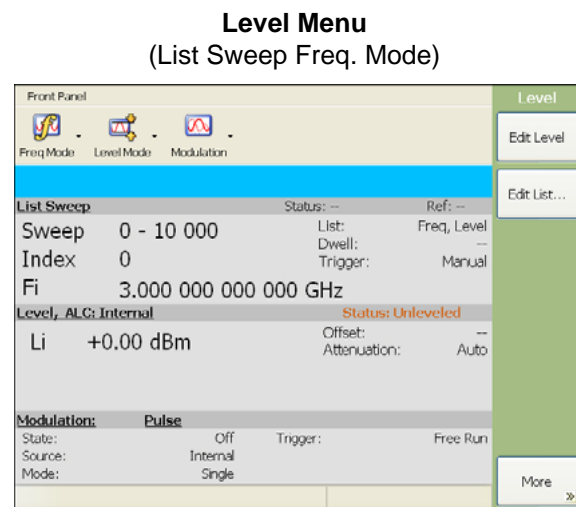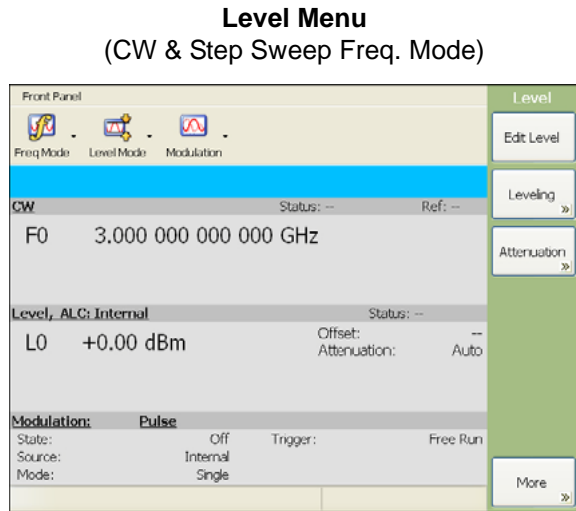
Edit Level: Opens the level edit parameter field.

Leveling>>: Opens the Leveling Menu
(not available in List Sweep mode).

Attenuation>>: Opens the Attenuation Menu
(not available in List Sweep mode).

More>>: Opens the Level Menu (More).

Edit List: Opens the List Edit Menu (Frequency + Level List Type) (only available in List Sweep mode).

Level Menu
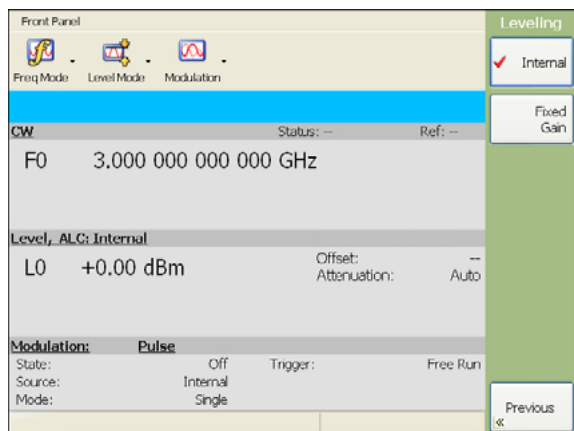(List Sweep Freq. Mode)

Level Menu (More)

Offset: Enables level offset.

Edit Offset: Opens the level offset edit parameter field.

<<Previous: Returns to the Level Menu.

Figure 3-14. Level Menus

Leveling Menu

This menu is not available in List Sweep mode.

Internal: Selects internal leveling.

Fixed Gain: Selects fixed gain leveling.

<<Previous: Returns to the Level Menu.

Attenuation Menu
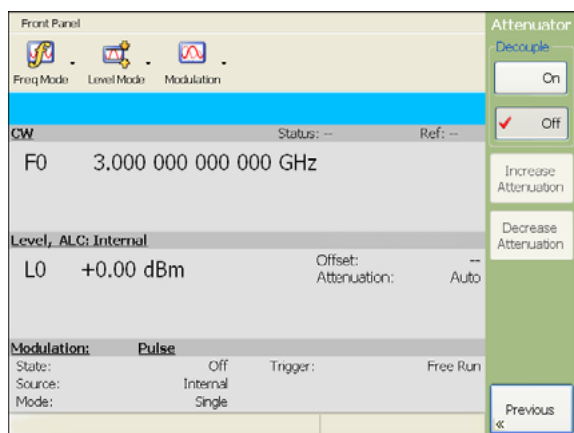
This menu is not available in List Sweep mode.

Decouple (On): Decouples the internal attenuator for manual attenuation control.

Increase Attenuation: When the internal attenuator is decoupled, increases the attenuation by 10 dB.

Decrease Attenuation: When the internal attenuator is decoupled, decreases the attenuation by 10 dB.

<<Previous: Returns to the Level Menu.

Figure 3-14. Level Menus

Pulse Modulation Menus

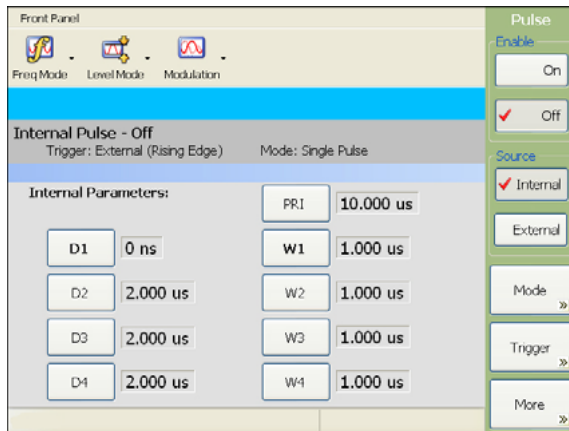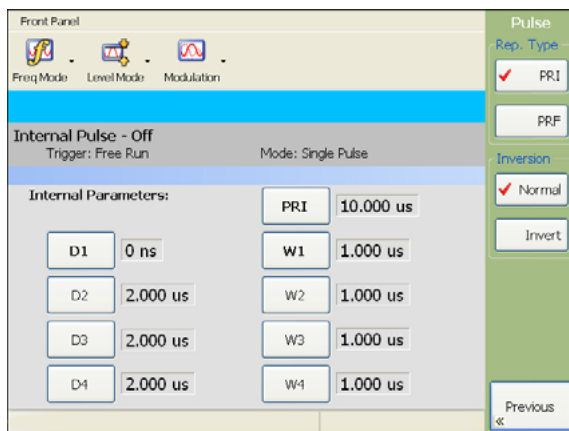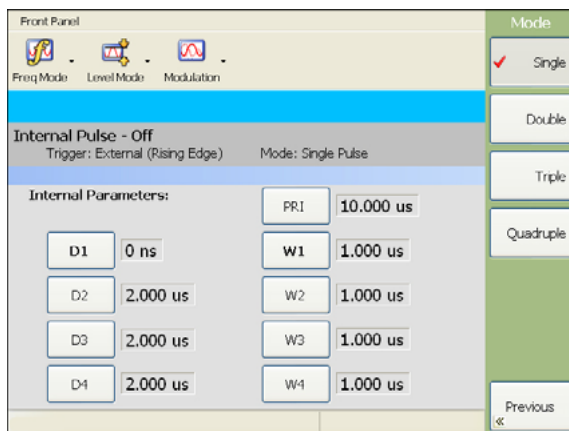| **Internal Pulse Modulation Menu**	
	Enable: Enables the pulse modulation from either an internal or external source. **Source:** Selects the pulse modulating source from either Internal or External. When external source is selected the RF On polarity can be selected between High RF On or Low RF On. **Mode>>:** Opens the Pulse Modulation Mode Menu. **Trigger>>:** Opens the Pulse Modulation Trigger Menu. **More>>:** Opens the Internal Pulse Modulation Menu (More). **Internal Parameters:** Refer to the Pulse Modulation Mode Menu for descriptions of these parameters.
Internal Pulse Modulation Menu (More)	
	Rep. Type: Selects between Pulse Repetition Interval or Pulse Repetition Frequency. **Inversion:** Normal selects RF On during pulse high, Invert selects RF Off during pulse high. **<<Previous:** Returns to the Internal Pulse Modulation Menu. **Internal Parameters:** Refer to the Pulse Modulation Mode Menu for descriptions of these parameters.
Pulse Modulation Mode Menu	
	Single: Selects single pulse. In this mode, the internal parameters D1 (pulse delay) and W1 (pulse width) are enabled. **Double:** Selects double pulse. In this mode, the internal parameters D1 and D2 (pulse delays) and W1 and W2 (pulse widths) are enabled. **Triple:** Selects triple pulse. In this mode, the internal parameters D1, D2, and D3 (pulse delays) and W1, W2, and W3 (pulse widths) are enabled. **Quadruple:** Selects quadruple pulse. In this mode, the internal parameters D1, D2, D3, and D4 (pulse delays) and W1, W2, W3, and W4 (pulse widths) are enabled. **<<Previous:** Returns to the Internal Pulse Modulation Menu.

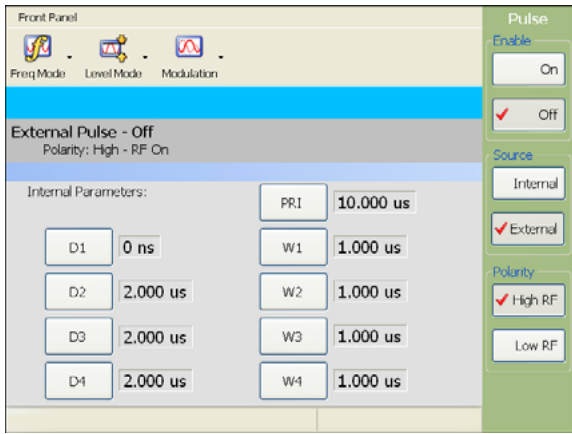**Figure 3-15.** Pulse Modulation Menus

Pulse Modulation Trigger Menu

Free Run: Selects continuous free run pulse triggering.

External Trigger: Selects external pulse triggering.

Edge: When external trigger is selected, the trigger edge can be selected between Rising or Falling.

Gated: Selects gated pulse triggering. Gated triggering allows the pulse to continue during the gate cycle.

Gate: When gated trigger is selected, the trigger gate can be selected between High or Low.

<<Previous: Returns to the Internal Pulse Modulation Menu.

External Pulse Modulation Menu

Enable: Enables the pulse modulation from either an internal or external source.

Source: Selects the pulse modulating source from either Internal or External.

Polarity: When external source is selected, the RF On polarity can be selected between High RF on or Low RF on.

Figure 3-15. Pulse Modulation Menus

System Menus

System Menu	
	The top-level System menu provides access to the following sub-level menus: Configuration Menus Setups Menus Self Test Menus Info Menus Reference Cal Menu Maintenance Menu

Figure 3-16. System Menu

Configuration Menus

Display Menu	
	View Desktop: Minimizes the MG3702xA software interface and shows the system desktop. **Secure Mode:** Sets the MG3702xA to secure mode of operation. Refer to "Secure Mode Operation" on page 4-25 for more information. **Touch Screen Calibration:** Launches the touch-screen control panel. Refer to "Calibrating the Touch Screen" on page 4-27 for more information. **<<Previous:** Returns to the System Menu.
Rear Panel Menu	
	Blanking: Sets the rear panel bandswitch blanking to either +5 V or –5 V. **<<Previous:** Returns to the System Menu.

Figure 3-17. Configuration Menus (1 of 3)

RF Menu
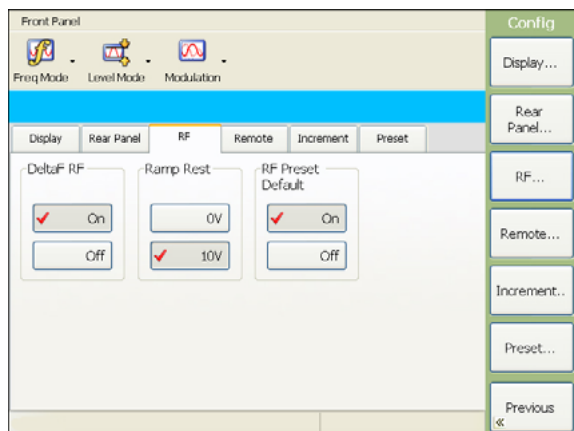
DeltaF RF: Sets RF On or Off during frequency switching.

Ramp Rest: Sets rear panel ramp voltage at ramp rest.

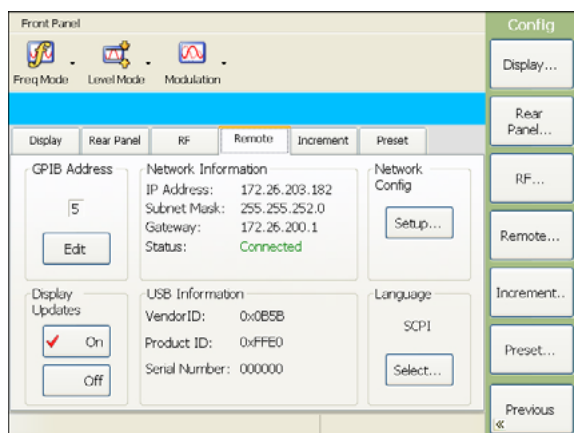**RF Preset Default:** Sets RF On or Off at preset.

<<Previous: Returns to the System Menu.

Remote Menu

GPIB Address: Opens the GPIB address edit parameter field.

Display Updates: Sets the local display mode when under remote operation.

Network Information: Provides network information about the IP Address, Subnet Mask, Gateway, and connection status.

Network Config: The Setup... button launches the Windows Network Connections dialog.

USB Information: Provides information about the USB hardware.

Language: Displays the current remote language. The Select button opens the Remote Language Select dialog box for changing between SCPI and MG3690B.

<<Previous: Returns to the System Menu.

Increment Menu
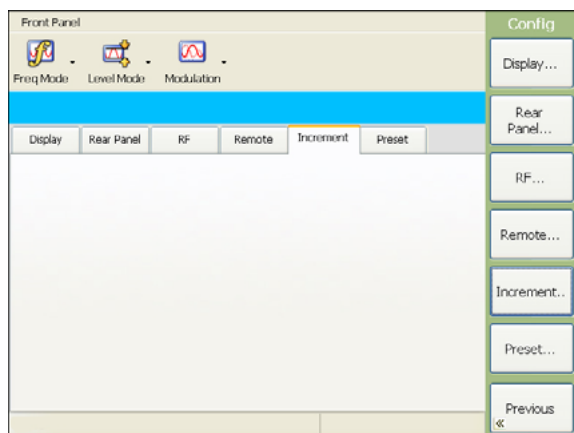
This menu has no function.

<<Previous: Returns to the System Menu.

Figure 3-17. Configuration Menus (2 of 3)

Preset Menu

Power On Setup: Sets the power on setup to retrieve the last state on power down or a default setup state.

Preset: Sets the preset state to retrieve the default setup state or a user defined state.

Select: Opens the Preset Select Menu.

Master Reset: Performs a master reset of the MG3702xA. A master reset performs a default preset and defaults additional items that survive a preset. The current list is:

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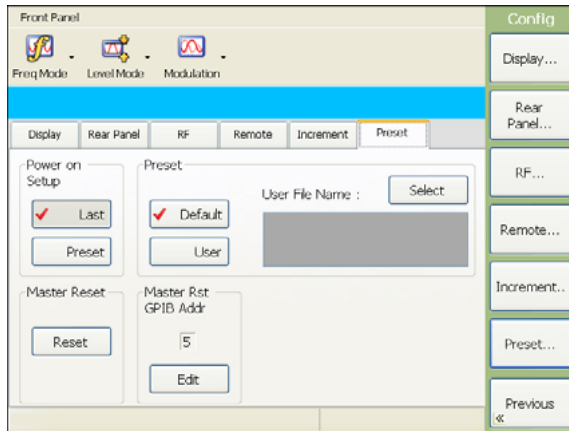> - Master Reset GPIB address setting
> - Remote display updates setting
> - Power on setup settings
> - Preset setup settings
> - Preset user filename
> - RF preset state

Master Reset GPIB Addr: Sets the GPIB address when a master reset is performed.

<<Previous: Returns to the System Menu.

Preset Select Menu
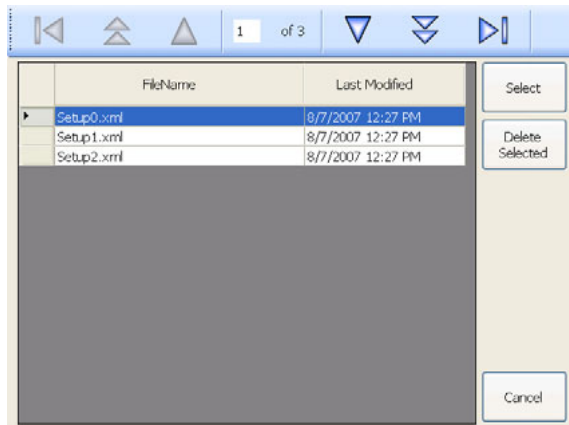
Select: Selects the highlighted file and returns to the Preset Menu.

Delete Selected: Deletes the highlighted file.

Cancel: Returns to the Preset Menu.

Figure 3-17. Configuration Menus (3 of 3)

Setups Menus
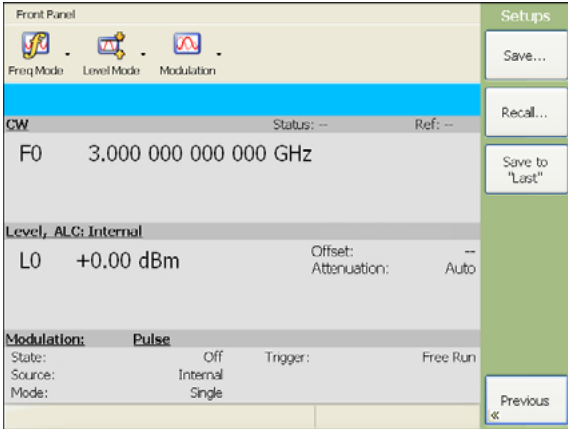
Setups Menu	
	Save: Opens the Save Setup Menu.
	Recall: Opens the Recall Setup Menu.
	Save to "Last": Saves the current setup to the last state file. Displays the Save to Last Dialog Box.
	<<Previous: Returns to the System Menu.
Save Setup Menu	
	The Save Setup menu provides an online keyboard to enter a setup filename and save the setup file.
	Cancel: Returns to the Setups Menu.
	Select File Name: Opens the Select File Name Menu.
	Save: Saves the setup file and returns to the Setups Menu.
Select File Name Menu	
	Select: Selects the highlighted file and returns to the Preset Menu.
	Cancel: Returns to the Save Setup Menu.
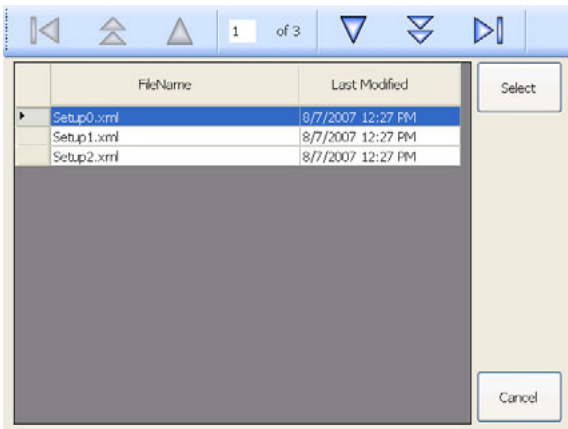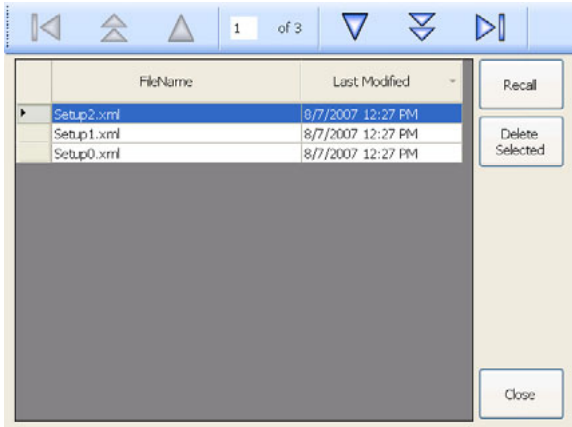
Figure 3-18. Setups Menu (1 of 2)

Recall Setup Menu	
	Recall: Selects the highlighted setup file and returns to the Setups Menu. **Delete Selected:** Deletes the highlighted file. **Close:** Returns to the System Menu.
Save to Last Dialog Box	
	Warning dialog box that selecting Yes will overwrite current data.
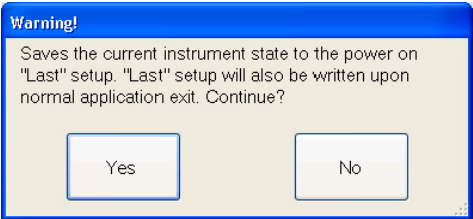
Figure 3-18. Setups Menu (2 of 2)

Self Test Menus
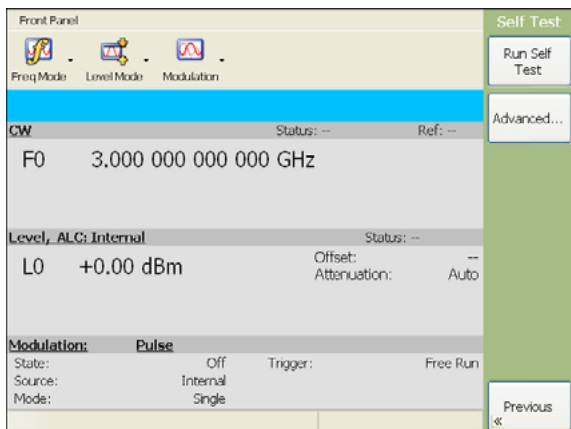
Self Test Menu	
	Run Self Test: Executes the set of 13 self test routines and displays the Self Test Status Log. **Advanced...:** Opens the advanced tests starting with the Frequency Self Tests. **<<Previous:** Returns to the System Menu.
Self Test Status Log	
	The Self Test Status log displays the results of the performed self tests.
Frequency Self Tests	
	Run Enabled: Executes the enabled self test routines and displays the Selected Self Test Log. **Enable/Disable All:** Toggles all of the Enabled check boxes. **Toggle Enable:** Toggles the selected Enabled check box. **Toggle Verbose:** Toggles the selected Verbose check box. **Selected Test Log...:** Displays the Selected Self Test Log. **<<Previous:** Returns to the System Menu.
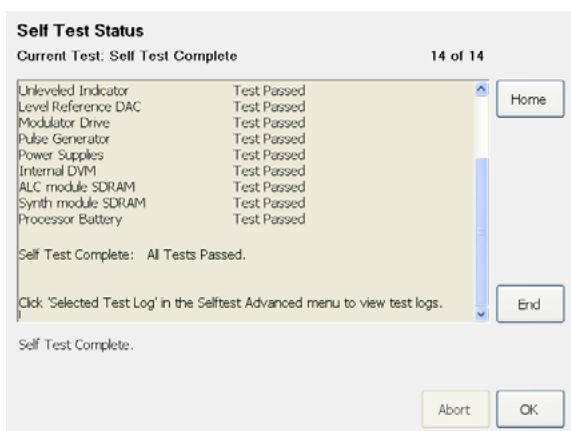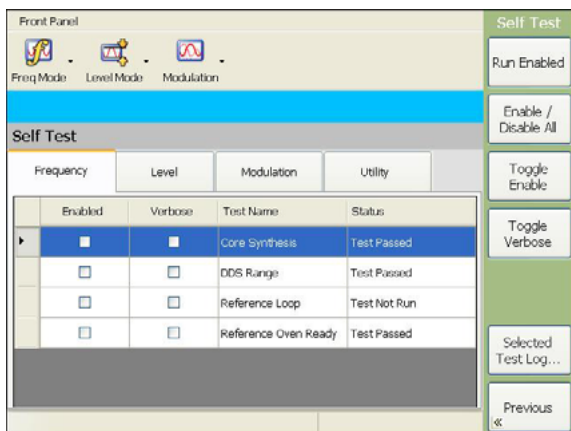
Figure 3-19. Self Test Menus (1 of 3)

Level Self Tests	
	Run Enabled: Executes the enabled self test routines and displays the Selected Self Test Log. **Enable/Disable All:** Toggles all of the Enabled check boxes. **Toggle Enable:** Toggles the selected Enabled check box. **Toggle Verbose:** Toggles the selected Verbose check box. **Selected Test Log...:** Displays the Selected Self Test Log. **<<Previous:** Returns to the System Menu.
Modulation Self Tests	
	Run Enabled: Executes the enabled self test routines and displays the Selected Self Test Log. **Enable/Disable All:** Toggles all of the Enabled check boxes. **Toggle Enable:** Toggles the selected Enabled check box. **Toggle Verbose:** Toggles the selected Verbose check box. **Selected Test Log...:** Displays the Selected Self Test Log. **<<Previous:** Returns to the System Menu.
Utility Self Tests	
	Run Enabled: Executes the enabled self test routines and displays the Selected Self Test Log. **Enable/Disable All:** Toggles all of the Enabled check boxes. **Toggle Enable:** Toggles the selected Enabled check box. **Toggle Verbose:** Toggles the selected Verbose check box. **Selected Test Log...:** Displays the Selected Self Test Log. **<<Previous:** Returns to the System Menu.
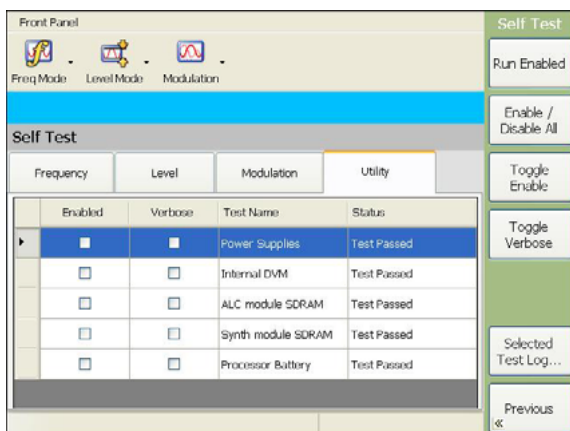
Figure 3-19. Self Test Menus (2 of 3)
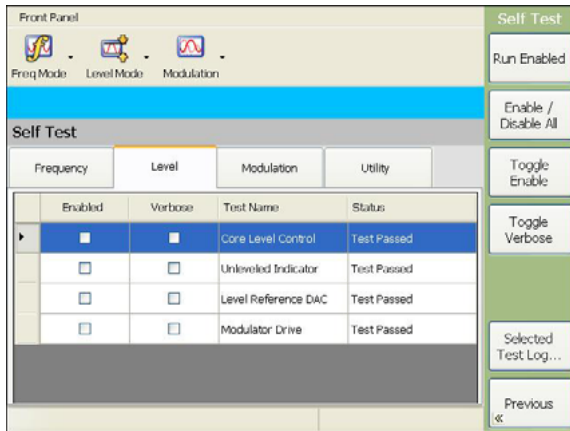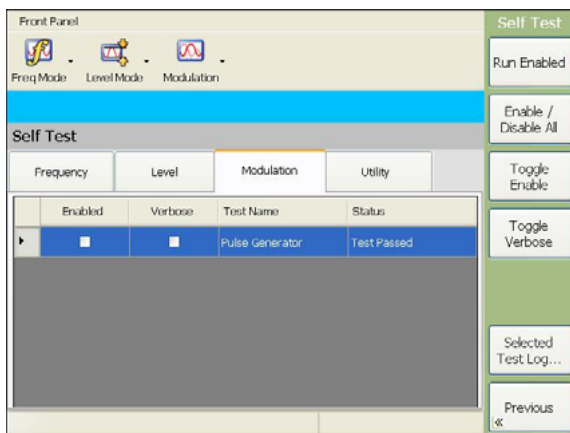
Selected Self Test Log
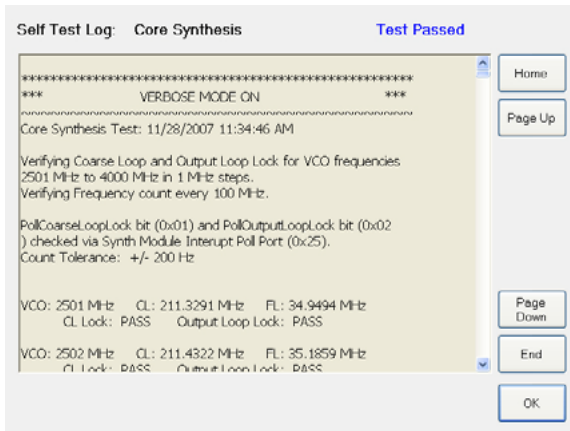
The Self Test Log displays the results of the performed self tests.

Figure 3-19. Self Test Menus (3 of 3)

Info Menus
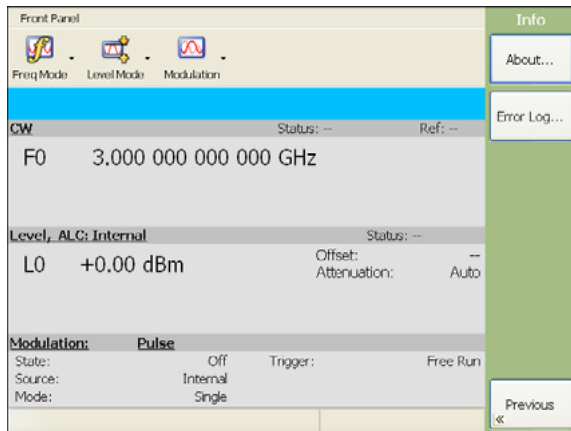
Info Menu	
	About...: Displays the System Information Dialog Boxes. **Error Log...:** Displays the Error Log Menu. **<<Previous:** Returns to the System Menu.
System Information Dialog Boxes	
  	The System Information Dialog provides a comprehensive description of the MG3702xA instrument version and configuration. Press OK to close the dialog.
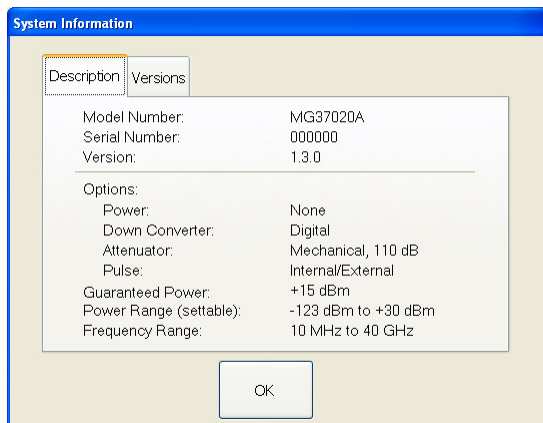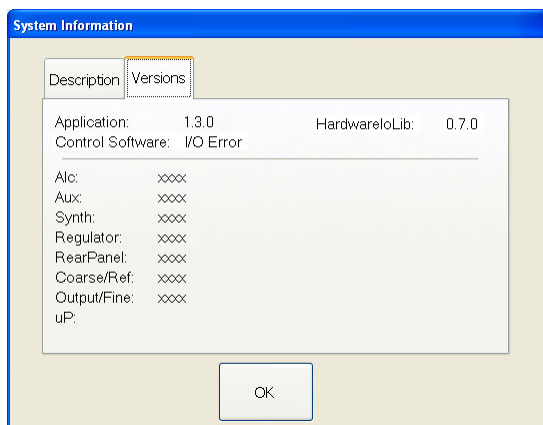
Figure 3-20. Info Menus (1 of 2)

Error Log Menu	
	Details: Displays the Error Details Dialog Box. **Refresh:** Refreshes the error log display list. **Recall Error Setup:** Recalls the instrument setup from when the error occurred. **Clear All:** Clears all of the error log entries. **Close:** Returns to the Info Menu.
Error Details Dialog Box	
	The Error Details dialog provides information about errors that occur during operation of the instrument. **Recall Error Setup:** Recalls the instrument setup from when the error occurred. **Close:** Returns to the Error Log Menu.

Figure 3-20. Info Menus (2 of 2)

Reference Cal Menu

Reference Cal... Menu	**Reread from Nonvolatile:** Reads the currently saved nonvolatile Cal DAC data from nonvolatile memory.
	Save to Nonvolatile: Saves the current volatile Cal DAC data to nonvolatile memory. **Default Volatile Data:** Reads uncalibrated, factory default cal DAC data from nonvolatile memory. **Run Cal:** Initiates a Cal DAC reference calibration. **Calibration Info:** Displays the current calibration information. **Edit Cal DAC:** Opens the 100 MHz reference Cal DAC parameter for editing. **<<Previous:** Returns to the System Menu.

Figure 3-21. Reference Calibration Menus

Maintenance Menu
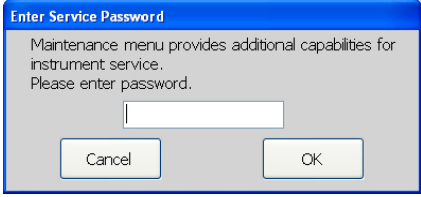
Maintenance Menu	
	The maintenance menu is password protected and is only available to trained Anritsu service technicians.

Figure 3-22. Maintenance Menus

Remote Menus
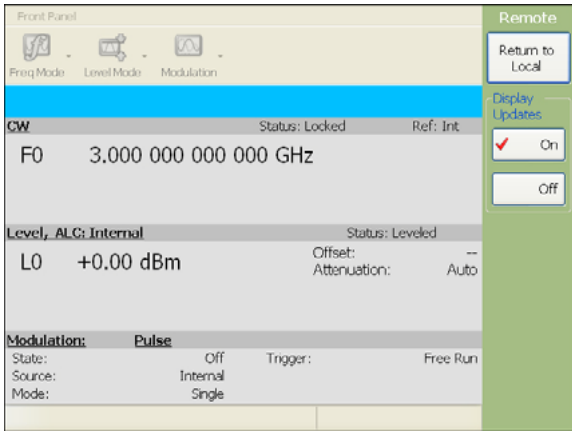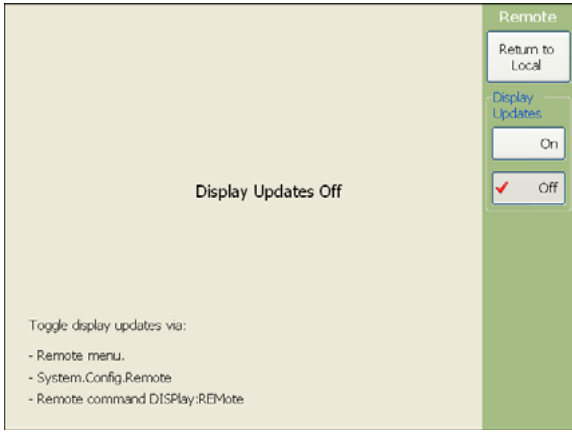
Remote Menu (Remote Updates On)	
(Remote Updates Off)	The remote menu is displayed when the instrument is being controlled through remote programming. **Return to Local:** Returns the instrument to local front panel control. **Display Updates:** Toggles the display updates on or off when in remote operation.

Figure 3-23. Remote Menus

Chapter 4 — Instrument Operation

4-1 Instrument Start-Up

Once you have familiarized yourself with the layout of the MG3702xA front panel controls and data display, you are ready to begin operating the instrument. Begin by powering it up.

Powering Up the MG3702xA

Connect the MG3702xA to an AC power source by following the . This automatically places the instrument into operation (front panel Operate LED on).

Start Up Display

During power up, the following screen is displayed:
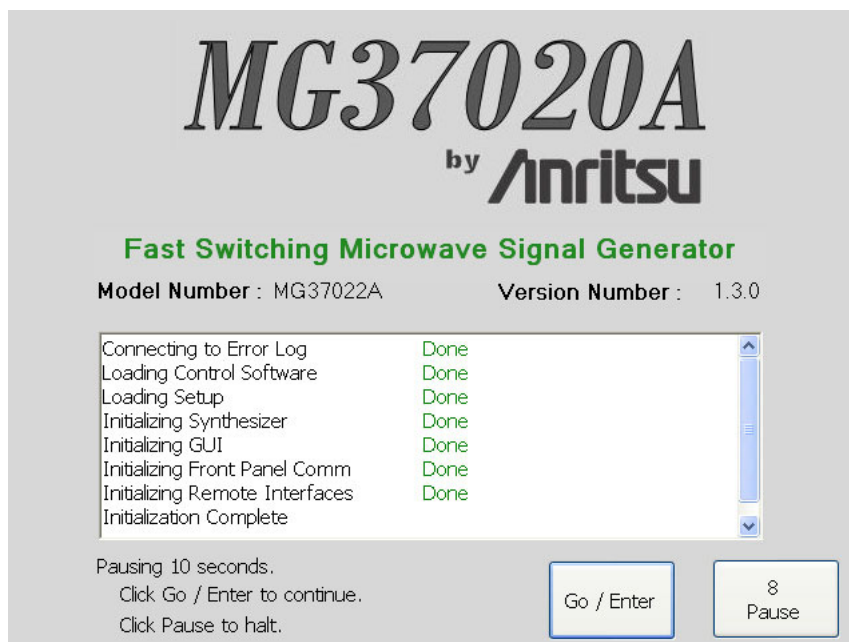
Figure 4-1. Startup Display Screen

When Go/Enter is pressed or the ten second countdown ends, the MG3702xA returns to the exact configuration it was in when last set to standby mode (or to the specified power on setup file). Whenever the signal generator is not being used, it should be left connected to the power source and placed in standby mode. Standby mode provides power to keep the internal time base at operating temperature to help ensure specified frequency accuracy and stability when the MG3702xA is placed back into operation.

Note	During standby mode, the fans run continuously at low speed.

Press **Line** (for 1/2 second minimum) to switch from Operate (green LED) to Standby (orange LED).

Note	When switching to operate from standby, allow at least a 30-minute warm-up before beginning signal generator operations.

4-2   Self Testing the MG3702xA

The MG3702xA firmware includes internal diagnostics that self test the instrument. These self test diagnostics perform a brief go/no-go test of most of the PCBs and other internal assemblies. If the signal generator fails self test, an error message is displayed in the self test status log. Error messages and descriptions are listed in Chapter 6, "Operator Maintenance".

Caution	During self test with RF OUTPUT set to ON, the output power level is set to 0 dBm. Always disconnect sensitive equipment from the unit before performing self test.

You can perform the following set of 14 self test routines of the signal generator at any time during normal operation:

- Core Synthesis
- DDS Range
- Reference Loop
- Reference Oven Ready
- Core Level Control
- Unleveled Indicator
- Level Reference DAC
- Modulator Drive
- Pulse Generator
- Power Supplies
- Internal DVM
- ALC Module SDRAM
- Synth Module SDRAM
- Processor Battery

To perform a self test from any menu, press **System**.
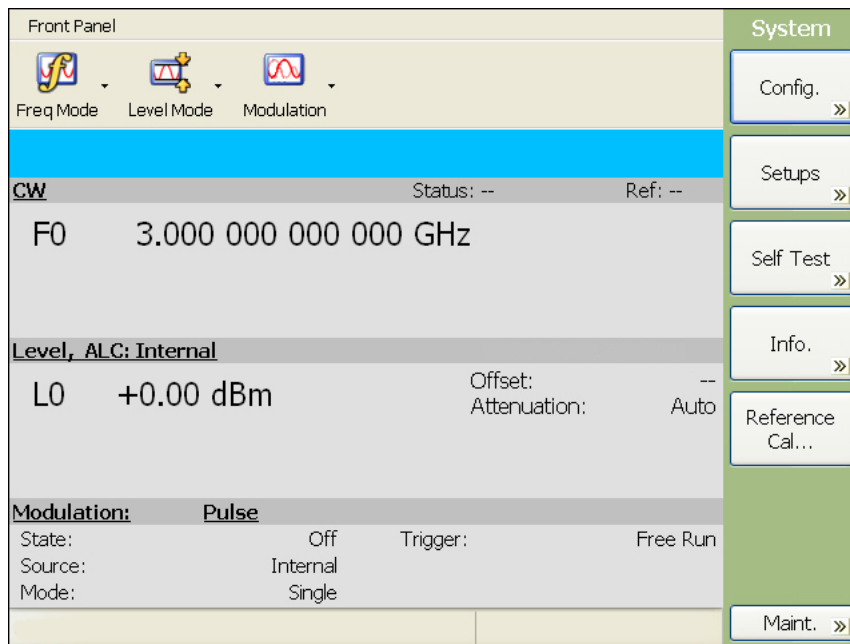
Figure 4-2.   System Menu

Then, when the System menu (shown above) is displayed, press Self Test>> to enter the Self Test menu.

Figure 4-3.   Self Test Menu

From the Self Test menu, press Run Self Test. The self test results are then displayed in the self test status message log shown below.
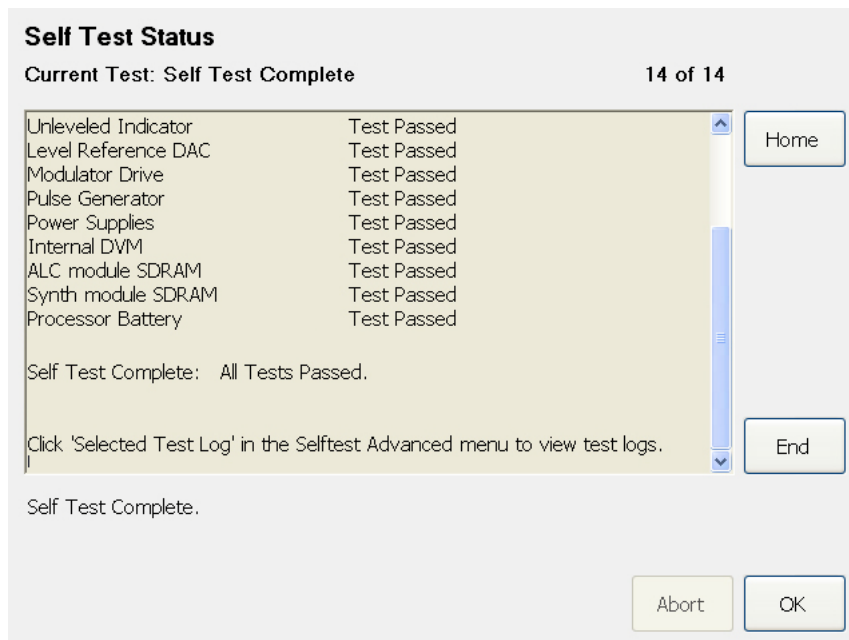
Figure 4-4.   Self Test Status Log

Selecting Self Tests

Selected self tests can be run individually or in groups from the Advanced self test menu, below:
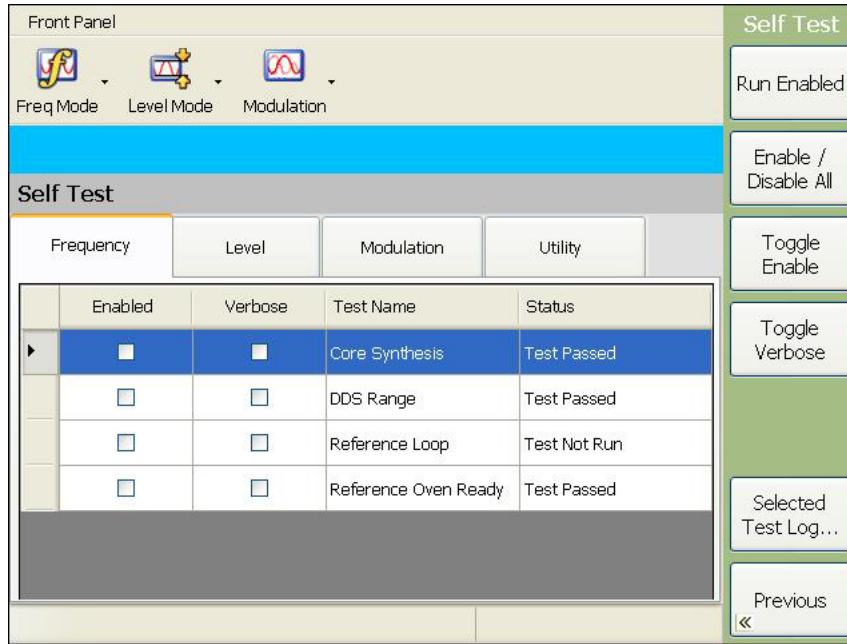
Figure 4-5.   Self Test Advanced Menu

To select the self test, toggle the Enabled check box by pressing on the check box or pressing the Toggle Enable button. The Toggle Verbose button toggles additional information to be displayed in the self test status log. Press Run Enabled to run the enabled self tests.

To view the highlighted self test log, press the Selected Test Log... button.
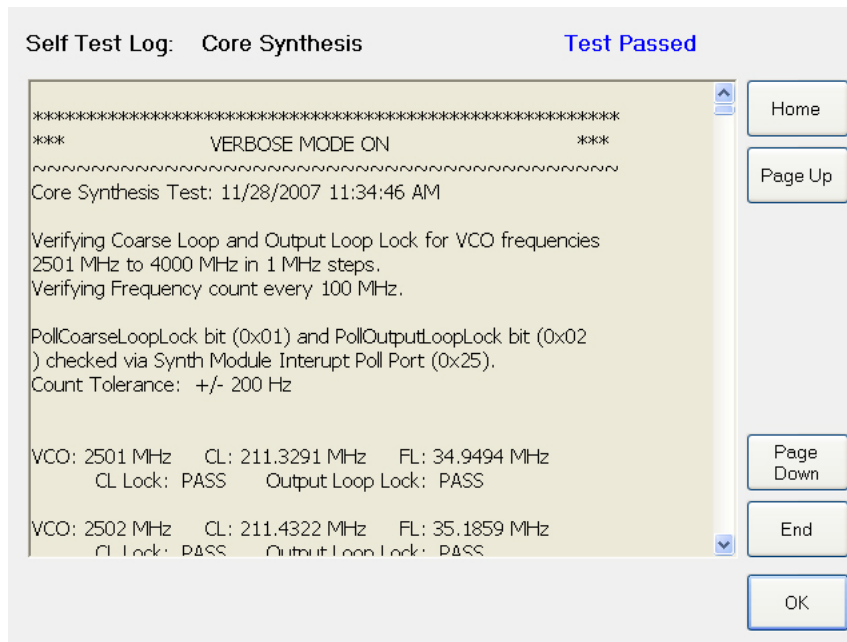
Figure 4-6.   Selected Self Test Log

4-3   Resetting to Default Parameters

You can reset the MG3702xA to the factory selected default parameter values at any time during normal operation.

Note	Resetting the instrument clears the current setup parameters. If these parameter values are needed for future testing, save them as a stored setup *before* resetting the signal generator. For information on saving and recalling instrument setups, refer to "Saving System Setups" on page 4-36 and "Recalling Stored Setups" on page 4-38.

To reset the signal generator, press the front panel **Preset** button.

4-4   Entering Data

Before proceeding to the various modes of signal generator operation, you need to know how to enter data from the front panel. Entering data refers to changing a parameter's value by editing its current value or by entering a new value to replace the current value. The following instructions describe how to (1) open a parameter, (2) edit its current value, and (3) enter a new value.

A typical MG3702xA menu display (below) is used throughout the data entry instructions. At this menu display, you can edit both the CW frequency and the output power level parameters.
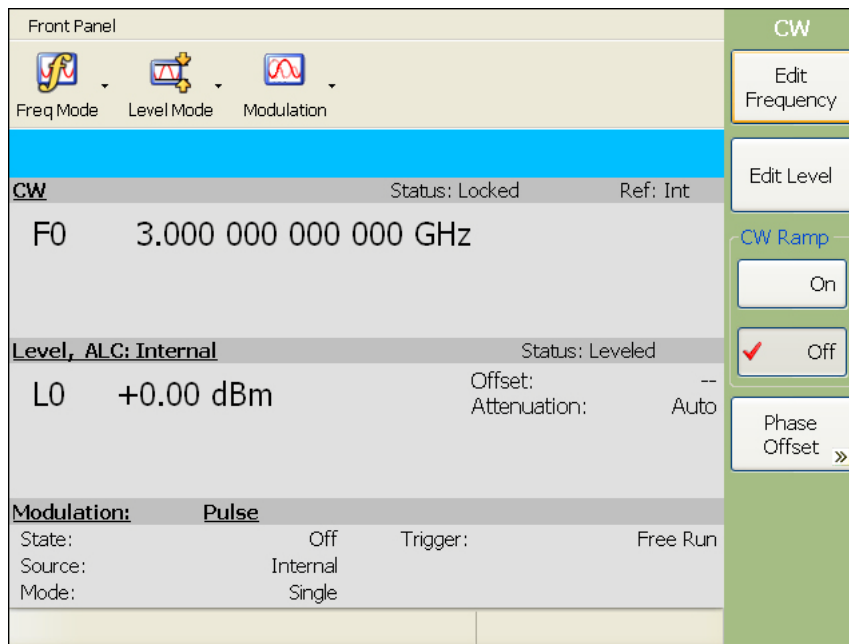
Figure 4-7.   Typical Menu Display

Note	Press the front panel **Frequency** button or **Level** button to change their value.

If you wish to follow along on your MG3702xA, you can obtain this same menu display by resetting your instrument (press the front panel **Preset** button).

Opening the Parameter

In order for the value of a parameter to be changed, the parameter edit field must first be opened. To open the frequency parameter edit field from the above menu, press Edit Frequency. The menu display changes (below) to show that the F0 parameter field is open for editing.
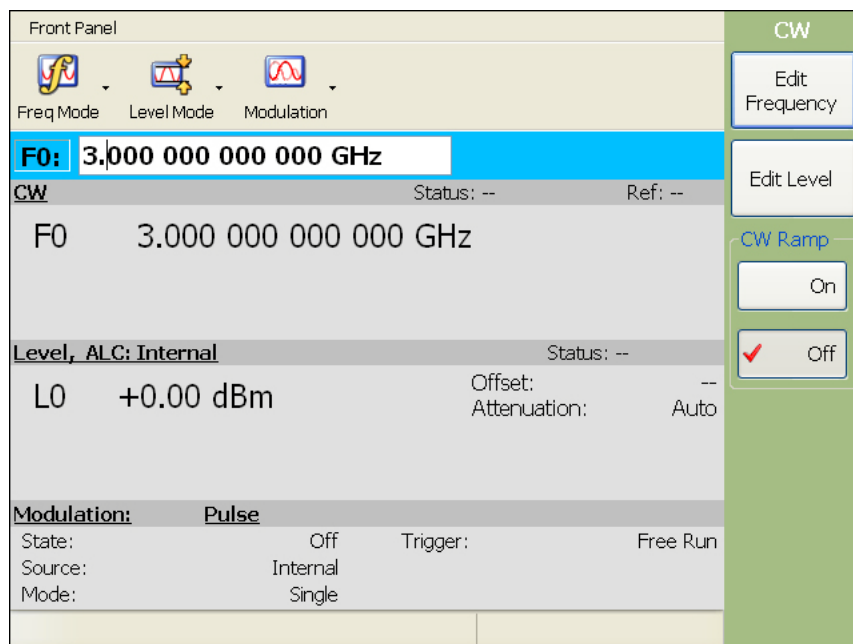
Figure 4-8.   Frequency Parameter Edit Field

An open parameter is indicated by the blue parameter editing field with a blinking cursor next to the digits.

Editing the Current Value

Only one parameter can be open and changed at a time. If you press Edit Level, then the frequency parameter field will close and the power level parameter field will open. You can change the current value of an open parameter by directly entering a new value using the numeric entry keys, or you can also use either the cursor control keys or the rotary data knob to increment the value.

Using the Cursor Control Keys

Using the left and right cursor control keys, move the cursor to the left of the digit that you want to begin editing. Then increase or decrease the value of the parameter using the up or down cursor control key. The unit size of the increase or decrease that occurs each time the up or down cursor key is pressed is determined by the cursor position.

Using the Rotary Data Knob

You can also increase or decrease the value of the parameter using the rotary data knob. Once you have positioned the cursor under the digit that you want to begin editing, slowly turn the knob clockwise or counter-clockwise to increase or decrease the value of the parameter by the unit size. Turning the knob rapidly changes the value of the parameter in larger steps.

Entering a New Value

To change the current value of a parameter by directly entering a new value, use the data entry keypad and termination buttons. As soon as you press one of the keys on the data entry keypad, the current parameter display clears for entry of a new value. Enter the new value for the parameter, then press the appropriate terminator button to store it in memory. If the entered value is outside the allowable range of the open parameter, the entry is not accepted and an error message is displayed next to the parameter field. If you make an error during data entry, either press the backspace key (←) or delete the entire entry by pressing the clear entry key (Clr→|)and re-enter a correct value.

To close an open parameter field when you are finished entering data, press the Edit button again or make another menu selection.

4-5   CW Frequency Operation

One of the signal generator's major functions is to produce discrete CW frequencies across the frequency range of the instrument. The following paragraphs describe how to place the MG3702xA in the CW frequency mode, select a CW frequency and power level for output, and activate the CW Ramp.

Note	When the signal generator is **Preset**, it automatically comes up operating in the CW frequency mode.

Editing the CW Frequency Setup

To place the MG3702xA in the CW frequency mode, press the Freq Mode toolbar button and select CW from the drop-down list. The CW menu (below) is displayed.
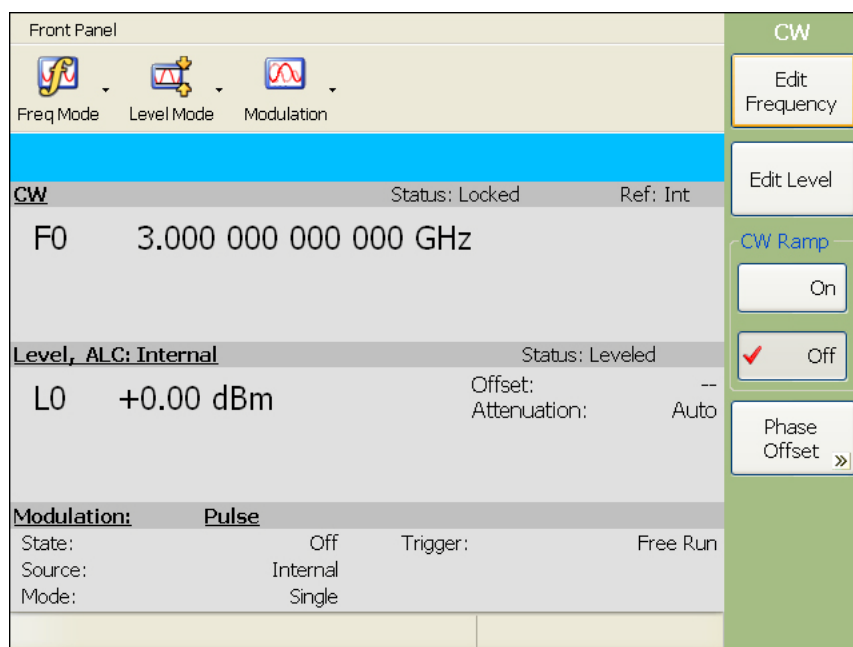
Figure 4-9.   CW Menu Display

The CW menu lets you perform the following functions:

- Edit the current frequency
- Edit the current power level
- Toggle the CW Ramp On or Off

Editing the Current CW Frequency

Press the Edit Frequency button to open the frequency parameter field. Edit the current CW frequency using the cursor control keys, the rotary data knob, or the keypad and the appropriate terminator button. To close the open frequency parameter, press the Edit Frequency button again.

Editing the Current CW Power Level

Press the Edit Level button to open the power level parameter field. Edit the current power level using the cursor control keys, the rotary data knob, or the keypad and the dBm terminator button. To close the open parameter field, press the Edit Level button again.

Activating the CW Ramp

When active, the MG3702xA's CW ramp provides a repetitive 0 V to 10 V ramp output to the rear panel Horizontal Output on the AUX I/O connector, pin 1. The CW ramp is used to drive a scalar analyzer display. To turn on the CW ramp from the CW menu, press CW Ramp On (below).
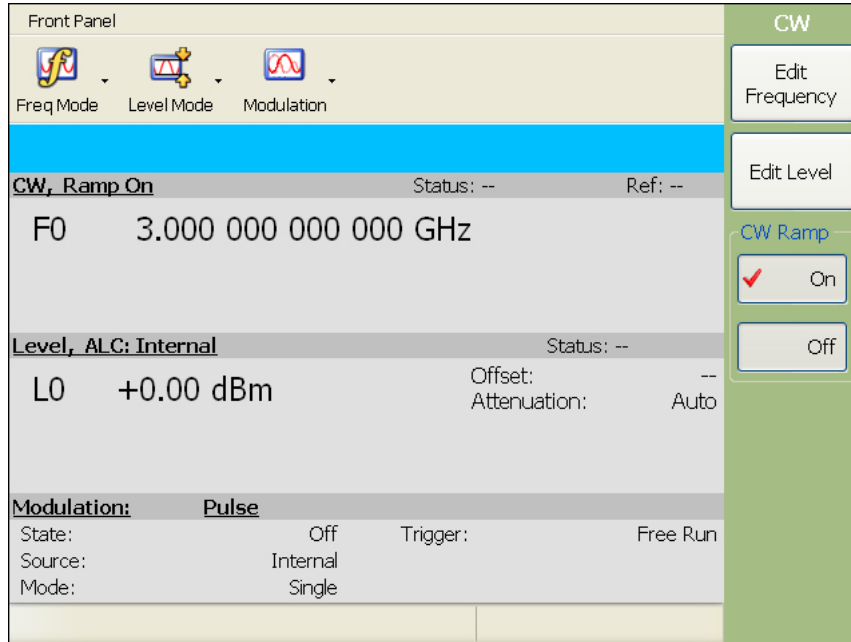
Figure 4-10. CW Menu

While the CW ramp is on, the message Ramp On appears on the frequency title bar on all CW menus. Press CW Ramp Off to turn the CW ramp off.

Editing the Phase Offset Setup

The MG3702xA's RF output can be phase shifted. The phase offset range is −360° to +360° with a resolution of 0.1°.

Note	The phase offset function is available in the CW operating mode only. The phase offset is always active and is a relative value compared to the current phase offset display.

To edit the phase offset setup, place the MG3702xA in the CW frequency mode by pressing the Freq Mode toolbar button and selecting CW from the drop-down list. Then, press Phase Offset>> to access the Phase menu below.
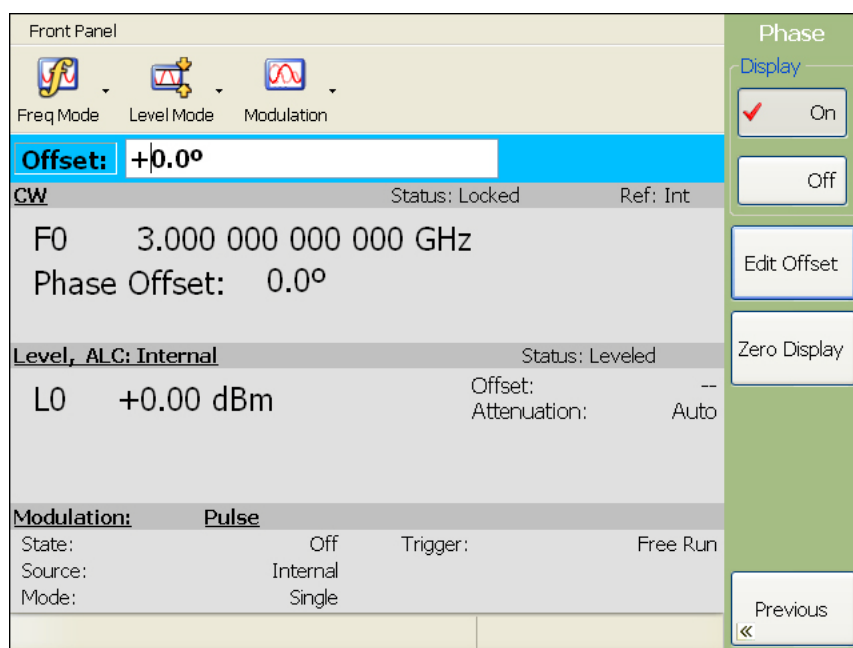
Figure 4-11. Phase Menu

The phase offset value is always active, but may or may not be displayed on the screen. Select Display On to view the phase offset value.

Editing the Current Phase Offset Value

To edit the phase offset value, press the Edit Offset button from the Phase menu, then edit the current offset value using the cursor control keys, rotary data knob, or enter a new value using the keypad and terminator button. To close the open offset parameter, press Edit Offset again.

The phase offset value may be zeroed. This allows you to normalize the phase offset display as appropriate.

Note	Adjusting the phase offset zero display does not affect the phase shift of the RF output.

To zero the phase offset display from the phase offset menu, press Zero Display to set the displayed offset value to 0.0°.

4-6   Step Sweep Frequency Operation

The signal generator can generate broad (full range) and narrow band sweeps across the frequency range of the instrument. In step sweep frequency mode, the output frequency changes in discrete, synthesized steps between the selected start and stop frequencies. Step sweeps can start from a low frequency to a high frequency or from a high frequency to a low frequency. The sweep width can be set from 0.001 Hz to the full frequency range of the instrument. The step size or number of steps between the sweep start and stop frequencies, the step dwell time, and sweep trigger are controllable from the step sweep menus.

To place the MG3702xA in step sweep frequency mode, press the Freq Mode toolbar button and select Step Sweep from the drop-down list. The Step Sweep menu (below) is then displayed.

Front Panel			Step Sweep
			Edit Setup…
Freq Mode	Level Mode	Modulation	

Step Sweep		Status: --	Ref: --
F1	10.000 000 000 MHz	Dwell:	10.000 ms
F2	40.000 000 000 000 GHz	Step Size:	3.999 MHz
		Num Steps:	10 000
		Trigger:	Auto

Level, ALC: Internal			Status: --
L0	+0.00 dBm	Offset:	--
		Attenuation:	Auto

Modulation:	**Pulse**		
State:	Off	Trigger:	Free Run
Source:	Internal		
Mode:	Single		
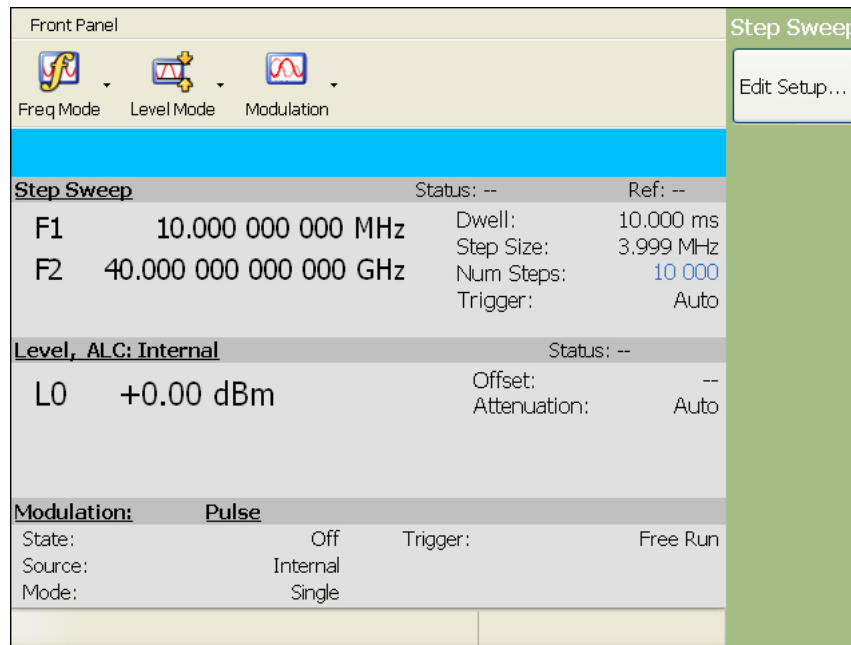
Figure 4-12. Step Sweep Menu

The Step Sweep menus let you perform the following:

- Select a sweep range (edit the sweep start and stop frequency parameters)
- Set the step dwell time
- Set the frequency step size
- Set Auto, External, or Single triggering
- Set the number of steps

Editing the Step Sweep Setup

To edit the step sweep, press the Edit Setup... button to display the Step Setup menu below.
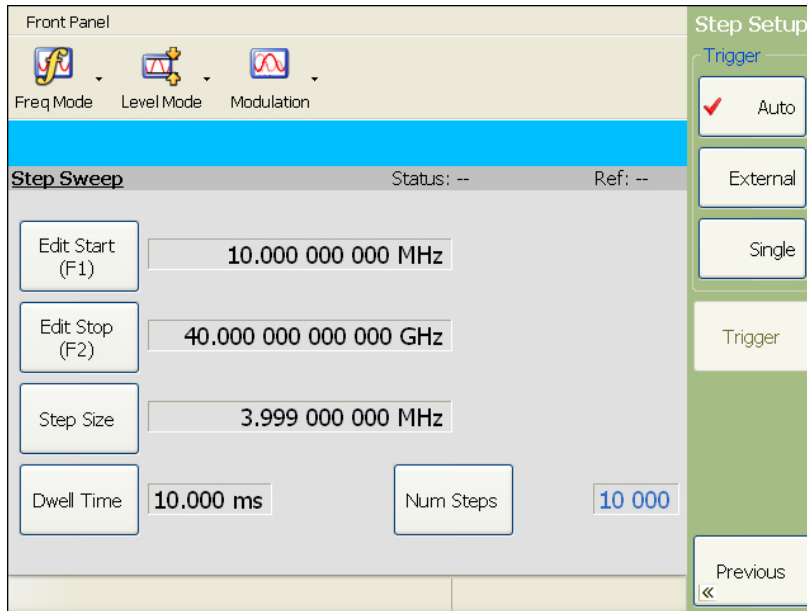

Figure 4-13. Step Sweep Setup Menu

Note	A Sweep Setup error message is displayed when the step size value entered is greater than the sweep range or the number of steps entered results in a step size of less than 0.001 Hz. Entering valid values will clear the error.

Editing the Current Start/Stop Frequencies

To edit the current frequency sweep range, open either the start or stop frequency parameter field. In the display above, Edit Start (F1) button opens the start frequency parameter; Edit Stop (F2) opens the stop frequency parameter.

Edit the open frequency parameter using the cursor control keys, the rotary data knob, or enter a new frequency using the keypad and appropriate terminator button. When you are finished, close the open parameter by pressing the Edit ... button again.

Setting the Step Size

In step sweep, the sweep is linearly incremented (or decremented) by the step size beginning with the start frequency (F1) to the stop frequency (F2). There are two ways to set the size of each step of the linear step sweep—set the step size or set the number of steps. The step size range is 0.001 Hz to the full frequency range of the instrument. When the step Dwell Time, Step Size, or Number of Steps is set, the sweep time equals:

Step Dwell time $\times$ Number of Steps + total phase-locking time for all the step frequencies

Press the Step Size button to open the step size parameter. Edit the open frequency parameter using the cursor control keys, rotary data knob, or enter a new frequency using the keypad and appropriate terminator button. When you are finished, close the open parameter by pressing its parameter edit button again.

Note	The Step Size and Number of Steps parameters are coupled values and change when either value is changed. When a coupled parameter value changes, its text color changes to blue.

Setting the Number of Steps

The number of steps range is 1 to 10,000. If the step size does not divide into the frequency range, the last step is truncated. When the step Dwell Time, Step Size, or Number of Steps is set:

sweep time = Step Dwell time × Number of Steps + total phase-locking time for all step frequencies.

Press the Num Steps button to open the step size parameter. Edit the open parameter using the cursor control keys or the rotary data knob, or enter a new frequency using the keypad and appropriate terminator button. When you are finished, close the open parameter by pressing its menu edit button.

Note	The Step Size or the Number of Steps parameters are coupled values and may change dynamically to accommodate the setup. When a parameter changes, its text color changes to blue.

Setting the Step Dwell Time

The Dwell Time of the step sweep can be set for any time in the range of 50 µs to 30 sec. When the step Dwell Time, Step Size, or Number of Steps is set:

sweep time = Step Dwell time × Number of Steps + total phase-locking time for all step frequencies.

Press the Dwell Time button to open the dwell time parameter. Edit the open parameter using the cursor control keys or the rotary data knob, or enter a new frequency using the keypad and appropriate terminator button. When you are finished, close the open parameter by pressing its menu edit button.

Selecting a Sweep Trigger

The following sweep trigger modes can be selected by pressing the appropriate button:

- **Auto (Automatic):** The sweep continually sweeps from the start frequency to the stop frequency with optimal retrace time.
- **External:** The sweep recurs when triggered by an external TTL-compatible clock pulse to the rear panel AUX I/O connector, pin 13.
- **Single:** A single sweep starts when the Trigger button is pressed. If a sweep is in progress when the trigger button is pressed, the current sweep aborts, goes to ramp rest, and waits for another trigger.

A message showing the selected sweep trigger mode appears on the right side of Step Sweep parameter area.

Trigger:	Auto
Trigger:	External
Trigger:	Single

4-7   List Sweep Frequency Operation

In list sweep mode, the output is a step sweep of up to 10,001 phase-locked, non-sequential frequencies. Each frequency can have a different power level setting. The list index (0 through 10,000) identifies each frequency/power level set in the list. The list sweep is defined by a list start index and list stop index.

There are four modes of sweep triggering in the list sweep mode—automatic, external, single, and manual. When automatic, external, or single trigger mode is selected, the output sweeps between the specified list start and stop indexes, dwelling at each list index for the specified dwell time. In manual trigger mode, the list index can be incremented by using an external trigger input. Each TTL trigger increments the list index by one. When the end of the list is reached, the list index begins again from the start index.

To place the MG3702xA in list sweep mode, press the Freq Mode toolbar button and select List Sweep from the drop-down list. The List Sweep menu (below) is then displayed.

Figure 4-14. List Sweep Menu

The data display shows the current list sweep setup parameters. The current index, frequency (Fi), and power level (Li) are displayed only when in manual sweep mode. The list of up to 10,001 frequency/power level sets are stored in non-volatile RAM to preserve any settings after the instrument is powered off. The list is stored with the other setup information in the instrument, so a Preset will reset the list index values as specified in the Preset setup file.

Editing the List Sweep Setup

To edit the list sweep setup, press the Edit Setup... button to display the List Setup menu below.
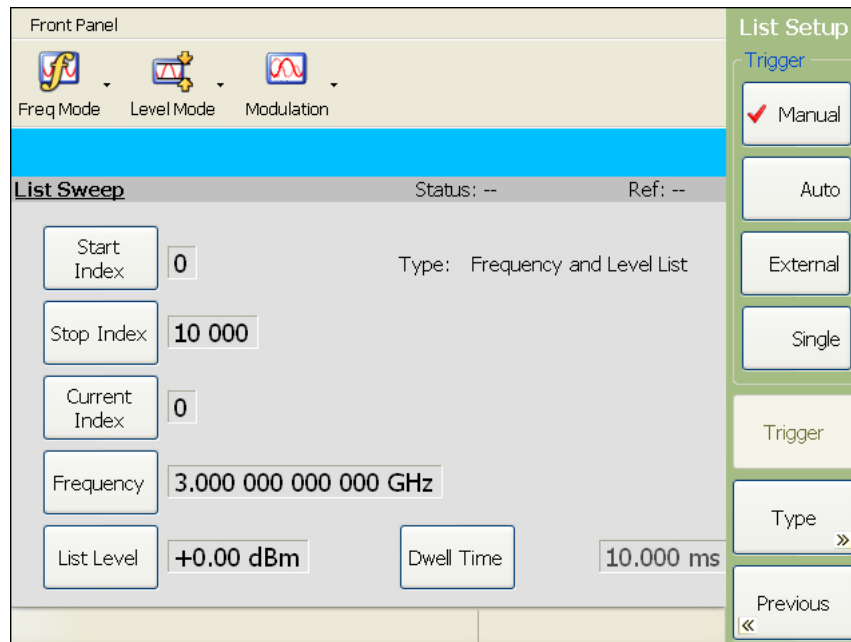
Figure 4-15. List Setup Menu

This menu lets you perform the following actions:

- Edit the start and stop index
- Edit the current index
- Edit the current list frequency and level
- Select a trigger mode
- Access the List Type menu (to select Frequency list or Frequency + Level list)

Editing the Start Index

Press Start Index to open the start index parameter field for editing. Edit the start index using the cursor control keys, rotary data knob, or enter a new value using the keypad and Enter button. When you have finished setting the open parameter, close it by pressing Start Index again.

Editing the Stop Index

Press Stop Index to open the stop index parameter field for editing. Edit the stop index using the cursor control keys, rotary data knob, or enter a new value using the keypad and Enter button. When you have finished setting the open parameter, close it by pressing Stop Index again.

Editing the Current Index

Press Current Index to open the current index parameter field for editing. Edit the current index using the cursor control keys, rotary data knob, or enter a new value using the keypad and Enter button. When you have finished setting the open parameter, close it by pressing Current Index again.

Editing the Current Index Frequency

Press the Frequency menu button to open the index frequency parameter field for editing. Edit the current list frequency using the cursor control keys, rotary data knob, or enter a new value using the keypad and appropriate termination. When you have finished setting the open parameter, close it by pressing Frequency again.

Editing the Current Index Level

Press List Level (or Fixed Level) to open the current level parameter field for editing. Edit the current level using the cursor control keys, rotary data knob, or enter a new value using the keypad and dBm terminator button. When you have finished setting the open parameter, close it by pressing List Level (or Fixed Level) again.

Setting the List Dwell Time

The dwell time of the step sweep can be set for any time in the range of 50 µs to 30 sec.

sweep time = Step Dwell time × Number of Steps + total phase-locking time for all the step frequencies.

Selecting the List Sweep Trigger Mode

The following list sweep trigger modes are available:

- **Manual:** The sweep steps through each index frequency when triggered by an external TTL-compatible pulse to the rear panel AUX I/O connector.
- **Auto (Automatic):** The sweep continually sweeps from the start index to the stop index with optimal retrace time
- **External:** The sweep occurs when triggered by an external TTL-compatible clock pulse to the rear panel AUX I/O connector, pin 13).
- **Single:** A single sweep starts when the Trigger button is pressed. If a sweep is in progress when the Trigger button is pressed, the current sweep aborts and returns to the start frequency.

A message showing the sweep trigger mode selected appears on the right side of List Sweep parameter area.

Trigger:	Auto
Trigger:	External
Trigger:	Single

Selecting the List Type

There are two available list types that can be accessed from the List Setup menu (Figure 4-15). Press the Type>> button to display the List Type menu below.
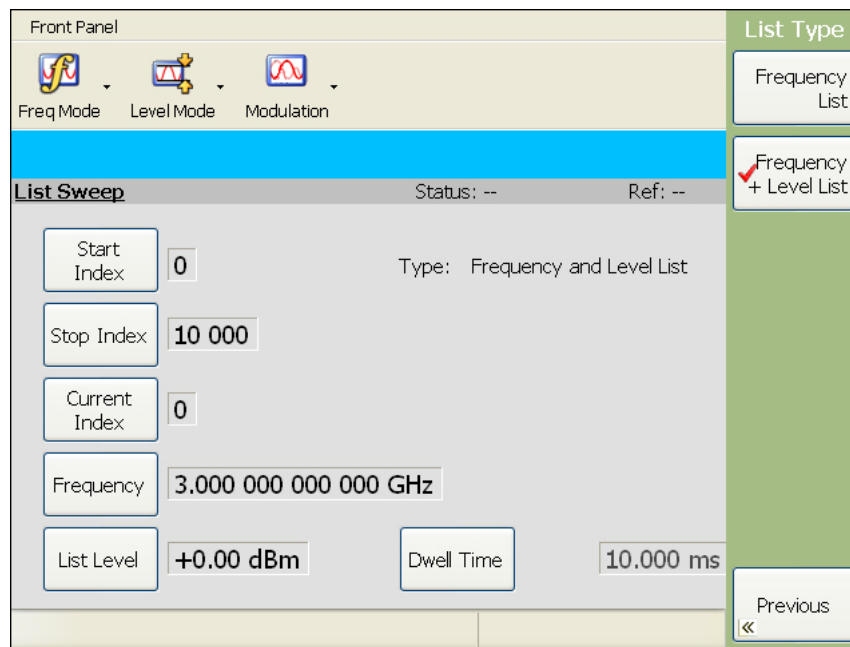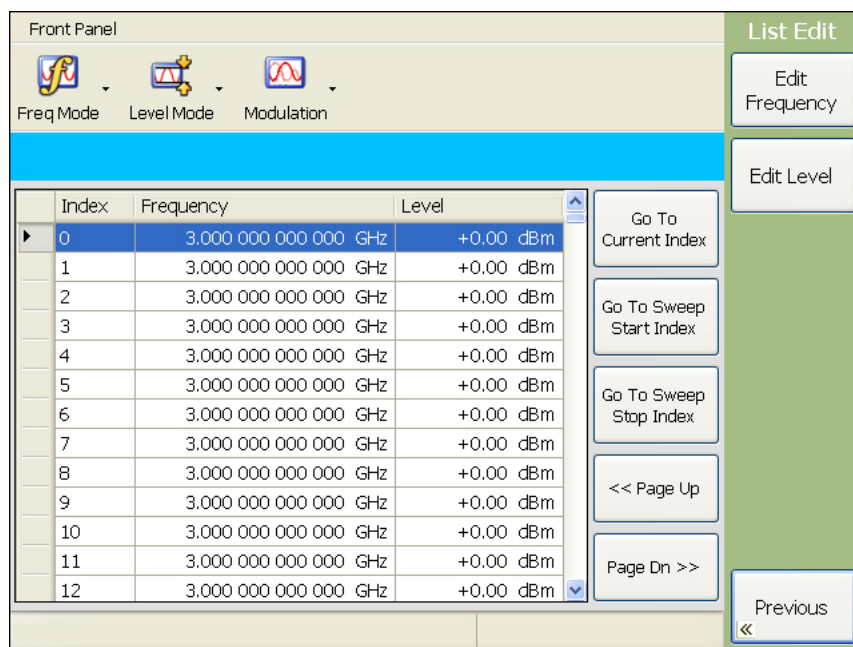

Figure 4-16. List Sweep Setup Menu

Select Frequency List to set a fixed power level for all of the list frequency values.

Select Frequency + Level List to set a list power level for each list frequency value.

Press <<Previous twice to return to the List Sweep Menu.

Editing the List

The list consists of 10,001 index entries. From the List Sweep menu, press Edit List... The List Edit menu that is displayed below is for a frequency +level list.

Figure 4-17. List Sweep Setup Menu

This menu lets you scroll through and edit the list of frequencies and power levels. Use the cursor control keys to select a frequency from the list. The selected frequency is highlighted in reverse video.

Press Edit Frequency to open the highlighted frequency's parameter edit field.

Press Go To Current Index to scroll the list to the current index row.

Press Go To Sweep Start Index to scroll the list to the set start index.

Press Go To Sweep Stop Index to scroll the list to the set stop index.

Press << Page Up to scroll the displayed frequencies to the previous page in the list. Press Page Down >> to scroll the displayed frequencies to the next page in the list.

Select the index row (highlighted list index) and press either the Edit Frequency or Edit Level button to edit the open parameter. Edit the open parameter using the cursor control keys, rotary data knob, or enter a new value using the keypad and appropriate termination. When you have finished setting the open parameter, close it by pressing the Edit button again.

| **Note**	The complete list of 10,001 index values remain as part of the list. Generally, a list sweep starts with list index 0 and stops at the index number of desired frequency steps, which may be less than index number 10,000. Each list index can also be individually edited from the List Setup and List Type menus.

Press << Previous to return to the List Sweep menu display.

4-8   Power Leveling Operations

The MG3702xA provides main band leveled output power over a maximum range of up to 24 dB (up to 123 dB with Option 2) for CW and sweep frequency operations. Instruments with Option 15 provide leveled output power over a maximum range of up to 28 dB (up to 123 dB with Option 2). An automatic level control (ALC) system controls the amplitude and power level of the RF output. You can select the ALC mode of operation—internal or fixed gain (ALC off). In addition, the signal generator provides a decouple function that allows decoupling of the step attenuator (if equipped) from the level setting. The following paragraphs provide descriptions and operating instructions for the leveling modes and functions.

Editing Output Power Level Setup

To place the MG3702xA in a fixed power level mode from a CW or sweep frequency menu, press the Level Mode toolbar button and select Level. The Level menu (below) is displayed.
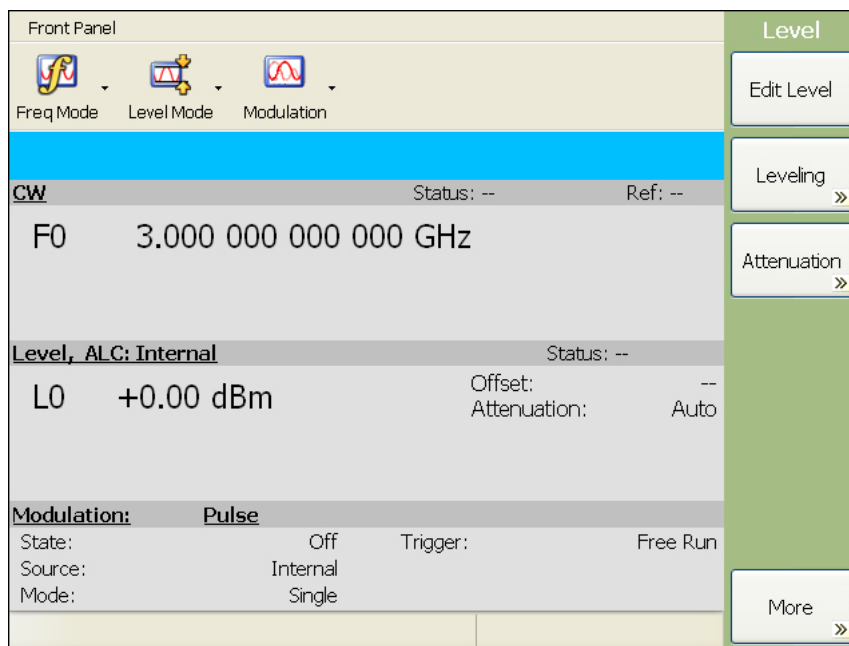
Figure 4-18. Level Menu

This menu lets you perform the following:

- Edit the power level parameter
- Access the Leveling mode menu
- Access the Attenuation menu
- Edit the level offset parameter (More>>)
- Turn level offset On or Off (More>>)

| **Note**	Leveling and Attenuation menus are not available in List Sweep mode.

Editing the Current Power Level

Press Edit Level to open the power level parameter field, then edit the current power level using the cursor control keys or the rotary data knob, or enter a new power level using the keypad and the dBM terminator. To close the open power level parameter, press Edit Level again.

Setting up a Power Level Offset

Level offset lets you compensate for a device on the signal generator's output that alters the RF output power level at the point of interest. For example, the power level at the test device may be less or more than the displayed power level because of the loss through an external transmission line or the gain of an amplifier located between the MG3702xA RF output and the test device. Using the level offset function, you can apply a constant to the displayed power level that compensates for this loss or gain. The displayed power level will then reflect the actual power level at the test device.

To enter an offset value and apply it to the displayed power level, access the Level menu, then press More >>. This opens the additional Level menu (below).
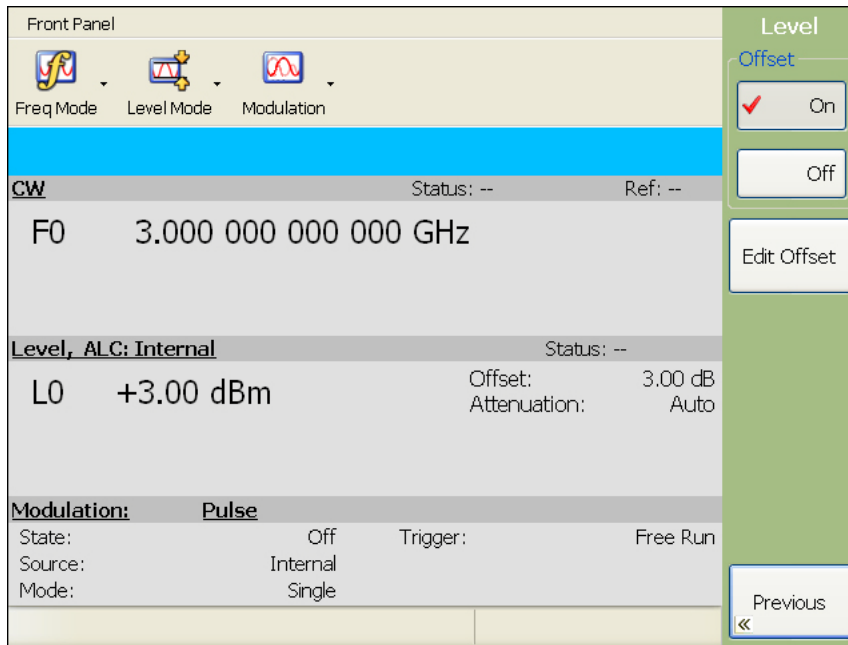
**Figure 4-19.** Level Menu with 3dB Offset

Press Edit Offset to open the power level parameter field, then edit the offset level using the cursor control keys, rotary data knob, or enter the new offset level using the keypad and dB terminator button. To close the open power level parameter, press Edit Offset again.

When Offset is selected On, the Offset value is displayed at the right in the power level setup parameters area and the offset value is added to the displayed level setting.

Setting up the Leveling Mode

The Automatic Level Control (ALC) system is a feedback control system in which the output power is measured at an internal detector and compared with the expected power level. If the output and desired power levels do not equal, the ALC adjusts the power output until they are equal. The output power can also be set to a fixed level without using the normal feedback (ALC off).

The Leveling menu lets you select a leveling mode. To access the Leveling menu, press the Level Mode toolbar button and select Level. From the Level menu, press the Leveling>> button. The Leveling menu (below) is displayed.
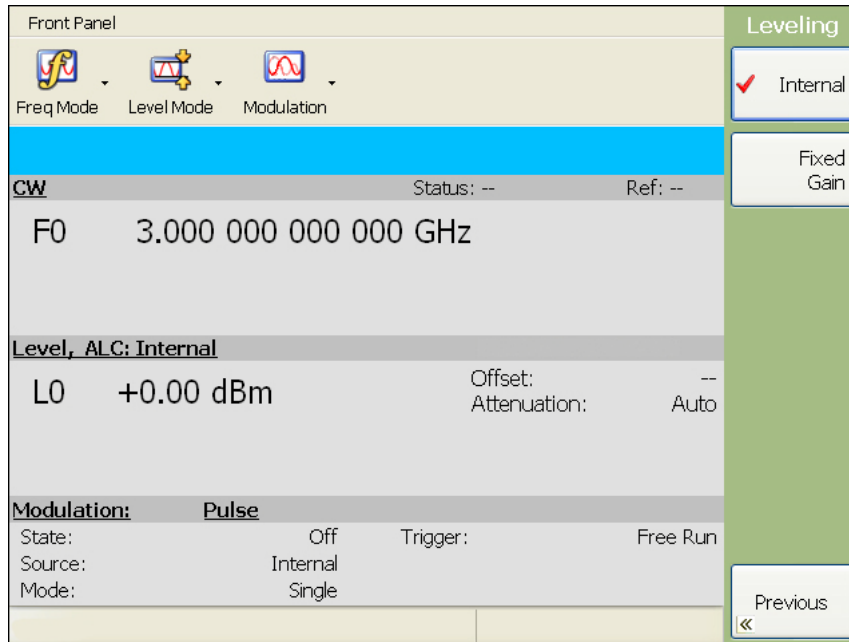
Figure 4-20. Leveling Menu

The Leveling menu lets you select between internal leveling (Internal button) or fixed gain leveling (**Fixed Gain** button) modes shown above.

Internal Leveling

This is the normal (default) leveling mode. Output power is sensed by the MG3702xA's internal detector. The detector output signal is fed back to the ALC circuitry to adjust the output power level.

Fixed Gain Leveling

In the fixed gain mode, the ALC is disabled. The RF level DAC and step attenuator (if installed) are used to control the relative power level. Power is not detected at any point and the absolute power level is uncalibrated. After fixed gain mode is selected, the attenuator (if installed) is decoupled and the RF level DAC value is displayed.

Press <<Previous to return to the Level menu and adjust the level DAC by pressing Edit Level, then edit the current power level using the cursor control keys, rotary data knob, or enter a new power level using the keypad and press Enter. To close the open power level parameter, press Edit Level again.

The RF level DAC adjustable range is from a minimum output of 0 to a maximum output of 65535.

Decoupling the Attenuator

In MG3702xAs equipped with Option 2 step attenuators, the ALC and attenuator work in conjunction to provide leveled output power down to −105 dBm. In the normal (coupled) leveling mode, when the desired power level is set, the correct combination of ALC level and attenuator setting is determined by the instrument firmware. In some applications, such as receiver sensitivity testing, it is desirable to control the ALC level and attenuator setting separately by decoupling the step attenuator from the ALC. The Attenuator menu lets you select attenuator decoupling.

At the Level menu, press Attenuation >>. The Attenuator menu below is displayed.
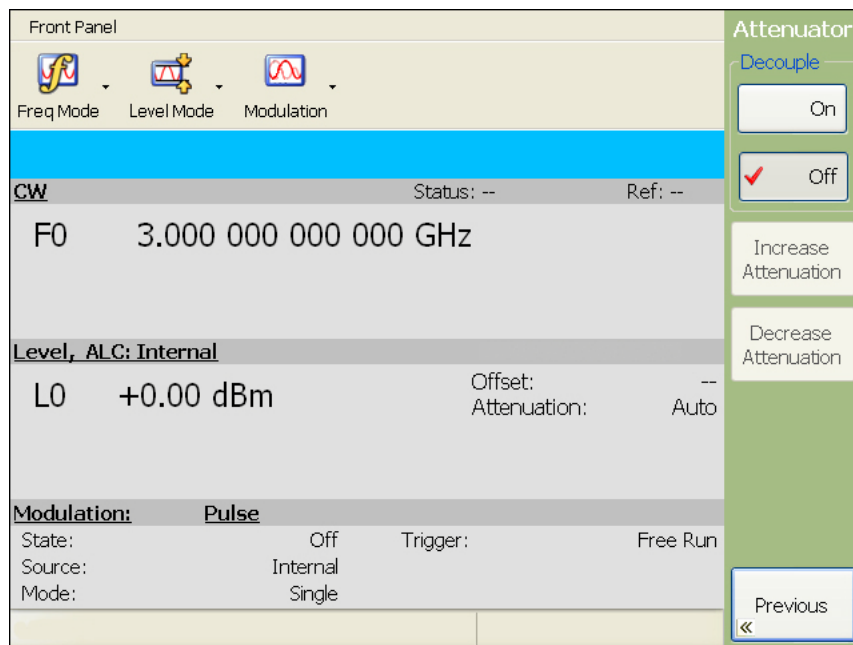
Figure 4-21. Attenuator Menu

This menu lets you decouple the step attenuator from the ALC and set the attenuation in 10 dB steps.

Select Decouple On to decouple the step attenuator from the ALC. When decoupled, press Increase Attenuation or Decrease Attenuation to change the attenuation in 10 dB steps. Press Decouple Off to couple the step attenuator.

Press << Previous to return to the Level menu.

4-9   System Configurations

The system configuration function provides menus to set instrument configuration items. Configuration and setup menus are accessed from the main system menu shown below by pressing the **System** key.
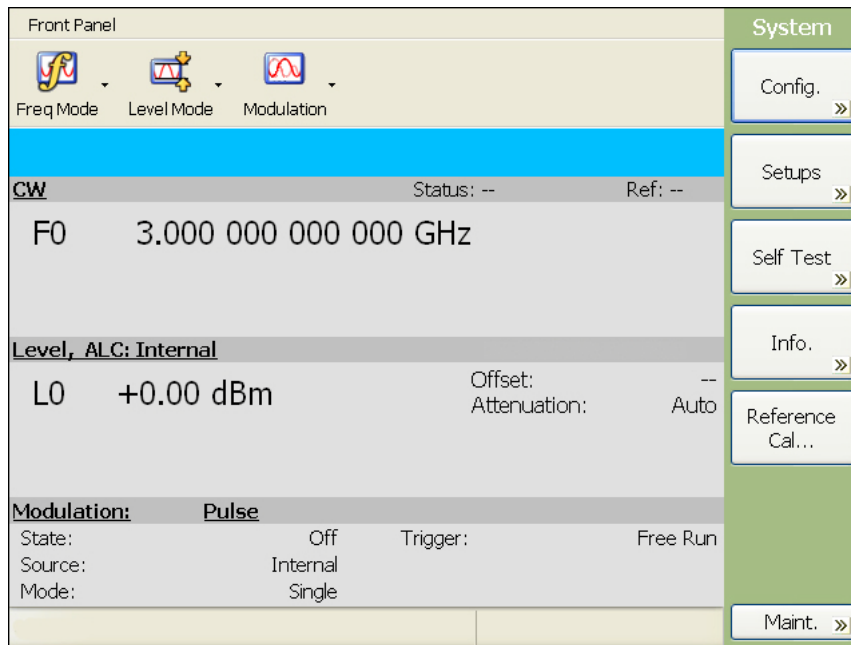

Figure 4-22. System Menu

Accessing the System Configuration Menu

To access the System Configuration menu, press System. At the System menu, press the Config.>> button. The System Configuration menu (below) is displayed.
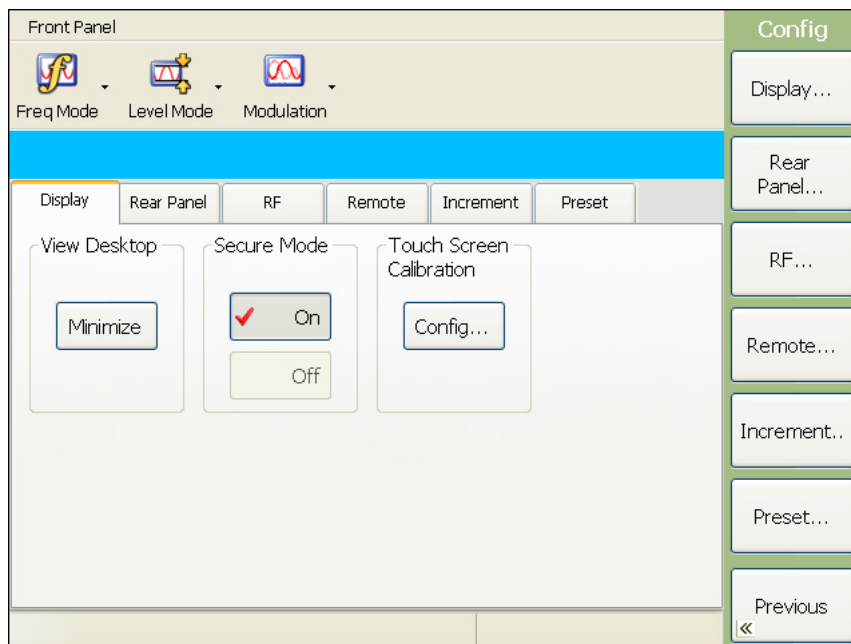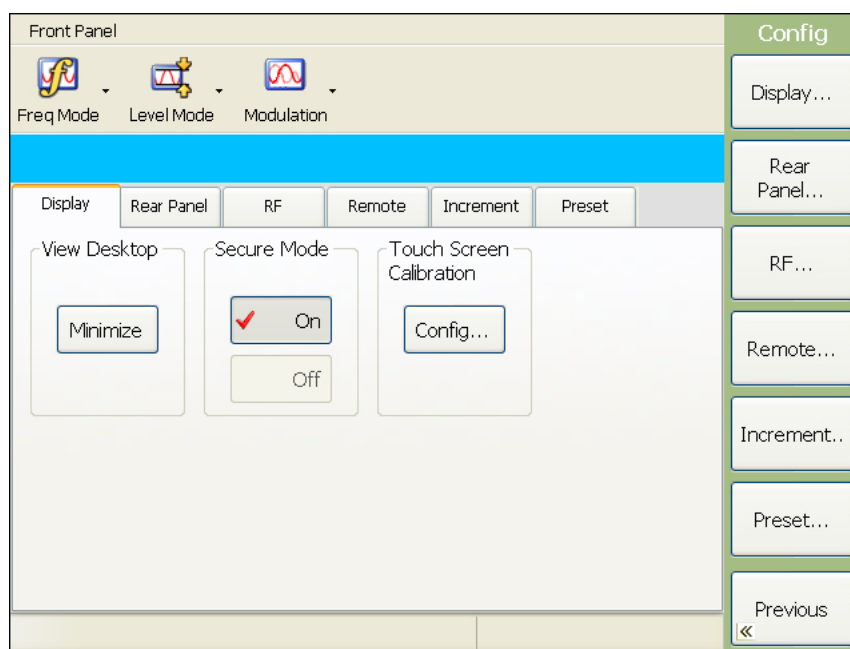

Figure 4-23. System Configuration Menu

The system Configuration menu provides access to a variety of instrument configurations as described in the following sections:

Each of these menus can be accessed by pressing the corresponding menu button or tab.

Press << Previous to return to the System menu.

Configuring the Display
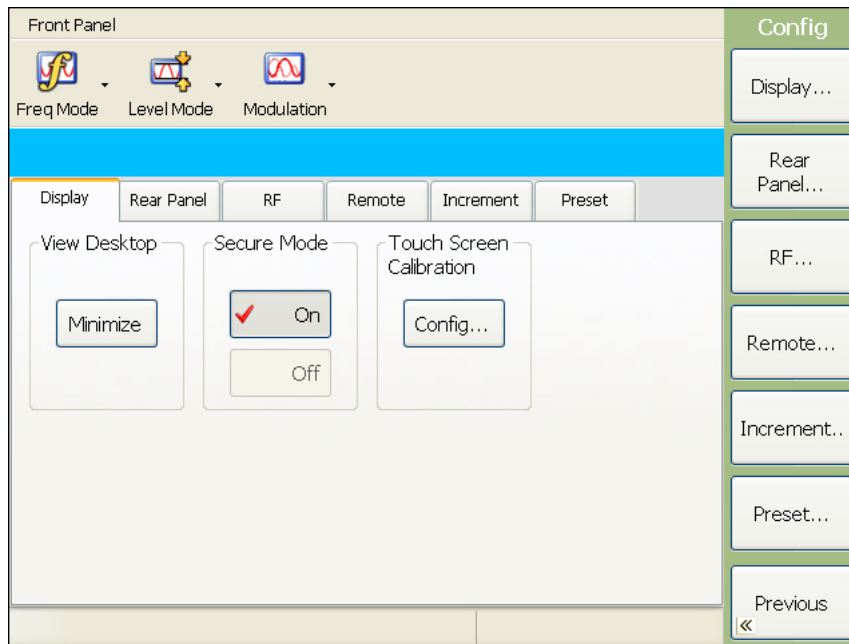

Figure 4-24. Display Configuration Menu

Configuring the display of the MG3702xA involves minimizing the signal generator application to view the Windows desktop. From the desktop select Start | Settings | Control Panel | Display.

Press << Previous to return to the System menu.

Secure Mode Operation

The MG3702xA can be operated in a secure mode where the display of all frequency and power level parameters are disabled during both local (front panel) and remote (GPIB) operations. When in secure mode, the instrument continues to function normally in all other respects.

To place the MG3702xA in the secure mode, enter the display configuration menu shown below by pressing **System** | Config | Display...
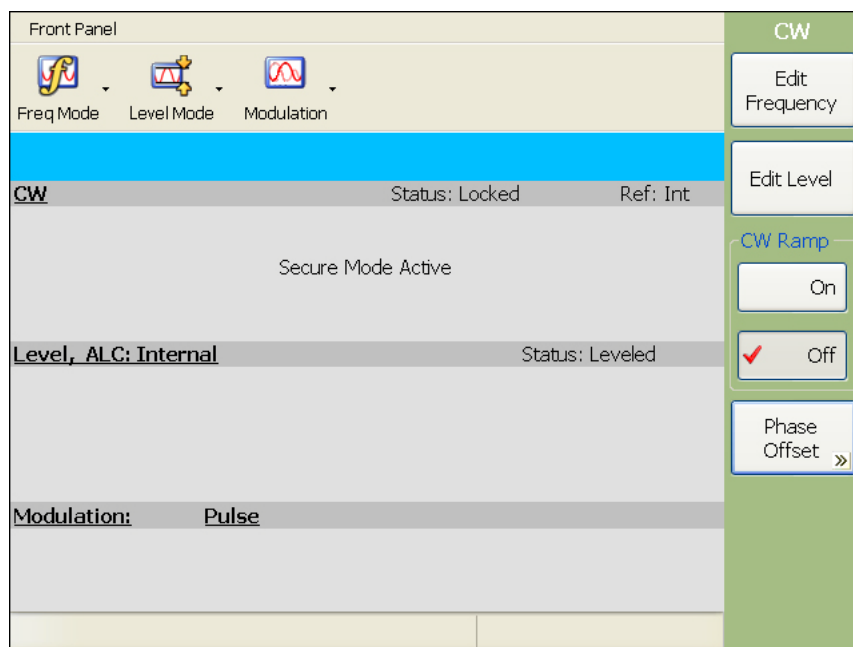

Figure 4-25. Display Configuration Menu

Then, press Secure Mode On. This places the signal generator in secure mode.

Note	During secure mode, all menu keys operate normally. The menu key labels are displayed and change with menu selections. Only the parameter display is disabled.

The display in Secure mode is shown below.

Figure 4-26. Sample Secure Mode CW Menu

To return the MG3702xA to unsecured (normal) operation, press the front panel **Preset** button.

Calibrating the Touch Screen

The MG3702xA's front panel touch screen can be calibrated to improve the accuracy of the touch screen. To calibrate the touch screen, enter the display configuration menu shown below by pressing **System** | Confi. | Display…
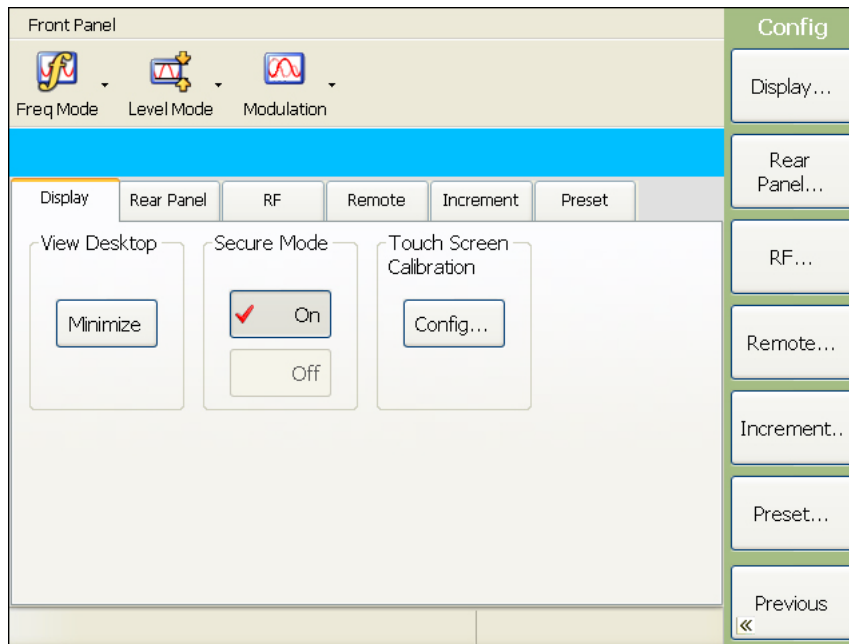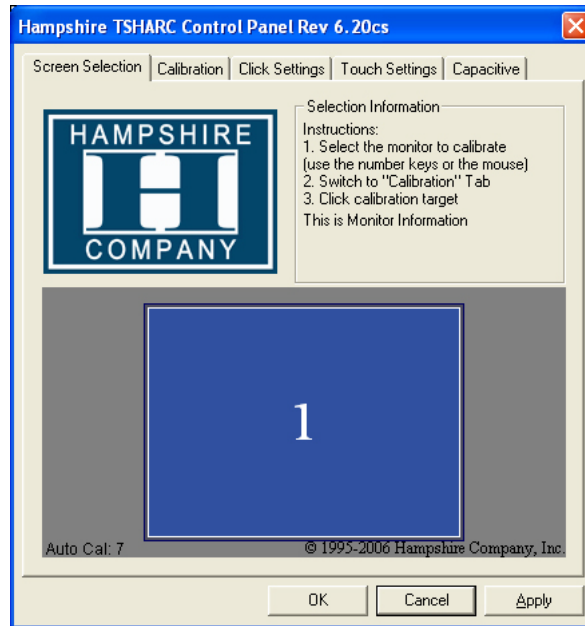

Figure 4-27. Display Configuration Menu

Note	After initiating the touch-screen calibration, the calibration routine will count down and automatically start the calibration sequence.

Press the Touch Screen Calibration Config... button shown in Figure 4-27 and follow the on-screen instructions found on the control panel shown below to start the automatic calibration function.


Figure 4-28. Touch Screen Control Panel

Select the Calibration tab before the countdown expires for manual calibration. The following screen is displayed, which offers additional calibration configurations and touch-screen tests. To continue with the manual touch-screen calibration, touch the calibration target shown below.
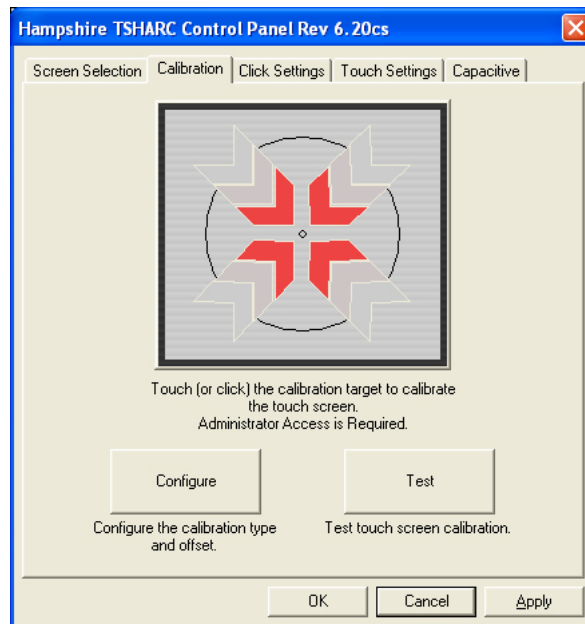
Figure 4-29. Touch Screen Control Panel

The calibration routine will continue as shown below. Touch and hold the center of the target for each step of the calibration process as directed in the on-screen display. After this step, test the calibration by dragging the target around the screen as instructed.
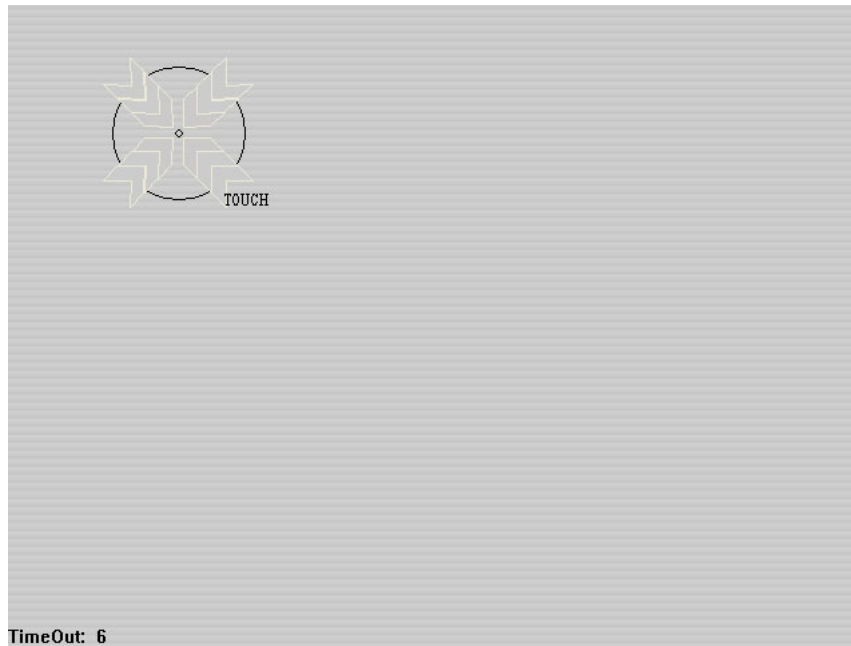
Figure 4-30. Touch Screen Calibration

Note	The calibration process has an automatic time-out feature to ensure that you are able to exit the calibration in the event of a problem.

The Configure button shown in Figure 4-29 sets the number of calibration points and the offset.

The Test button shown in Figure 4-29 allows you to draw a line on the screen with your finger to test the calibration settings.

The Click Settings tab controls the touchscreen right-click and double-click settings.

The Touch Setting tab sets the touch screen sound feedback options.

The Capacitive tabs is not used in calibration of the MG3702xA touch screen.

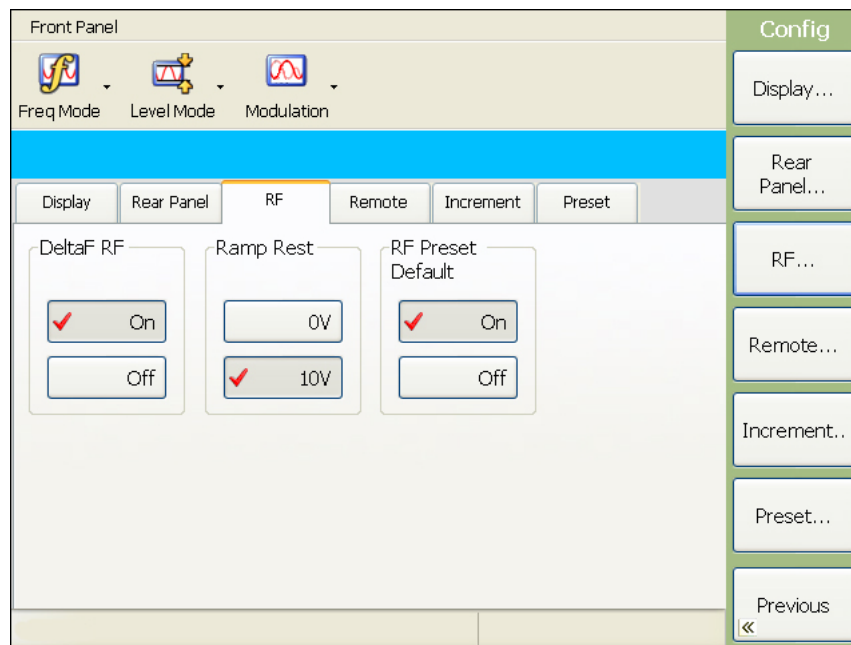**Configuring the Rear Panel**
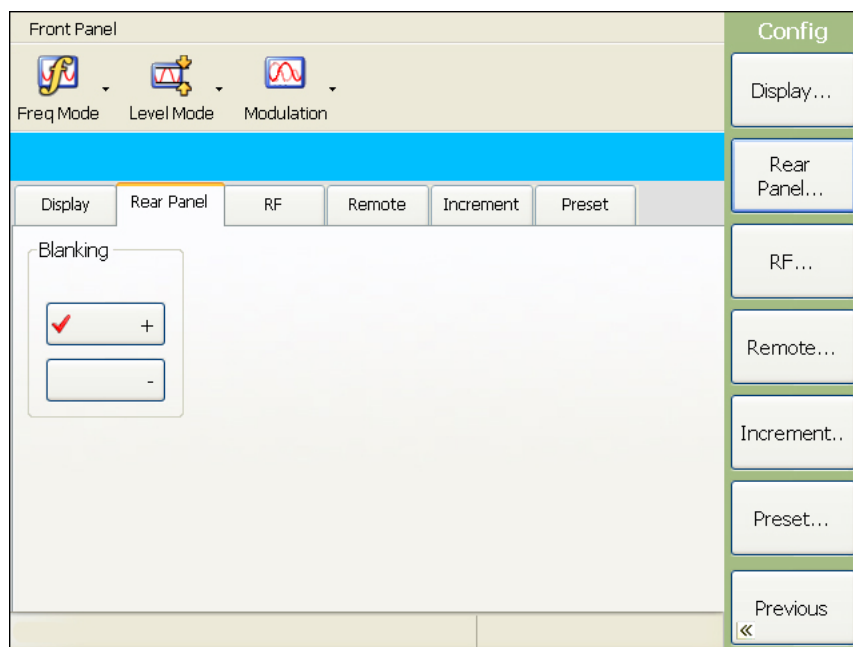
Figure 4-31. Rear Panel Configuration Menu

Configuring the rear panel of the signal generator consists of setting the polarity of the retrace and bandswitch blanking signals. Press Blanking + or – to select a +5 V or –5 V level for the retrace and bandswitch blanking outputs. The retrace and bandswitch blanking signal outputs are both available at the rear panel AUX I/O connector (retrace blanking at pin 6; bandswitch blanking at pin 20).

Press << Previous to return to the System menu.

Configuring the RF

Figure 4-32. RF Configuration Menu

Configuring the RF of the MG3702xA involves the following:

- **DeltaF RF:** Selects RF On or Off during frequency switching. Selecting DeltaF RF Off significantly improves spurious performance.
- **Ramp Rest:** Selects whether a sweep triggered by a single or external trigger should rest at the top (10V) or bottom (0V) of the sweep ramp
- **RF Preset Default:** Selects RF On or Off for when the MG3702xA is preset.

Press << Previous to return to the System menu.

Configuring the Remote Interface
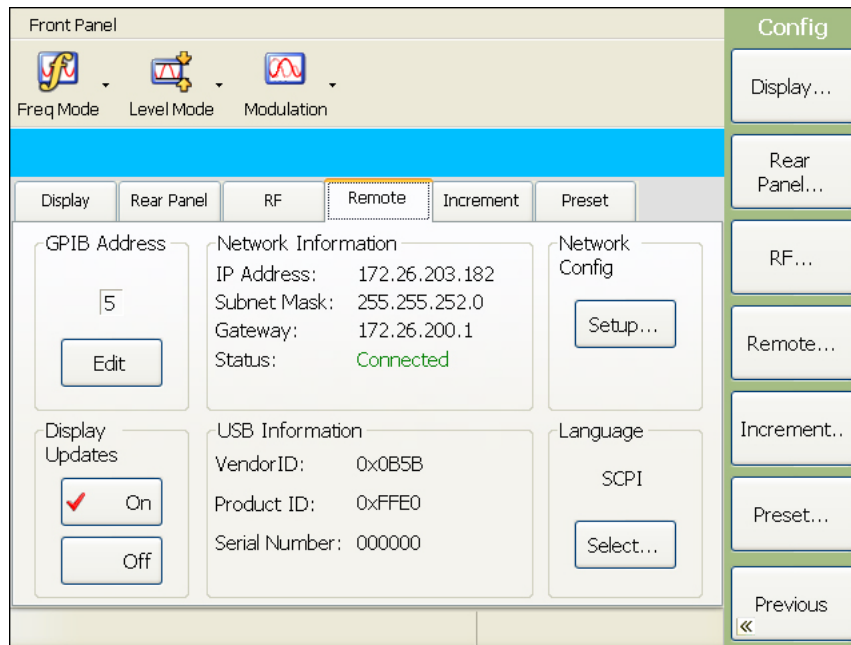
Figure 4-33. Remote Configuration Menu

The Remote configuration menu lets you set the following:

- **GPIB Address:** Press the Edit button to change the address of the MG3702xA on the bus (the default GPIB address is five). Enter a new address, between 0 and 30, using the cursor control keys or the data entry keypad and the Enter button. The new GPIB address will appear on the display.

- **Display Updates:** Set display updates to On to have the display updated with the current instrument settings when in remote operation mode.

- **Network Information:** Displays the local area network configuration settings.

- **Network Config:** The Setup... button accesses the Windows local area network configuration menus. Refer to "Ethernet Interface Connection and Setup" on page 2-10.

- **USB Information:** Displays the USB device information.

- **Language:** The MG3702xA has two language options for remote programming, SCPI or MG3690B. Click on the Language Select button to change the programming language and press the Close button to confirm the selection. More information about programming in SCPI and the SCPI equivalents to MG3690B programming commands is available in the MG3702xA programming manual, PN 10370-10371.

Press << Previous to return to the System menu.

Setting the Increment Size
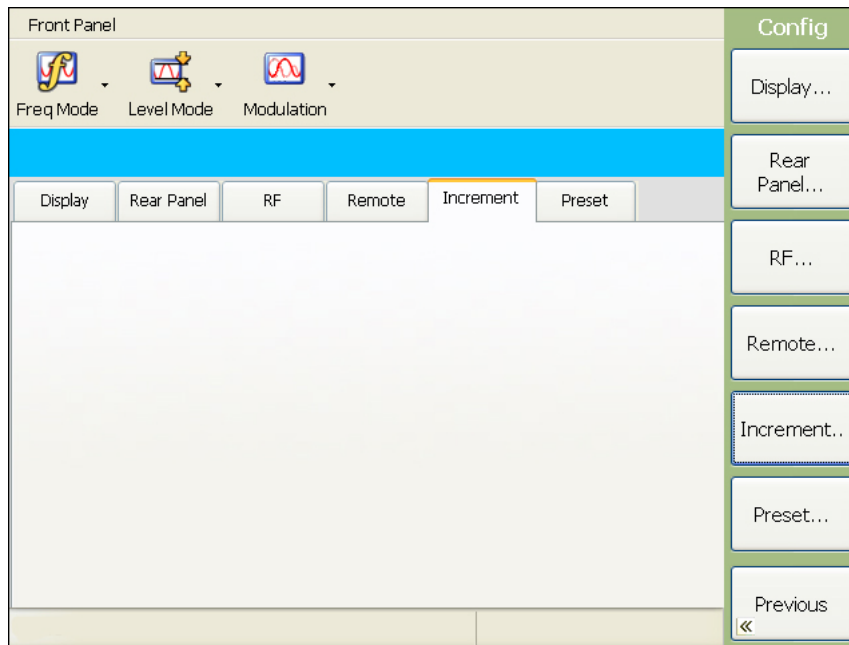
Figure 4-34. Increment Configuration Menu

The Increment menu is not available at this time.

Press << Previous to return to the System menu.
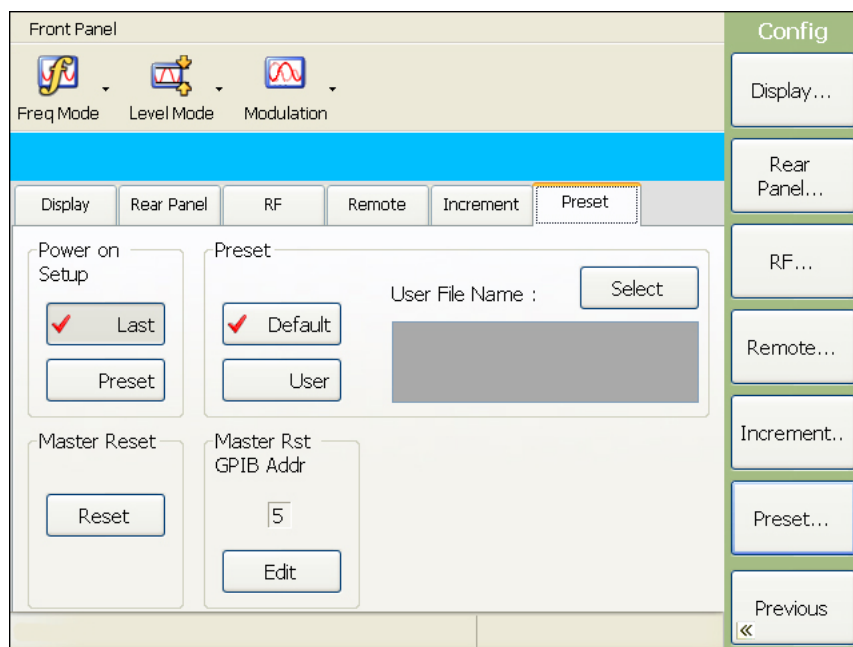
Configuring Preset Conditions

Figure 4-35. Preset Configuration Menu

The Preset configuration menu provides access to the following:

- **Power On Setup:** Sets the instrument to recall the last power down configuration or the selected preset configuration when brought back into operation from standby or power down.

- **Preset:** Provides for selecting the preset configuration as either the factory default configuration or a user defined configuration. Press the Select button to open the Preset Select menu below.
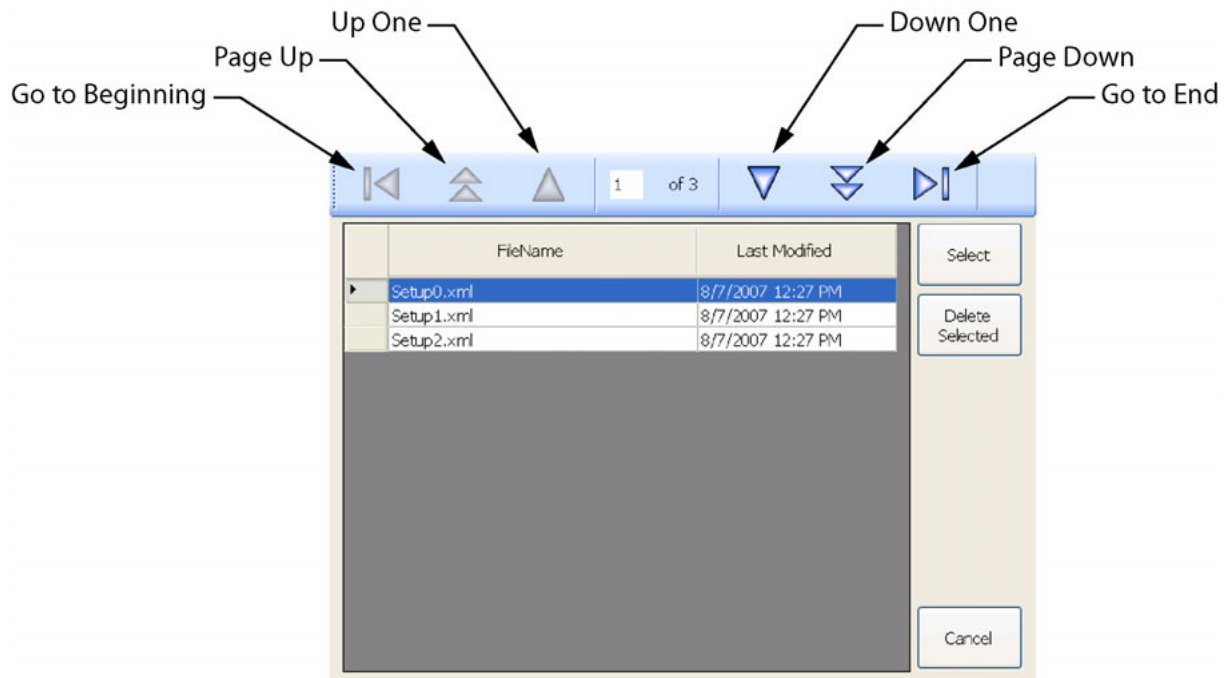
Figure 4-36. Preset Select Menu

Use the navigation controls to select the desired user preset file (highlighted in reverse video), then press the Select button.

- **Master Reset:** Press Reset to perform a master reset of the instrument.

Caution	A master reset performs a default preset and defaults additional items that survive a preset. 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

- **Master Rst GPIB Addr:** Sets the default GPIB address when a master reset is performed. Press the Edit button to change the default GPIB address (the default GPIB address is five). Enter a new address, between 0 and 30, using the cursor control keys or the data entry keypad and the terminator button. The new GPIB address will appear on the display.

Press <<Previous to return to the System menu.

System Setups

The MG3702xA offers the capability to store instrument setups. The setups are stored as .XML files on the instrument's hard drive. The following paragraphs describe how to save and recall front panel setups.

Saving System Setups

1. Press the **System** button to display the System menu.

2. Press the Setups>> button to display the Setups menu below.
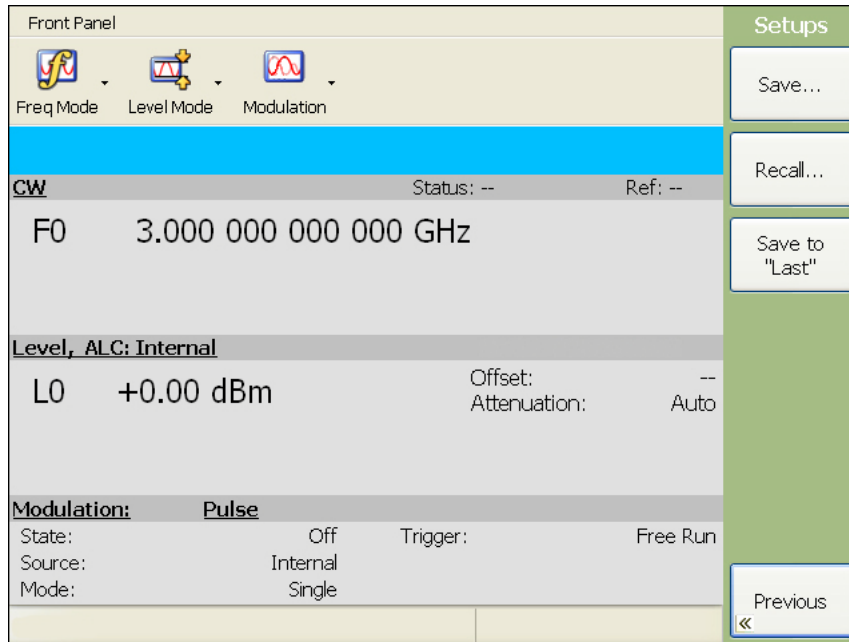

Figure 4-37. System Setups Menu

3. Press Save... to open the Save Setup menu below.

| Note	The current front panel settings are automatically saved to SetupLast.xml when the instrument is shut down using the front panel **Line** key. Therefore, it is recommended that you use a different file name to save front panel setups.
	When an MG3702xA shutdown occurs because of main power interruptions, the current front panel settings are not saved.
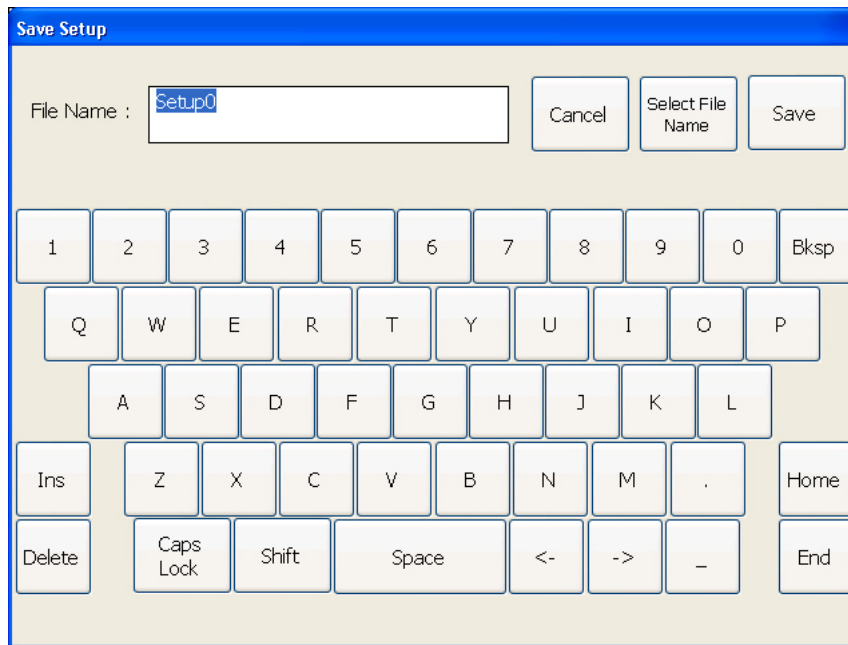
Figure 4-38. Save Setup Menu

4. Enter the desired filename using the keypad, then press the Save button.

   Alternatively, you can select an existing filename by pressing the Select File Name button and selecting the setup file from the Select menu below.
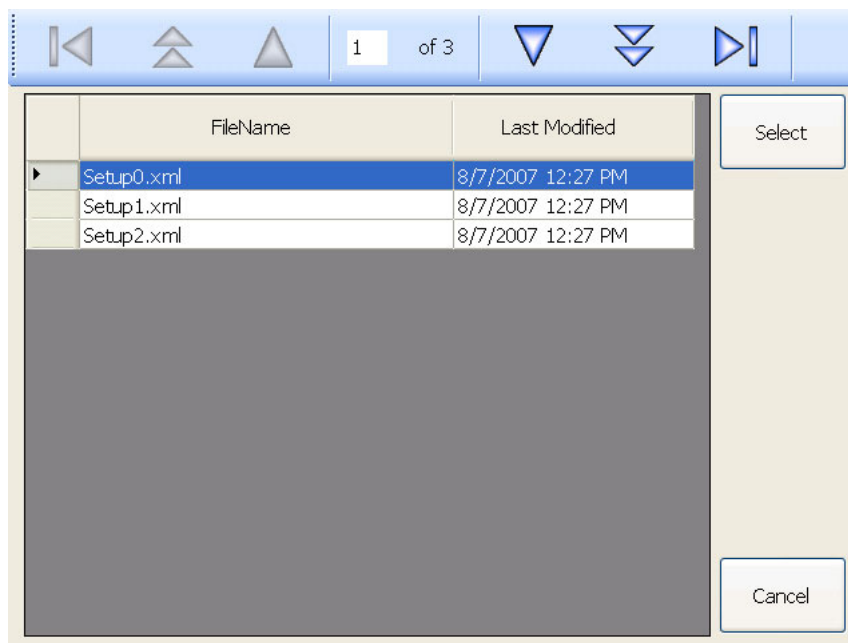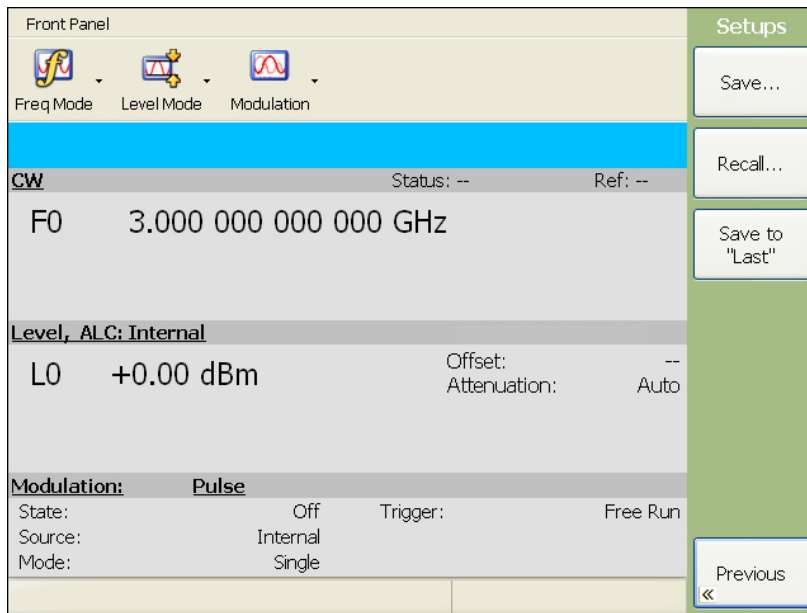

Figure 4-39. Select Setup File Menu
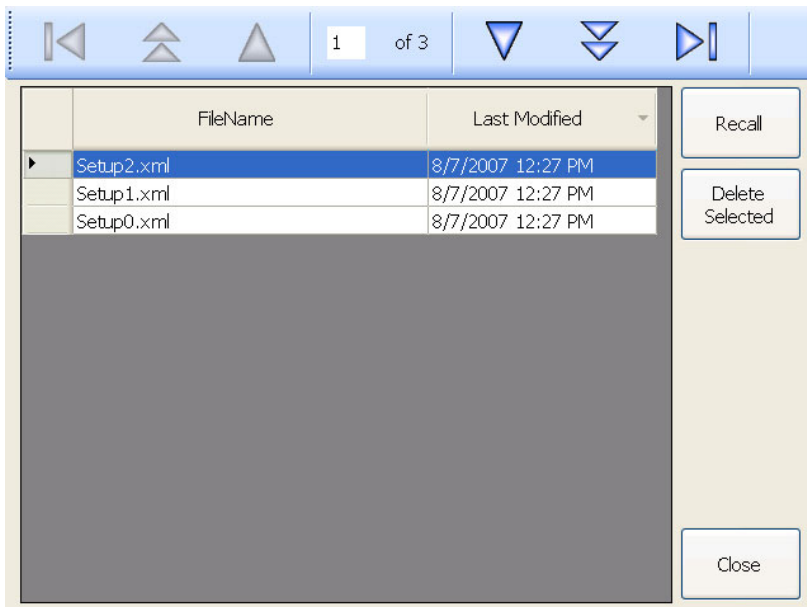
Recalling Stored Setups

To recall a previously saved setup file, first access the Setups menu as described below:

1. Press **System** to display the System menu, then press the Setups>> button. The Setups menu below is displayed.

Figure 4-40. System Setups Menu

2. Press Recall… to open the Recall Setup menu below.

Figure 4-41. Recall Setup Menu

3. Select the desired file from the list and press the Recall button.
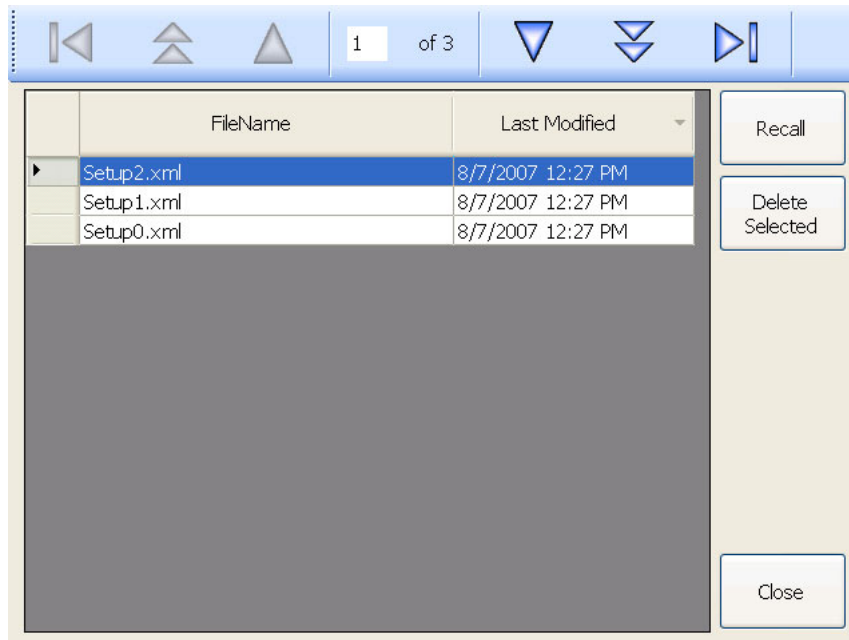
The MG3702xA resets to the recalled configuration.

Deleting Stored Setups

A highlighted stored setup can be deleted from the Recall Setup menu (described above) by pressing the Delete Selected button.

Caution	When pressing the Delete Selected button, the highlighted file is deleted from the instrument's hard drive and cannot be recovered.

**Figure 4-42.** Recall Setup Menu

4-10   Reference Loop Adjustments

The signal source reference loop can be calibrated to an external reference source by following the calibration procedure below.

Calibrating the Reference Oscillator

The reference oscillator calibration function lets you calibrate the internal 100 MHz crystal reference oscillator of the MG3702xA using an external 10 MHz, 0 dBm to +10 dBm reference signal.

| Note	Before beginning calibration, always let the MG3702xA warm up for a minimum of 120 hours.

1. To perform a calibration of the internal reference oscillator, first connect the external 10 MHz reference signal to the MG3702xA rear panel 10 MHz REF IN connector.

2. Next, press the **System** key. At the System menu display, press Reference Cal. to access the Cal menu below.
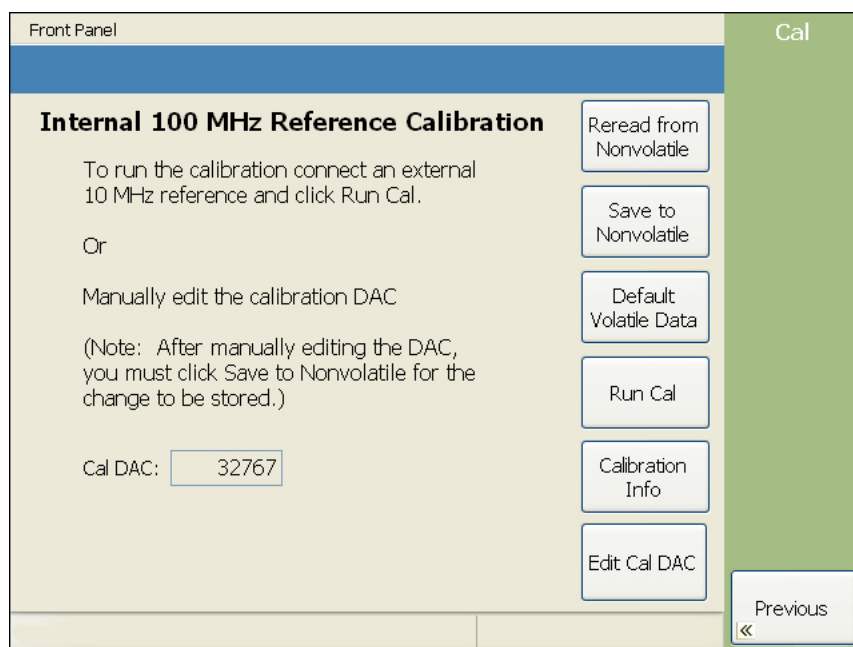
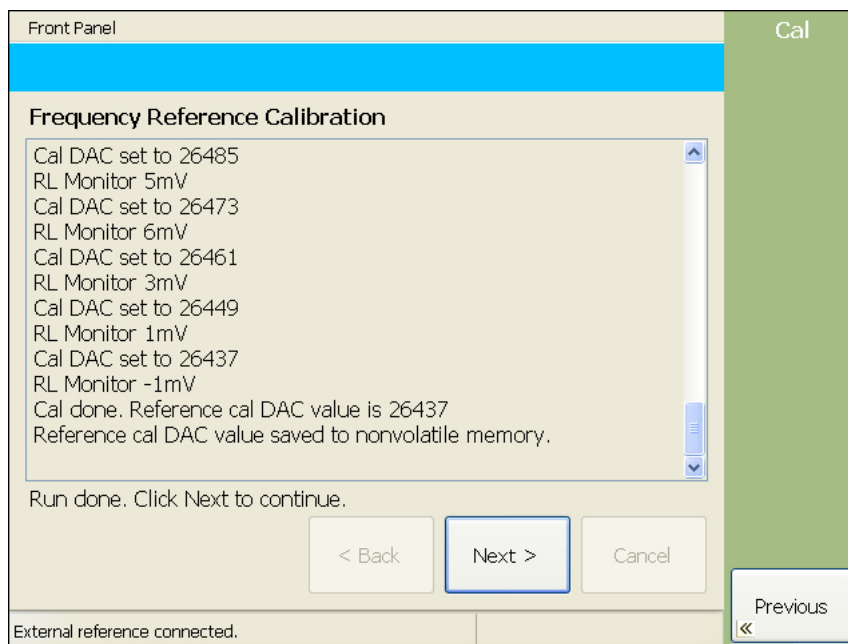
Figure 4-43. Frequency Reference Calibration

3. Press Run Cal from the menu above to start the calibration sequence.

4. Press Next to begin the calibration and follow the on-screen instructions.
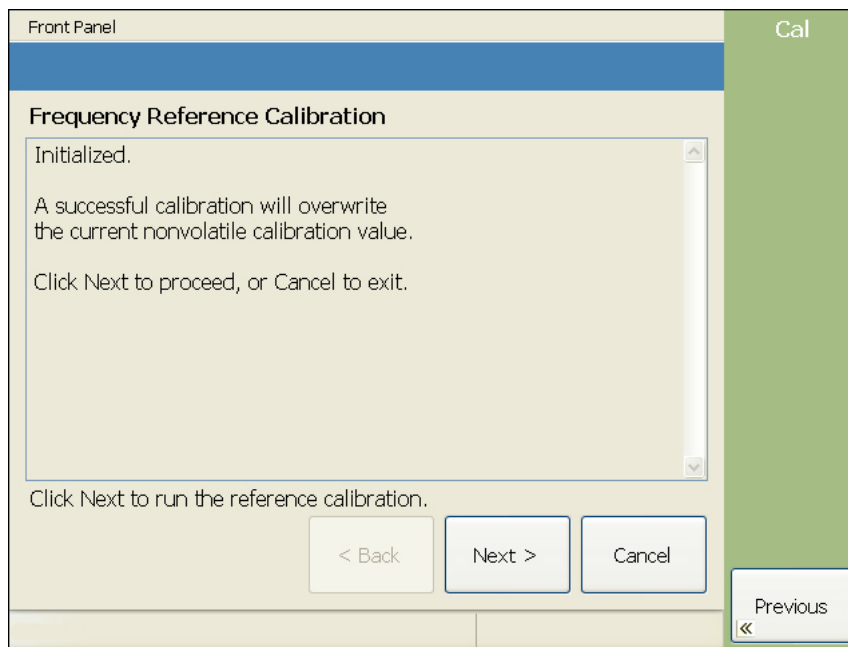
Figure 4-44. Frequency Reference Calibration

When the reference calibration is in process, the calibration status is shown on the menu. When the reference calibration is complete, the calibration status is displayed as shown below.

Figure 4-45. Frequency Reference Calibration

5. Press Next to return to the Cal menu.

4-11   Pulse Modulation

The MG3702xA provides pulse modulation (Option 26) of the output signal using modulating signals from either its internal pulse generator or external sources that are TTL-compatible.

To provide pulse modulation of the output signal using a modulating signal from an external source, set up the external pulse generator and connect it to the MG3702xA rear panel PULSE TRIG IN connector.

The internal pulse generator has four pulse modes– single, doublet (double pulse), triplet (triple pulse), and quadruplet (quadruple pulse). Individual pulse widths (W1, W2, W3, and W4) and delays (D1, D2, D3, and D4) can be set for each of the pulses in a mode.

The internal pulse generator can be internally triggered (free run), externally triggered, or externally gated.
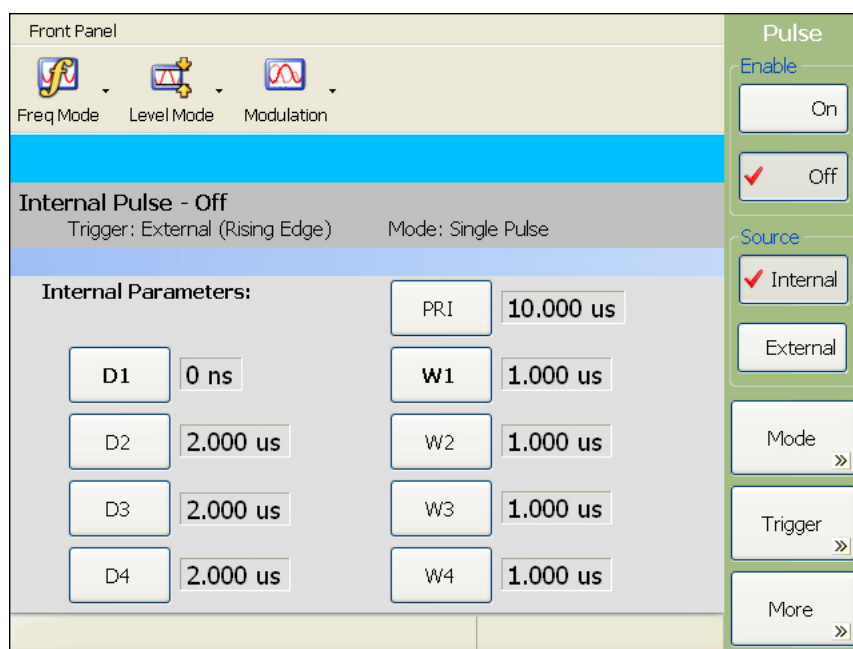
Whenever the internal pulse generator is internally triggered, a TTL compatible signal that is synchronized to the internal pulse modulation output is available at the rear panel PULSE SYNC OUT connector. External signals to trigger or gate the internal pulse generator can be applied to the rear panel PULSE TRIGGER IN connector.

The following paragraphs provide descriptions and operating instructions for the pulse modulation mode.

Note	Modulation capabilities are dependent on the instrument's installed options. The following descriptions and procedures are presented to cover all of the possible instrument configurations. Refer to your instrument's rear panel for a list of installed options.

Accessing the Modulation Menu

The modulation setups are all accessed from the Modulation Pulse menu. To access this menu (below), press either the **Modulation** front panel key or the Modulation toolbar icon and select Pulse.

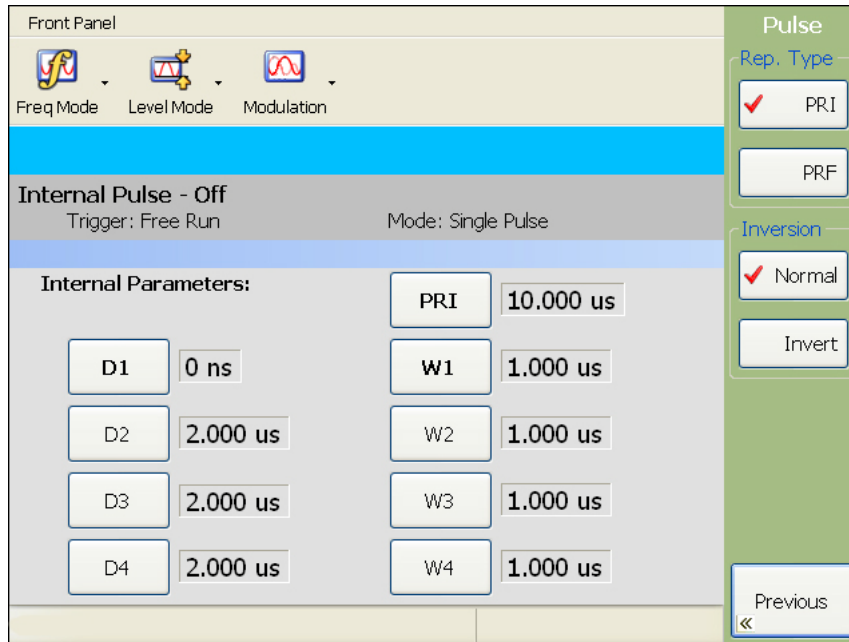**Figure 4-46.** Pulse Modulation Menu

Providing Internal Pulse Modulation

Press the Source Internal button to select the internal pulse generator as the modulating signal source.

Press the On or Off buttons to turn pulse modulation on and off. The Pulse status display area reflects your selection as On or Off.

Setting the Pulse Repetition Type and Inversion

Access the additional Pulse menu (below) by pressing the More>> button from the initial Pulse menu.

**Figure 4-47.** Pulse Modulation Menu (More)

Set the pulse repetition type to use either Pulse Repetition Interval (PRI) set in units of time or Pulse Repetition Frequency (PRF) set in units of Hertz. The PRI/PRF value can be set from the pulse internal parameters area.

Set the Inversion mode to Normal (RF on during pulse highs) or Invert (RF off during pulse highs).

Press <<Previous to return to the initial Pulse menu.

Selecting the Pulse Mode

Select the pulse mode by pressing the Mode>> button.
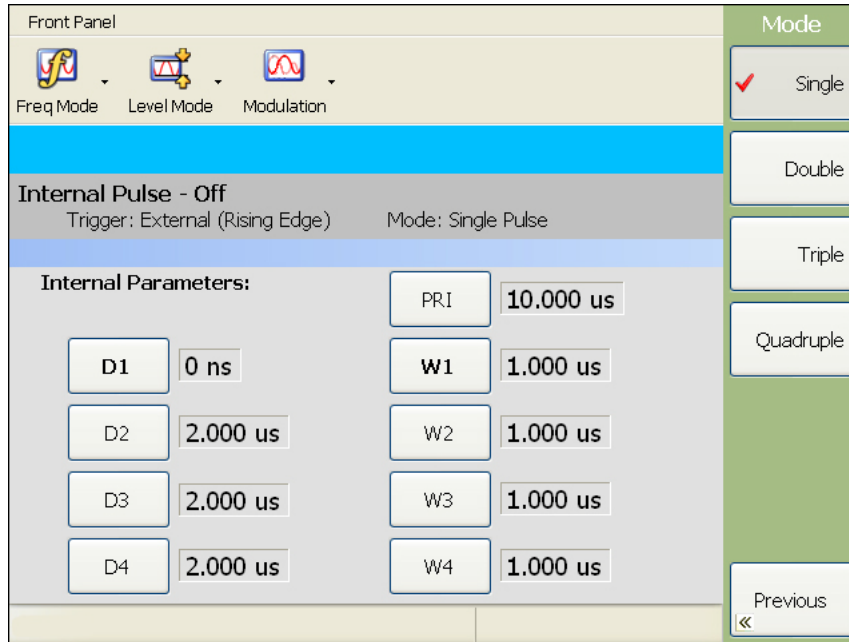
Figure 4-48. Pulse Mode Menu

Refer to Figure 4-50 on page 4-46 for illustrations of each pulse mode.

Select from the following pulse modes:

- **Single:** Provides a single RF pulse with each pulse cycle
- **Double:** Provides two RF pulses with each pulse cycle
- **Triple:** Provides three RF pulses with each pulse cycle
- **Quadruple:** Provides four RF pulses with each pulse cycle

  The pulse parameters become available depending on the pulse mode selected. For example, D1, W1 and PRI (or PRF) are available for a Single pulse mode. D1 through D4, W1 through W4 and PRI (or PRF) are available for a Quadruple pulse mode. Change these values by pressing their corresponding button and edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator button. To close the open parameter, press the open parameter button again.

Note	The pulse Period, pulse Widths, and pulse Delays must be set to conform as follows: $D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq Period - 20$ ns An Error message is displayed when a pulse parameter setting is invalid for the current pulse modulation state.

Press <<Previous to return to the Pulse menu.

Selecting the Pulse Triggering

From the Pulse menu, press the Trigger>> button to access the pulse Trigger menu below.

Figure 4-49. Pulse Triggering Menu

Refer to Figure 4-50 on page 4-46 for illustrations of each triggering mode.

Select from the following pulse modes:

- **Free Run:** The pulse generator produces Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms at the internal pulse repetition rate.

- **External Triggered:** The pulse generator is triggered by an external trigger to produce Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms. When External Trigger is selected, the menu display adds the menu buttons Rising or Falling to select whether the pulse generator is triggered by the rising or falling edge of the external trigger pulse.

- **Gated:** An external pulse gates the internal pulse generator on and off. When Gated is selected, the pulse generator produces a Single pulse modulation waveform at the internal pulse repetition rate. Doublet, Triplet, and Quadruplet pulse modes are not available in this trigger mode. When Gated is selected, the menu display adds the menu buttons High or Low to select whether the pulse generator is triggered by a TTL-high level or TTL-low level of the external trigger input.

Note	The pulse Period, pulse Widths, and pulse Delays must be set to conform as follows: $D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq Period - 20$ ns.

To prevent relative timing jitter, the external gating pulse source can be synchronized with the internal pulse generator by using the 10 MHz REF OUT signal output (MG3702xA rear panel) as a frequency reference for the external generator.

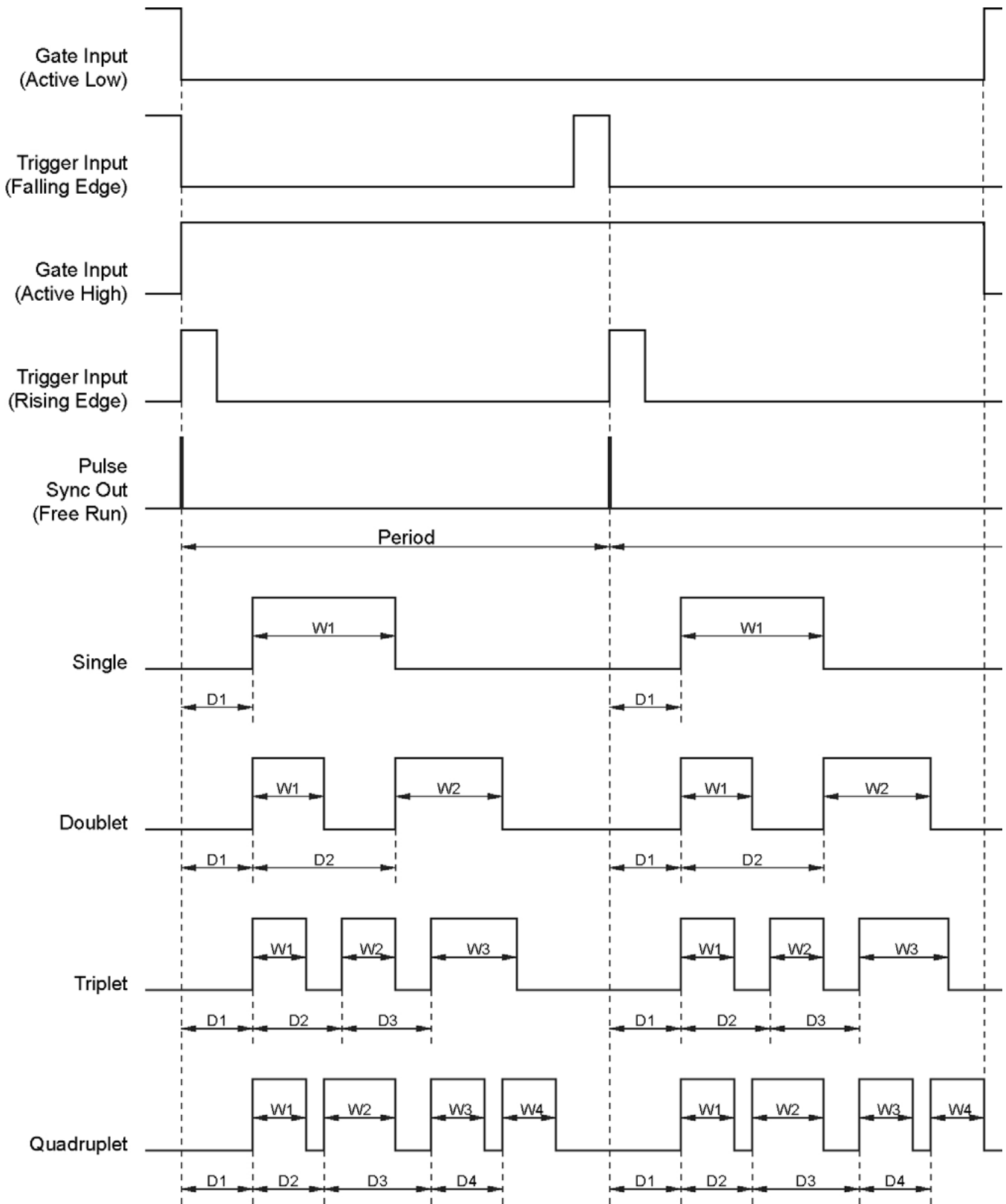Press <<Previous to return to the Pulse menu.

Figure 4-50. Pulse Pattern and Trigger Relationships

Providing External Pulse Modulation

To provide pulse modulation of the output signal using a modulating signal from an external source, first set up the external pulse generator and connect it to the MG3702xA rear panel PULSE TRIGGER IN connector. Next, access the Pulse menu and select the External pulse source to select the external source for the modulating signal as shown below.
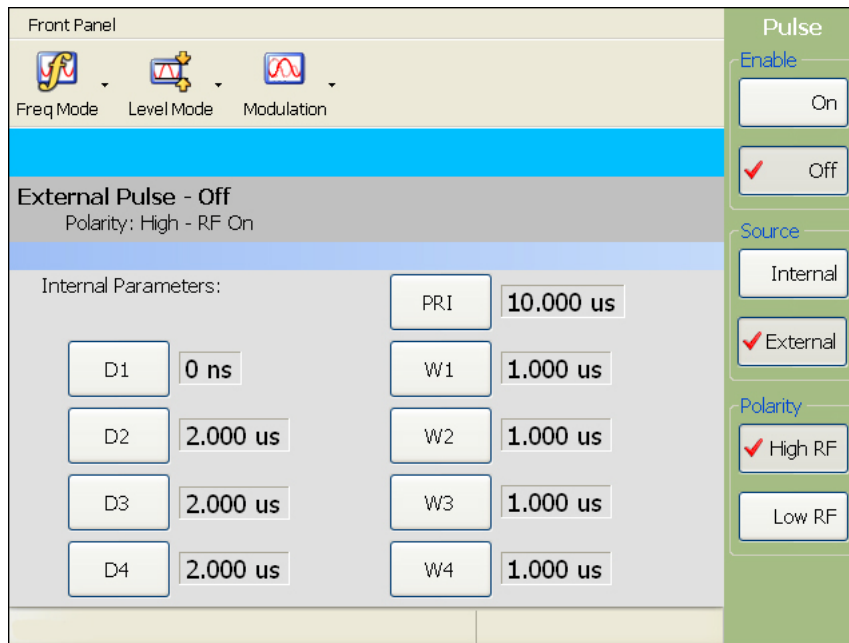
Figure 4-51. External Pulse Menu

The External Pulse menu lets you perform the following:

- Enable the external pulse modulation On and Off
- Select the modulating signal source (Internal or External)
- Select the polarity of the pulse input signal (High RF or Low RF) that turns on the RF

The External Pulse Status display area will reflect your selections.

Note	The pulse width/delay and PRF/PRI settings are not used in the external pulse mode.

4-12 Optimizing Frequency Switching Time

Optimizing switching time involves setting up a sweep or a change in frequency that does not cross a Dwell frequency. Switching times can be optimized by using a list sweep that meets this criteria, and by using an external trigger to step through the list index. Dwell frequencies are listed in the technical data sheet (PN: 11410-00429) that was shipped with the instrument.

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Chapter 5 — Operation Verification

5-1 Introduction

This chapter contains three operation verification tests that can be used to verify the Series MG3702xA RF/Microwave signal generator operation. Setup instructions and performance procedures are included for each test. The results can be compared with the specified limits that are shown on the test record forms that are provided for each test.

Note	The tests in this operation manual are designed to verify that the signal generator is operating correctly and are not designed to verify performance to published specifications.
	Specifications shown in this chapter and in other chapters are for reference only. Refer to the performance specifications for the MG3702xA found in the technical data sheet that was shipped with your instrument; Anritsu part number: 11410-00429.

5-2 Test Equipment

Table 5-1 lists the recommended test equipment for performing the operation verification tests in this chapter.

Table 5-1. Recommended Test Equipment

Equipment	Critical Specification	Recommended Manufacturer/Model
Frequency Counter or	Range: 0.01 GHz to 40 GHz Input Z: 50 Ω Resolution: 1 Hz Other: External Time Base or Input	Anritsu Model MF2414
Frequency Counter with Cable Kit and External Mixer	Range: 0.01 GHz to 20 GHz Input Z: 50 Ω Resolution: 1 Hz Other: External Time Base or Input	EIP Microwave, Inc. Models 538B, 548B, or 578B
Power Meter with Power Sensor	Level Range: –30 dBm to +20 dBm (1 µW to 100 mW) Frequency Range: 0.01 GHz to 20 GHz	Anritsu Models ML2437A or ML2438A with Power Sensor: MA2474A
Fixed Attenuator	Frequency Range: DC to 65 GHz Max Input Power: >+23 dBm Attenuation: 10 dB	Anritsu Model 41KC-10
Special AUX I/O Interface Cable	25-pin parallel connector (DB25-M) with shielded BNC connections to pins 1 and 3	Anritsu Part Number: 806-97

5-3 Test Records

Table 5-2, Table 5-3, and Table 5-4 contain test record forms that can be photocopied and used to record the results of operational verification tests of your MG3702xA. These tables are included as part of the operational verification test procedures and contain test information for all MG3702xA models.

5-4 Initial MG3702xA Checkout

Before starting the operation verification tests in this chapter, perform an initial checkout of the MG3702xA to be tested. This initial checkout consists of applying power to the signal generator, verifying that it passes self test, and resetting it to the factory default parameters.

Power Up

Connect the MG3702xA to the power source and turn on the rear panel power switch. This automatically places the signal generator in operation (front panel Operate LED green). During power up, the signal generator loads its operating program, and then returns to the specified power on setup file.
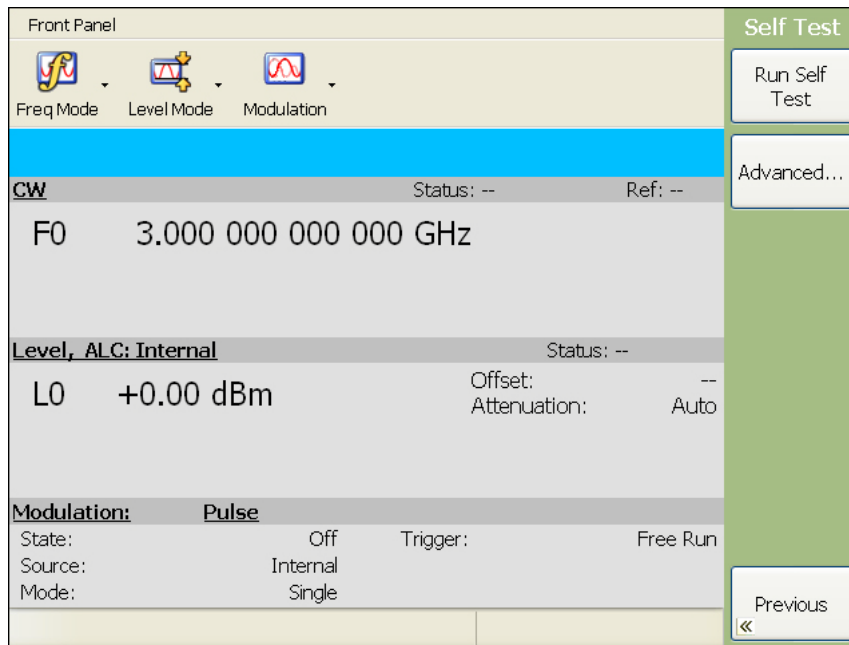
Self Test

Next, perform a self test of the MG3702xA to ensure proper operation of the instrument's internal assemblies.

To perform a self test from any menu, press the **System** key to access the System menu.
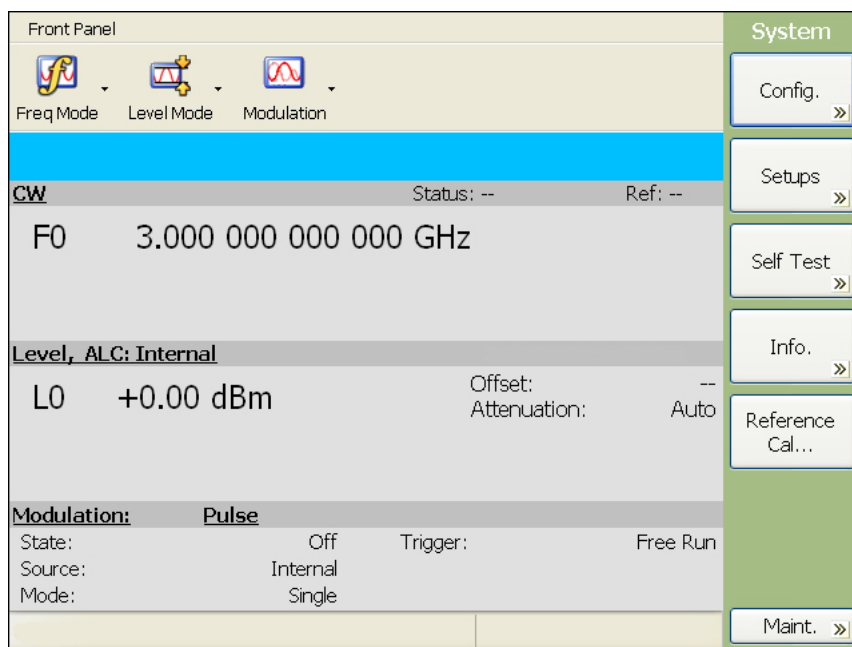
Figure 5-1.   System Menu

From the System menu, press Self Test to enter the Self Test menu.

Figure 5-2.   Self Test Menu

From the Self Test menu, press Run Self Test. After the self test runs, the results are displayed in the self test status message log as shown below.
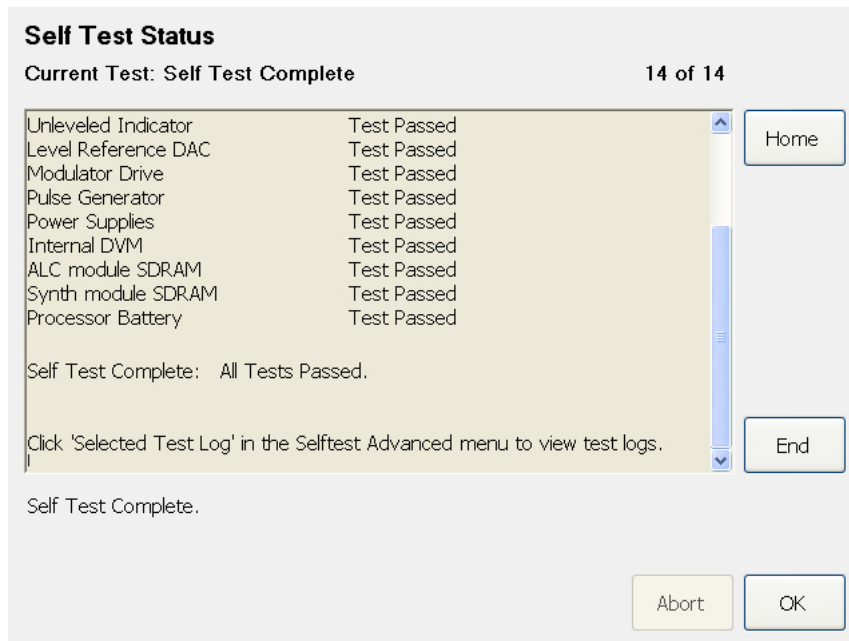
Figure 5-3.   Self Test Status Log

Error conditions detected during self test must be corrected before continuing. Refer to Chapter 6, "Operator Maintenance" for a listing of error messages and descriptions.

Presetting the MG3702xA

The signal generator should be preset to the factory-selected default parameters before commencing operation verification testing. Ensure that the default Preset configuration is selected from the **System** | Configuration | Preset menu below:
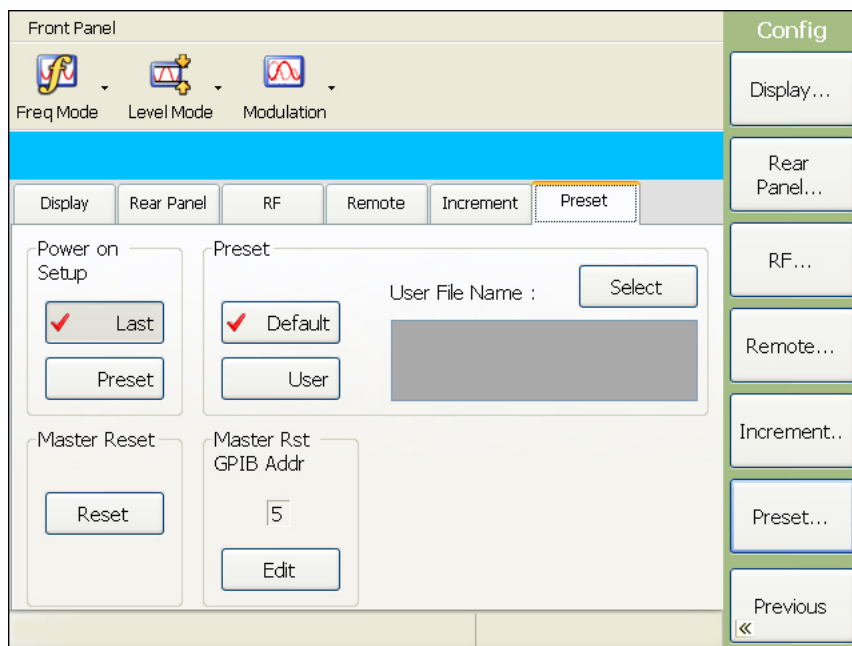
Figure 5-4.   Preset Configuration Menu

Note	Presetting the instrument clears the current setup parameters. If these parameter values are needed for future testing, save them as a stored setup *before* presetting the signal generator. For information on saving and recalling instrument setups, refer to "Saving System Setups" on page 4-36 and "Recalling Stored Setups" on page 4-38.

Preset the MG3702xA by pressing the **Preset** button on the front panel. The signal generator resets to the CW frequency mode and displays the CW Menu.

Warm-up Time

When the signal generator is turned on, allow one hour of warm-up time before performing operational verification testing. This will assure stable operation of the instrument.

5-5 Frequency Synthesis Test

The following test verifies that the CW frequency output of the MG3702xA under test is within tolerance. Table 5-2 contains a standard test record that you can copy and use to record test results for this test.
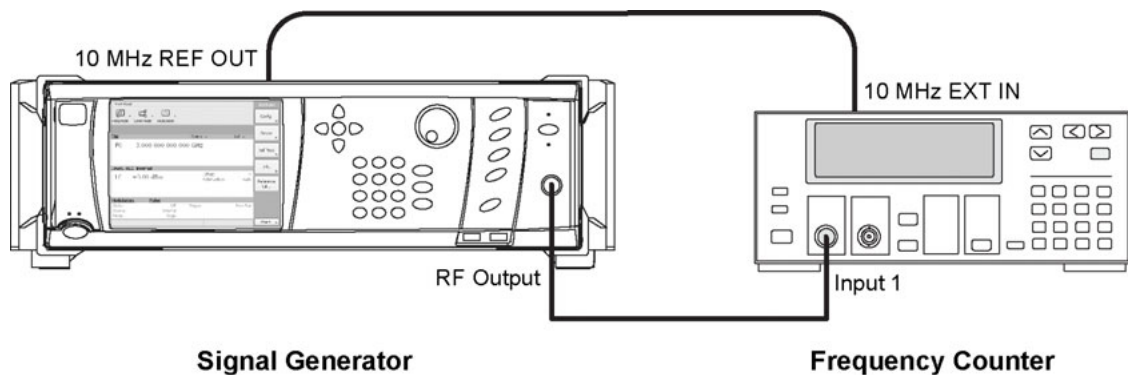
Figure 5-5.   Test Equipment Setup for Frequency Synthesis Test

The following procedure tests both the coarse and fine frequency synthesis loops to verify the tolerance of the CW frequency output.

1. Connect the equipment shown in Figure 5-5 as follows:

   a. Connect the MG3702xA rear panel 10 MHz REF OUT to the Frequency Counter 10 MHz External Reference input.

   b. Connect the MG3702xA RF OUTPUT to the Frequency Counter RF Input 1.

2. Set up the MG3702xA as follows:

   a. Reset the instrument by pressing the front panel **Preset** key. Upon reset, the CW Menu is displayed.

   b. Press Edit Frequency to open the current frequency parameter for editing.

   c. Set F0 to the first test frequency listed in Table 5-2, "Frequency Synthesis Test Record".

3. Record the frequency counter reading on the test record and calculate the difference between the test frequency and the measured value.

4. Verify that the calculated difference meets specifications.

Note	The frequency counter reading is typically within ±1 Hz. Differences of a few hertz can be caused by noise or counter limitations. Differences of more than ±10 Hz indicate a frequency synthesis problem.

5. Set F0 to the next test frequency in Table 5-2.

6. Record the frequency counter reading in Table 5-2 and calculate the difference between the test frequency and the measured value.

7. Repeat steps 5 and 6 until all of the test frequencies listed in Table 5-2 have been recorded.

Table 5-2.   Frequency Synthesis Test Record

Model MG3702xA	Serial Number:	Date:
Test Frequency F0 (GHz)	**Recorded Frequency (GHz)**	**Calculated Difference (Hz)[1]**
COURSE FREQUENCY SETTINGS		
2.000 000 000 000		
5.000 000 000 000		
8.000 000 000 000		
11.000 000 000 000		
14.000 000 000 000		
17.000 000 000 000		
20.000 000 000 000		
FINE FREQUENCY SETTINGS		
2.000 000 100 000		
2.000 000 200 000		
2.000 000 300 000		
2.000 000 400 000		
2.000 000 500 000		
2.000 000 600 000		
2.000 000 700 000		
2.000 000 800 000		
2.000 000 900 000		
2.000 001 000 000		

[1]Tolerance for all frequencies listed above is ± 10 Hz.

5-6   Level Accuracy and Flatness Test

The following tests verify that the power level accuracy and flatness of the MG3702xA meet specifications. Table 5-3 and Table 5-4 contain test records that you can copy and use to record test results.
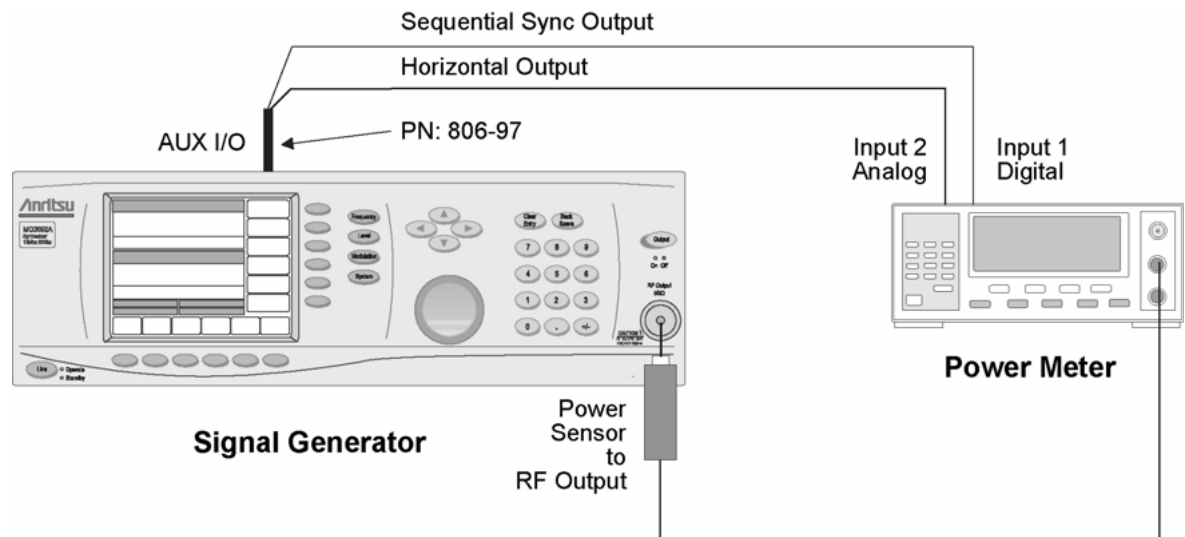
Figure 5-6.   Equipment Setup for Power Level Accuracy and Flatness Tests

Caution	The MG3702xA is capable of output power levels in excess of +20 dBm. Ensure that proper care is taken to protect sensitive power sensors from being damaged by using a fixed attenuator. **Do not** apply power above +19 dBm to the power sensor.

Set up the equipment shown in Figure 5-6 as follows:

1. Set up the power meter as follows:

   a. Reset the power meter by pressing:

   System | Setup | -more- | PRESET | RESET.

   b. Configure the power meter to perform power measurements by pressing:

   Sensor | Setup | MODE | Default.

   c. Configure the power sensor's calibration factor source by pressing:

   Sensor | CalFactor | SOURCE | V/GHz

   until V/GHz is displayed.

   d. Set up the minimum V/GHz range by pressing:

   Setup | StartF

   and enter the minimum frequency of the MG3702xA.

   e. Set up the maximum V/GHz range by pressing:

   Setup | StopF

   and enter the maximum frequency of the MG3702xA.

   f. Press any hard key to begin the measurement.

   g. Calibrate the power meter with the power sensor.

2. Connect the power sensor to the RF Output of the MG3702xA (use a fixed attenuator when measuring power levels above +19 dBm).

3. Connect the special AUX I/O interface cable (Anritsu PN 806-97) to the MG3702xA rear panel AUX I/O connector. Connect the cable BNC connectors as follows:

    a. Connect the cable labeled "SEQ SYNC" to the power meter rear panel INPUT 1 DIGITAL connector.

    b. Connect the cable labeled "HORIZ OUT" to the power meter rear panel INPUT 2 ANALOG connector.

Power Level Accuracy Test Procedure

Power level accuracy is checked by stepping the power down in one dB increments from the maximum rated power level.

1. Set up the MG3702xA as follows:

    a. Reset the instrument by pressing the front panel **Preset** key. The CW menu is displayed.

Note	The power level accuracy test records are generic to all models and option configurations. Not all of the power level settings may apply to your specific model configuration. Start with the highest specified power level as indicated in the technical data sheet that was shipped with your instrument.

    b. Press the Edit Frequency button to open the current frequency parameter for editing.

    c. Set F0 to the CW frequency listed in Table 5-3, "Power Level Accuracy Test Record".

    d. Press the Edit Level button to open the current power level parameter for editing and set L0 to the maximum specified power level noted in the data sheet (use a fixed attenuator when measuring power levels above +19 dBm).

2. Measure the output power level with the power meter and record the power meter reading on the test record (ensure that any fixed attenuation value is added to the reading).

3. Verify that the measurement meets the specifications listed on the test record.

4. Set L0 to the next test power level listed on the test record. Record the power meter reading on the test record and verify that it meets specification (ensure that any fixed attenuation value is added to the reading).

5. Repeat step 4 for the remaining power levels listed in Table 5-3 for the current CW frequency.

6. Repeat steps 1 through 5 for all CW frequencies listed Table 5-3.

Table 5-3. Power Level Accuracy Test Record

Model MG3702xA		Serial Number:		Date:	
Power Level Accuracy[2] **(CW Frequency = 500 MHz)**		**Power Level Accuracy[2]** **(CW Frequency = 5.0 GHz)**		**Power Level Accuracy[2]** **(CW Frequency = 15.0 GHz)**	
Set Power (dBm)	**Measured Power (dBm)**	**Set Power (dBm)**	**Measured Power (dBm)**	**Set Power (dBm)**	**Measured Power (dBm)**
		+23[3]			
		+22[3]			
		+21[3]			
		+20[3]			
+19		+19			
+18		+18			
+17		+17		+17	
+16		+16		+16	
+15		+15		+15	
+14		+14		+14	
+13		+13		+13	
+12		+12		+12	
+11		+11		+11	
+10		+10		+10	
+9		+9		+9	
+8		+8		+8	
+7		+7		+7	
+6		+6		+6	
+5		+5		+5	
+4		+4		+4	
+3		+3		+3	
+2		+2		+2	
+1		+1		+1	
+0		+0		+0	
−1		−1		−1	
−2		−2		−2	
−3		−3		−3	
−4		−4		−4	
−5		−5		−5	

[2]Specification is ± 1.0 dB for standard power instruments and 1.5 dB for high power (Option 15) instruments.
[3]Ensure that a fixed attenuator is used to protect the power sensor from input overload.

Power Level Flatness Test Procedure

Power level flatness is checked by measuring the power level variation during a full band sweep in the step sweep mode.

1. Set up the MG3702xA as follows for a step sweep power level flatness test:

    a. Reset the instrument by pressing the front panel **Preset** key. The CW menu is displayed.

    b. Press the front panel **Level** key and press the Edit Level button to set L0 to the power level to 0 dBm.

    c. Press the Freq Mode toolbar button and select Step Sweep from the drop-down list. From the Step Sweep menu, select Edit Setup to enter the Step Setup menu below.
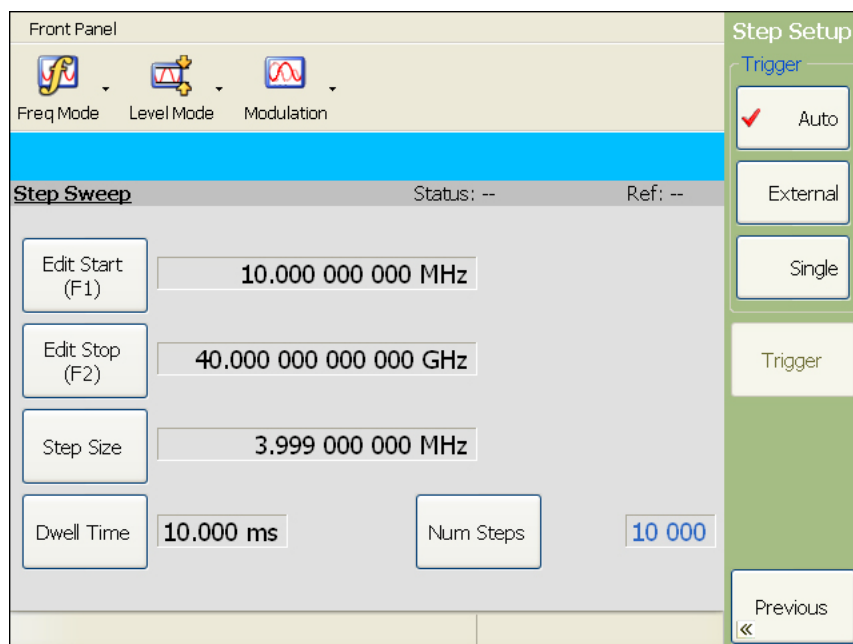
Figure 5-7.   Step Sweep Setup Menu

    d. Set F1 to the lowest frequency of the instrument and set F2 to the highest frequency of the instrument for a full frequency sweep.

    e. Set the Dwell Time to 1 second, or to a time that is comfortable between recordings.

    f. Set the Num Steps to 100.

    g. Select Single trigger.

2. Press the Trigger button to start a sweep.

3. As the MG3702xA steps through the full frequency range, observe the maximum and minimum power meter readings and record the values on the test record. Verify that the variation (difference between the maximum and minimum readings) does not exceed the value noted in Table 5-4, "Power Level Flatness Test Record". The sweep may be repeated as necessary by pressing the Trigger button.

Table 5-4.   Power Level Flatness Test Record

Model MG3702xA	Serial Number:		Date:
Set Power	**Maximum Power**	**Minimum Power**	**Variation**[4]
+0 dBm	dBm	dBm	dB

[4]Maximum variation is 1.6 dB for standard power instruments and 3.0 dB for high power (Option 15) instruments.

Chapter 6 — Operator Maintenance

6-1 Introduction

This chapter provides the information necessary for operator maintenance of the signal generator. Operator maintenance is limited to troubleshooting and repairs that can be made without removing the instrument covers.

6-2 Error and Warning Status Messages

During normal operation, the MG3702xA generates operational status error messages to indicate internal malfunctions, abnormal signal generator operations, or invalid signal inputs or data entries. It also displays warning messages to alert you of conditions that could result in inaccurate signal generator output. In addition, status messages are displayed to remind you of current menu selections or settings.

Self Test Errors

The MG3702xA firmware includes internal diagnostics that self test the instrument. These self test diagnostics perform a brief go/no-go test of most of the instrument PCBs and other internal assemblies.

Caution	During self test with RF OUTPUT set to ON, the output power level is set to 0 dBm. Always disconnect sensitive equipment from the unit before performing a self test.

You can perform a signal generator self test at any time during normal operation by pressing **System** | Self Test | Run Self Test. If the signal generator fails self test, error messages are displayed on the front panel data display. These error messages describe the malfunction and, in most cases, provide an indication of what has failed.

Table 6-1 is a summary listing of the self test error messages. Included for each is a description of the probable causes, whether or not the MG3702xA is still operable, and if operable, what operational degradation can be expected.

Warning	Self test error messages normally indicate the failure of an internal component or assembly of the signal generator. There are no operator serviceable components inside. Refer servicing of the instrument to qualified service technicians. To prevent the risk of electrical shock or damage to precision components, do not remove the equipment covers.

Table 6-1. Self-Test Error Messages (1 of 2)

Error Message	Description/Remarks
Error 100 DVM Ground Offset	Indicates self test failed because of a calibration-related problem.
Error 101 DVM Positive 10V Reference	Indicates that either a calibration-related problem or a defective +10 Volt reference. *Do Not Attempt to Operate!* Refer the instrument to a qualified service technician.
Error 102 DVM Negative 10V Reference	Indicates that either a calibration-related problem or a defective −10 Volt reference. *Do Not Attempt to Operate!* Refer the instrument to a qualified service technician.
Error 108 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.
Error 109 The 100MHz Reference is not Locked to the External Reference	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.
Error 112 Coarse Loop Osc Failed	Indicates that the coarse loop oscillator is not phase locked. The MG3702xA is still operable, but the accuracy and stability of the frequency outputs are greatly reduced.
Error 114 Down Converter LO not Locked	Indicates that the local oscillator in the down converter assembly is not phase locked. The MG3702xA is still operable, but the accuracy and stability of frequency outputs below 2 GHz is greatly reduced.
Error 121 Unleveled Indicator Failed	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.
Error 122 Level Reference Failed	Indicates a failure of the level reference circuitry. Use caution and always determine the output power level when operating the MG3702xA in this condition.
Error 144 RF was Off when Self Test started. Some tests were not performed	Indicates that some tests were not performed because the RF output was selected Off when the self test was started. Press the front panel **RF Output Control** key to turn the RF Output On and run the instrument self test again.
Error 148 Pulse 100 MHz reference circuitry failed	Indicates a failure of the pulse generator 100 MHz oscillator reference circuitry. The pulse generator may or may not operate.
Error 160 Core Synthesis	Indicates a lock error while verifying coarse loop and output loop lock for VCO frequencies.
Error 161 DDS Range	Indicates that the fine loop frequency is not set correctly.
Error 162 Modulator Drive	Indicates that the modulator drive voltage is out of range or is incorrect.
Error 163 Digital Power	Indicates that the digital power supply voltages are not in tolerance.
Error 164 Power 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.
Error 165 Synth RAM Data	Indicates a failure while testing the data bus for the A8 PCB RAM.
Error 166 Synth RAM Address	Indicates a failure while testing the address bus for the A8 PCB RAM.
Error 167 Synth RAM device	Indicates a failure while the testing A8 PCB RAM device.
Error 168 ALC RAM Data	Indicates a failure while testing the data bus for the A6 PCB RAM.
Error 169 ALC RAM Address	Indicates a failure while testing the address bus for the A6 PCB RAM.

Table 6-1. Self-Test Error Messages (2 of 2)

Error Message	Description/Remarks
Error 170 ALC RAM Device	Indicates a failure while testing A6 PCB RAM device.
Error 171 Processor Battery	Indicates that the battery voltage on the A2 PCB is out of tolerance.
Error 172 Core 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.

Table 6-2 is a summary list of possible error/status messages that can be displayed during normal operations.

Table 6-2. Possible Error/Status Messages during Normal Operation

Message	Description
Locked	The RF output frequency is phase locked to the internal or external reference.
Error: Lock Error	The RF output frequency is **not** phase locked to the internal or external reference. The frequency accuracy and stability of the RF output is greatly reduced. This is usually caused by an internal component failure. Run self test to verify the malfunction.
Error: Sweep Setup	Displayed when the sweep setup is invalid. In this case, the last valid sweep is still occurring. Changing the sweep parameters to create a valid sweep setup ($\leq$10,000 points) should clear the error.
INT	The frequency reference is the internal 100 MHz reference oscillator.
EXT	The frequency reference is an external 10 MHz source (connected to the rear panel external reference input).
Leveled	The ALC is stable.
Unleveled	The ALC is unstable. Displayed when the RF output goes unleveled and is normally caused by exceeding the specified leveled power rating. Reducing the power level usually clears the error message.
ERROR	Displayed in the modulation mode title bar when a pulse parameter setting is invalid for the current pulse modulation state. The Pulse Period, Widths, and Delays must be set to conform as follows: $D1 + W1 + (D2 - W1) + W2 + (D3 - W2) + W3 + (D4 - W3) + W4 \leq \text{Period} - 20 \text{ ns}$
Over Range Under Range	Displayed in the parameter editing area when the value entered is outside the range of the instrument. Entering valid values usually clears the error.

6-3   Troubleshooting Procedures

This section provides procedures for troubleshooting common malfunctions encountered during operation of the signal generator. Included are procedures for troubleshooting faults that do not produce error messages, such as, failure to power up and unexpected shutdown.

Signal Generator will not turn on (Operate LED is OFF)

When the MG3702xA is connected to the power source and the rear panel power switch turned on, the Operate LED should illuminate and the instrument should power up. If this does not occur, proceed as follows:

1. Disconnect the MG3702xA from the power source, then check the line fuses on the rear panel.

   If a fuse is defective, replace the fuse (see "Replacing the Line Fuses" on page 6-5).

   If the fuses are good, go to the next step.

2. Check to see if power is available at the power receptacle.

   If not, move to a working receptacle.

   If power is available, go to the next step.

3. Check the power cable.

   If defective, replace.

   If good, call a service technician.

Signal Generator will not turn on (Operate LED is ON)

When the MG3702xA is connected to the power source and the rear panel power switch turned on, the Operate light should illuminate and the instrument should power up. If the Operate light illuminates, but the unit fails to power up, the MG3702xA has an internal component failure. Call a service technician.

Signal Generator malfunctions during operation (Operate LED remains on)

Instrument Shuts Down:

If the signal generator operates for some time, then shuts down (Operate light remains on) or, after a short time, the signal generator resumes normal operation, then this is an indication that the MG3702xA has reached an excessive operating temperature.

1. Check that the fan is still operating during the time that the instrument is shut down.

2. If the fan is still operating, clean the fan filters (see "Cleaning the Fan Filters" on page 6-5)

3. If the fan is not operating, call a service technician

Instrument Shows Lock Error:

This error message is displayed in the frequency parameters area to indicate that the output frequency is not phase locked and is normally caused by an internal component failure.

1. Perform a self test of the signal generator by pressing **System** | Self Test | Run Self Test.

2. If the self test does not result in an error message, resume normal operation.

3. If an error message is displayed, call a service technician.

Instrument Shows Unleveled:

This message is displayed to indicate that the RF output is unleveled.

1. Check that the output power does not exceed the specified leveled power rating and that the RF Output connector is terminated into a 50 ohm load.

2. Reduce the power level to not exceed the specified leveled power rating or terminate the RF Output connector with a 50 ohm load.

3. If the error message remains displayed, call a service technician.

6-4 Routine Maintenance

Routine maintenance that you can perform consists of cleaning the fan filters, cleaning the data display, and replacing a defective line fuse(s).

Cleaning the Fan Filters

The signal generator must always receive adequate ventilation. A blocked fan filter can cause the instrument to overheat and shut down. Check and clean the rear panel fan filters periodically. Clean the fan filters more frequently in dusty environments.

Clean the filters as follows:

1. Disconnect the MG3702xA from the power source.

2. Carefully vacuum the fan filters from the outside to clean them.

Caution	Do not use compressed air to blow the filters clean as this can damage the filters and force debris into the instrument.

Cleaning the Data Display

The data display of the signal generator is protected by a plastic lens. To clean the display lens, use a mild soap and water solution, or a commercial window cleaner. Do not use abrasive cleaners, tissues, or paper towels that can scratch the plastic lens.

Replacing the Line Fuses

The line fuses used in the MG3702xA are 5A, type T fuses. The line fuse value is printed on the rear panel next to the power connector.

Danger	Before changing the fuse, always remove the power cord from the power outlet. There is the risk of receiving a fatal electric shock if the fuse is replaced with the power cord connected. Always use a new fuse of the type and rating specified by the fuse markings on the rear panel of the instrument.

1. Turn off the rear panel power switch and disconnect the MG3702xA from the power source.

2. Using a small flat-blade screwdriver, carefully pry under the tab next to the rear panel power switch to open the cover and gain access to the fuse holders (refer to Figure 6-1, below).
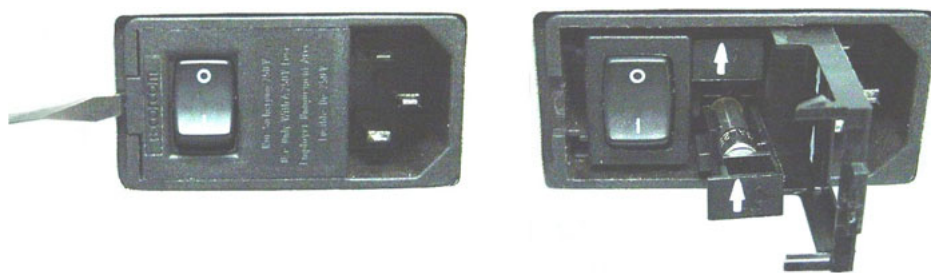
Figure 6-1. Changing the Fuse

3. Slide out the fuse holders.

4. Replace the fuses in the fuse holders.

5. Slide the fuse holders back into the rear panel power receptacle.

6. Close the cover to secure the fuse holders in place. It will close with an audible snap.

7. Reconnect the signal generator to the power source and turn on the rear panel power switch.

Appendix A — Rear Panel Connectors

A-1 Introduction

This appendix provides descriptions for the rear panel connectors on a typical Series MG3702xA RF/Microwave signal generator.

A-2 Rear Panel Connectors

Table A-1 provides an illustration of the rear panel connectors and describes the rear panel connectors.

Note	Connectors are option dependent.

A-3 Connector Pin-Out Diagrams

Table A-2 through Table A-8 provide pin-out diagrams and descriptions for the following connectors:

- Rear Panel AUX I/O Connector
- Rear Panel IEEE-488 GPIB Connector
- Rear Panel Serial I/O Connector
- Ethernet RJ45 Connector
- 15-pin VGA Connector
- USB Type A Connector
- USB Type B Connector

Table A-1. Rear Panel Connectors, Series MG3702xA Synthesized Signal Generator (1 of 2)
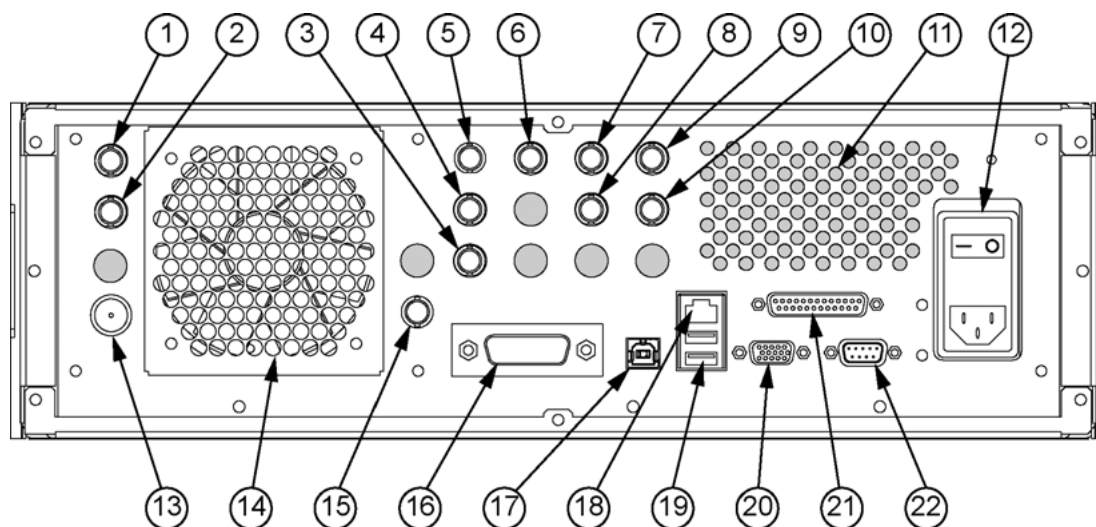
Index	Description
1	100 MHz IN (Option 36): Accepts a 100 MHz reference signal from another MG3702xA with Option 36. This input is only intended for use with other Option 36 instruments.
2	100 MHz OUT (Option 36): Provides the reference signal to drive up to three other MG3702xA. All must have Option 36. This signal is only intended for use with other Option 36 instruments.
3	EXT TRIG: Accepts an external LVTTL compatible signal (5V tolerant) to trigger a frequency sweep, frequency step, power sweep, power step, list sweep or the next step in a list.
4	LOCK STATUS OUT: Provides a TTL high-level signal when the frequency is phase-locked.
5	10 MHz REF IN: Accepts an external 10 MHz ±100 Hz, 0 to +20 dBm time-base signal. BNC connector, 50 Ω impedance.
6	10 MHz REF OUT: Provides a TTL compatible, DC coupled, 10 MHz signal derived from the internal frequency standard of the signal generator. BNC connector, 50 Ω impedance.
7	PULSE TRIG IN: Accepts an external TTL level signal to pulse modulate the RF output or to trigger or to gate the optional internal pulse generator. BNC connector. Available with Option 26, Pulse Modulation.
8	Not used.
9	PULSE VIDEO OUT: Provides a video modulating signal from the internal pulse generator or external pulse input. BNC connector. Available with Option 26, Pulse Modulation.
10	PULSE SYNC OUT: Provides a TTL compatible signal synchronized to the internal pulse modulation output. BNC connector. Available with Option 26, Pulse Modulation.
11	INTAKE VENT: Provides for airflow. **Do Not** block airflow or the instrument may overheat.
12	Input Line Voltage Module: Contains an input receptacle for connecting line voltage to the MG3702xA, two 5A, type T line fuses that provide over-voltage/current protection for the signal generator's circuits during operation and standby, and an On/Off power switch for applying line power to the MG3702xA.
13	RF Output Connector (Option 9): Provides RF output at the rear panel of the instrument.
14	FAN: Provides forced airflow. Do Not block the fan intake or the instrument may overheat.

Table A-1. Rear Panel Connectors, Series MG3702xA Synthesized Signal Generator (2 of 2)
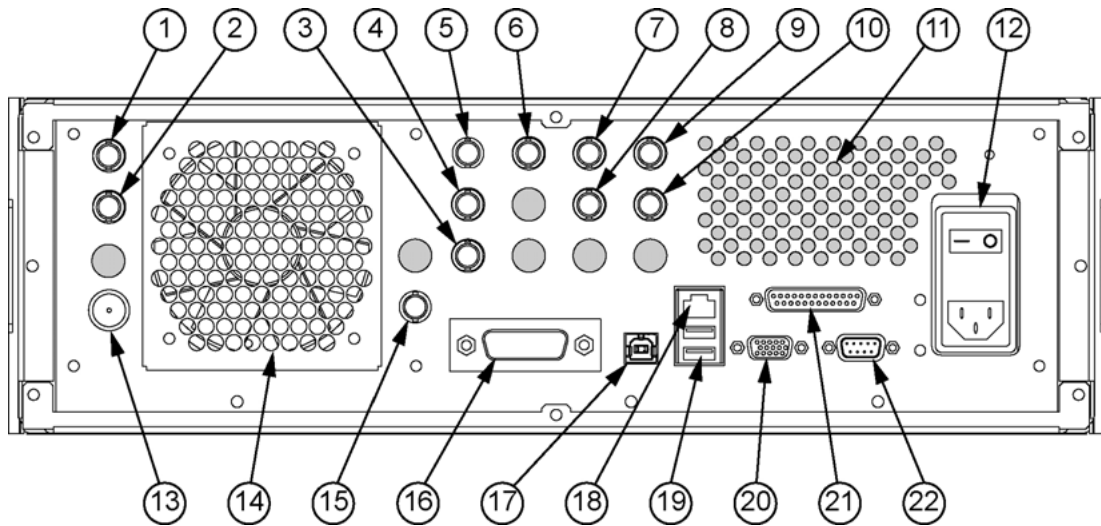
Index	Description
15	EFC IN: Electronic Frequency Control input accepts an external dc signal (–5 V to +5 V) to modulate the RF output. Sensitivity: 10/n kHz/V where n is the reference multiplier and the modulation bandwidth is 250 Hz. BNC connector.
16	IEEE-488 GPIB: 24-pin connector that provides for remotely controlling the signal generator from an external controller via the IEEE488 bus (GPIB). A pin-out diagram for this connector is shown in Table A-3.
17	USB: Serial bus interface version 2.0, type B connector for USB device mode. A pin-out diagram for this connector is shown in Table A-8.
18	ETHERNET: 100BASE-T with LED indicators. Amber LED indicates power Green LED indicates communication Provides input/output connections for the LAN interface. A pin-out diagram for this connector is shown in Table A-5.
19	USB: Serial bus interface version 2.0, type A connector for input/output. A pin-out diagram for this connector is shown in Table A-7.
20	MONITOR: Provides a VGA connector for the use of an external display monitor. A pin-out diagram for this connector is shown in Table A-6.
21	AUX I/O: 25-pin connector that provides for single cable interface with several MG3702xA rear panel signals. A pin-out diagram for this connector is shown in Table A-2.
22	SERIAL I/O: Provides access to RS-232 terminal ports. A pin-out diagram for this connector is shown in Table A-4.

Table A-2. Rear Panel AUX I/O Connector (1 of 2)

Pin	Name	Description
1	HORIZ OUTPUT	Horizontal Sweep Output: Provides a 0V at beginning and +10V at end of sweep for all sweep modes, regardless of sweep width. In the CW mode, the voltage is proportional to frequency between 0V at low end and +10V at the high end of range. In CW mode, if CW Ramp is enabled, a repetitive, 0V to +10V ramp is provided. The ramp speed is adjusted by the Sweep Time function.
2	GND	Chassis Ground
3	SEQ SYNC	Sequential Sync Output: Provides a +5V signal during sweep retrace, at band switching points, and during each frequency step in step sweep mode, –5V during markers, and –10V during the selected marker.
4	L ALT ENABLE	Not used.
5	MARKER OUTPUT	Not used.
6	RETRACE BLANKING	Retrace Blanking Output: Provides a +5V or –5V signal coincident with sweep retrace. Signal polarity selected from a front panel menu.
7	L ALT SWP	Not used.
8	SHIELD	Cable Shield/Chassis Ground.
9	TRIGGER OUTPUT	Not used.
10	SWP DWELL OUT	Sweep Dwell Output: Provides an open-collector output which goes to ground when the sweep is dwelled at the start, stop, and band switching frequencies, and at the markers.
11	LOCK STATUS	Lock Status Output: Provides a TTL high-level signal when the frequency is phase-locked.
12	PENLIFT	Not used.
13	EXT TRIGGER	External Trigger: Accepts a TTL low-level signal of 10 µs width to trigger a sweep.
14	V/GHz	V/GHz Output: Provides a reference voltage (1.0 V/GHz) relative to the RF output frequency.
15	EOS INPUT	Not used.
16	EOS OUTPUT	Not used.
17	AUX 1	Not used.
18	SWP DWELL IN	Not used.

Table A-2. Rear Panel AUX I/O Connector (2 of 2)
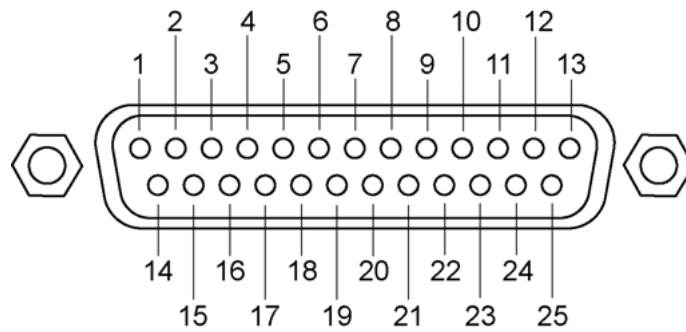
Pin	Name	Description
19	AUX 2	Not used.
20	BAND SWITCH BLANK	Band Switch Blanking Output: Provides a +5V or –5V signal coincident with band switching points. Signal polarity is selected from a front panel menu.
21	SPARE	NC
22	HORIZ IN	Horizontal Sweep Input: Accepts a 0V to 10V external sweep ramp.
23	RETURN	Not used.
24	GND	Chassis Ground
25	MEMORY SEQ	Not used.

Table A-3. Rear Panel IEEE-488 GPIB Connector
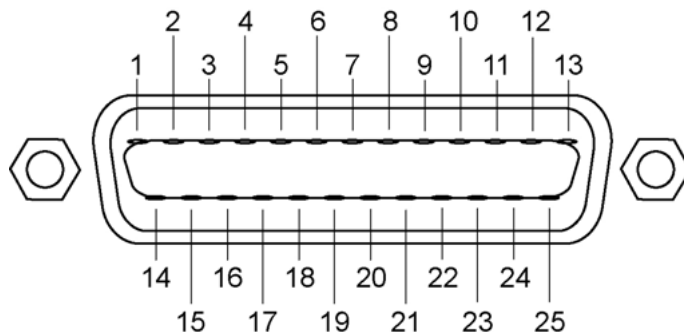
Pin	Name	Description
1-4	DIO 1 through DIO 4	Data Input/Output. Bits are HIGH when the data is logical 0 and LOW when the data is logical 1.
5	EOI	End or Identify. A low-true state indicates that the last byte of a multi byte message has been placed on the line.
6	DAV	Data Valid. A low-true state indicates that the talker has (1) sensed that NRFD is LOW, (2) placed a byte of data on the bus, and (3) waited an appropriate length of time for the data to settle.
7	NRFD	Not Ready For Data. A high-true state indicates that valid data has not yet been accepted by a listener.
8	NDAC	Not Data Accepted. A low-true state indicates that the current data byte has been accepted for internal processing by a listener.
9	IFC	Interface Clear. A low-true state places all bus instruments in a known state—such as, unaddressed to talk, unaddressed to listen, and service request idle.
10	SRQ	Service Request. A low-true state indicates that a bus instrument needs service from the controller.
11	ATN	Attention. A low-true state enables the controller to respond to both its own listen/talk address and to appropriate interface messages—such as, device clear and serial poll.
12	Shield	Ground
13 to 16	DIO 5 through DIO 8	Data Input/Output. Bits are high with the data is logical 0 and LOW when the data is logical 1.
17	REN	Remote Enable. A low-true state enables bus instruments to be operated remotely, when addressed.
18 to 24	GND	Logic ground.

Table A-4.   Rear Panel Serial I/O Connector
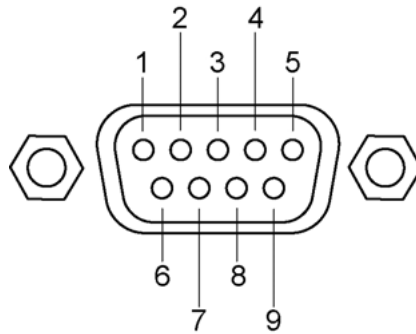
Pin	Name	Description
1	DCD	Data Carrier Detect
2	RX	Receive Data
3	TX	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

Table A-5.   Ethernet RJ45 Connector
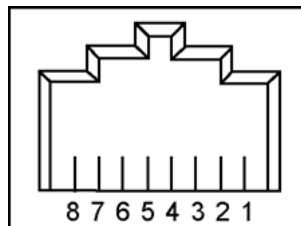
Pin	Name	Description
1	TX+	Transmit data (> +3 Volts)
2	TX−	Transmit data (< −3 Volts)
3	RX+	Receive data (< −3 Volts)
4	–	Not used (common mode termination)
5	–	Not used (common mode termination)
6	RX−	Receive data (> +3 Volts)
7	–	Not used (common mode termination)
8	–	Not used (common mode termination)

Table A-6. 15-pin VGA Connector
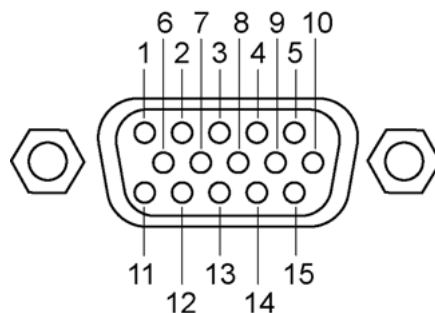
Pin	Name	Description
1	Red	Red Video (75 Ω, 0.7 V_{p-p})
2	Green	Green Video (75 Ω, 0.7 V_{p-p})
3	Blue	Blue Video (75 Ω, 0.7 V_{p-p})
4	ID2	Monitor ID Bit 2
5	GND	Ground
6	RGND	Red Ground
7	GGND	Green Ground
8	BGND	Blue Ground
9	Key	Connector Orientation Key
10	SGND	Sync Ground
11	ID0	Monitor ID Bit 0
12	ID1	Monitor ID Bit 1
13	Hsync	Horizontal Sync
14	Vsync	Vertical Sync
15	ID3	Monitor ID Bit 3

Table A-7. USB Type A Connector
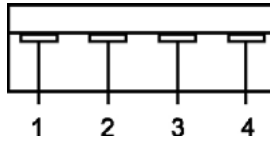
Pin	Name	Description
1	Vcc	+5 volts, 500 mA
2	–Data	Data input
3	+Data	Data output
4	GND	Ground

Table A-8. USB Type B Connector
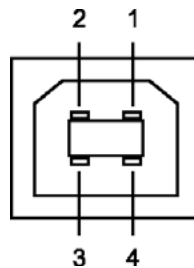
Pin	Name	Description
1	Vcc	+5 volts, 500 mA
2	–Data	Data input
3	+Data	Data output
4	GND	Ground

Appendix B — Performance Specifications

In the printed manuals, this appendix includes the technical data sheet for the series MG3702xA RF/Microwave Signal Generator, part number: 11410-00429.

Electronic manuals do not contain this data sheet. The latest electronic copy of this data sheet may be downloaded from the Anritsu Internet site at: http://www.us.anritsu.com

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