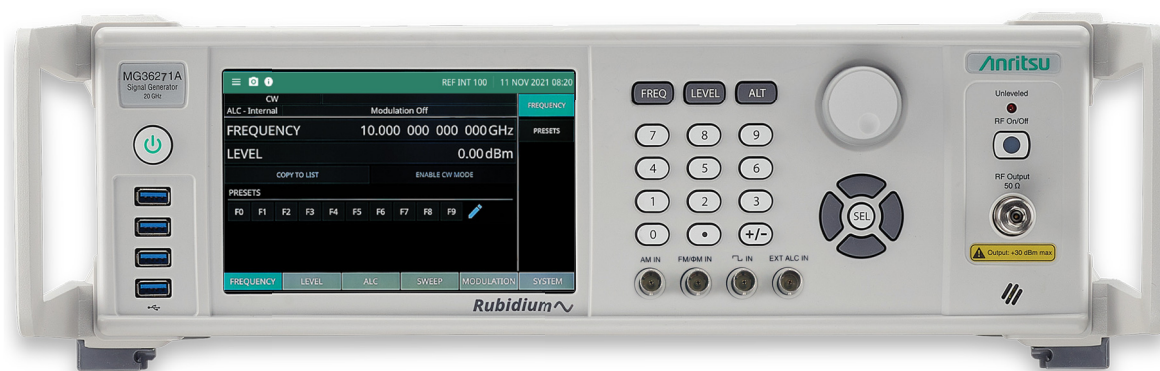


Rubidium™ MG362x1A Series Low-Noise RF/Microwave Signal Generators

MG36221A, 9 kHz to 20.0 GHz

MG36241A, 9 kHz to 43.5 GHz

MG36271A, 9 kHz to 70.0 GHz



Anritsu

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Chapter 1 — General Information

1-1 About This Guide

This manual provides general and operating information for the Anritsu series MG362x1A synthesized signal generator. Throughout this manual, the terms MG362x1A, signal generator, and synthesizer will be used interchangeably to refer to the instrument.

1-2 About This Chapter

This chapter contains general information about the series MG362x1A signal generators. It includes a general description of the instrument and information on its identification number, related manuals, options, and performance specifications.

1-3 Additional Documentation

Table 1-1. Related Manuals

Document Part Number	Description
10100-00070	Product Information, Compliance, and Safety Notices
10100-00031	RF and Microwave Connector Care Instruction Sheet
11410-00928	MG362x1A Rubidium Technical Data Sheet
10370-10385	MG362x1A Rubidium Programming Manual
10370-10386	MG362x1A Rubidium Maintenance Manual

For additional information and literature covering your product, visit the product page of your instrument and select the Library tab:

<https://www.anritsu.com/en-us/test-measurement/products/mg362x1a>

1-4 Options

Available options for the MG362x1A are listed in [Table 1-2](#).

Table 1-2. Available Options

Option	Description
MG362x1A-0001	Option 1, Rack Mount with Slides (Cannot be ordered with Option 11)
MG362x1A-0002	Option 2, Mechanical Step Attenuator, 110 dB
MG362x1A-0003	Option 3, Low Phase Noise and High Stability (Required for Option 13)
MG36221A-0006 MG36241A-0006	Option 6, Analog Sweep
MG362x1A-0009	Option 9, Rear Panel K(m)-Connector RF Output
MG362x1A-0010	Option 10, User Defined Modulation (requires Option 12, 26 and 27)
MG362x1A-0011	Option 11, Rack Mount without Slides (Shelf Mount)
MG362x1A-0012	Option 12, Amplitude, Frequency, and Phase Modulation, Internal/External (requires Option 27)
MG362x1A-0013	Option 13, Ultra Low Phase Noise (requires Option 3)
MG362x1A-0015	Option 15, High Power Output
MG362x1A-0016	Option 16, Analog Power Sweep
MG362x1A-0017	Option 17, No Front Panel
MG362x1A-0018	Option 18, User internal power level flatness calibration
MG36221A-0023	Option 23, Available in the MG36221A model. Premium Phase Noise, CW (requires Option 3 and 13)
MG362x1A-0025	Option 25, Pulse Train Modulation (requires Option 26 and 27)
MG362x1A-0026	Option 26, Pulse Modulation, Internal/External (requires Option 27)
MG362x1A-0027	Option 27, Modulation Hardware (requires Option 12, 26, or both for functionality)
MG362x1A-0029	Option 29, Front Panel Modulation Input Output Access (requires Option 27)
MG362x1A-0033	Option 33, Phase noise, Export option
MG362x1A-0037	Option 37, Removable SDIO memory
MG362x1A-0045	Option 45, High Power Pulse
MG362x1A-0056	Option 56, Ultra Stability Time Base (requires Option 3 or 13)
MG362x1A-0066	Option 66, GNSS Atomic Clock Receiver (requires Option 3 or 13)
MG36221A-0082 MG36241A-0082	Option 82, K(f) connector
MG362x1A-0097	Accredited Calibration to ISO17025 and ANSI/NCSL Z540-1, includes calibration certificate, test report, and uncertainty data
MG362x1A-0098	Standard Calibration to ISO17025 and ANSI/NCSL Z540-1, includes calibration certificate

Table 1-2. Available Options

Option	Description
MG362x1A-0099	Premium Calibration to ISO17025 and ANSI/NCSL Z540-1, includes calibration certificate, test report, and uncertainty data

1-5 Description

The series MG362x1A synthesized signal generators are microprocessor-based, synthesized signal sources with high resolution phase-lock capability. The MG362x1A is the "ideal microwave signal generator," offering frequency coverage from 9 kHz to 70 GHz and provides the lowest phase noise, leveled output power, spectral purity, switching speed, AM, FM, Phase and Pulse modulation performance, upgradability, reliability, and service. Accepts GNSS as well as accepts and provides 1600 MHz, 100 MHz, 10 MHz $\pm$ 100 Hz, 0 to 10 dBm time-base signals. Our signal generators are configurable for a broad range of applications from R&D to manufacturing and depot repair. Anritsu provides a total solution including proven reliability and standard 3 year warranty plus pre-sale and post-sale support that is the best in the industry. All functions of the signal generator are fully controllable locally from the front panel or remotely (except for power on/standby) via Ethernet (raw sockets over TCP/IP) or GPIB (IEEE-488 interface bus).

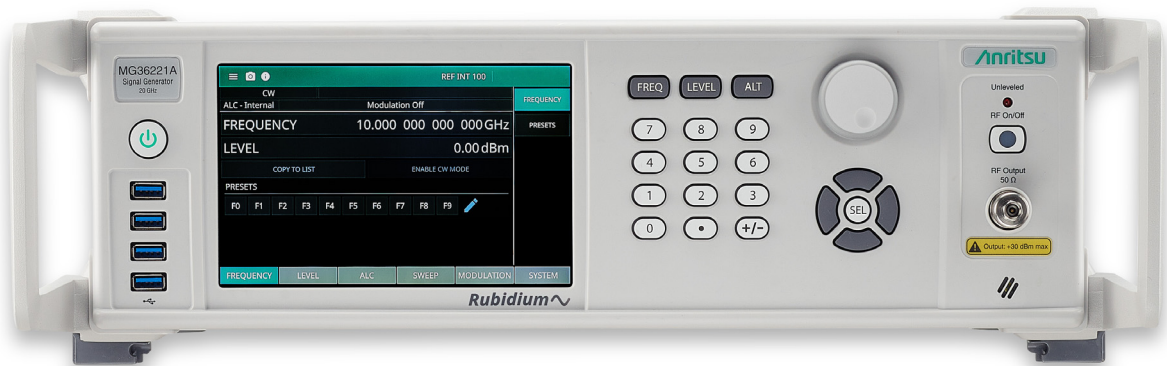


Figure 1-1. MG36221A Synthesized Signal Generator

1-6 Instrument Integrity

The MG362x1A is configured for optimum signal generator performance when the instrument leaves the factory. To maintain the system's operating integrity, it is best to put the instrument into standby from the front panel before cycling power.

Antivirus Protection

The MG362x1A is tested with most common antivirus software, but stability is not guaranteed with all anti-virus 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.

1-7 ESD Caution

Connection of coaxial cables carrying an electrostatic potential, excess power, or excess voltage can damage the internal circuitry of the signal generator. Operators must be aware of the potential for ESD damage and take all necessary precautions. Operators should exercise practices outlined within industry standards such as JEDEC-625 (EIA-625), MIL-HDBK-263, and MIL-STD-1686, which pertain to ESD and ESDS devices, equipment, and practices. Because these apply to the MG362x1A, Anritsu recommends that any static charges that may be present be dissipated before connecting coaxial cables to the signal generator. It is important to remember that the operator may also carry a static charge. Following the practices outlined in the referenced standards will ensure a safe environment for both personnel and equipment.

1-8 Instrument Care and Preventive Maintenance

The MG362x1A signal generator care and preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connectors on the instrument and all accessories. Clean the signal generator with a soft, lint-free cloth dampened with water or water and a mild cleaning solution.

Caution To avoid damaging the display or covers, do not use solvents or abrasive cleaners.

Cleaning the Fan Grill

The signal generator must always receive adequate ventilation. A blocked fan grill can cause the instrument to overheat and shut down. Clean the fans as follows:

1. Disconnect the MG362x1A from the power source.
2. Carefully vacuum the fan filters from the outside to clean them.

Connector Care

Refer to the Anritsu RF and Microwave Connector Care Instruction Sheet for recommended connection procedures, connector care, and maintenance.

<https://www.anritsu.com/en-us/test-measurement/support/downloads/manuals/dwl20373>

Power Output

The MG362x1A is capable of output power in excess of +30 dBm. Ensure that proper care is taken to protect sensitive power sensors from being damaged by using a fixed attenuator.

1-9 Unpacking the Product

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 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.

1-10 Operating Environment

Before installing the MG362x1A 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. See the MG362x1A Technical Data Sheet for environmental requirements (P/N:11410-00928).

1-11 Typographic Conventions

Sequential menu successions are presented as a string of actions separated with a vertical pipe. For example, to trigger a level-sweep:

Press: SWEEP | LEVEL | TRIGGER

1-12 Preparation for Storage/Shipment

The following paragraphs give instructions for preparing the MG362x1A 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°C and $+75^{\circ}\text{C}$.

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 detailed 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.

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. Surround the unit with polyethylene sheeting to protect the finish.

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 and your return address on the carton in one or more prominent locations.

1-13 Contacting Anritsu for Sales and Service

To contact Anritsu, visit the following URL and select the services in your region:

<http://www.anritsu.com/contact-us>

Instrument Identification

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.

Chapter 2 — Instrument Overview

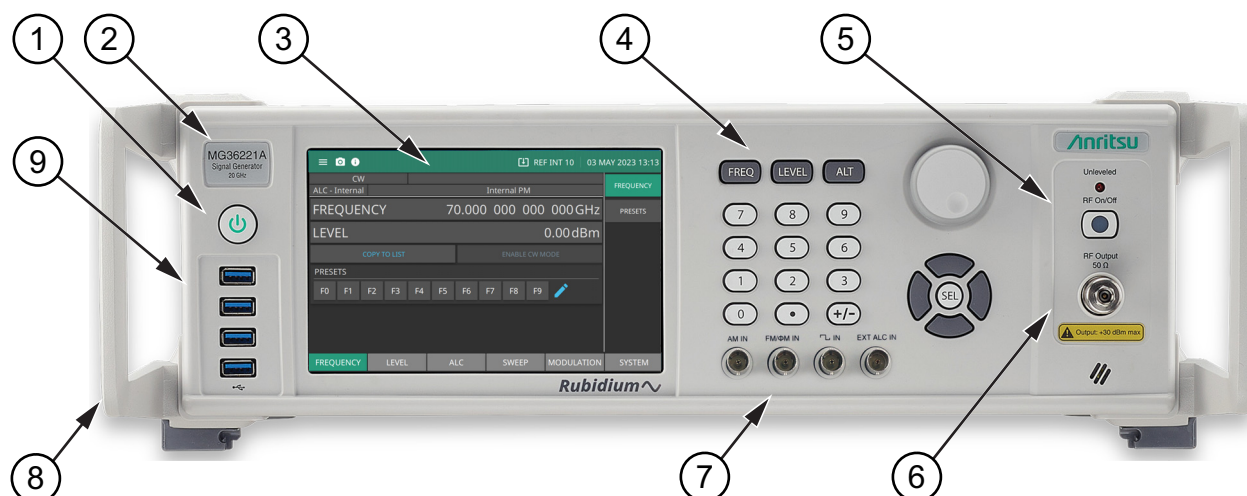
2-1 Introduction

This chapter provides an overview of the Anritsu MG362x1A signal generator. It describes the instrument hardware features, touch screen display, general system settings and instrument configurations, and the connector panels.

2-2 Front Panel

The MG362x1A front panel consists of 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 2-1](#). See also [Section 2-7 “GUI Overview” on page 2-12](#).



1. Power Button: Press the power button to power the signal generator on and off. Standby (off) is indicated by the white illuminated power button; Operate (on) is indicated by the green illuminated power button.
2. Model Identification Label: Identifies the model type and frequency range.
3. LCD Display: The LCD display provides information about the current status of the MG362x1A in a menu display format. This information includes the operating mode of the instrument and the value of the active frequency and parameters. The display functions as a touch-screen interface to provide access to graphical button controls and additional setting menus.
4. Front Panel Buttons: The front panel buttons provide controls for changing parameter values.
5. RF Output Control Key: The RF output control key turns the RF output power on and off. Output Off is indicated by an orange LED; Output On is indicated by a green LED.
6. RF Output Connector: The RF output connector provides the 50 Ω RF signal output. Before making connections to the RF output connector, see [“Torque Requirements” on page 2-3](#).
7. Front Panel BNCs: Available with Option 29. Input BNCs are AM IN, FM/ Φ M IN, Pulse IN, External ALC IN).
8. Handles: Standard configuration includes handles.
9. USB Interface: Four front panel Type A USB Inputs.

Figure 2-1. MG362x1A Front Panel Overview

Front Panel Controls

Use the numeric keypad, arrow hard buttons, or rotary data knob to change the MG362x1A parameter values. The data entry area is shown in [Figure 2-2](#) and described in the following paragraphs.



1. Menu Buttons
2. Rotary Knob
3. Cursor Control Pad
4. Numeric Keypad

Figure 2-2. Front Panel Controls

Menu Buttons

FREQ: Press to access the frequency menu.

LEVEL: Press to access the level menu.

ALT: Non-Functional

Rotary Knob

Use the rotary knob to change the value of a parameter that is open for editing. The cursor is moved under the open parameter using the left or right pad cursor control pads. Turn the rotary knob clockwise to increase the parameter or counterclockwise to decrease by the parameter unit size. The unit size is determined by the cursor placement. Turn the knob rapidly changes the value in larger steps.

When editing frequency and time parameters, the incremental size can be set to using the system configuration increment menu. Refer to [“Increment Size” on page 3-110](#). Once set, each time the knob is turned clockwise or counter-clockwise, the parameter's value increases or decreases by the set unit amount.

Cursor Control Pad

The left and right pads control the direction of the cursor when editing a parameter. Press the left keypad to move the cursor left to edit an open parameter. Press the right keypad to move the cursor right to edit an open parameter. Press the top keypad to increase a units value, Press the bottom keypad to decrease the units value. Press and hold will allow the selected parameter to continually increase or decrease. Press Select to enter an opened single terminator value.

Numeric Keypad

The numeric keypad provides for entering frequency, time, number-of-steps, modulation parameters, and GPIB address values. The “+/-” key functions as a “change sign” key during any keypad entry.

RF Output

The front panel output connector panel is described in [Figure 2-3](#).

Torque Requirements

To avoid connector damage or inaccurate measurements, review document Connector Care Reference (10100-00031) before making any connections.

N-Type Connector: Torque to 0.9 N-M (8in.lb) for standard N connectors using Anritsu Model 01-203 13/16 in Torque End Wrench.

K (2.92 mm) Connector: Torque to 0.9 Nm (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 Connector: Torque to 0.9 Nm (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.

	Unleveled Indicator: The unleveled indicator is displayed when the RF output goes unleveled and is normally caused by exceeding the specified leveled power rating. RF On/Off Button: Press to manually turn RF output on or RF output off. RF Output Connector: The female RF output connector. The 50 Ω output connector is: K for the 20 GHz model MG36221A K for the MG36241A model V for the MG36271A model CAUTION Label: The output power may exceed +30 dBm. Attenuate output power as necessary to protect RF test equipment from excessive output power when connecting to the output connector.
--	--

Figure 2-3. RF Output Panel

Note	To prevent power losses due to an impedance mismatch, the mating connector and cable should also be rated at 50 Ω
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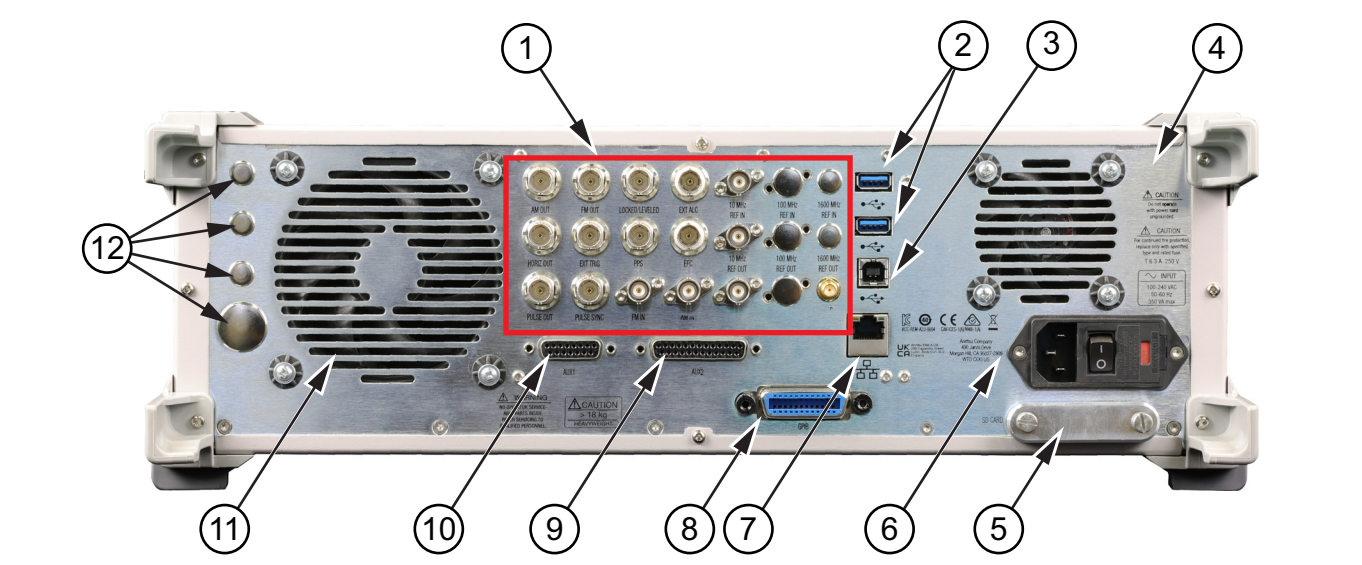
2-3 Rear Panel

This section provides descriptions for the rear panel connectors on a typical Series MG362x1A RF/Microwave signal generator.

Table 2-1 provides an overview of the MG362x1A rear panel.

Note Connectors are option dependent.

Table 2-1. Rear Panel Overview



Index	Description
1	Input/Output BNCs. See “Rear Panel BNCs” on page 2-5.
2	Two USB 3.0 Type-A for peripherals such as memory device.
3	One USB 2.0 Type-B for USB-TMC.
4	Cooling Fan
5	Accepts an external SDIO memory card. Removable with Option 37
6	AC Input connector, with On/Off switch, and fuses 350 VA maximum, 90 to 264 VAC, 47 Hz to 63 Hz
7	Provides input/output connections for a Gigabit Ethernet interface. RJ45 type, rear panel
8	Provides input/output connections for the General Purpose Interface Bus (GPIB).
9	AUX2 I/O: 25-pin connector that provides for single cable interface with several MG362x1A rear panel signals. A pin-out diagram for this connector is shown in Table 2-3 on page 2-7. - (Future capability)
10	AUX1 I/O: 15 Pin connector - (Future capability) A pin-out diagram for this connector is shown in Table 2-2 on page 2-6
11	Fan: Instrument air-intake fan. Do not block airflow or the instrument may overheat.
12	Cover plates: Not Used

Rear Panel BNCs

The MG362x1A rear panel BNCs are described in [Figure 2-4](#).

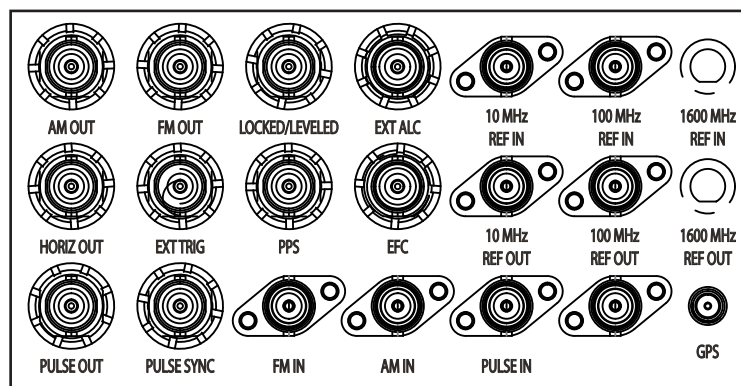


Figure 2-4. Rear Panel BNCs

AM OUT: Provides the amplitude modulation waveform from the internal LF generator. Enabled with Option 27. (BNC type, rear panel)

HORIZ OUT: Provides 0 V at beginning and +10 V at end of sweep, regardless of sweep width. In CW mode, the voltage is proportional to frequency between 0 V at low end and +10 V at the high end of the range. In CW mode, if CW RAMP is enabled, a repetitive, 0 V to +10 V ramp is provided. (BNC type, rear panel)

PULSE OUT: Provides a video modulating signal from the internal pulse generator. Enabled with Option 27. (BNC type, rear panel)

FM OUT: Provides the frequency or phase modulation waveform from the internal LF generator. Enabled with Option 27. (BNC type, rear panel)

EXT TRIG: Accepts a TTL low-level signal of 1 μ s width to trigger a sweep. (BNC type, rear panel)

PULSE SYNC: Provides a TTL compatible signal, synchronized to the internal pulse modulation output. Enabled with Option 26. (BNC type, rear panel)

LOCKED/LEVELLED: TTL high/low output signal when in internal ALC mode that is a logical AND of frequency locked condition and output leveled condition. When in Fixed Gain mode this signal indicates only frequency locked/unlocked condition. (BNC type, rear panel)

PPS: 1PPS input/output from either GNSS atomic clock receiver or internal rubidium reference option. (3.3V CMOS I/O, BNC type, rear panel)

FM IN: Accepts an external signal to frequency or phase modulate the RF output signal. Enabled with Option 12. (50 Ω impedance. (BNC type, rear panel)

EXT ALC: Provides for leveling the RF output signal externally with either a detector or power meter. Signal requirements are shown in the RF Output specifications. (BNC type, rear panel)

EFC: ± 4 VDC 30 Hz bandwidth in wide reference PLL mode 1 M Ω input impedance. Provides the capability to frequency modulate the internal crystal oscillator, allowing phase locking of the synthesizer inside an external lock loop. (BNC type, rear panel)

AM IN: Accepts an external signal to amplitude modulate the RF output signal. Enabled with Option 12. 50 Ω impedance. (BNC type, rear panel)

10 MHZ REF IN: Accepts an external 10 MHz ± 3 Hz, 0 dBm to +10 dBm (20 dBm no-damage level) time-base signal. Automatically disconnects the internal high-stability time-base option, if connected. (50 Ω impedance input BNC type, rear panel)

10 MHZ REF OUT: Provides a 10 dBm, AC coupled, signal derived from the internal frequency standard. (50 Ω impedance, SMA type, rear panel)

PULSE IN: Accepts an external TTL compatible signal to pulse modulate the RF output signal or to trigger or to gate the optional internal pulse generator. Enabled with Option 26. (BNC type, rear panel)

100 MHZ REF IN: Accepts an external 100 MHz $\pm$ 200 Hz or 2 ppm 12 $\pm$ 1 dBm (20 dBm no-damage level) reference signal. Enabled with Option 3 or 13. Automatically disconnects the internal high-stability time-base option, if connected. (50 Ω impedance, SMA type, rear panel)

100 MHZ REF OUT: Provides a 12 dBm, AC coupled, 100 MHz signal derived from the internal frequency standard. Enabled with Option 3 or 13. (50 Ω impedance, SMA type, rear panel)

1600 MHZ REF IN: Accepts an external 1600 MHz $\pm$ 3.2 kHz or 2 ppm, 4 $\pm$ 1 dBm (20 dBm no-damage level) reference signal. Enabled with Option 3 or 13. Automatically disconnects the internal high-stability time-base option, if connected. (50 Ω impedance, SMA type, rear panel)

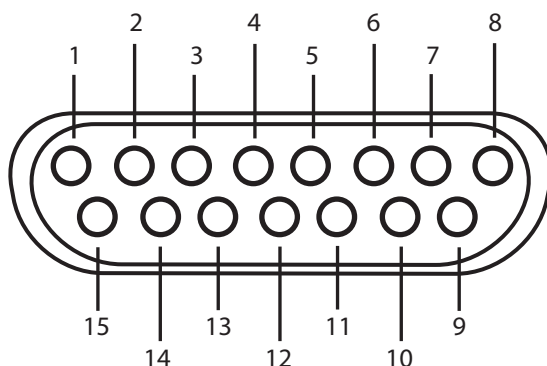
1600 MHZ OUT: Provides a 5 dBm, AC coupled, 1600 MHz signal derived from the internal frequency standard. Enabled with Option 3 or 13. (50 Ω impedance, SMA type, rear panel)

GPS: Accepts GPS/GNSS antenna input.

AUX1 Connector

The MG362x1A AUX1 pin descriptions are described in [Table 2-2](#).

Table 2-2. Rear Panel AUX1 I/O Connector

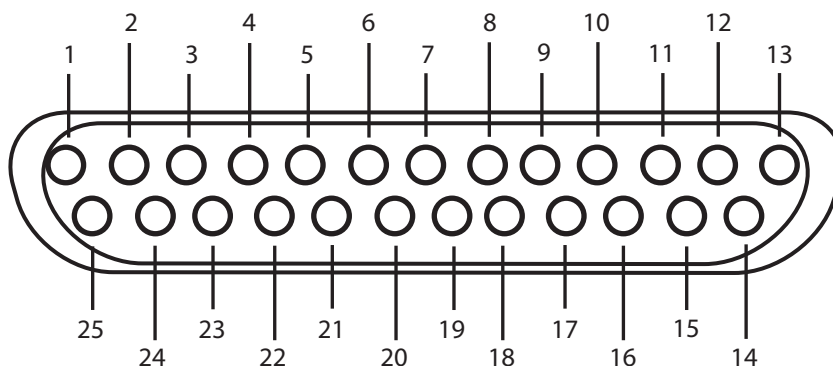


Pin	Name	Description
1	UART RX1	Receive Data
2	Ground (tied to pin 8)	Chassis Ground
3	GPI02 Trig Out	Provides a TTL high trigger output.
4	GPI04 Ref Det	Provides a TTL high when reference detector is enabled.
5	AUX Spare 1	Not Used
6	AUX Spare 2	Not Used
7	AUX Spare 3	Not Used
8	Ground (tied to pin 2)	Chassis Ground
9	UART TX1	Transmit Data
10	GPI01 LEV	Provides a TTL high when Rf is leveled.
11	GPI03 Ref Lock	Provides a TTL high when reference oscillator is locked.
12	GPI05 Ovn Rdy	Provides a TTL high when (OCXO) reference oven is ready.
13	–6V	Provides –6 V DC output
14	+13 (tied to pin 15)	Provides +13 V DC output
15	+13 (tied to pin 14)	Provides +13 V DC output

AUX2 Connector

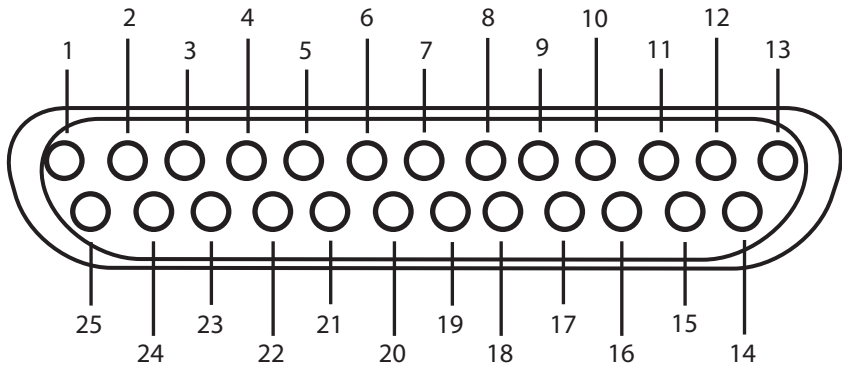
The MG362x1A AUX2 pin descriptions are described in [Table 2-3](#).

Table 2-3. Rear Panel AUX2 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	Low Alternate Enable Output
5	MARKER OUTPUT	Marker Output: Provides a +5 V or -5 V signal during a marker. Signal polarity selected from a front panel menu.
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	Not Used	Not used.
13	EXT TRIGGER	External Trigger: Accepts a TTL low-level signal of 10 μ s 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	End-of-Sweep Input

Table 2-3. Rear Panel AUX2 I/O Connector (2 of 2)



Pin	Name	Description
16	EOS OUTPUT	End-of-Sweep Output
17	AUX 1	Not used.
18	SWP DWELL IN	Sweep Dwell Input
19	Not Used	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	Not Used	Not Used
22	HORIZ IN	Horizontal Sweep Input: Accepts a 0V to 10V external sweep ramp.
23	RETURN	Horizontal Sweep Input Return
24	GND	Chassis Ground
25	Not Used	Not Used

2-4 Installation and Power Requirements

The signal generator accepts 90 to 264 VAC, 47 Hz to 63 Hz, single-phase, AC mains input power. The signal generator is intended for Installation Category (Overvoltage Category) II. To connect the MG362x1A 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 2-5](#). Then plug the male end of the power cord into a three-wire power line outlet. Turn on the rear panel power button. This automatically places the signal generator in operation (front panel Operate LED on).

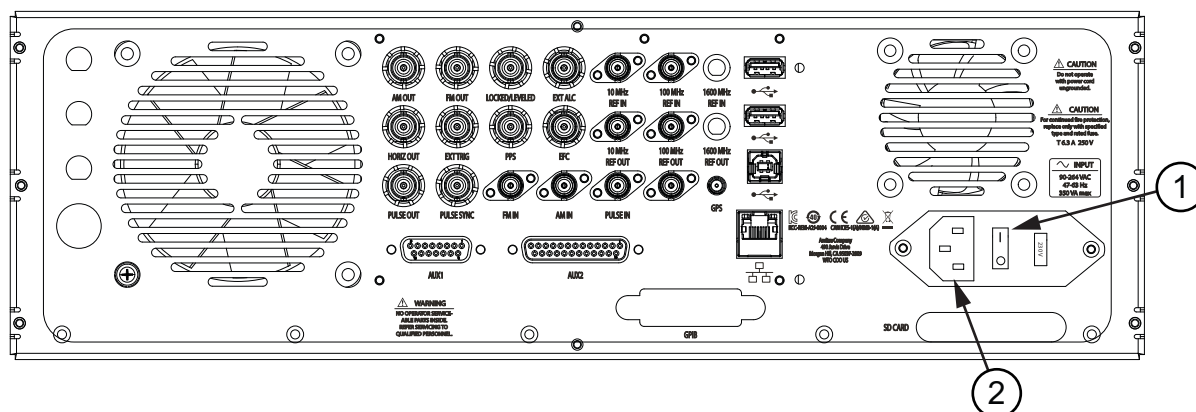
Warning



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.

2-5 Powering On the MG362x1A

Connect the MG362x1A to an AC power source. Turn on the rear panel power button as shown in [Figure 2-5](#). 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.



1. Power Button
2. AC Mains Input

Figure 2-5. Rear Panel Power Connection

Power on the signal generator. The front panel display is shown as in [Figure 2-6](#) during power-on. The power-on sequence shows the loading internal programs status bar, the model number of the signal generator, the options installed, and the revision level of the installed firmware. When complete, the MG362x1A then returns to the same configuration it was in when last set to Standby.

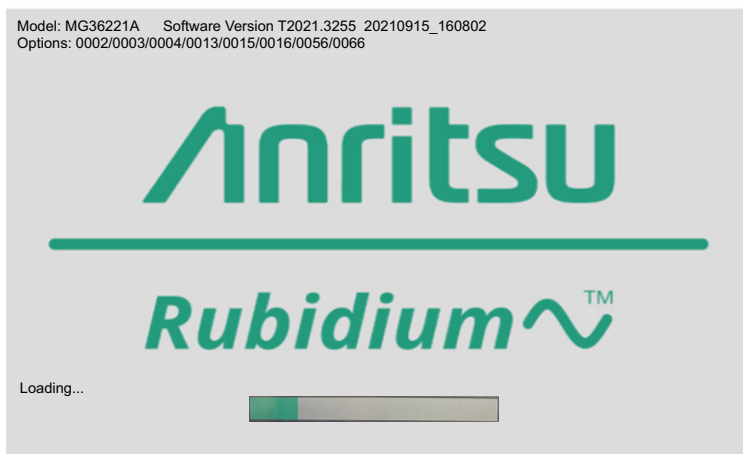


Figure 2-6. Startup Screen

Standby Mode

Whenever the signal generator is not being used, it should be left connected to the power source and placed in standby. Standby mode provides power to keep the internal time base at operating temperature. This assures specified frequency accuracy and stability when the MG362x1A is placed in operation.

Warm-up Time

After placing the MG362x1A 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

The Ref Cold message may appear on the MG362x1A user interface task bar when the instrument is first powered on from a cold condition. The message may be displayed for a few minutes until the lock circuitry has reached the operational temperature. This warning message may display for units with Option 3, 13, 23, 56, and 66.

Note

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

2-6 Common GUI Controls

In addition to the touch gestures described in the previous section, the following lists the most common controls that you will encounter when working with the Rubidium signal generator.

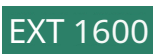
	System Menu: The System Menu (3-Line icon) provides access to the MG362x1A system operation parameters. See “System Menu” on page 2-22 .
	Notification Icon: The notification icon provides access to informational and error messages. The number indicates the how many notification messages are recorded. Press the notification icon to display the messages.
      	Frequency Reference: Shows the current frequency reference as an internal or external reference. The frequency references are: EXT 1600: 1600 MHz external signal input EXT 100: External 100 MHz external signal input EXT 1PPS: 1 Pulse Per Second external signal input EXT 10: 10 MHz external signal input INT RB: Internal Rubidium signal INT 100: Internal 100 MHz signal INT 10: Internal 10 MHz signal
	Close Icon: The close icon is used to close menus and other dialogs.
	Chevron Icon: The chevron icon will expand and collapse the status and table displays.
	Toggle Icon: The toggle icon will enable and disable the feature. When highlighted in blue, the item is enabled.
	Drop Down Icon: The drop-down icon exposes a of items from which to choose.
	Refresh Icon: The refresh icon will restart a process, such as a sweep or averaging count.
	Edit Icon: The edit icon allows editing of a feature or label.
	Enter Icon: The enter icon accepts an entry. A similar icon is found on menu buttons to indicate an additional menu.
	Previous Menu Icon: Press to go back to the previous menu.
	Page Icon: The highlighted dot indicates the active page. This icon indicates page 1 of 2 is active.
	Page Arrow: Left arrow points to the previous page. Right Arrow points to the next page. Press to view either the previous or next page.
	Information Icon: Press to provide additional information.

Figure 2-7. Common GUI Controls

2-7 GUI Overview

The MG362x1A software controls all instrument functions. The software runs locally on the instrument. The User Interface provides the parameter settings and menu buttons as shown in [Figure 2-8](#). Each are described in more detail later in this chapter.

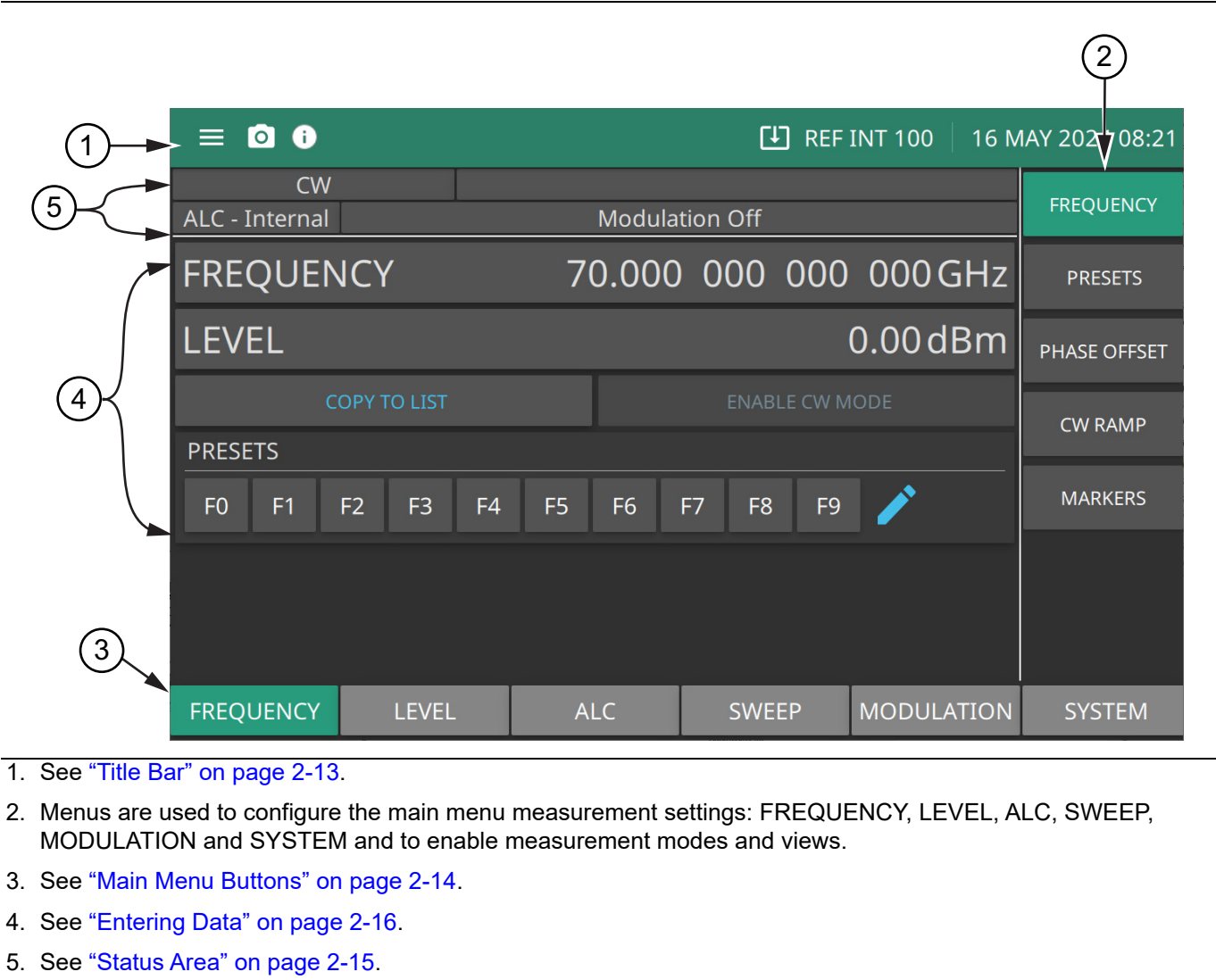
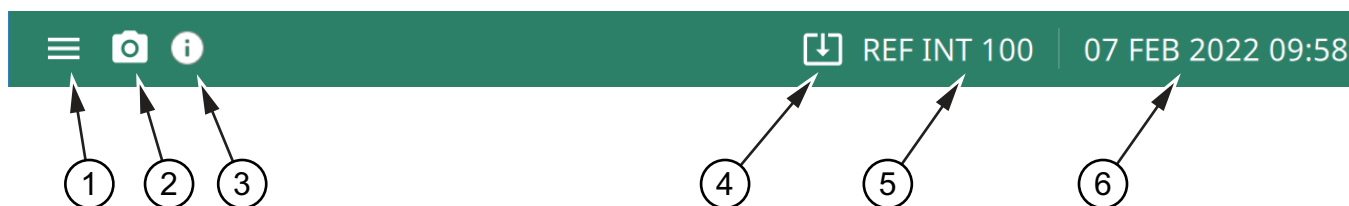


Figure 2-8. GUI Overview

Title Bar

The title bar is located at the top of the interface screen. It displays icons that provide access to information and user actions as described below. All of the icons are active and will open the appropriate menu or item when touched.



1. Press the System Menu to display the instrument model and its serial number. The System Menu also consists of System Information, Settings, Files and Diagnostics menus.
2. Press the camera icon to capture a screen shot of the current display. The image file is saved in PNG format with the following naming scheme: screenshot_yymmdd_hhmmss.png (year, month, day, hour, minute, second). Using the [“SCREENSHOT Settings” on page 2-33](#), you can set the screen capture region, color theme, annotations, and destination directory.
3. Notifications are generated when an error is detected or an activity such as a screen shot has taken place. The number of unread notifications appears next to the icon. The notification area is where all dynamic notifications are presented. These notifications are generally information messages to the user and not hardware failure messages. Press the icon to display the Notifications list.
4. Displayed when a USB device is attached. To ensure the device or its data does not become corrupted, press this icon to eject the USB device before it is unplugged from the USB port. This icon is also displayed when WEB UPDATES toggle is turned on and a firmware update is available on the company website. Note that it is only possible if the instrument is connected to the Internet.
5. Press Frequency Reference icon to open standard 100 MHz menu under Reference submenu. Refer to [“REFERENCE Menu” on page 3-101](#) for detailed information.
6. The right side of the instrument title bar displays the system date and time. Pressing this field opens the [“DATE TIME Settings” on page 2-35](#).

Figure 2-9. Title Bar

Main Menu Buttons

The main menu buttons are shown in [Figure 2-10](#).

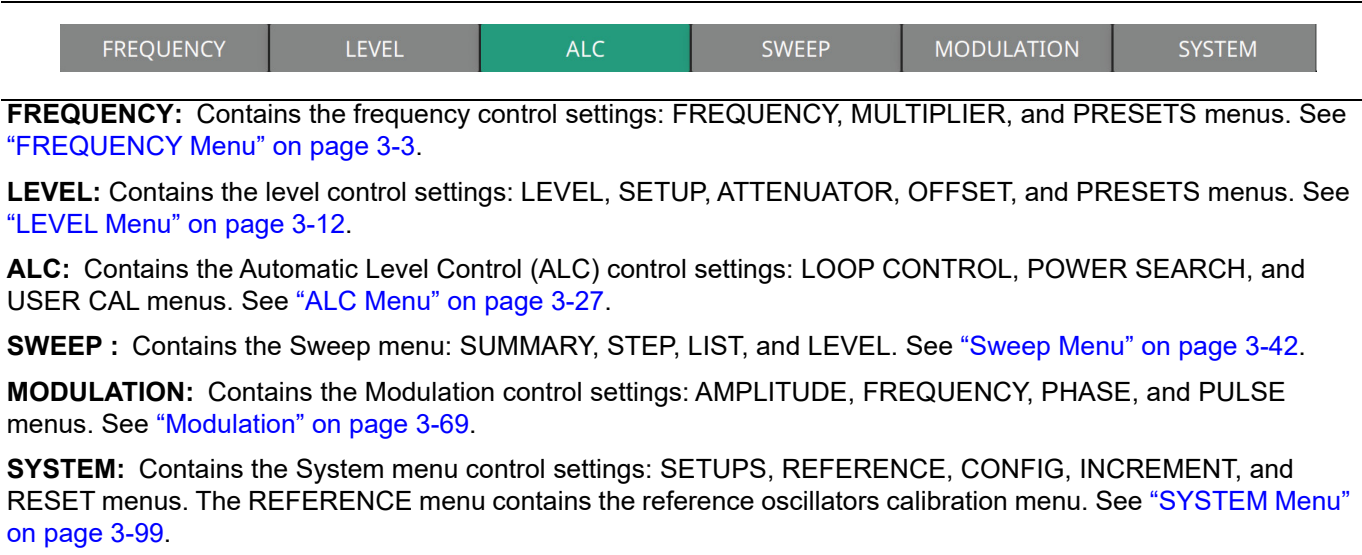
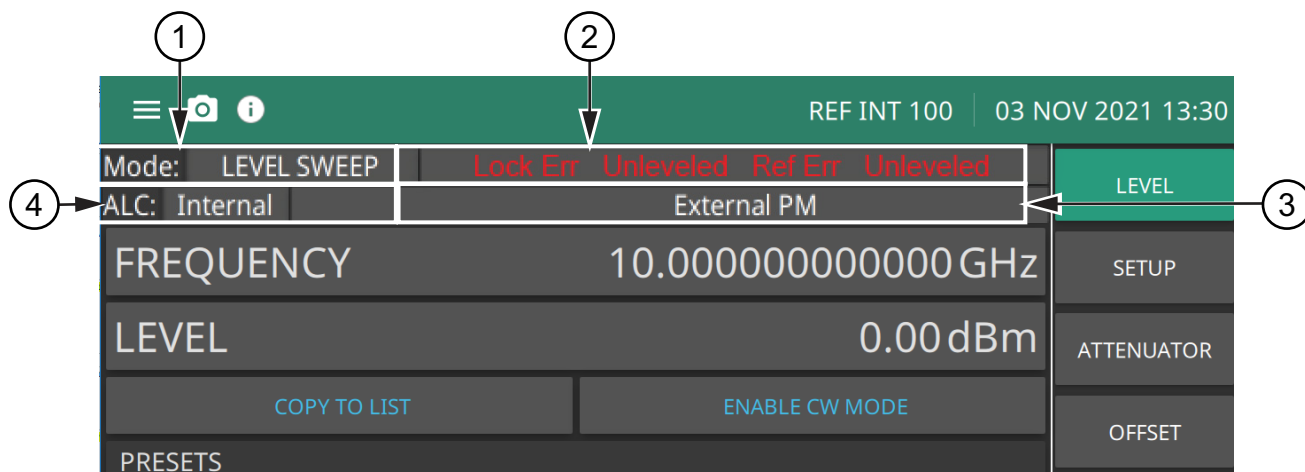


Figure 2-10. Main Menu Buttons

Status Area

The status area of the GUI provides a summary of instrument settings. Status text is displayed only if the condition is active.



1. Sweep Mode Panel
2. Error Message Panel
3. Modulation Mode Panel
4. ALC Mode Panel

Figure 2-11. Status Area

The status rows contain the following entries:

Sweep Mode: CW, Step Sweep, Analog Sweep, Level Sweep, List Sweep

Error Messages: Error messages are displayed when an error condition is active. The error messages that are displayed when active are:

- Unlocked: Frequency is unlocked
- Lock Err: A lock error condition exists
- Ref Err: The reference is unlocked
- Unleveled: An unleveled condition exists

Modulation: Always displays the modulation condition as.

- On is displayed when the source selection (int or Ext) is active?
- Modulation error (Err) is display if the modulation state is On and an error is occurring.
- Off is displayed if the modulation state is Off.

The modulation condition is displayed when active as:

- AM: Internal (Int), External (Ext), Error (Err), AM when AM is on. No display when AM is off.
- FM: Internal (Int), External (Ext), Error (Err), FM when FM is on. No display when FM is off.
- PM: Internal (Int), External (Ext), Error (Err), PM when PM is on. No display when PM is off.
- Pulse: Internal (Int), External (Ext), Error (Err), Pulse when Pulse is on. No display when Pulse is off.

ALC: Always displays the ALC condition as:

- Internal
- External
- Fixed Gain
- Open Loop

Entering Data

Entering data refers to changing a parameter's value by editing its current value or entering a new value to replace the current value. The following instructions describe how to open a parameter, edit its current value, and enter a new value.

The typical MG362x1A menu display shown in [Figure 2-12](#) is used throughout the data entry instructions. At this menu display, you can edit both the CW frequency and the output parameters.

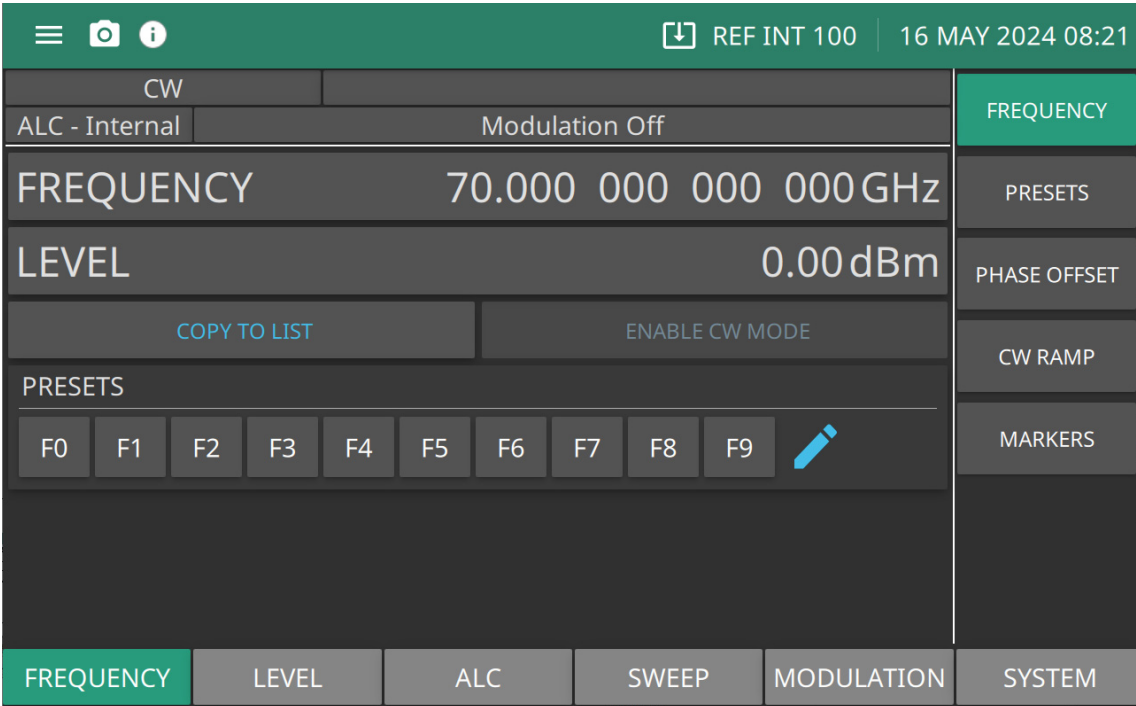


Figure 2-12. Frequency Menu Display

Opening a Parameter

Open a parameter for editing by pressing a function from the main menu. In the following example, to open the frequency function, press **FREQUENCY**. The menu display changes to show that the frequency parameter has been opened as shown in [Figure 2-13](#). The highlighted digit shows the active unit set for change. To change the unit value, see below for [“Cursor Control Buttons”](#).

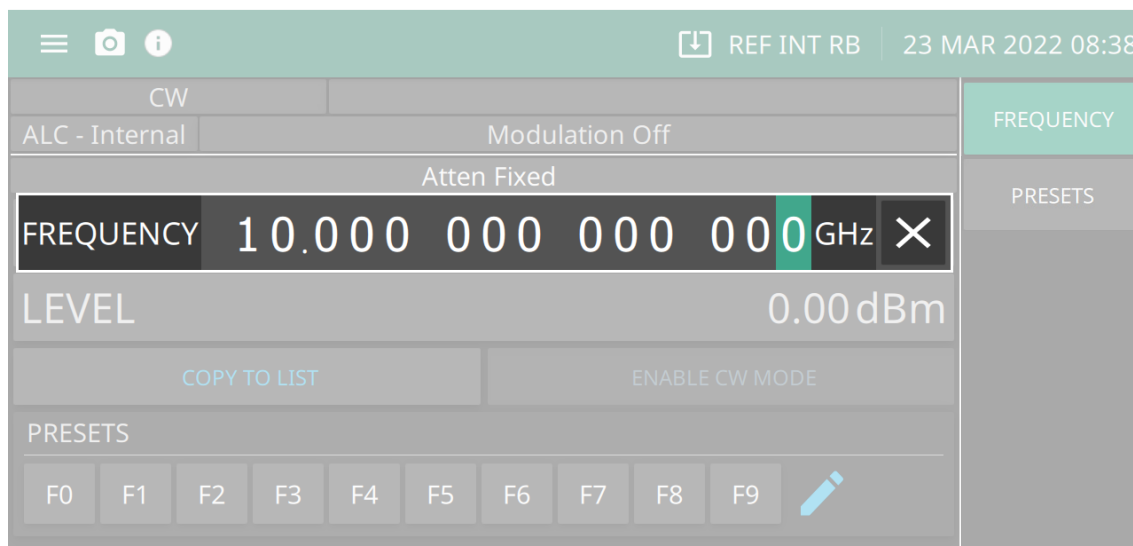


Figure 2-13. Edit Parameter

Cursor Control Buttons

The cursor buttons control the movement of the cursor on the display. When a parameter is opened for editing, a cursor highlights the open parameter. Each time the right or left pad is pressed, the cursor moves left or right by one digit. The up or down pad 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 the up or down pad is pressed is determined by the cursor position. Only one parameter can be opened at a time.

In addition, when editing frequency and time parameters, the incremental size can be set to a specific value. Once set and activated, each time the up or down pad is pressed, the parameter's value increases or decreases by the set amount. The cursor does not appear with the increment mode is toggled ON. See [“Increment Size” on page 3-110](#).

Editing the Parameter

To modify a numeric parameter setting that is displayed on a menu or edit window, press the unit to make it active. Edit the parameter by using the numeric keypad, arrow buttons, or rotary data knob to change the value as shown in [Figure 2-14](#).

Use a termination buttons to close the window. The termination buttons are described in [“Termination Buttons” on page 2-19..](#)

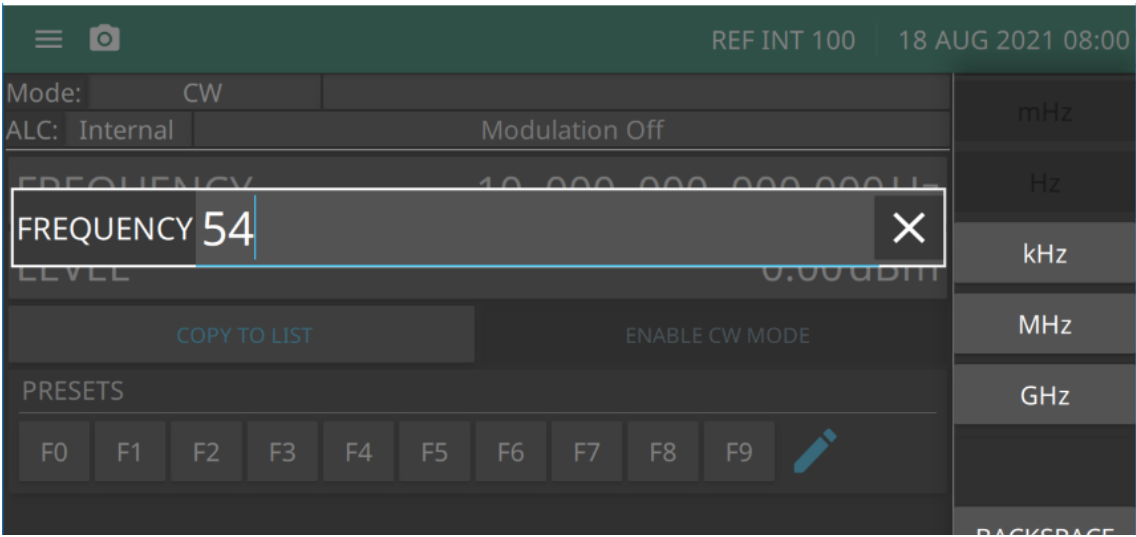


Figure 2-14. Edit Parameter Display

Termination Buttons

Termination buttons are used to terminate keypad data entries and change the parameter values in memory. As shown on the left, termination soft buttons are located on the right side of the menu display. If the entered value is outside the allowable range of the open parameter, an error message will be displayed along with an audible “beep.”

Frequency: GHz / MHz / kHz / Hz / mHz

Level: dB / dBm / dB/mV (in log mode)

Time: Sec / ms / μ s / ns

BACKSPACE: The backspace button is used to correct keypad data entry errors by deleting the last number, “-”, or decimal point entered.

CLEAR: When a parameter is open for editing, the clear entry button is used to clear the parameter entry.

ESC: Clears the data entry and the previous parameter is displayed.

Entering a New Value

To change the current value of a parameter by entering a new value for the parameter, use the data entry keypad and termination buttons.

Press the parameter to be edited. Enter the new value for the parameter, then press the appropriate terminator button. If the entered value is outside the allowable range of the open parameter, the entry is not accepted and the previous value for the parameter is displayed.

Numeric Entry Buttons

The numeric keypad provides for direct entry of numerical values. The +/- button changes the sign of the numerical value during data entry. The SELECT button enters the value that is currently displayed in the parameter entry field.

Invalid Entries

When setting parameters or entering other types of data, if an entry is out of range or is otherwise invalid, an audible beep will be sound and may provide a message indicating a invalid range. In this case, clear or cancel the entry and enter a valid value or change the units by using either the drop-down selection next to the data entry window, or with the unit terminators to the left of the keypad.

Using a Set Increment

When editing frequency and time parameters, you can increase or decrease the parameter's value by a set amount each time the arrow buttons are pressed or the rotary data knob to increase or decrease the value. For instructions on setting the increment size, refer to [“Press < Previous to return to the main Configure RF menu display.” on page 3-110](#).

Text Entry

When an instrument function requires test to be entered, such as entering an Ethernet hostname, a touch screen alphabetic keyboard is displayed. See [Figure 2-15](#). Press the “?123” button to toggle to the digits and symbols keyboard. Use the left arrow button (backspace) to delete the character to the left of the insertion point. The insertion point can be moved to a touched position in the data entry field. Enable caps-lock by double tapping the shift^ button.

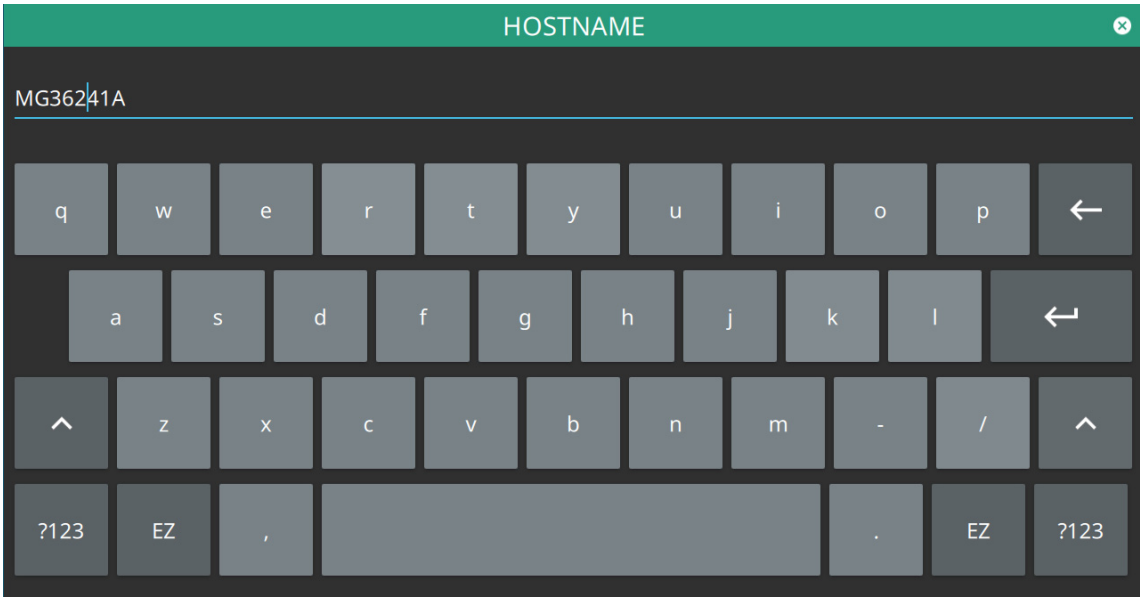


Figure 2-15. Touch Screen Keyboard

The EZ button toggles to a configurable EZ keyboard, illustrated below.

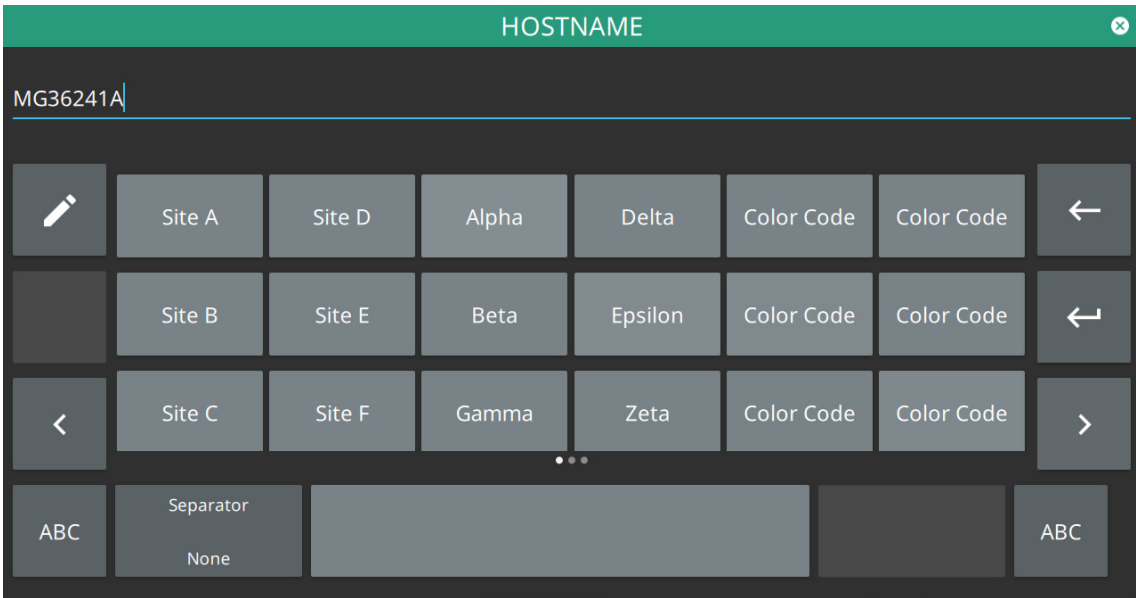


Figure 2-16. Touch Screen EZ Keyboard

Use the EZ keyboard to enter frequently used text strings with a single screen tap. The EZ keyboard is initially populated with default values. Each button enters the entire string as shown on the key. For convenience, you can set an automatic Separator character to be placed between each EZ key string.

To change a key’s value:

- 1. Press the pencil (edit) button. The EZ buttons will become highlighted.

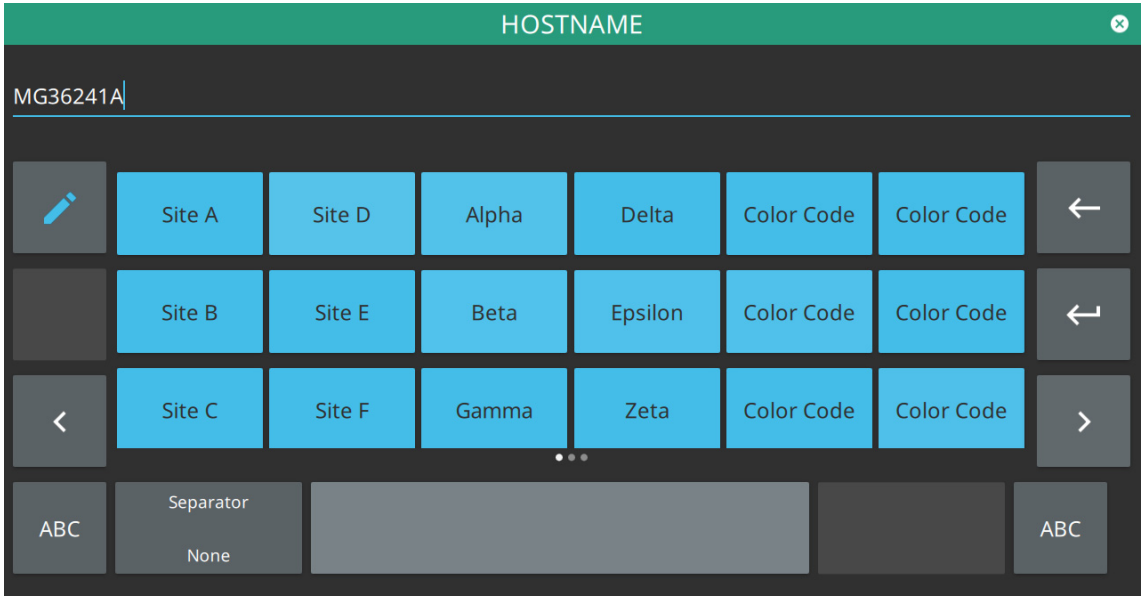


Figure 2-17. Touch Screen EZ Keyboard

- 2. Press the button to be edited. This will display the standard keyboard for entering a new EZ key value.

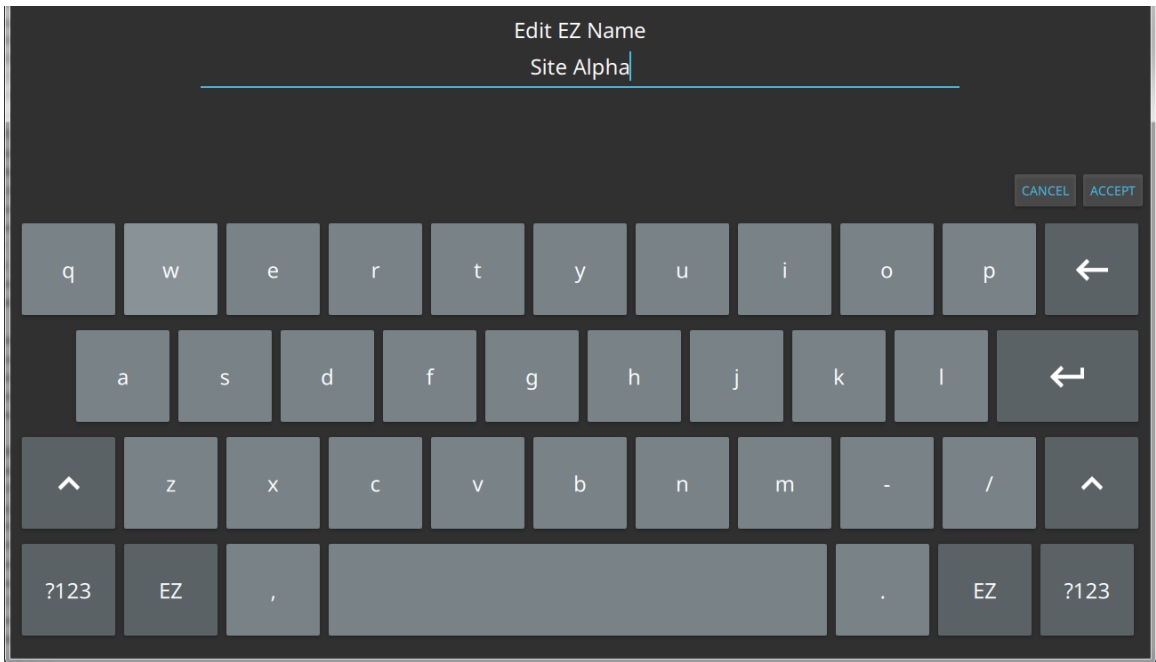


Figure 2-18. Touch Screen EZ Keyboard

- 3. Enter the new value, then press ACCEPT to assign the new value to the EZ button, or press CANCEL.

2-8 System Menu

Press the 3-Line icon to view the instrument model number and serial in addition to System Information, Settings, Files, Diagnostics and System Power menus.

Anritsu MG36221A 2346011 SYSTEM INFORMATION SETTINGS FILES DIAGNOSTICS SYSTEM POWER	SYSTEM INFORMATION: Opens “SYSTEM INFORMATION Menu” on page 2-23. SETTINGS: Opens “SETTINGS Menu” on page 2-26. FILES: Opens “FILES Menu” on page 2-39 DIAGNOSTICS: Opens “DIAGNOSTICS Menu” on page 2-40 SYSTEM POWER: Press System Power to either restart or power off the instrument.
---	--

Figure 2-19. System Menu

2-9 SYSTEM INFORMATION Menu

The System Information screen provides current status of the Instrument, Software, and Connectivity.

INSTRUMENT Menu

The INSTRUMENT menu is shown in [Figure 2-20](#).

Press: 3-Line Menu | SYSTEM INFORMATION

INSTRUMENT	SOFTWARE	CONNECTIVITY
Manufacturer Anritsu	Model Number MG36221A	
Options 0002, 0006, 0012, 0015, 0016, 0018, 0025, 0026, 0027, 0030		
Serial Number 2220304	MB Serial Number 20360915	
CPU TEMP 34.90°C / 94.82°F	Storage Used 1.12 MB	
Storage Free 6704.53 MB		

Manufacturer: The manufacturer name: Anritsu.

Options: Displays the options that are installed.

Serial Number: The serial number of the instrument.

CPU Temperature: Displays the current instrument internal CPU temperature.

Storage Free: How much instrument internal CPU free storage is available.

Model: The model of the instrument.

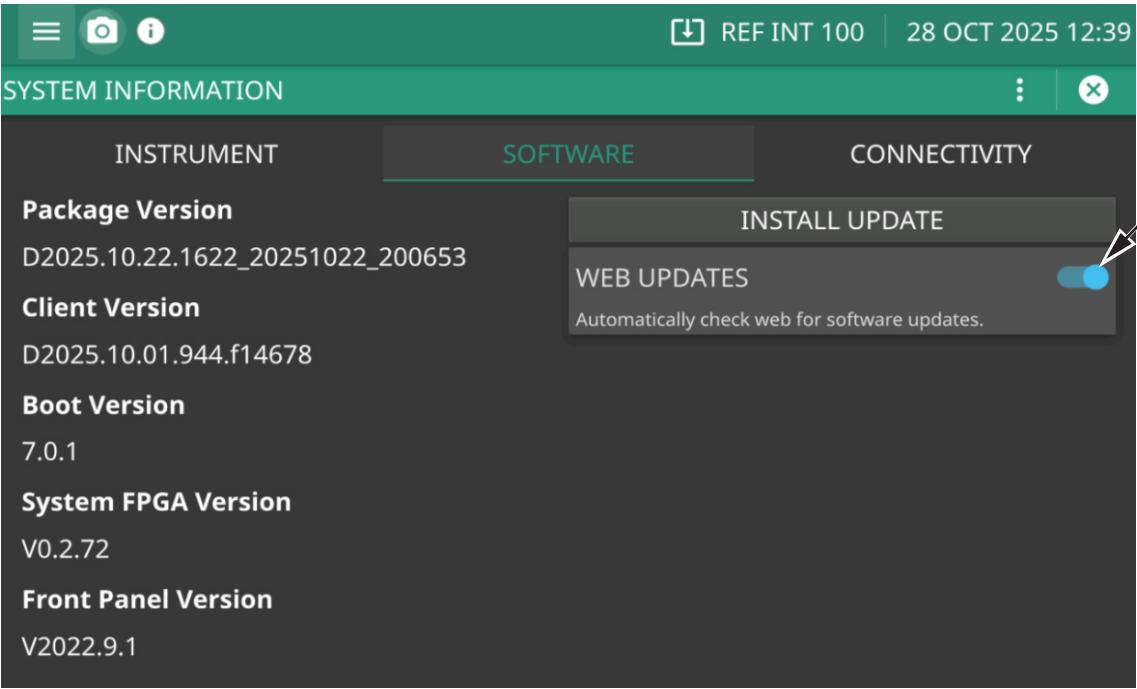
MB Serial Number: The motherboard serial number.

Storage Used: The amount of CPU storage used.

Figure 2-20. INSTRUMENT Menu

SOFTWARE Menu

Click SOFTWARE to view the screen shown in [Figure 2-21](#).



- Package Version:** Displays the current version software installed.
- Boot Version:** Provides the boot version.
- Front Panel Version:** Provides the front panel software version.
- Client Version:** Provides the client version.
- Web Updates:** Automatically checks for the latest software updates on the company website.

Figure 2-21. SOFTWARE Menu

CONNECTIVITY Menu

Click CONNECTIVITY to view the network settings screen shown in [Figure 2-22](#)

SYSTEM INFORMATION ✕		
INSTRUMENT	SOFTWARE	CONNECTIVITY
IP Type	IP Address	
IP Address set dynamically using DHCP.	172.26.202.33	
Gateway	Subnet Mask	
172.26.200.1	255.255.252.0	
Hostname	MAC Address	
everest20	00:00:91:F0:8E:13	

IP Type: There are two primary types of IP address formats used today, IPv4 and IPv6

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 another LAN 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.

Hostname: A Hostname is a label assigned to a device (a host) on a network. It distinguishes one device from another on a specific network or over the Internet.

IP Address: Every computer and electronic device in a TCP/IP network requires an IP address. An IPv4 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.

MAC Address: An Ethernet address, or Media Access Control (MAC) address, is a unique 48-bit value that identifies a network interface card to the rest of the network. Every network card has a unique Ethernet address permanently stored in its memory.

Figure 2-22. CONNECTIVITY Menu

2-10 SETTINGS Menu

The system **SETTINGS** menu provides access to all instrument system-level settings such as network, GNSS/GPS, date and time, and display.

Press: System Menu | **SETTINGS**.

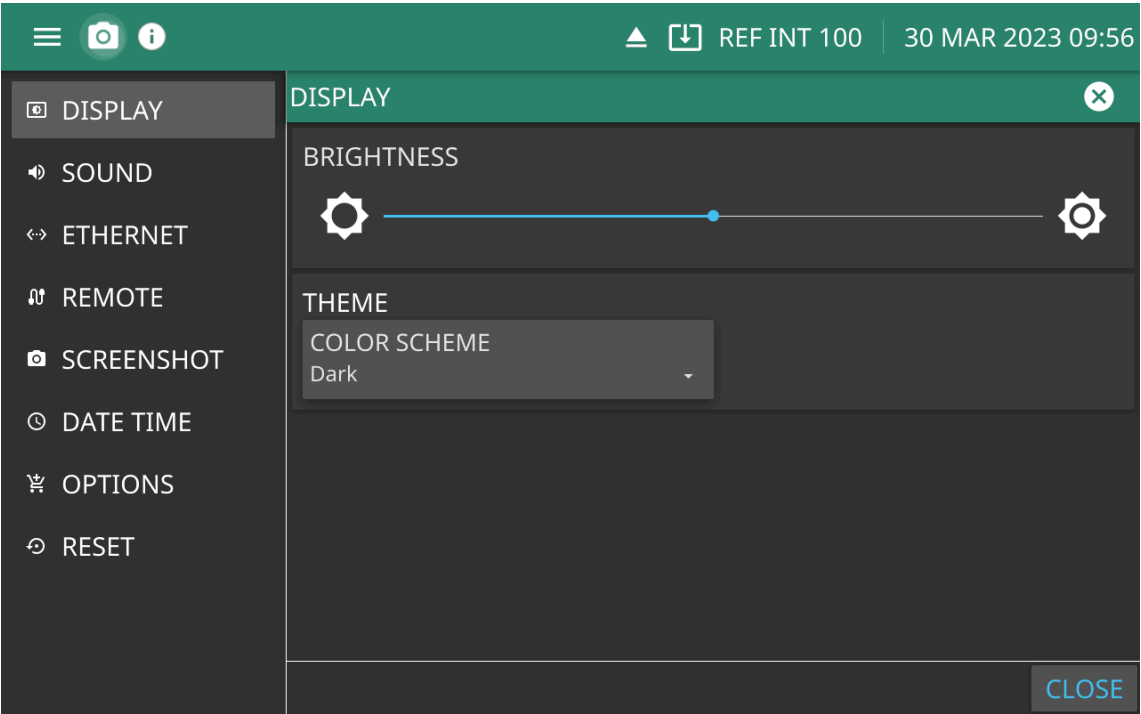
DISPLAY SOUND ETHERNET REMOTE SCREENSHOT DATE TIME OPTIONS RESET	DISPLAY: Opens “DISPLAY Settings” on page 2-27. SOUND: Opens “SOUND Settings” on page 2-27. ETHERNET: Opens “ETHERNET Settings” on page 2-28. REMOTE: Opens “REMOTE Settings” on page 2-31 SCREENSHOT: Opens “SCREENSHOT Settings” on page 2-33. DATE TIME: Opens “DATE TIME Settings” on page 2-35. OPTIONS: Opens “OPTIONS Settings” on page 2-36. RESET: Opens “RESET Settings” on page 2-37.
--	--

Figure 2-23. SETTINGS Menu

DISPLAY Settings

The display can be adjusted as shown in [Figure 2-24](#).

Press: System Menu | SETTINGS | DISPLAY



BRIGHTNESS: Use the scrollbar to adjust the display brightness.

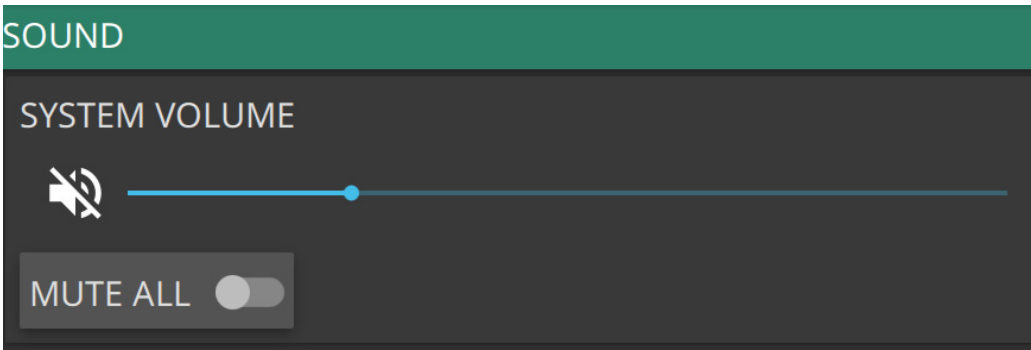
THEME: Set the display to a Dark or Light color scheme. Light may be more suitable for viewing in bright ambient conditions or print job.

Figure 2-24. DISPLAY Settings

SOUND Settings

The SOUND settings are shown in [Figure 2-25](#)

Press: System Menu | SETTINGS | SOUND



SYSTEM VOLUME: Use the scrollbar to adjust the sound volume

MUTE ALL: Press to mute on or off instrument sounds

Figure 2-25. SOUND Settings

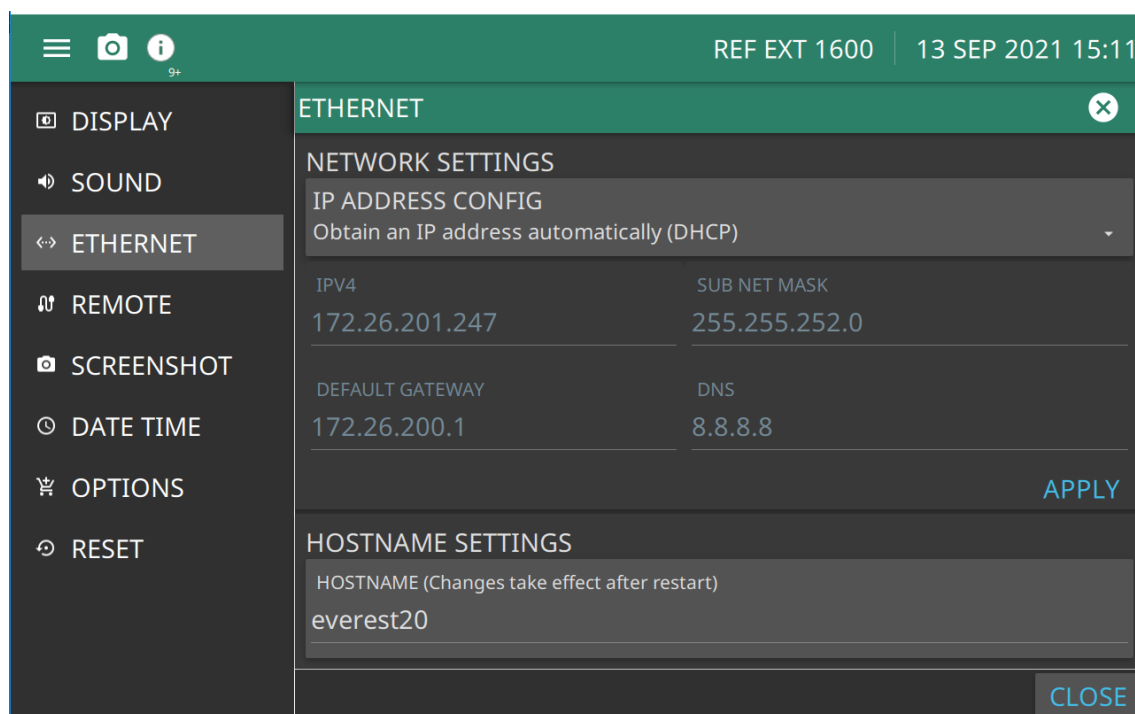
ETHERNET Settings

From the Settings menu, press Ethernet to display the screen shown in [Figure 2-26](#). Refer to “[Network Settings](#)” on [page 2-29](#) for general network setup and information.

Press: System Menu | SETTINGS | ETHERNET

Note

If an active Ethernet cable is connected to the instrument while it is turned on, a reboot may be required to establish a DHCP connection. If the port becomes inactive, verify that an active Ethernet cable is attached to the instrument, then cycle the instrument power off and on.



ID ADDRESS CONFIG: The instrument IP address can be set automatically using DHCP or manually by entering the desired IP address, gateway address, and subnet mask

IPV4: Press and type the IPV4 using the keypad. Press APPLY to enter changes.

DEFAULT GATEWAY: Press and type the Default Gateway using the keypad. Press APPLY to enter changes.

SUB NET MASK: Press and type the Sub Net Mask using the keypad. Press APPLY to enter changes.

DNS: Press and type the DNS using the keypad. Press APPLY to enter changes.

HOSTNAME SETTINGS: Press and type the Hostname using the keypad. Changes to the Hostname take affect after Restart.

Figure 2-26. ETHERNET Menu

Editing Ethernet Settings

Press IPV4, SUB NET MASK, DEFAULT GATEWAY and DNS to display the touch screen keyboard. Type the parameters and press apply when complete. For more on keyboard entry, “[Text Entry](#)” on [page 2-20](#).

Network Settings

The MG362x1A fully supports the IEEE-802.3 standard. Most MG362x1A front panel functions (except power on/off) can be remotely controlled via a network server and an Ethernet connection. The MG362x1A 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 (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.

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. Remote programming and operation between the instrument and remote program is accomplished via a TCP/IP raw socket connection to port 9001. The remote program must establish a TCP/IP raw socket connection at port 9001 to the MG362x1A.
- Remote programming and operation between the instrument and remote program is accomplished via a TCP/IP raw socket connection to port 9001. The remote program must establish a TCP/IP raw socket connection at port 9001 to the MG362x1A.
- The remote program may connect to the instrument IP address or to its `HOSTNAME` (Ethernet only). If using DHCP instead of a static IP, using the `HOSTNAME` may be more reliable for finding an instrument on a network.
- You may need to contact your network administrator to ensure network security policies, anti-virus, and firewall settings do not block access to the controlling computer and its ports.

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.

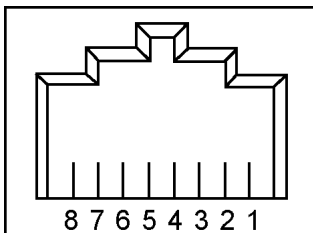
The instrument can be remotely programmed using the raw sockets over TCP/IP protocol. The NI-VISA™ I/O library is used on the server side to facilitate the communications. The SCPI or MG362x1A command sets listed in the MG362x1A programming manual (10370-10385) apply to LAN programming as well.

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 MG362x1A instrument and the host PC must be connected to the network.

Network Connection

Interface between the instrument 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 insulated copper wires terminated into an RJ45 connector. CAT-5 cabling is capable of supporting frequencies up to 100 MHz and data transfer speeds up to 1 Gbps, which accommodates 1000Base-T, 100Base-T, and 10Base-T networks. CAT-5 cables are based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard developed by the Electronics Industries Association. A pinout diagram is shown in [Table 2-4](#).

Table 2-4. 8-pin Ethernet RJ45 Connector Pinout Diagram



Pin	Name	Description	Wire Color
1	TX+ or BI_DA+	Transmit or bidirectional data	White/Green
2	TX- or BI_DA-	Transmit or bidirectional data	Green
3	RX+ or BI_DB+	Receive or bidirectional data	White/Orange
4	BI_DC+	Not used (common mode termination) or bidirectional	Blue
5	BI_DC-	Not used (common mode termination) or bidirectional	White/Blue
6	RX- or BI_DB-	Receive or bidirectional data	Orange
7	BI_DD+	Not used (common mode termination) or bidirectional	White/Brown
8	BI_DD-	Not used (common mode termination) or bidirectional	Brown

Integrated into the RJ45 connector are two LEDs. The amber LED indicates the presence of LAN voltages (a live LAN connection) while the green LED flashes to show that LAN traffic is present. The instrument IP address and its `HOSTNAME` are set via the System menu (upper left corner) and accessing the ETHERNET or WIFI settings menu.

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 MG362x1A.

Note

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

REMOTE Settings

The MG362x1A provides automated signal generator operation via the GPIB, and Ethernet. The following paragraphs provide information about the interface connections, cable requirements, and setting up the remote operating parameters.

GPIB Interface Connection and Setup

Interface between the signal generator and other devices on the GPIB is via a 24-wire interface cable. This cable uses connector shells having two connector faces. These double-faced connectors allow for the parallel connection of two or more cables to a single device. The only interconnection required for GPIB operation is between the signal generator and the controller. This interconnection is via a standard GPIB cable. The Anritsu part number for GPIB cables of proper length is 2100-1, -2, or -4 (1, 2, or 4 meters in length).

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: No more than 15 instruments installed on the bus and the 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 as shown in [Figure 2-27](#). To change the GPIB address:
Press: System Menu | REMOTE | GPIB PRIMARY ADDRESS
Type the new GPIB address and then press the ENTER button.

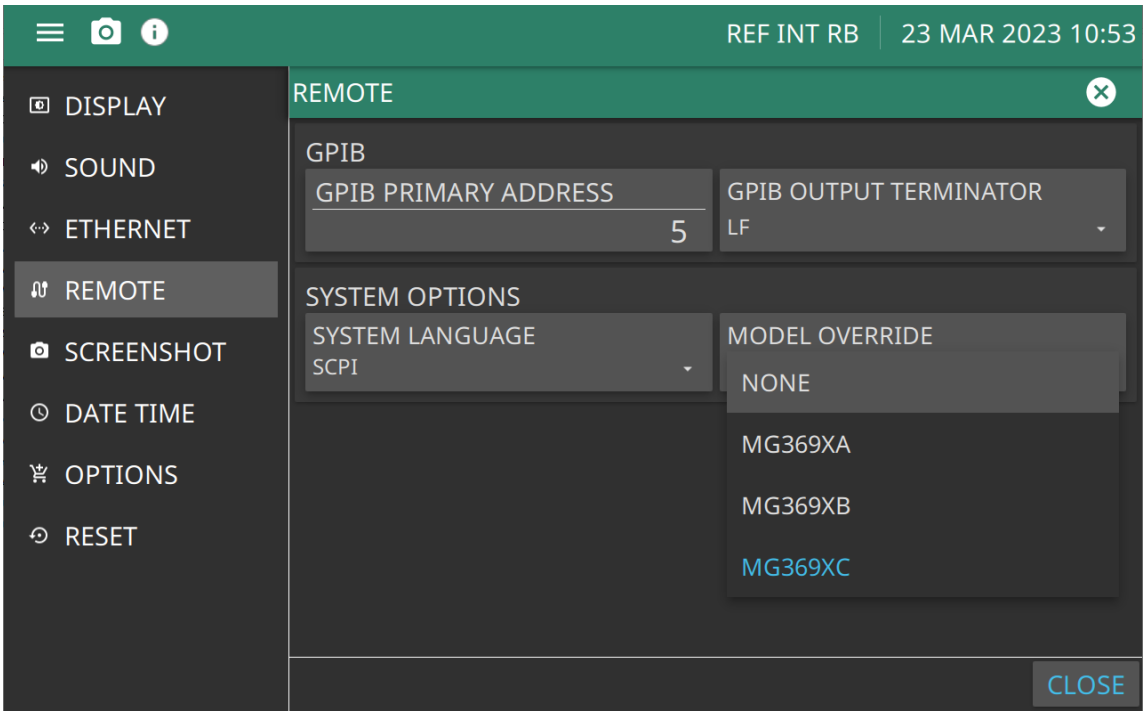


Figure 2-27. Configure GPIB Menu

GPIB: Set the GPIB preferences.

GPIB PRIMARY ADDRESS: Select the address of the MG362x1A on the bus. Enter a new address, between one and 30. The new GPIB address will appear on the display.

GPIB OUTPUT TERMINATOR : Select the carriage return (CR) or a carriage return and line feed (LF) or (CR/LF) as the GPIB data delimiter. Consult the GPIB controller's manual to determine which data delimiter is required.

SYSTEM OPTIONS: Set the REMOTE system options

SYSTEM LANGUAGE: Set the remote language as SCPI Native or Tmsl ('Tmsl is an alias for SCPI). Entering either will return SCPI when queried.

MODEL OVERRIDE: Changes the “*IDN?” response to the appropriate model.

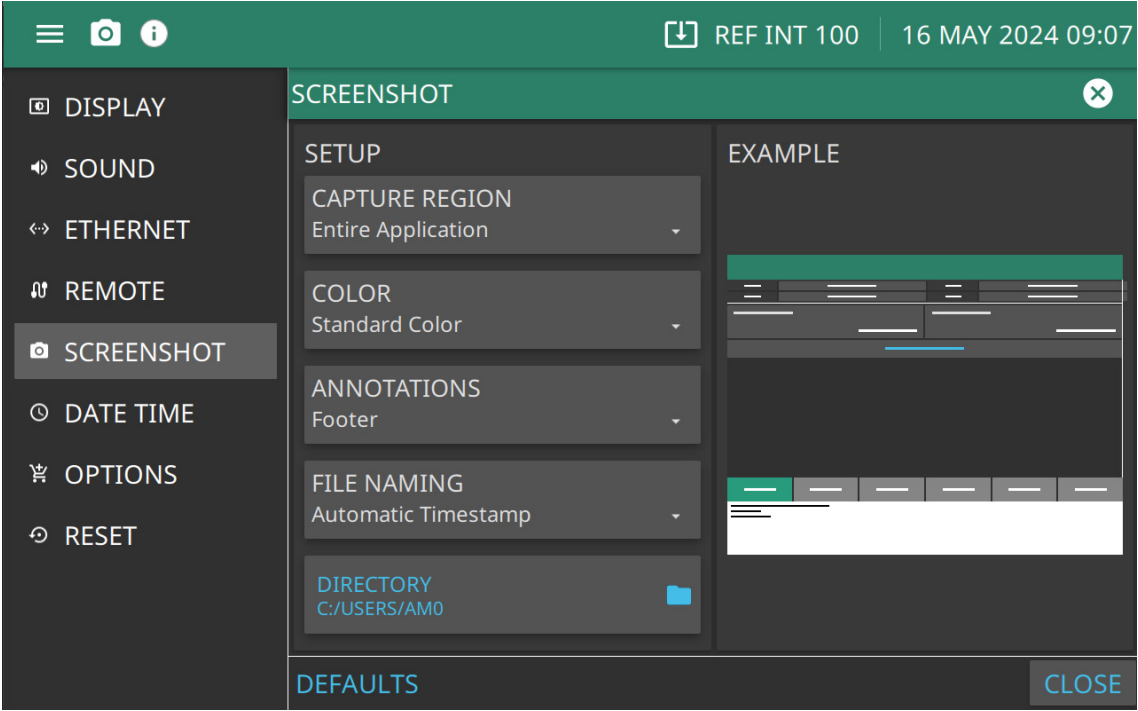
Figure 2-27. Configure GPIB Menu

SCREENSHOT Settings

SCREENSHOT menu provides setup and file saving parameters. The screenshot is saved in a internally or a users set file location.

Press: System Menu | SETTINGS | SCREENSHOT

Screenshots can be previewed and retrieved from the instrument display. See[“The FILE MANAGEMENT toolbar displays the file operations via the following icons.”](#) on page 2-39.



- CAPTURE REGION:** Entire window or graph area only
- COLOR:** Standard or Printable Color
- ANNOTATIONS:** May be placed at top (header) or bottom (footer) of captured image
- FILE NAMING:** Set with Automatic Timestamp or Manual
- DIRECTORY:** Directory path to destination folder where the file is to be saved
- DEFAULTS:** Resets parameters on this page to default values

Figure 2-28. Screenshot Setup

Previewing Screenshots

While in File Manager, you can preview screenshots on the instrument display simply by touching the screenshot file name. While the preview is displayed, you can use the controls to:

- Cycle forward and backward through each screenshot in the directory.
- Rename the file by selecting RENAME, then use the keypad to enter a new filename.
- Delete the file by selecting DELETE and then confirming your choice.
- Copy the file, then close the preview dialog and navigate to the desired location, then touch the Paste icon at the top of the File Manager.

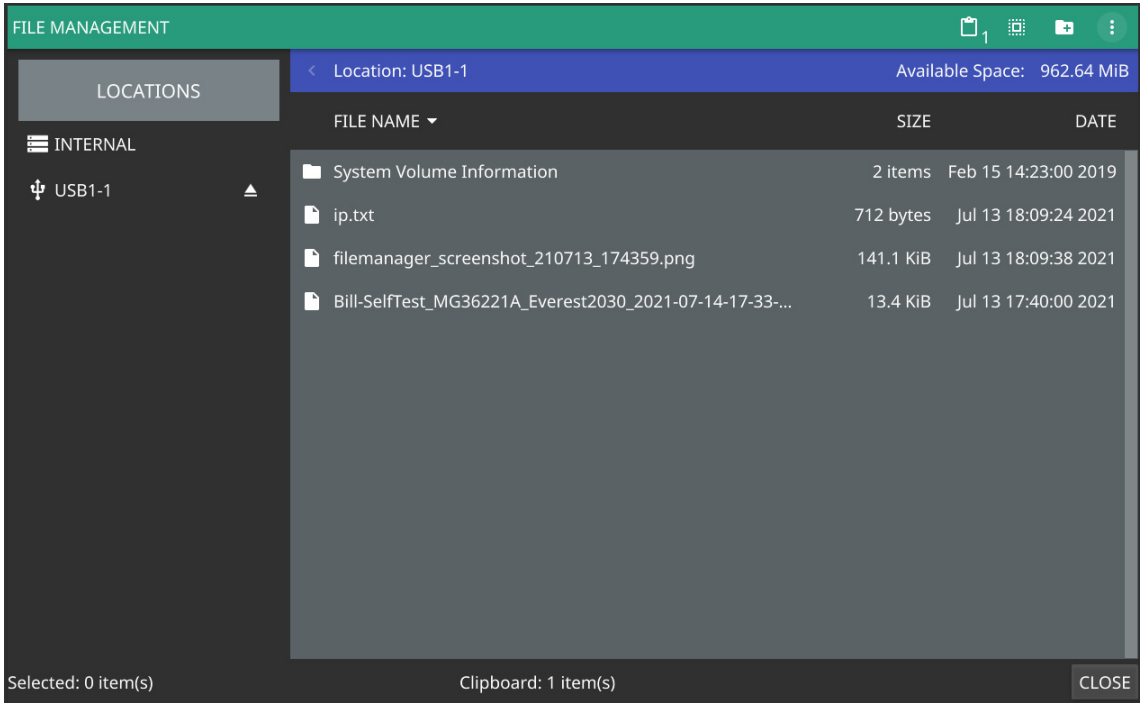
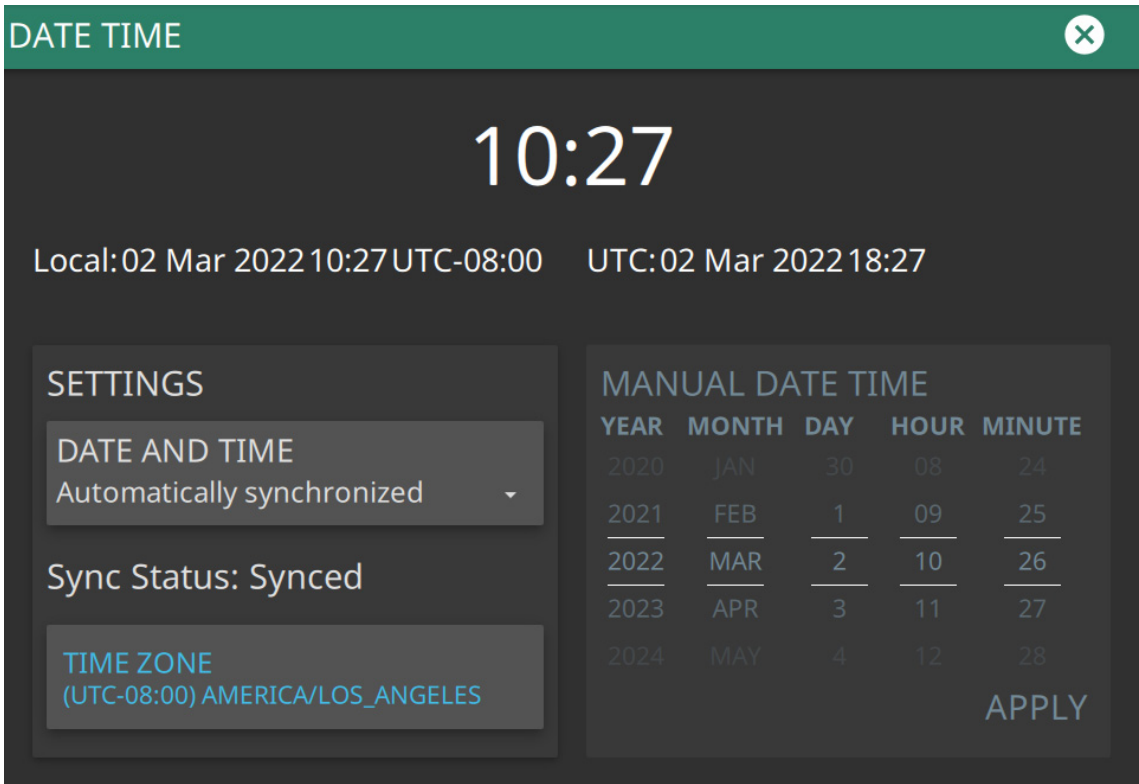


Figure 2-29. Screenshot Preview

DATE TIME Settings

Set the current date, time, and the time zone.

Press: System Menu | SETTINGS | DATE TIME



Settings: Date and Time: Manually set or Automatically synchronized.

Set Manually to activate the MANUAL DATE TIME window. Here you can scroll to a selectable year, month, day, hour, and minute.

Automatically synchronized uses the network time; if the instrument also has a GPS location fix, the system will determine and use the more accurate of the two, between network and GPS time. Automatically synchronized mode may take several minutes to sync.

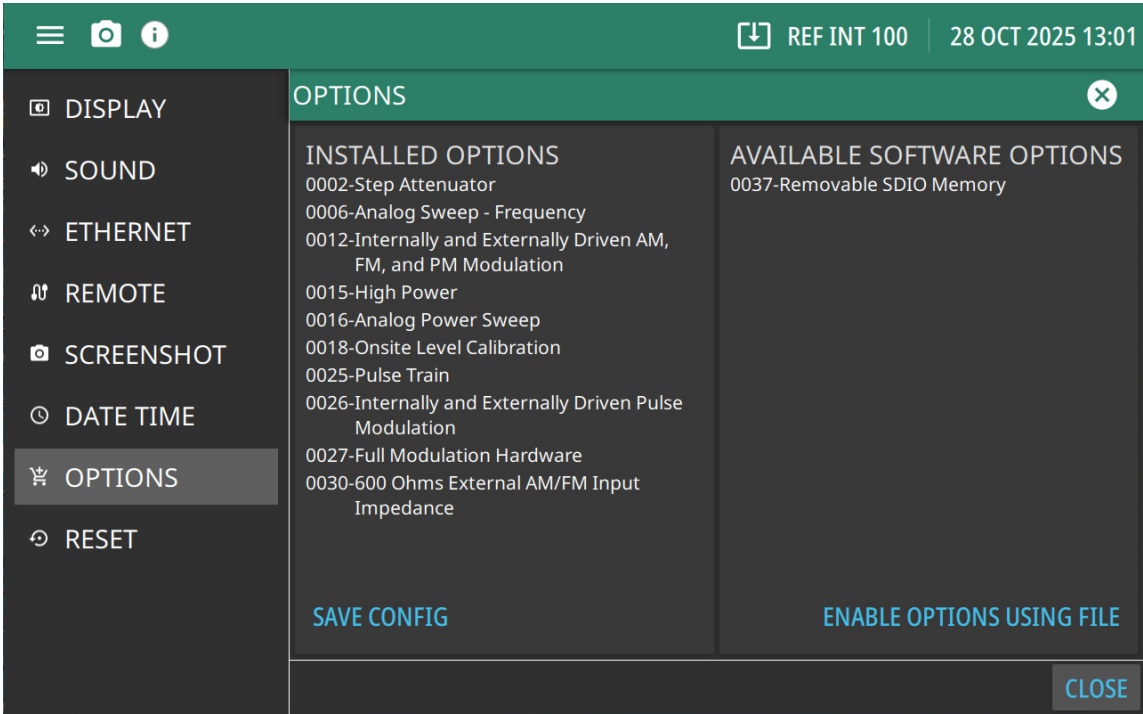
Time Zone: Select a time zone from the list provided.

Figure 2-30. Set DATE TIME

OPTIONS Settings

Select OPTIONS to display the list of currently installed software options on the left pane and those that are available for installation on the right pane as shown in [Figure 2-31](#). Some options can be installed using only a software file. Others may require additional hardware. Contact your local sales or service representative for information on installing new options. For a list of options that are available for the MG362x1A, see the Technical Data Sheet (11410-00928).

Press: System Menu | SETTINGS | OPTIONS



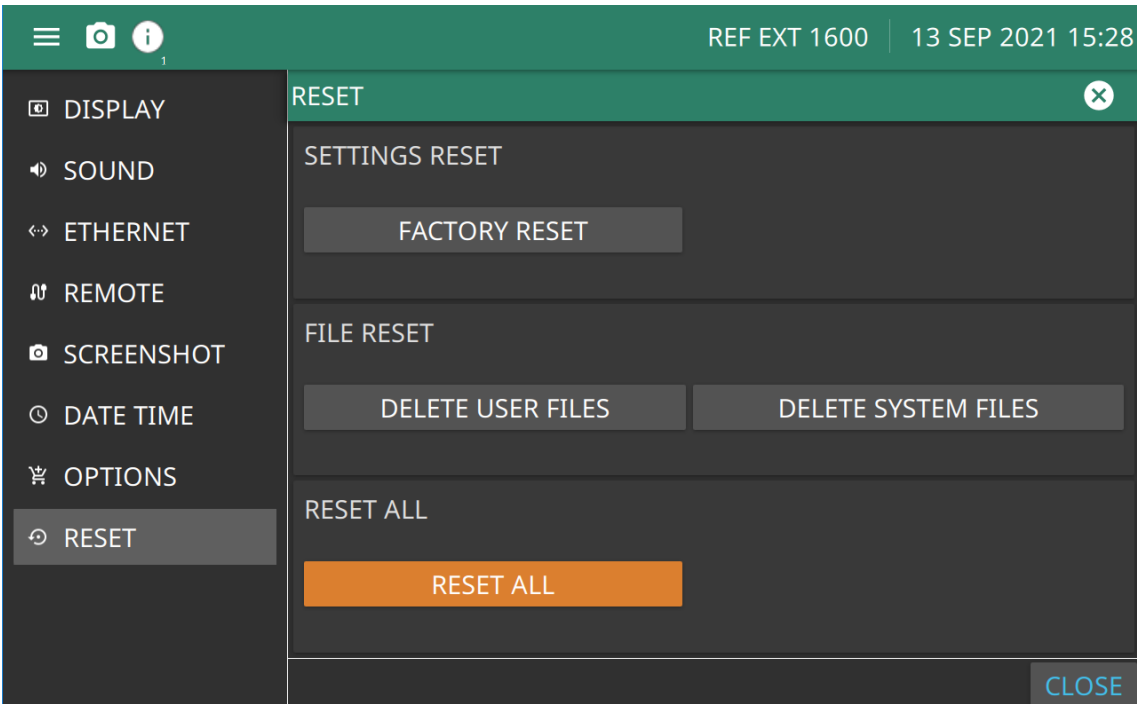
- INSTALLED OPTIONS:** Displays the options currently installed.
- AVAILABLE SOFTWARE OPTIONS:** Displays options available to download and install.
- SAVE CONFIG:** Opens the Save File dialog. Name and store the file. If upgrading options, use this config file to send to Anritsu as described in [Appendix C, “Software Option Upgrades”](#).
- ENABLE OPTIONS USING FILE:** Searches for a license file from a USB stick and installs those options. See [Appendix B, “Updating Firmware”](#).

Figure 2-31. Options Settings

RESET Settings

The RESET menu is shown in [Figure 2-32](#).

Press: System Menu | SETTINGS | RESET



SETTINGS RESET

FACTORY RESET : Restores the instrument to the factory default settings for all measurement modes and system settings, including language, display and audio settings. Ethernet and, time zone settings are not affected. The instrument will automatically restart. If the unit is connected to Wi-Fi, the previous connections will be preset.

FILE RESET

DELETE USER FILES : Deletes all user files from the instrument’s internal memory, including measurement, setup, and screenshot files. System files are not affected.

DELETE SYSTEM FILES: Deletes all user system files from the instrument’s internal memory, including keyboard EZ names, cable and antennas, and log files. Other user files are not affected.

RESET ALL

RESET ALL: Performs a Factory Reset as described above and deletes last saved settings, log files and user files from the instrument’s internal memory. The RESET ALL function overwrites all information stored in the non-volatile memory with default values. This includes the table of 2000 frequency sets used for the sweep mode and the five power-offset tables used for the user level flatness correction function. The sweep is defined by a start index and stop index. The instrument will automatically restart.

Figure 2-32. RESET Settings

Resetting to Default Parameters

You can reset the MG362x1A to the factory-selected default parameter values at any time during normal operation. To reset to Factory Reset, refer to “[RESET Settings](#)” on page 2-37. [Table 2-5](#), shows the default parameters for all MG362x1A models.

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.

There are two ways to restart the instrument.

Press: SYSTEM | SYSTEM POWER | RESTART INSTRUMENT

or

Press: SYSTEM | SETTINGS | RESET | FACTORY RESET

Table 2-5. Restart (Default Parameters)

Model Number	Frequency Parameters (GHz)									
	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9
MG36221A	3.5	2.2	20.0	2.2	5.0	8.0	11.0	14.0	17.0	20.0
MG36241A	3.5	2.2	43.5	2.2	5.0	8.0	11.0	14.0	17.0	20.0
MG36271A	3.5	2.2	70.0	2.2	5.0	8.0	11.0	14.0	17.0	20.0

Model Number	Parameters (dBm)									
	L0	L1	L2	L3	L4	L5	L6	L7	L8	L9
MG362x1A	+1.0	0.0	−1.0	−2.0	−3.0	−4.0	−5.0	−6.0	−7.0	−8.0

Model Number	Sweep Time	Step Sweep		Level Sweep		Level Offset
		Dwell Time	Number of Points	Dwell Time	Number of Steps	
MG362x1A	50 ms	1 ms	1000	1 ms	1000	0.0 dB

2-11 FILES Menu

Click the FILES menu to save to a default file location in the local drive or to a user defined file location.

Press: System Menu | FILES

File Management

The file management toolbar appears when in the FILES menu and a file is selected.

1. Access the SYSTEM menu from the System Menu in the upper left corner.
2. Press FILES to access the instrument file management menu.



Figure 2-33. File Management Menu

File Locations

Displays the available memory locations. Touch the location that you want to access and the available files will be displayed on the right side. You can touch the column headers to change the sort order.

File Management Operations

The FILE MANAGEMENT toolbar displays the file operations via the following icons:

	3-Dots: Use the 3-dots menu to refresh the displayed folder contents or to close the file management menus.
	New Folder: Use the New Folder icon to create a new directory in the current memory location. When pressed, the virtual keyboard is displayed, allowing you to enter a new directory name.
	Screenshot: The screenshot icon will capture a screen image and save it to a file.
	Select: The Select icon enables check-boxes next to your folder and file names. You can then select multiple files to move, copy, or delete.
	Clipboard: The Clipboard icon displays the number of items that you have selected and copied to the clipboard. Use this icon to paste the copied items to the destination folder.
	Edit: Use the Edit icon to change file or folder names. Select the item you wish to edit, then press Edit to display the virtual keyboard and edit the item's name.
	Delete: Use the Delete icon to remove files or folders from memory. Select the item you wish to delete, then press Delete to remove the item. Caution: The item will be permanently deleted and cannot be recovered.
	Cut: Use the Cut icon to move files or folders. Select the items you wish to move, then press Cut to store the items on the clipboard. Navigate to the new location and press the Clipboard icon to paste the items. The moved items are deleted from the source location.

Figure 2-34. File Management Icons (1 of 2)

	Copy: Use the Copy icon to select files and folders to copy to a new location. Select the items you wish to copy, then press Copy to store the items on the clipboard. Navigate to the new location and press the Clipboard icon to paste the items. Copies of the items remain in the source location.
	USB Eject: Use the USB Eject icon to properly dismount the USB memory device before removing it from the instrument port. Failing to properly eject the device could cause data corruption.

Figure 2-34. File Management Icons (2 of 2)

2-12 DIAGNOSTICS Menu

The DIAGNOSTICS menu is shown in [Figure 2-35](#).

Press: System Menu | DIAGNOSTICS

 EVENT LOG	EVENT LOG: Opens the “EVENT LOG Menu” .
 LEVEL CAL LOG	LEVEL CAL LOG: Opens “LEVEL CAL LOG” on page 2-41.
 SELF TEST	SELF TEST: Opens the “SELF TEST” on page 2-41.
 SERVICE	SERVICE: Opens the “SERVICE Mode” on page 2-44.

Figure 2-35. DIAGNOSTICS Menu

EVENT LOG Menu

The EVENT LOG allows you to save the event log as a file. This log file is a binary file that may be used by customer service to open and view saved logs.

Press: SYSTEM| DIAGNOSTICS | EVENT LOG

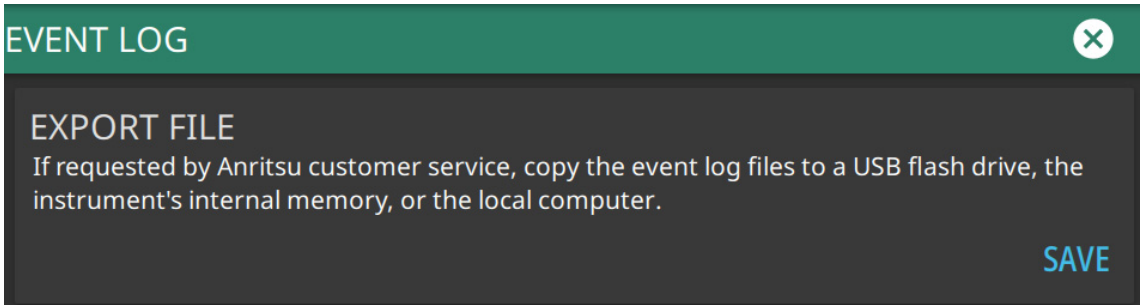


Figure 2-36. EVENT LOG

LEVEL CAL LOG

The LEVEL CAL LOG provides an EXPORT FILE tool. Press EXPORT to open the save dialog. Uses an Int Cal File (*.tar.gz) file extension when the file is saved.

Press: System Menu | DIAGNOSTICS | LEVEL CAL LOG

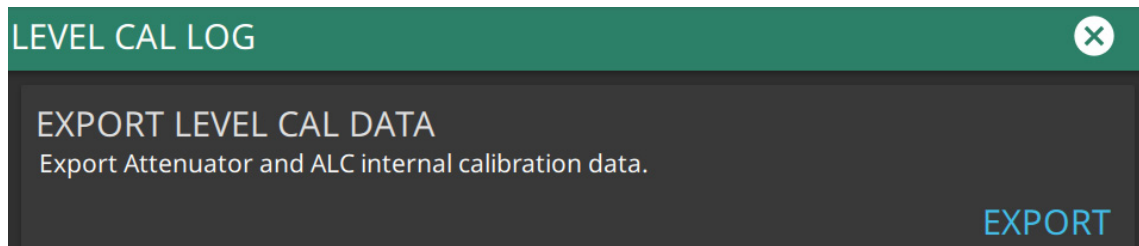


Figure 2-37. LEVEL CAL LOG

SELF TEST

The MG362x1A firmware includes internal diagnostics that self-test the instrument. Self-test performs a diagnostics of most of the PCBs and other internal assemblies.

Caution

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

Perform a self-test of the signal generator at any time during normal operation.

To perform a system self test:

Press System Menu | DIAGNOSTICS | SELF TEST

The SELF TEST RESULTS page is displayed after Self Test is performed. A sample of a SELF TEST pass screen is shown in [Figure 2-38](#). A sample of a SELF TEST failed screen is shown in [Figure 2-39](#). Press the **karat** at the right of the status results to show the passing and/or failing measurement results as shown in [Figure 2-40](#).

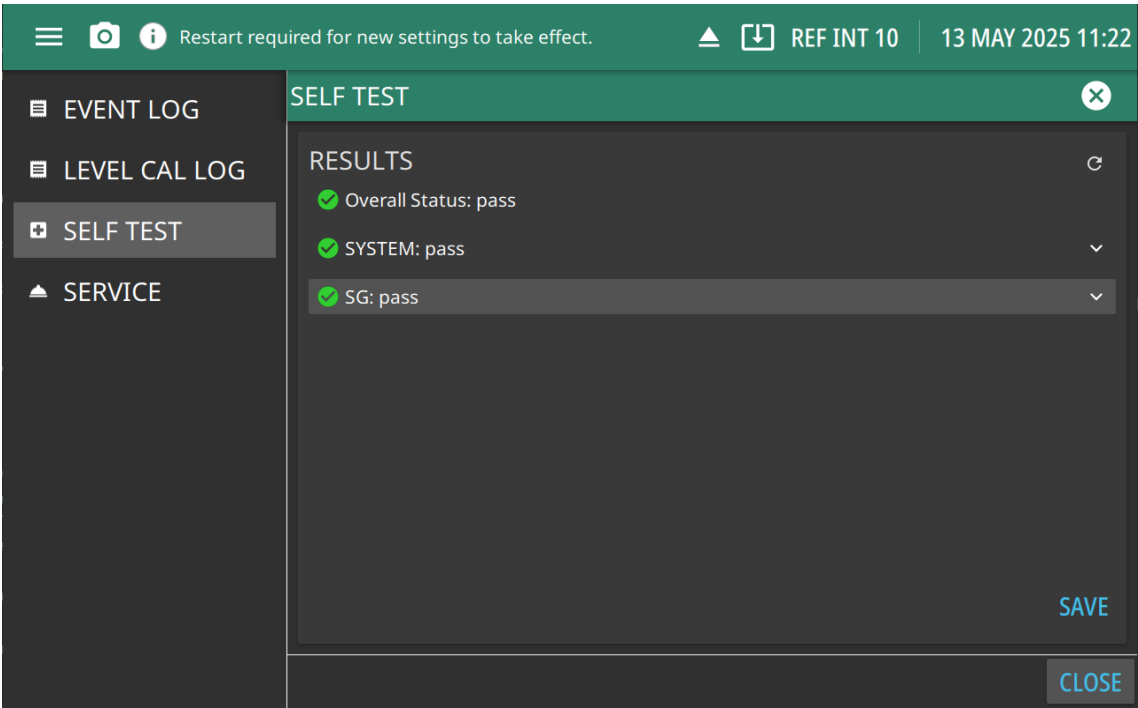


Figure 2-38. SELF TEST Pass

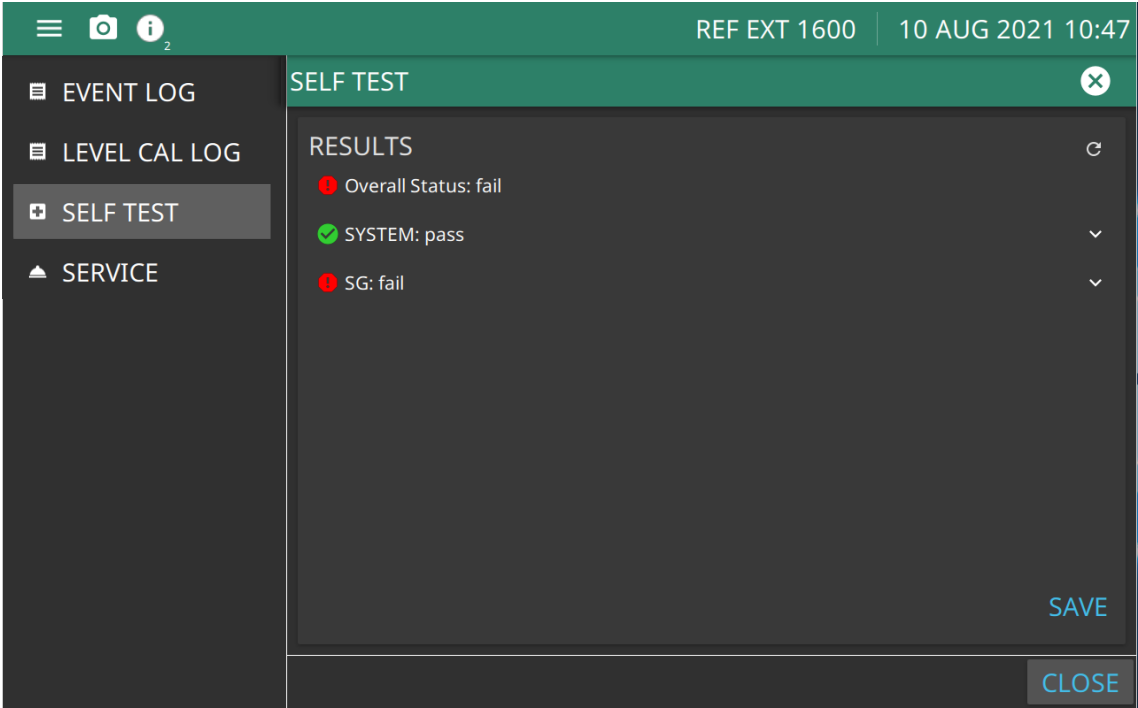


Figure 2-39. SELF TEST Failed

Self Test Results

When Self Test is performed, a comprehensive status log of the measurement results can be viewed as shown in [Figure 2-40 on page 2-43](#). The results that are displayed for each module are option dependent. Self-test status results will be provided for each option installed. See [Appendix C](#) for a complete log of self-test results. The self test results can be saved to a file for future reference.

Pass: Pass is displayed when all self testing measurements pass, the Overall Status and SYSTEM would display “pass”.

Fail: Fail is displayed if some or all tests detect an error which is not a command error, a query error, or an execution error and some device operations did not properly complete, possibly due to an abnormal hardware or firmware condition.

Pass and Fail: Both the pass and fail results are displayed.

RESULTS

Press SAVE in the lower right corner to open the Save File dialog. The self test results are a log file saved internally as “SelfTest__2021-08-18-09-21-48.log (yyyy-mm-dd- hr-min-sec). The file name and location can be changed and saved per the user’s discretion.

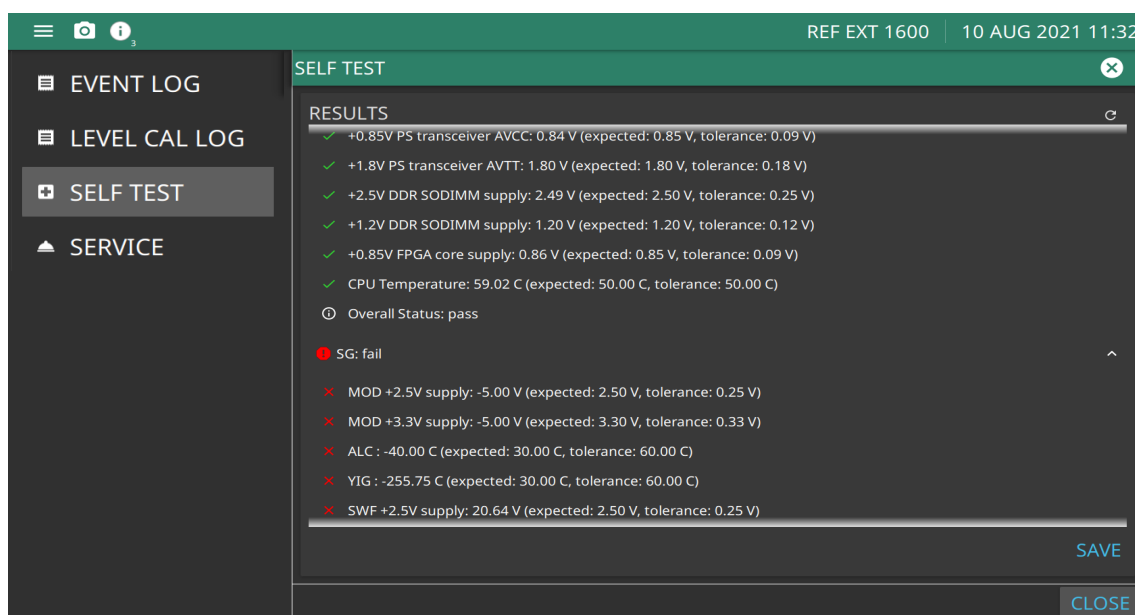


Figure 2-40. Self Test Status Log

SERVICE Mode

The SERVICE mode is for Anritsu Customer Service use only.

Press: SYSTEM | DIAGNOSTICS | SERVICE

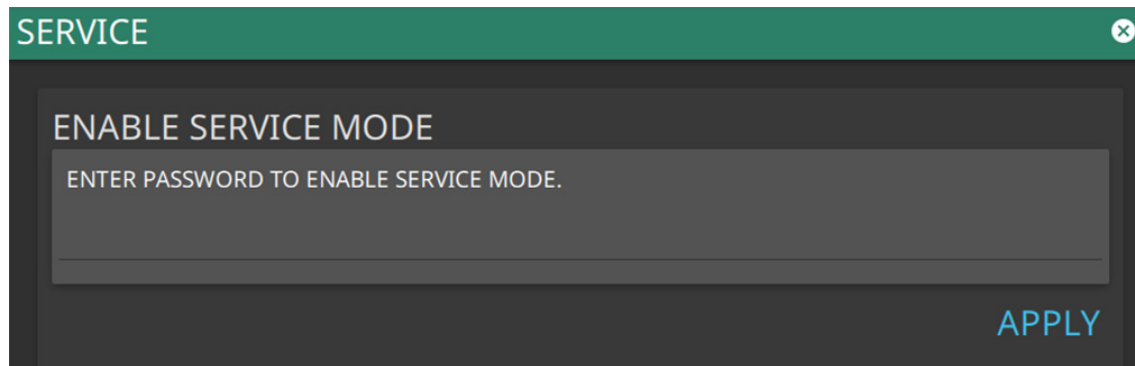


Figure 2-41. SERVICE Menu

2-13 TOOLS Menu

The TOOLS menu includes WAVEFORM and DISCOVERY as shown [Figure 2-42](#). Note that Tools menu is available only in the Rubidium MG362x1A software and not supported on the instrument display.

See “DISCOVERY” on page 2-46.

See “WAVEFORM Menu” on page 2-47.

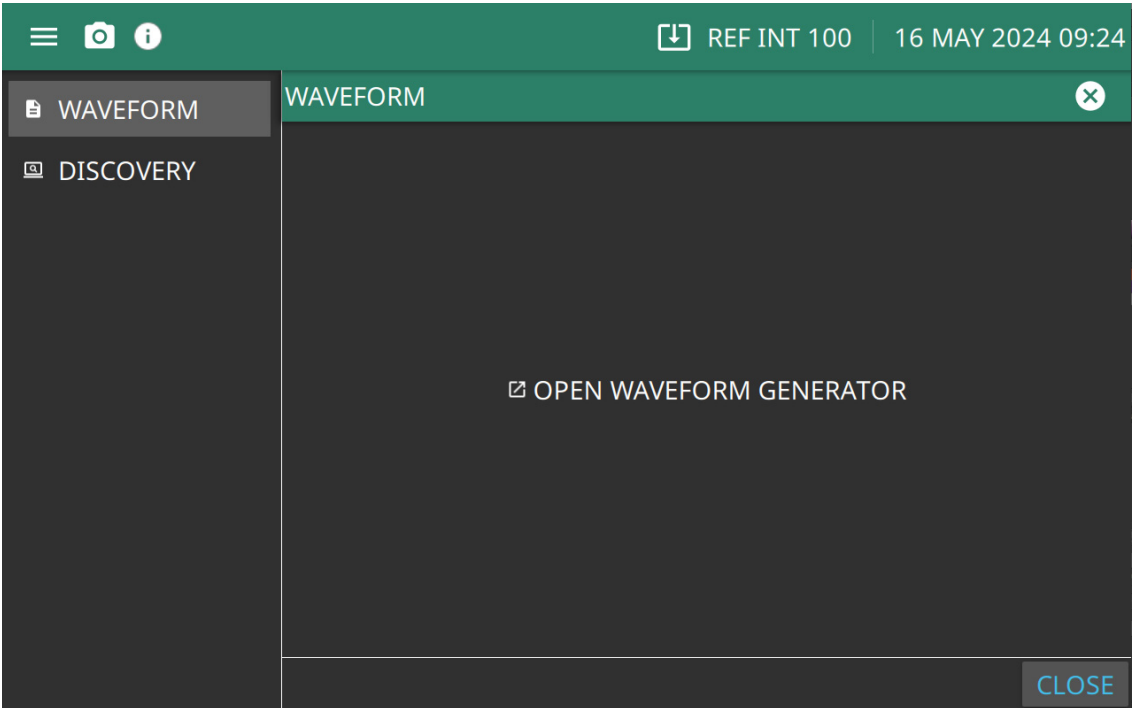


Figure 2-42. Tools Menu

DISCOVERY

Opens the DISCOVERY screen shown in [Figure 2-43](#). The DISCOVERY screen shows the MG362x1A models connected to your network.

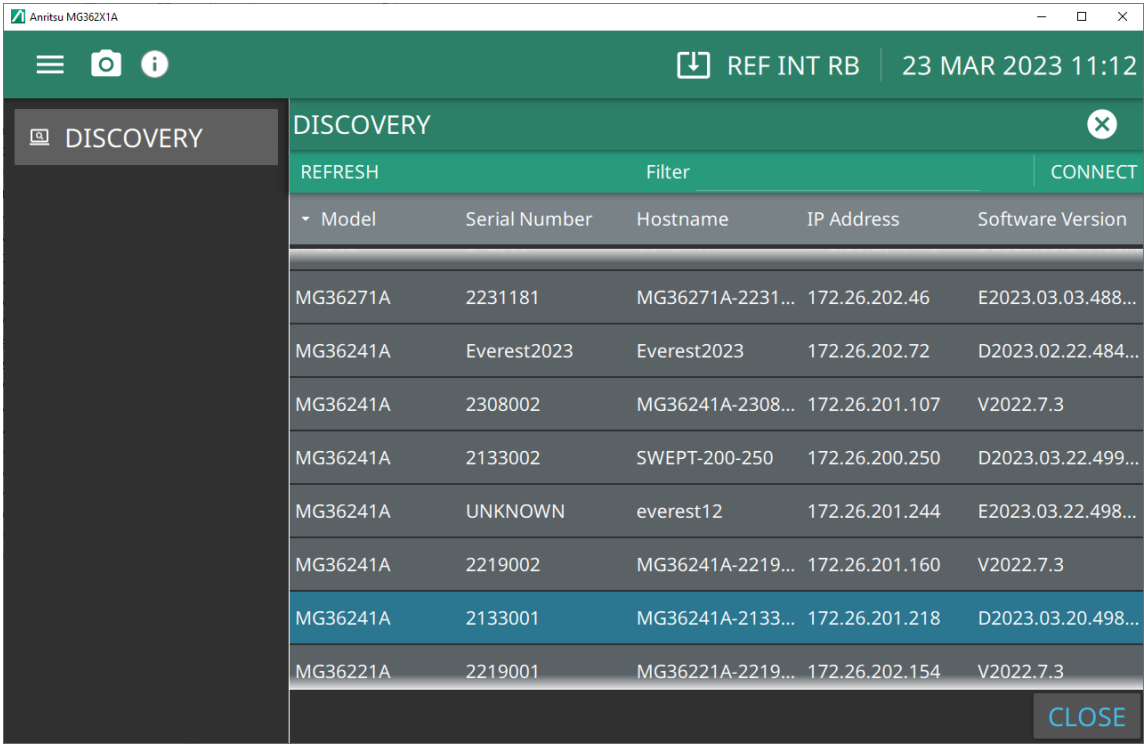


Figure 2-43. DISCOVERY Menu

WAVEFORM Menu

Option 10 provides The WAVEFORM menu is shown in [Figure 2-44](#). The Waveform Generator provides the user with the capability to create modulation waveforms and waveform data that can be sent to the signal generator to be used as the modulating waveform for AM and/or FM/ Φ M. With the waveform data loaded, the user can select which modulation type is enabled. Any combination of AM, FM/ Φ M, Pulse modulation, or SCAN modulation can be selected. See [Appendix E, “Waveform Generator \(Option 10\)”](#).

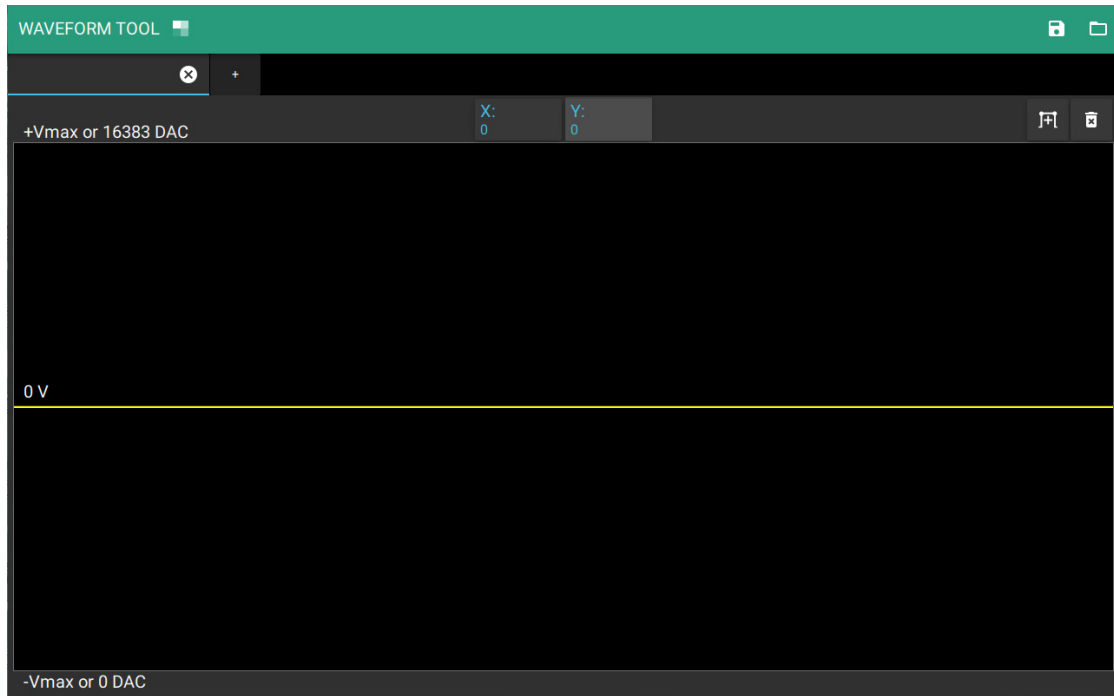


Figure 2-44. WAVEFORM Menu

Chapter 3 — Instrument Operation

3-1 Introduction

This chapter provides a brief overview of the Anritsu MG362x1A signal generator real-time operation and to provide a starting point for making basic measurement setups. This chapter describes general instrument operation including setting frequency, power level, modulation, sweep applications, and system configurations.

- Power-on Display

During power-on, the following screen is displayed as shown in [Figure 3-1](#). The display shows the model number, software version installed, and the options installed. The progress bar displays the system power up and loading sequence status.

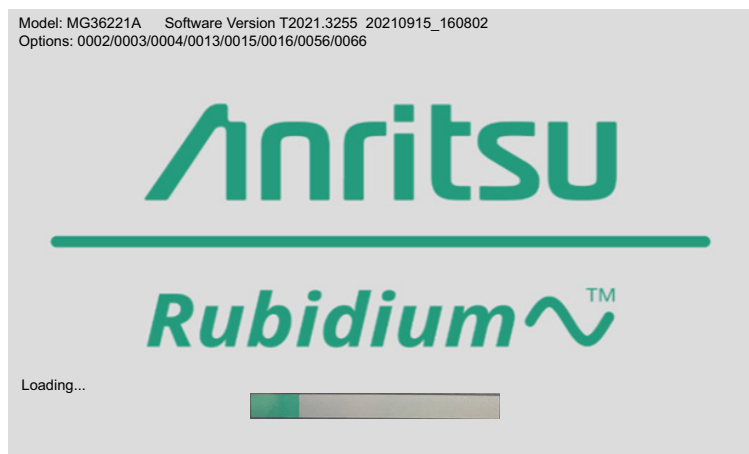


Figure 3-1. Startup Display Screen

3-2 Standby Mode

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 MG362x1A is placed back into operation.

Note

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

3-3 Self Testing the MG362x1A

The MG362x1A firmware includes internal diagnostics that self test the instrument. These self-test diagnostics perform a brief functionality test of most of the PCBs and other internal assemblies. For more on performing self test and viewing the results, see [Appendix D](#).

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.

3-4 Resetting to Default Parameters

Reset the MG362x1A 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 [“SETUPS” on page 3-99](#).

Factory Reset will delete the last saved settings, restore all the settings to their factory default values and will restart the signal generator.

To reset the signal generator:

Press: System Menu | SETTINGS | RESET | RESET ALL

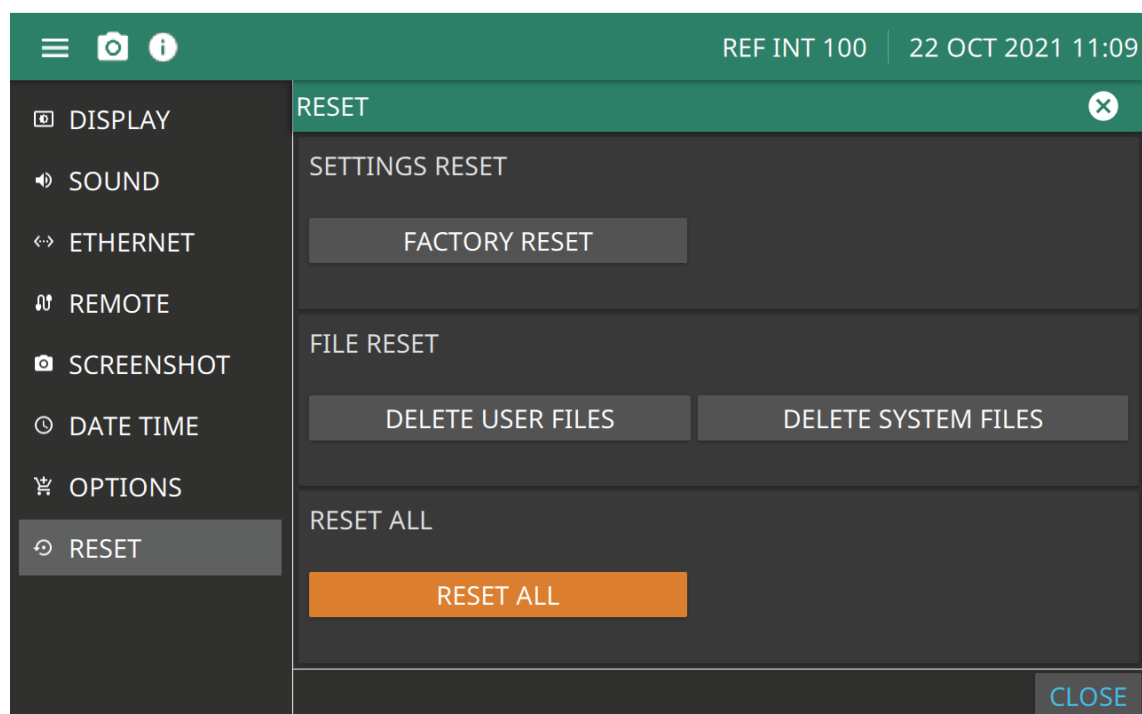


Figure 3-2. System Menu - Reset All

3-5 CW Frequency Operation

This section describes how to place the MG362x1A in the CW frequency mode, select a CW frequency, and power level for output.

Note When the signal generator is PRESET, it automatically powers up operating in CW frequency mode.

Refer to the following sections for FREQUENCY setting and operation.

- [“FREQUENCY Menu”](#)
- [“Phase Offset Menu” on page 3-5](#)
- [“PRESETS Menu” on page 3-10](#)

FREQUENCY Menu

The signal generator produces discrete CW frequencies across the frequency range of the instrument. The FREQUENCY menu is shown in [Figure 3-3](#). Refer to the following sections for FREQUENCY setting and operation.

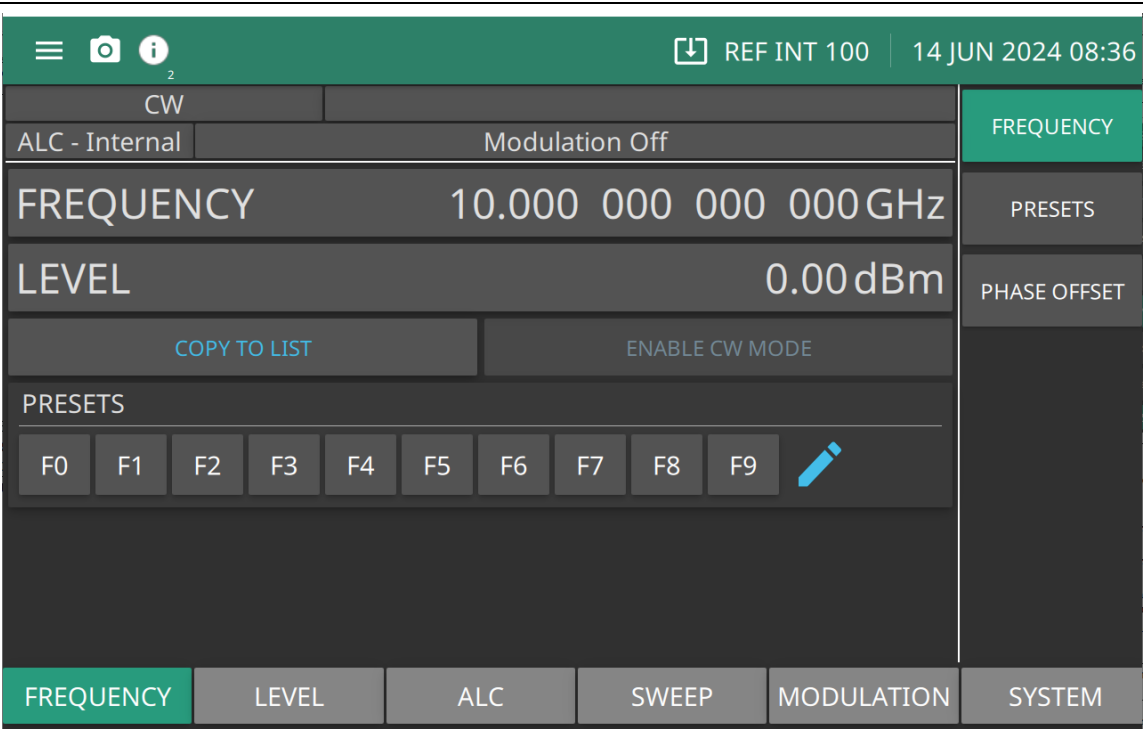


Figure 3-3. Frequency Menu

FREQUENCY: Press to type or edit a CW frequency.

MG36221A Frequency Range: 9kHz to 20.0 GHz
MG36241A Frequency Range: 9kHz to 43.5 GHz
MG36271A Frequency Range: 9kHz to 70.0 GHz

LEVEL: Press to type or edit a power level.

Range: –130 dBm to 33 dBm with step attenuator: –20 to 33 dBm without step attenuator

COPY TO LIST: Copies the set frequency and level parameters to the LIST menu. See [“COPY TO LIST” on page 3-56](#).

ENABLE CW MODE: When pressed, CW mode is enabled. If a sweep is in progress, pressing ENABLE CW MODE will stop the sweep and CW mode will be enabled.

PRESETS: Press to type or edit a CW Frequency in the Presets list. Press the pencil icon to edit an F0 - F9 preset frequency, or select the PRESETS menu from the right column of the Frequency menu. See the [“PRESETS Menu” on page 3-10](#).

Figure 3-3. Frequency Menu

Edit the CW Frequency

To select a CW frequency for output, edit the current frequency, enter a new frequency, or select one of the preset frequency parameters from the PRESET menu. To place the MG362x1A in the CW frequency mode, go to the main menu:

Press: FREQUENCY

The frequency edit window is displayed as shown in [Figure 3-4](#). Enter new CW frequency or edit the current CW frequency using the cursor control keys, the rotary data knob, or the front panel keypad and the appropriate terminator button. If a parameter was selected in error and no editing is required, click outside the active window or click a terminator to close.

Once a CW frequency has been entered into the field, press a terminator button and then press outside the entry window to show the frequency in the LCD display.

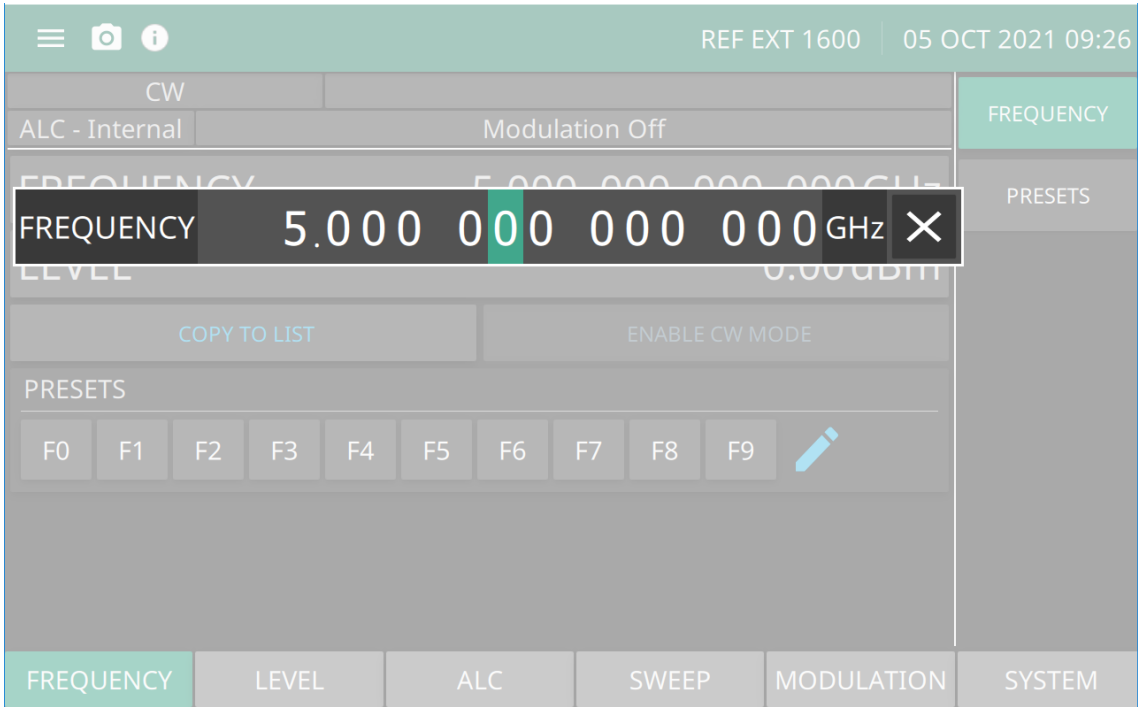
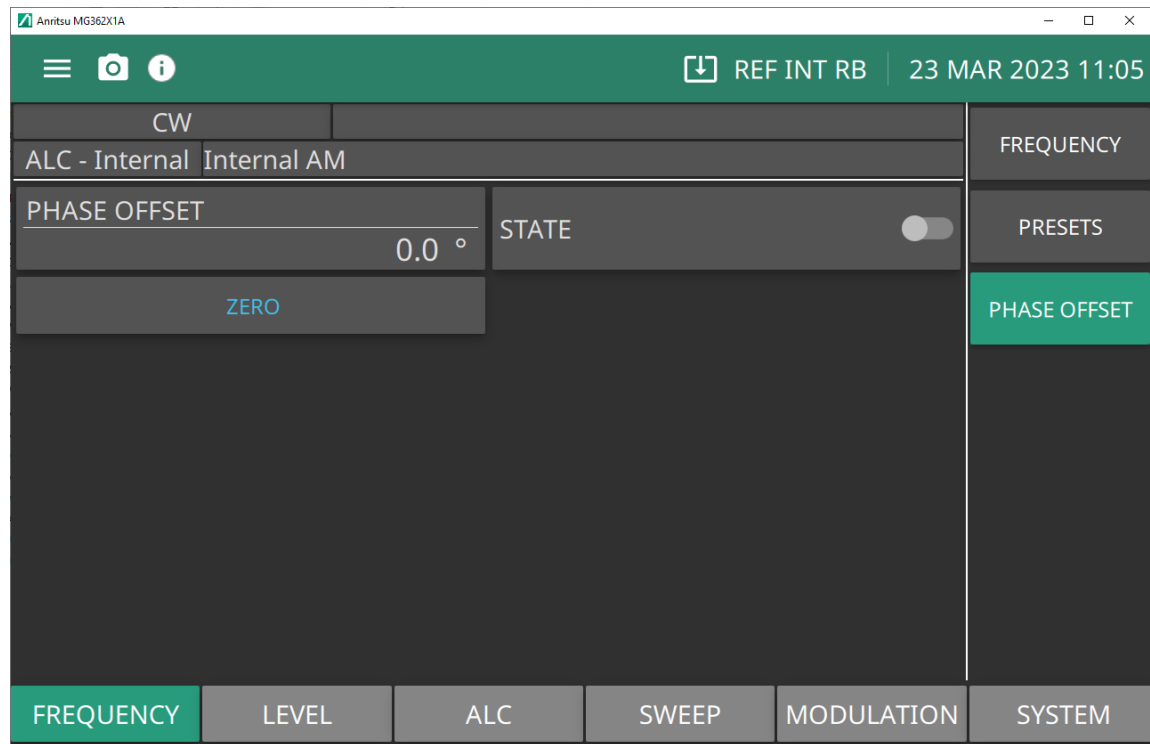


Figure 3-4. Frequency Entry

Phase Offset Menu

The Phase Offset menu is shown in [Figure 3-5](#). The phase offset function is available in CW operating mode only. When active, the MG362x1A RF output will be phase shifted by the specified amount displayed in the phase offset parameter. The phase offset range is -360° to +360° with a resolution of 0.1°. When the phase offset is on, the phase offset value is displayed in the CW menu. To zero the phase offset display from the phase offset menu, press Zero Display.



PHASE OFFSET: Set the phase offset range from -360 to 360°.

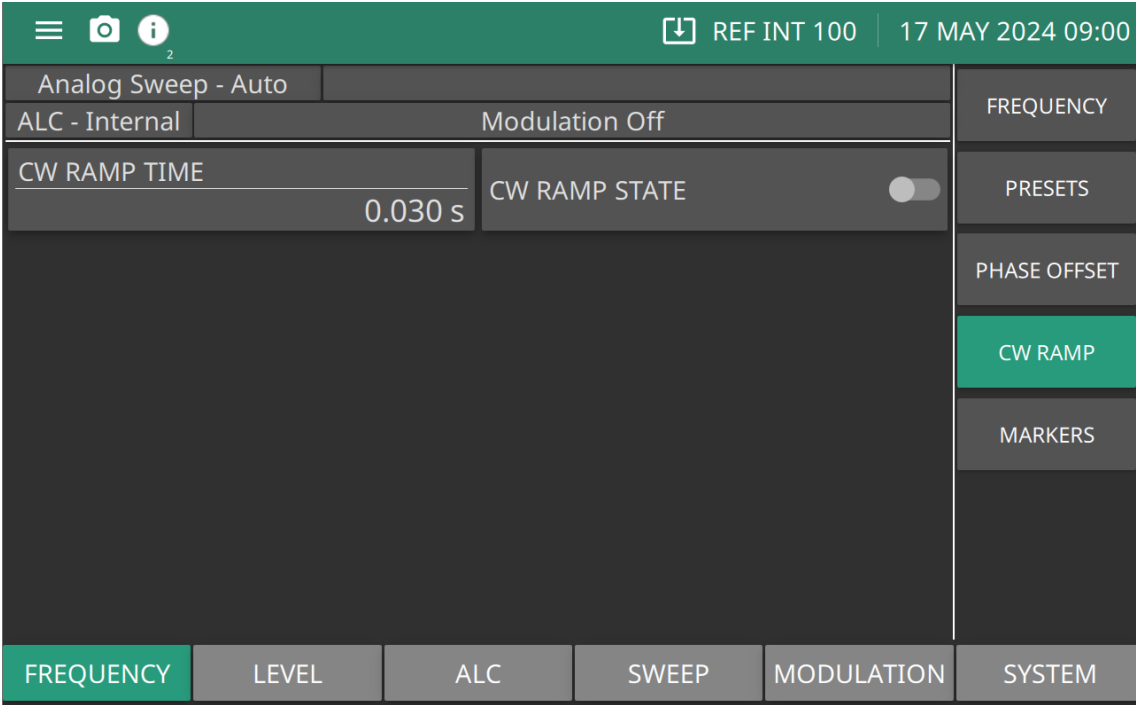
STATE: Set the phase offset to on or off.

ZERO: Set the phase offset to zero (0°).

Figure 3-5. PHASE OFFSET Menu

CW RAMP Menu

CW Ramp is available with Option 6. The CW ramp provides a repetitive 0V to 10V ramp output to the rear panel HORIZ OUT BNC connector and AUX I/O connector, pin 1. While the CW ramp is on, the message CW Ramp appears on the frequency title bar.



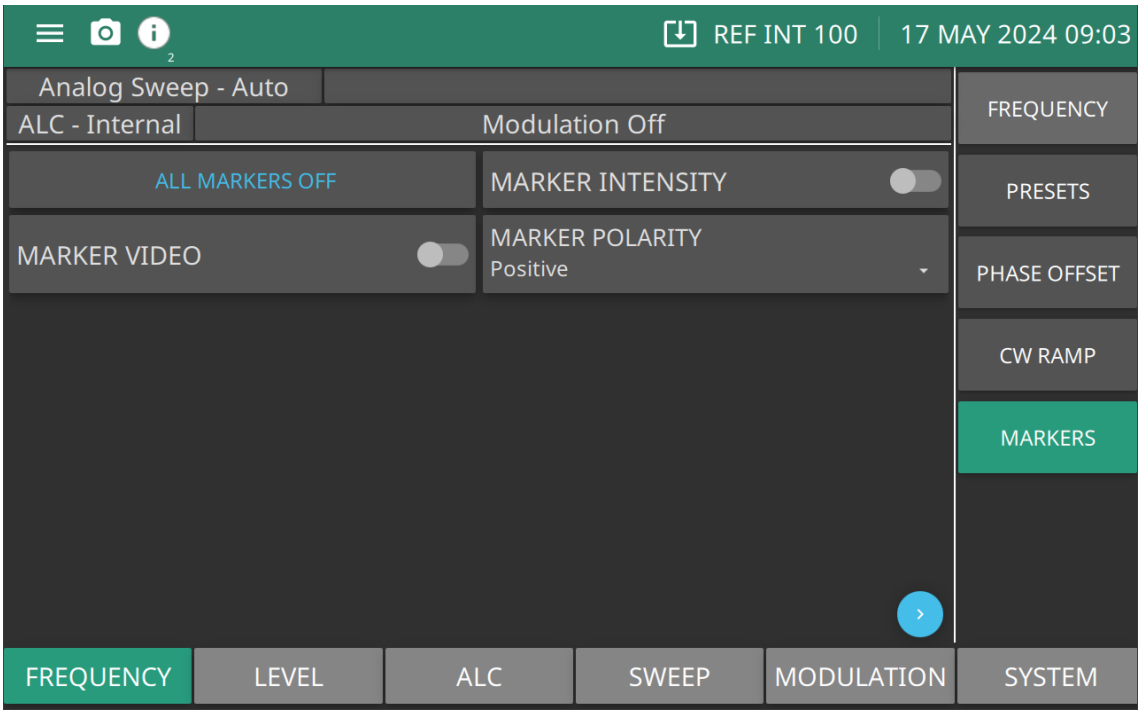
CW RAMP TIME: Range: Set from 0.03 seconds to 99 seconds.

CW RAMP STATE: Switch to the on position to activate the CW Ramp.

Figure 3-6. CW RAMP Menu

Markers Menu

Markers are available with Option 6. The signal generator provides ten independent, pre-settable markers, M0-M9, that can be used in the step sweep and analog frequency mode for precise frequency identification. Marker frequency accuracy is the same as sweep frequency accuracy. The markers are visible on a monitor display.



- ALL MARKERS OFF:** Press to turn off all markers.
- MARKER INTENSITY:** Produces an intensified dot on the display at each marker frequency. They are obtained by a momentary dwell in the sweep at each marker frequency. Intensity markers are only available in the analog sweep frequency mode at sweep times of < 1 second. To output markers during a sweep you must first select (tag) the marker frequencies.
- MARKER VIDEO:** Produces a pulse on the display at each marker frequency.
- MARKER POLARITY:** Provides the a +5 V or a –5 V pulse. Set polarity as shown in [Figure 3-8](#).

Figure 3-7. MARKERS Menu

Marker Polarity

Press MARKER POLARITY and then press Positive or Negative to set the markers polarity on the signal display as positive or negative. All active markers on the display are set.

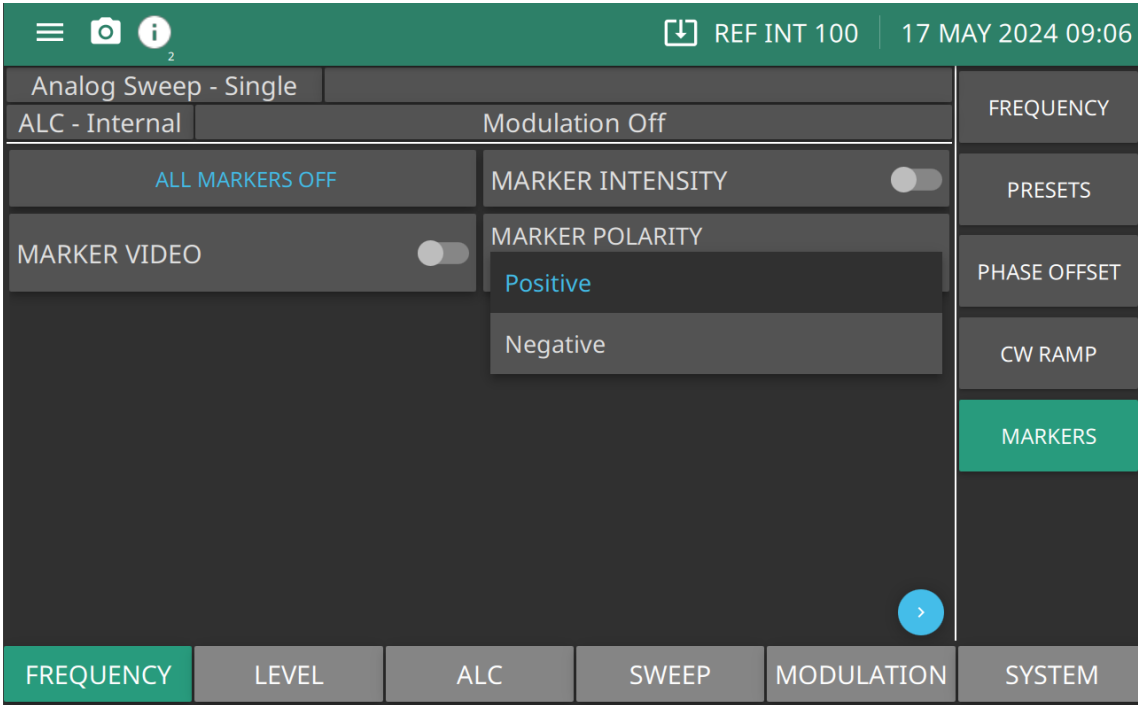


Figure 3-8. MARKER POLARITY

SET MARKERS

Use the blue arrows as shown in [Figure 3-8](#) to scroll the page to the right. There are totally 10 markers available. Press M(x) toggle to turn on the marker and enter a desired frequency to set the marker frequency. Turn on the desired marker toggle to see the marker. Press the “Page Arrow” button on the right as shown in [Figure 3-9](#) to scroll to the page to the right, to view markers M6 through M9 as shown in [Figure 3-10](#).

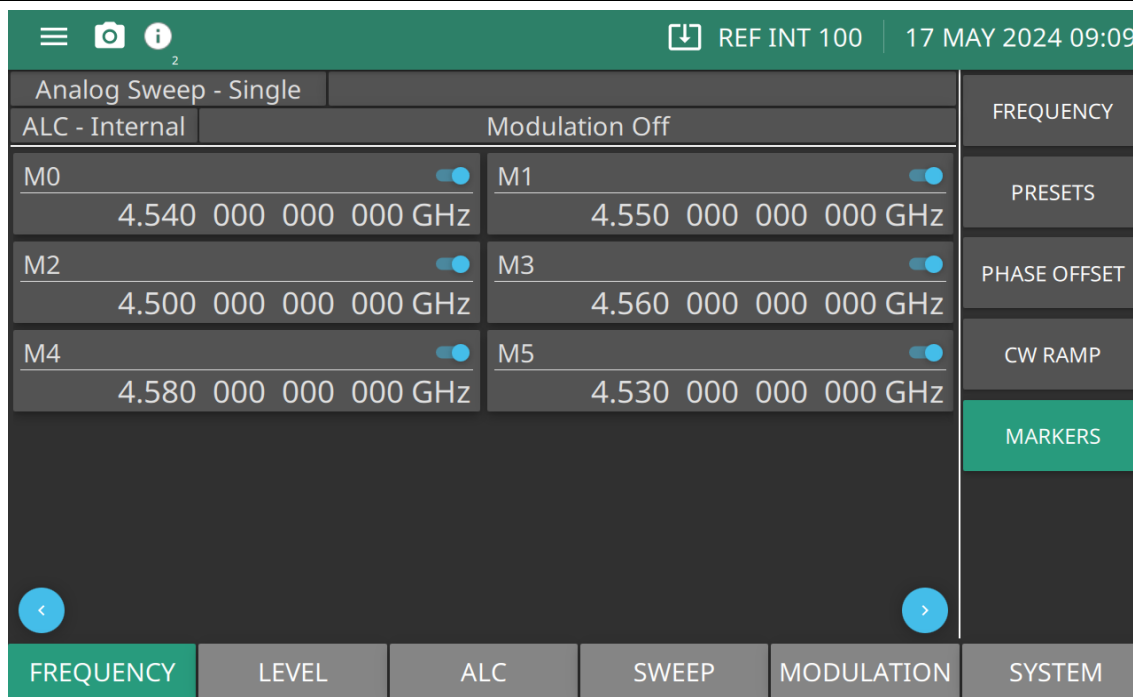


Figure 3-9. Markers - M0 to M5

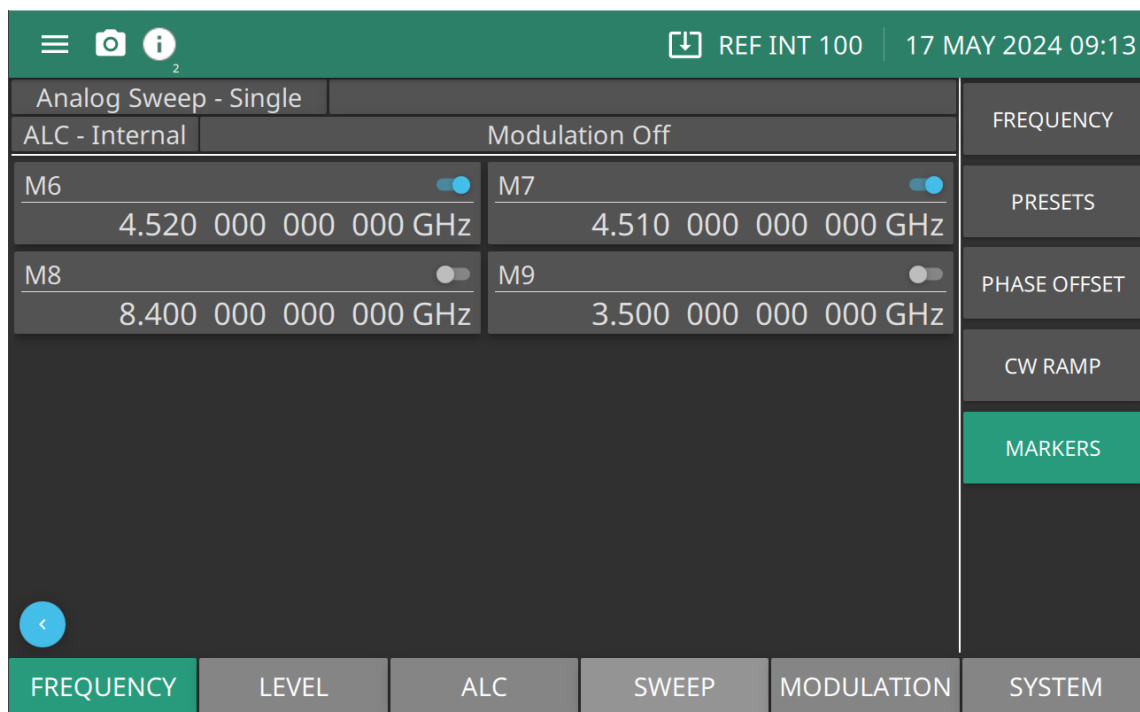
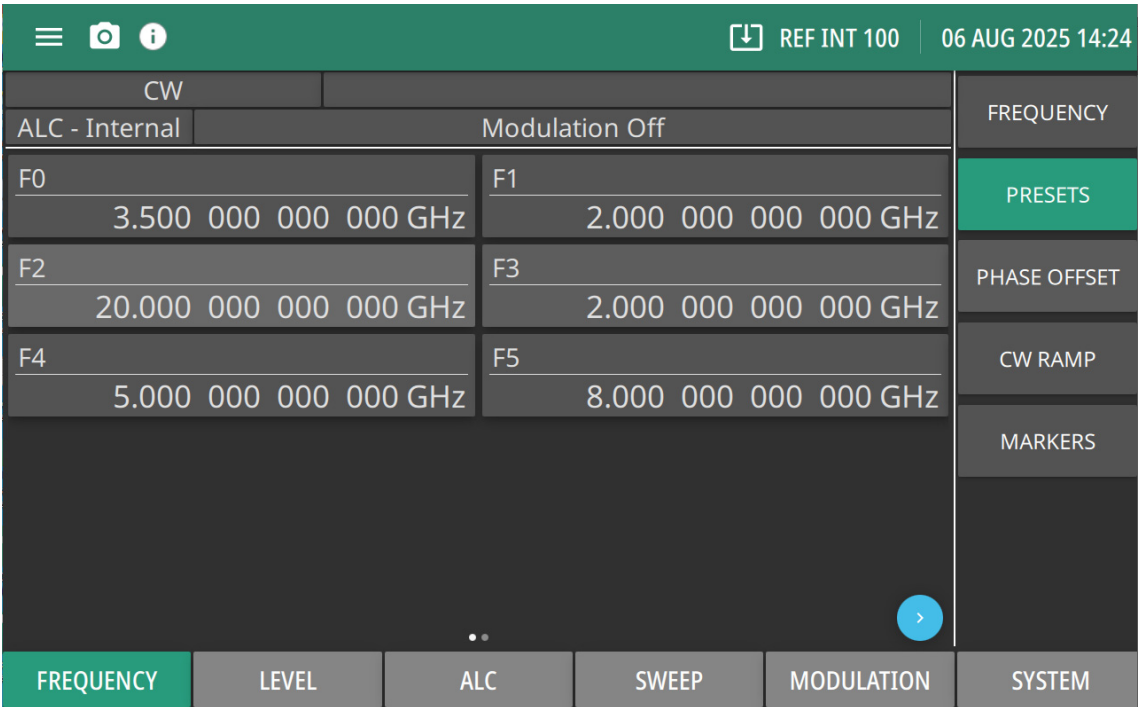


Figure 3-10. Markers - M6 to M9

PRESETS Menu

To select one of the preset frequencies for output, press the PRESETS button in the Frequency menu shown in [Figure 3-11](#).

Press: FREQUENCY | PRESETS



F0-F5: The first page displays the F0-F5 frequencies. Press the “[Page Arrow](#)” button to display the F6 - F9 frequencies as shown in [Figure 3-12](#). Each preset frequency can be adjusted and set as an output CW frequency.

Figure 3-11. PRESETS - F0 to F5

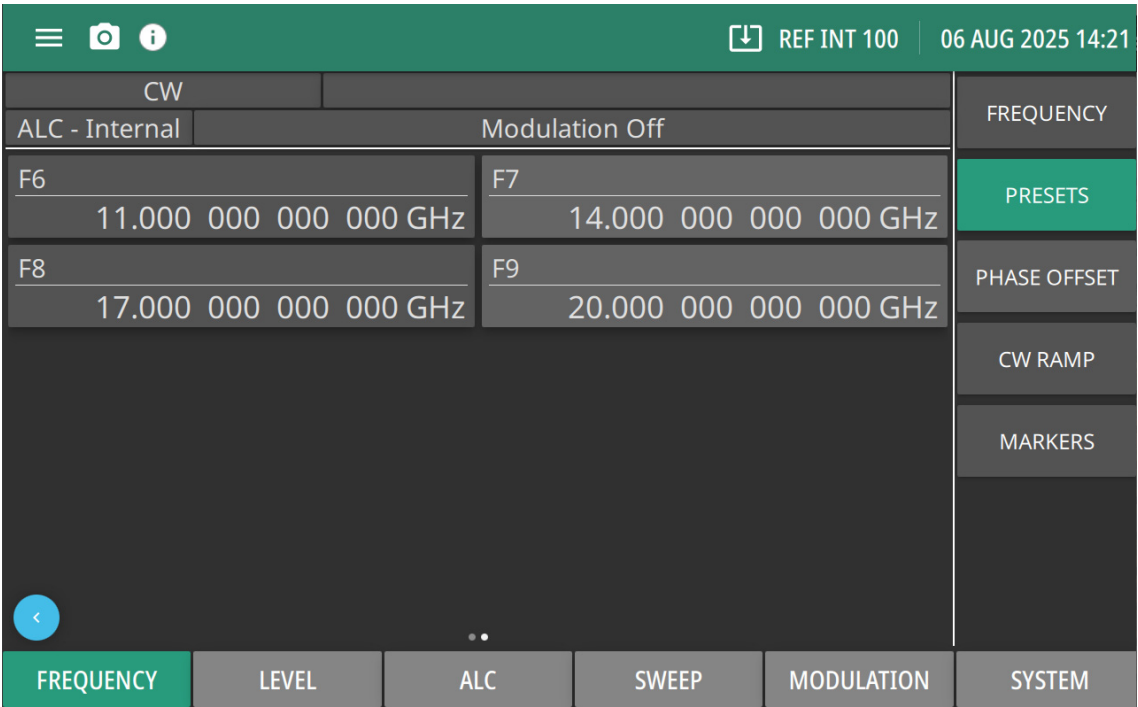


Figure 3-12. PRESETS - F6 to F9

Selecting Preset Frequency

Pressing a preset frequency will display that frequency in the main menu. For example, pressing F3 will display 2.2 GHz as the CW frequency in the FREQUENCY menu.

Editing Preset Frequency

Press a preset frequency and edit the same as described in [“Edit the CW Frequency” on page 3-4](#). The parameter can be edited and closed. Only one parameter can be edited at a time.

3-6 Power Level Operation

The following paragraphs describe how to place the signal generator in fixed (non-swept) power level mode, select a power level for output, and activate level offset. Power level operations can consist of a single CW power level change, swept power level changes, to an 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 from the level setting.

You can select the ALC mode of operation as 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.

Refer to the following sections for the level setting menus.

- “LEVEL SETUP Menu” on page 3-14
- “LEVEL PRESETS Menu” on page 3-17
- “LEVEL OFFSET Menu” on page 3-22
- “ATTENUATOR Menu” on page 3-24

LEVEL Menu

RF Power Level parameters can be set and applied to CW frequencies and Swept Frequencies. From the main menu press LEVEL to view level menu parameters as shown in [Figure 3-13](#).

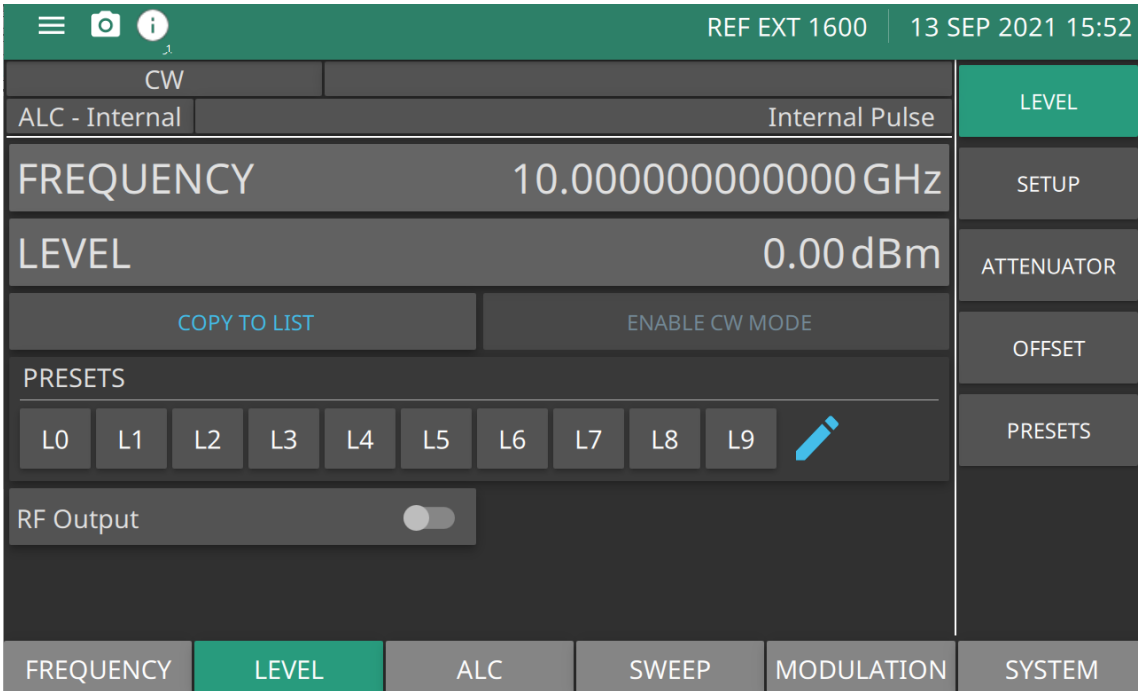


Figure 3-13. Level Menu

- LEVEL:** Press to edit the power level. Range is -130 dBm to 33 dBm with Option 2. Range is -20 to 33 dBm without Option 2.
- FREQUENCY:** Press to edit the CW frequency. Range is same as described in [Figure 3-47 on page 3-43](#).
- COPY TO LIST:** Copies the set frequency and level parameters to the LIST menu. See [“COPY TO LIST” on page 3-56](#).
- ENABLE CW MODE:** To enable this button turn on the corresponding sweep toggle of the Sweep menu parameters, see [“Frequency Sweep Operation” on page 3-42](#) for more information. Press to stop a sweep. When pressed, CW mode is enabled.
- PRESETS:** Press to edit a LEVEL in the Presets list. Press the pencil icon to edit an F0 - F9 preset level. See the [“LEVEL PRESETS Menu” on page 3-17](#).
- RF OUTPUT:** Toggle to turn RF on or Off.

Figure 3-13. Level Menu

Editing CW Power Level

To select a CW power level for output, edit the current power level, enter a new power level, or select one of the preset level parameters from the PRESET menu. Set MG362x1A in the CW level mode from the main menu:

Press: FREQUENCY | LEVEL

or

Press: LEVEL | LEVEL

Press the LEVEL field in the display. The edit window is displayed as shown in [Figure 3-14](#). Enter and new CW power level or edit the current power level using the cursor control keys, the rotary data knob, or the front panel keypad and the appropriate terminator button. If a parameter was selected in error and no editing is required, click outside the active window or click a terminator to close.

Once a CW power level has been entered into the field, press a terminator button and then press outside the edit window to show the power level in the LCD display as shown in [Figure 3-14](#).

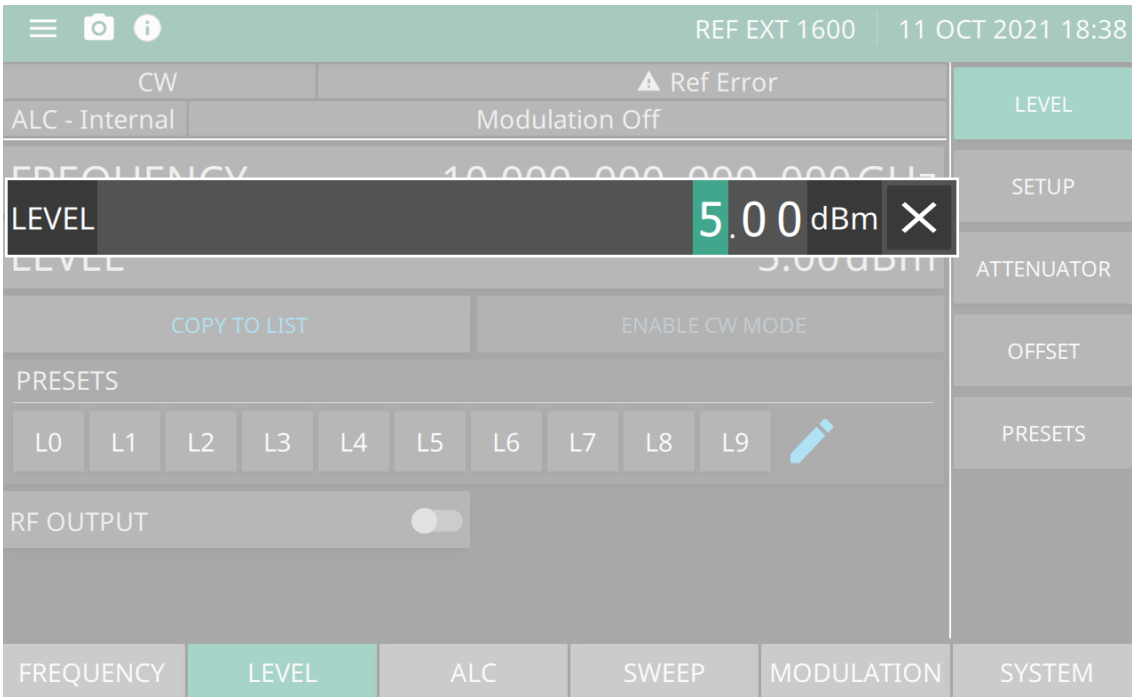


Figure 3-14. Power Level Entry

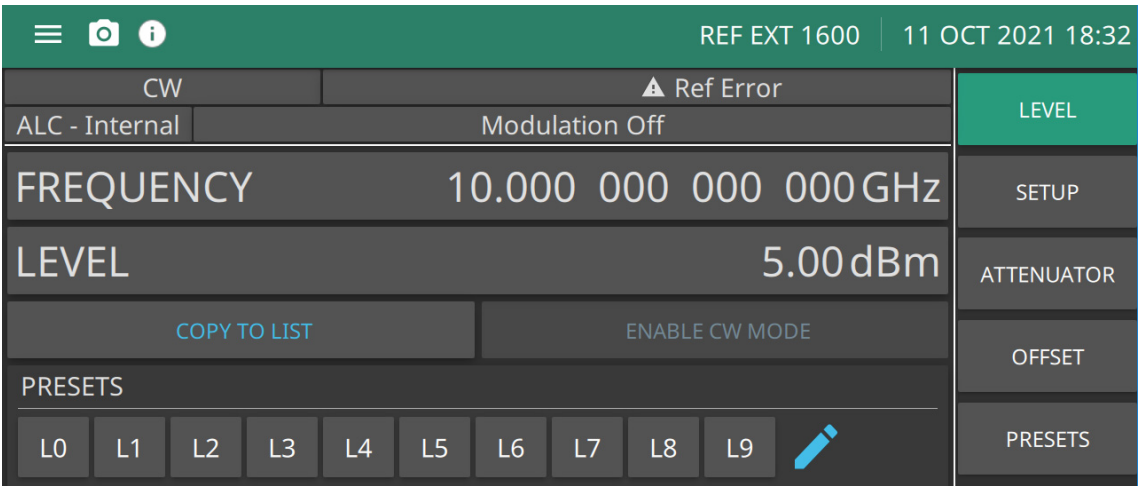


Figure 3-15. Power Level Entered

LEVEL SETUP Menu

The SETUP menu is shown in Figure 3-16.

Press: LEVEL | SETUP.

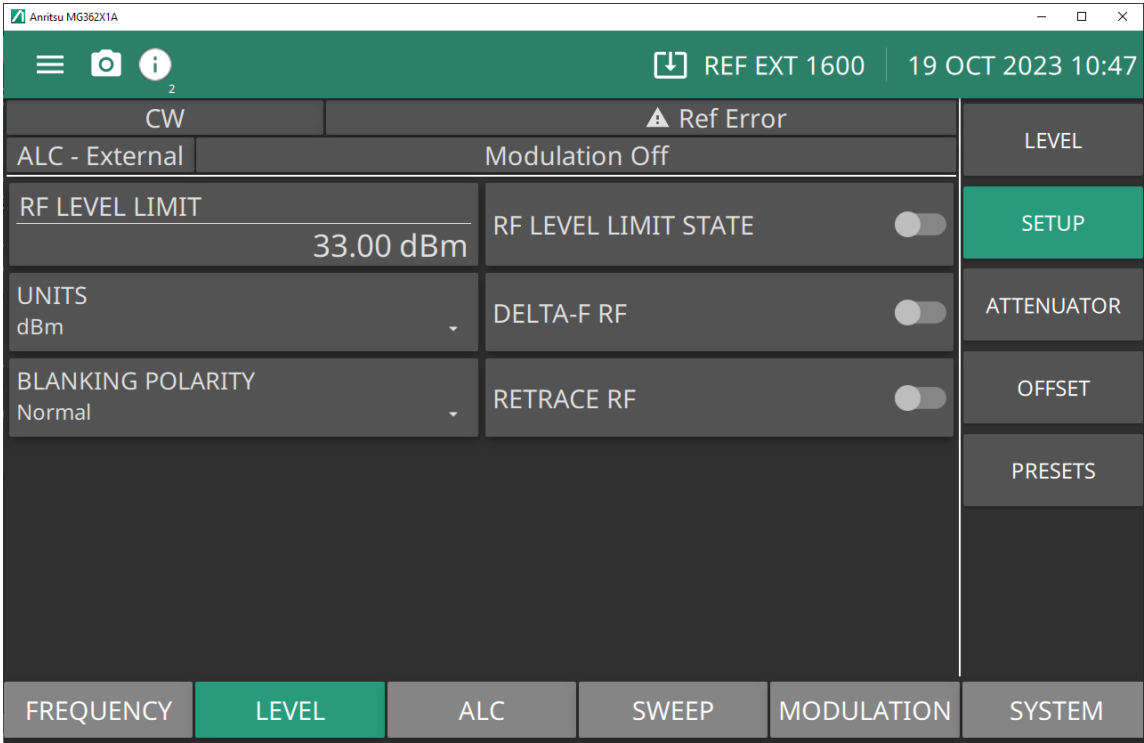


Figure 3-16. LEVEL SETUP Menu

RF LEVEL LIMIT: Sets the maximum power level when level limit state is enabled. Range is -130 dBm to 33 dBm with Option 2. Range is -20 to 33 dBm without Option 2.

RF LEVEL LIMIT STATE: When ON, the level status area displays “Limit” or “Lim”.

UNITS: Level units, select dBm, dBμV, mV.

DELTA-F RF: Toggle that controls RF On or Off during frequency switching in CW, Step sweep, and List sweep modes. Toggle Retrace RF Output protection On turns Delta-F RF Off.

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

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

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

RETRACE RF: Controls the RF output On/Off during retraces. Toggling retrace RF Output protection On turns RF Off during retrace.

Figure 3-16. LEVEL SETUP Menu

Setting RF LEVEL LIMIT

RF LEVEL LIMIT sets the maximum power level when RF Level Limit State is enabled. The RF limit shown in [Figure 3-17](#) shows the RF Limit Level State toggled on and the maximum achievable RF power level limit clamped to +5 dBm. In this example, the power level settings may be entered at a higher power level value, but the power output will remain at +5dBm until the RF Level Limit State is toggled off.

Press: LEVEL | SETUP | RF LEVEL LIMIT

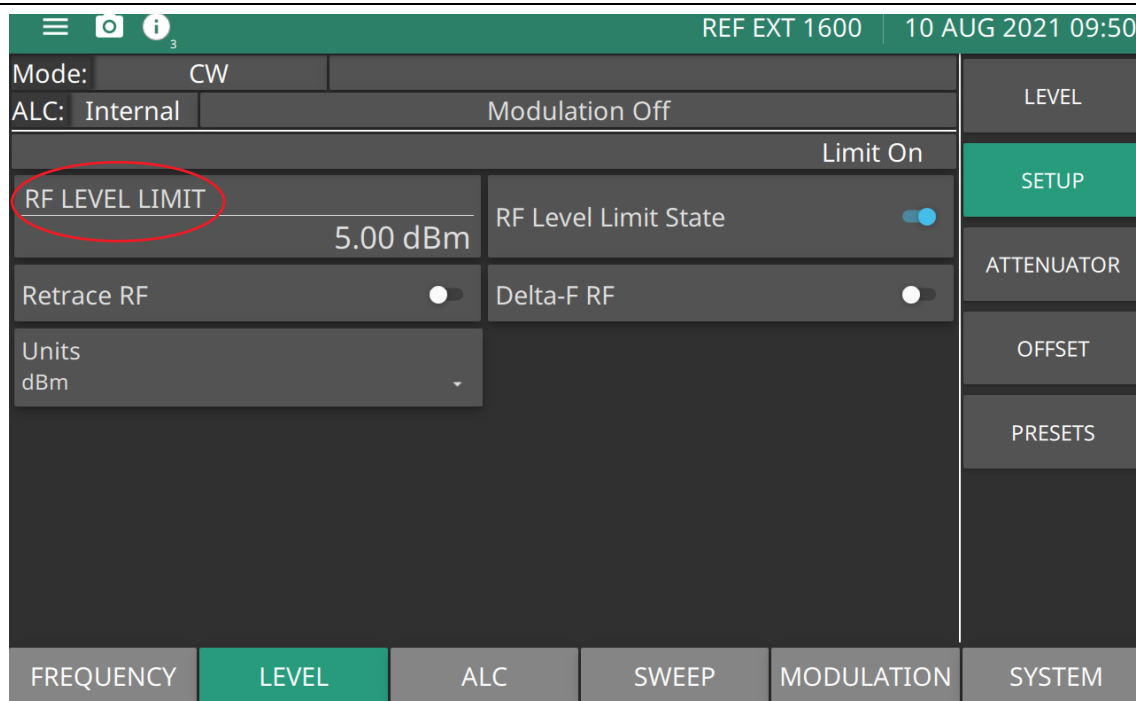


Figure 3-17. RF Level Limit State

Setting Retrace RF

Switch Retrace RF to ON sets the RF output off during sweep retrace.

Switch Retrace RF to OFF sets the RF output on.

Setting Delta-F RF

Switch Delta-F RF to select RF on or off during frequency switching in CW, step sweep, and list sweep modes.

Units

Press Units to show the power level units as shown in [Figure 3-18](#). When SWEEP TYPE Log as described in [“”](#) on [page 3-48](#) is selected, the units are displayed in dBm or dBμV. When SWEEP TYPE Linear is selected, the units are displayed in mV. The units are displayed with the indicated power level.

Press: LEVEL | Units

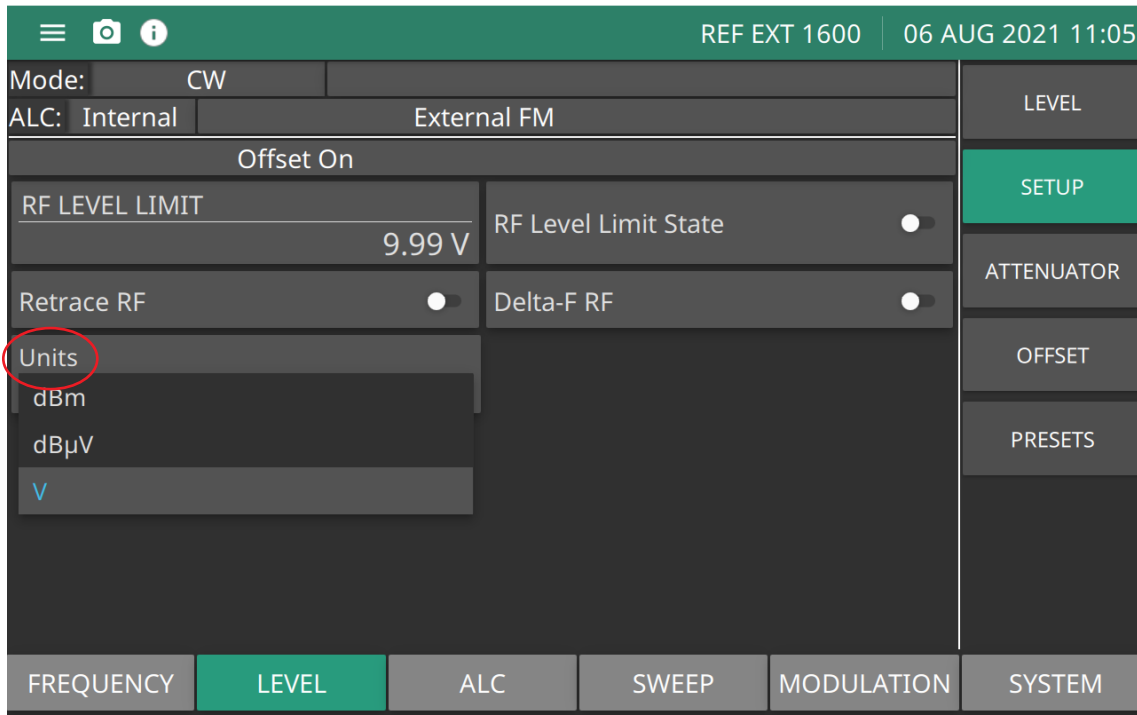
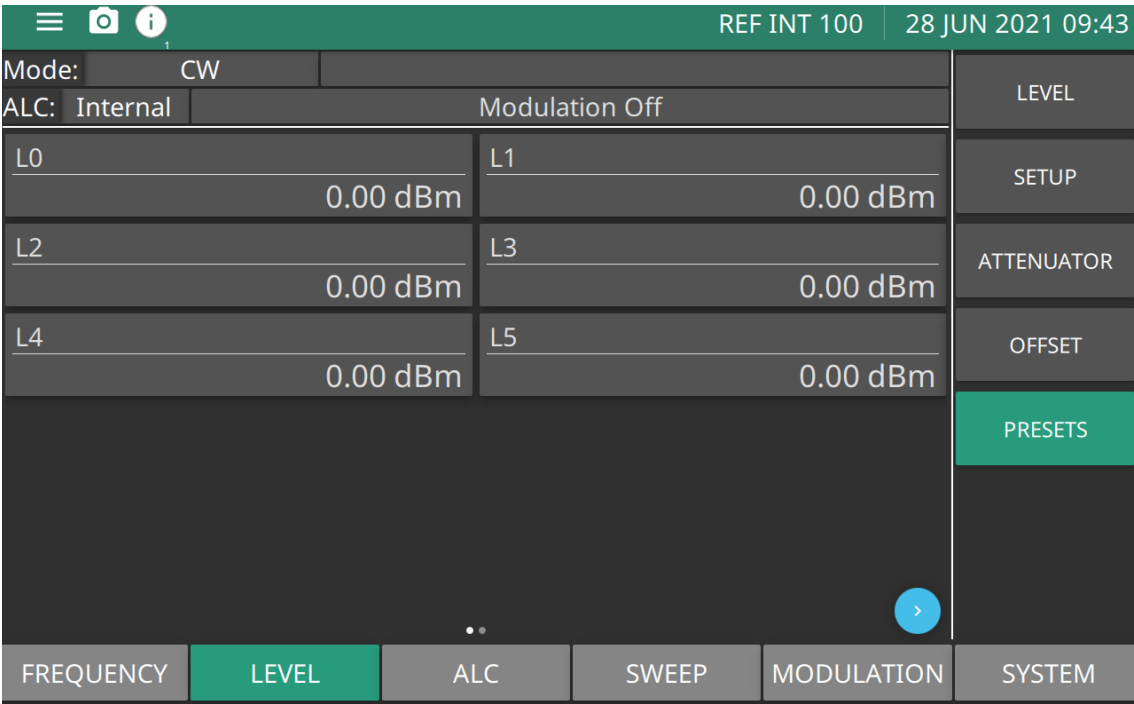


Figure 3-18. LEVEL SETUP Units Menu

LEVEL PRESETS Menu

The PRESETS menu provides ten selectable power levels. The Preset menu is shown in [Figure 3-19](#). Page one shows the L0 through L5 settings. Press the page arrow button to show page two and L6 through L9 as shown in [Figure 3-20](#). Press each power setting to edit.

Press: LEVEL | PRESETS



L0 - L5: Press or scroll to select and edit from ten power level parameters, L0 to L9. Six selectable power levels L0 L5 are available to edit on the first page.

Figure 3-19. PRESETS Menu - L0 to L5



L8 - L9: Press the page arrow button in the bottom right to view the remaining four power levels L6-L9.

Figure 3-20. PRESETS Menu - L6 to L9

Setting Fixed Power

There are two ways to set the MG362x1A in a fixed power level mode.

- 1. From the main menu:
 - a. Press FREQUENCY. The Frequency menu is displayed as shown in [Figure 3-21](#).
 - b. Press LEVEL.
 - c. Edit the power level parameter as described in [“Editing the Power Level” on page 3-20](#).

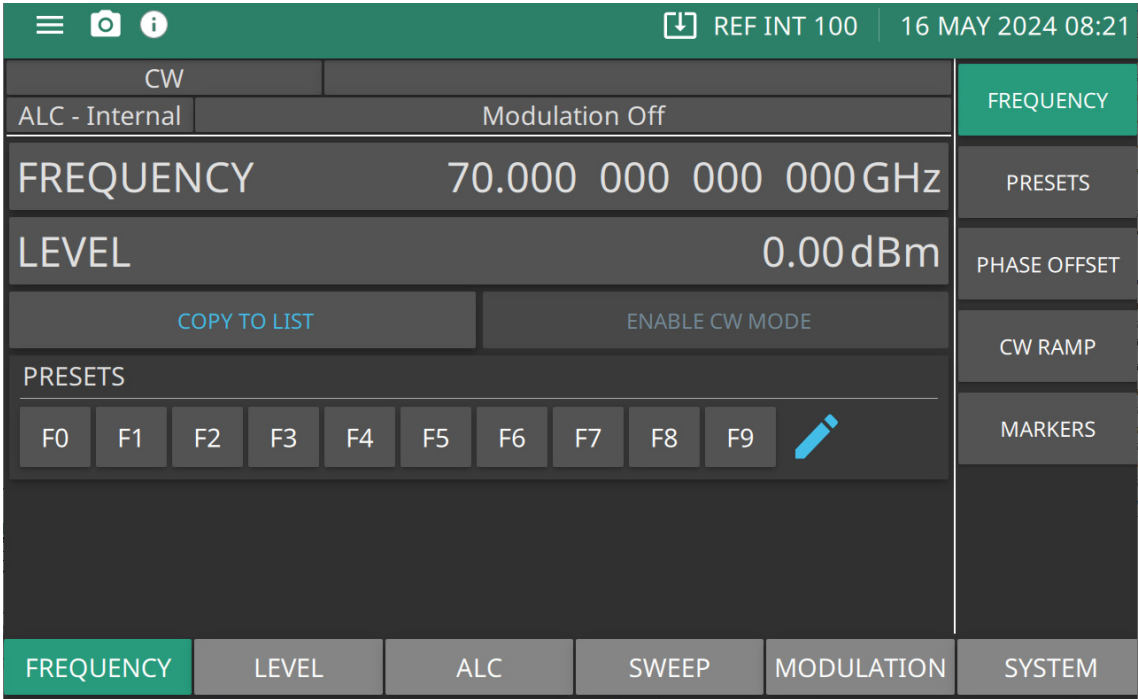


Figure 3-21. FREQUENCY Menu

- 2. From the main menu:
 - a. Press LEVEL. The Level menu is displayed as shown in [Figure 3-22](#).
 - b. Edit the power level parameter as described below in [“Editing the Power Level”](#).

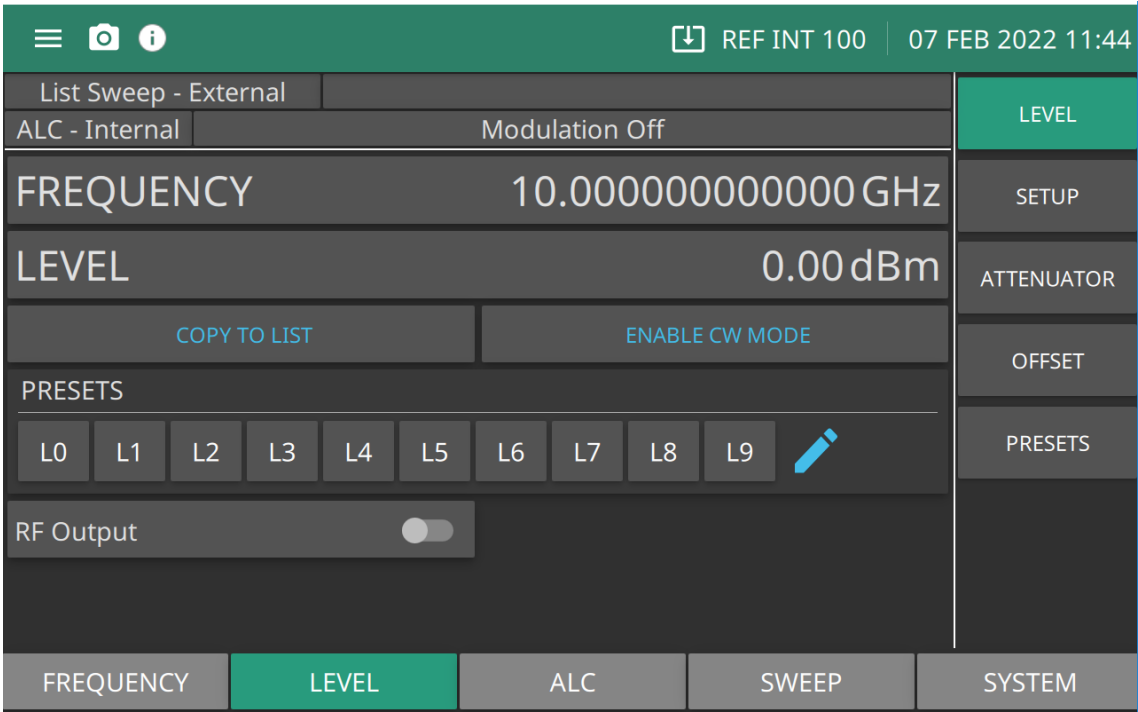


Figure 3-22. LEVEL Menu

Editing the Power Level

Press the LEVEL button to display the power level edit window. Edit the value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key.

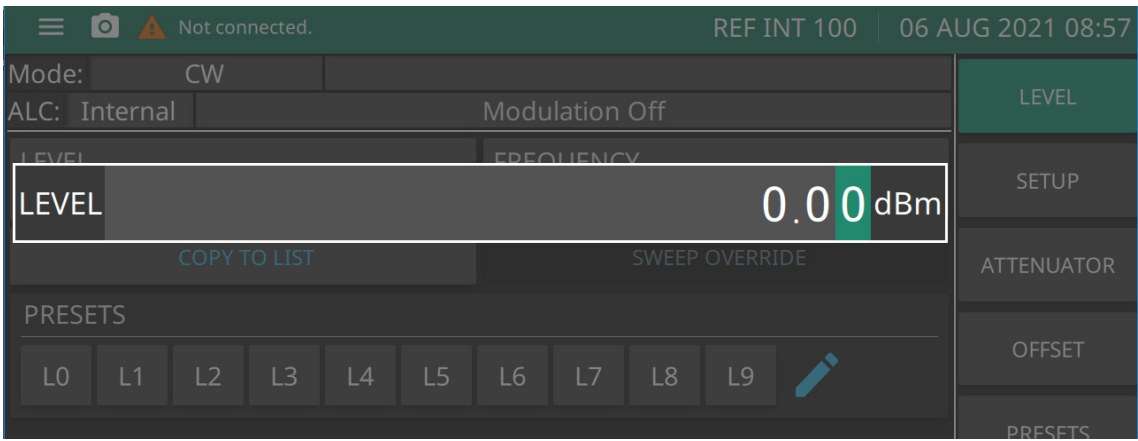


Figure 3-23. Edit Level Parameter

Setting a Preset Power Level

The PRESETS menu provides access to the level list menu.

Press: LEVEL | PRESETS

The PRESETS menu is displayed as shown in [Figure 3-24](#). Select one of the preset power levels L0 through L9. Edit any power level to set as the output power level.

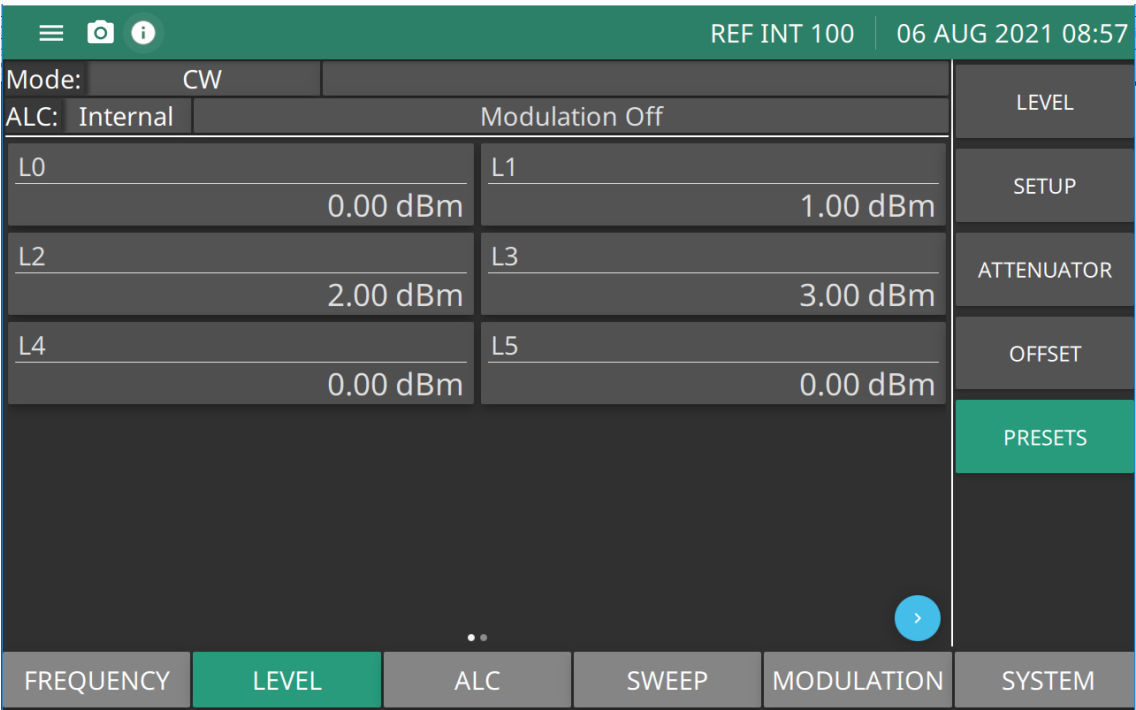
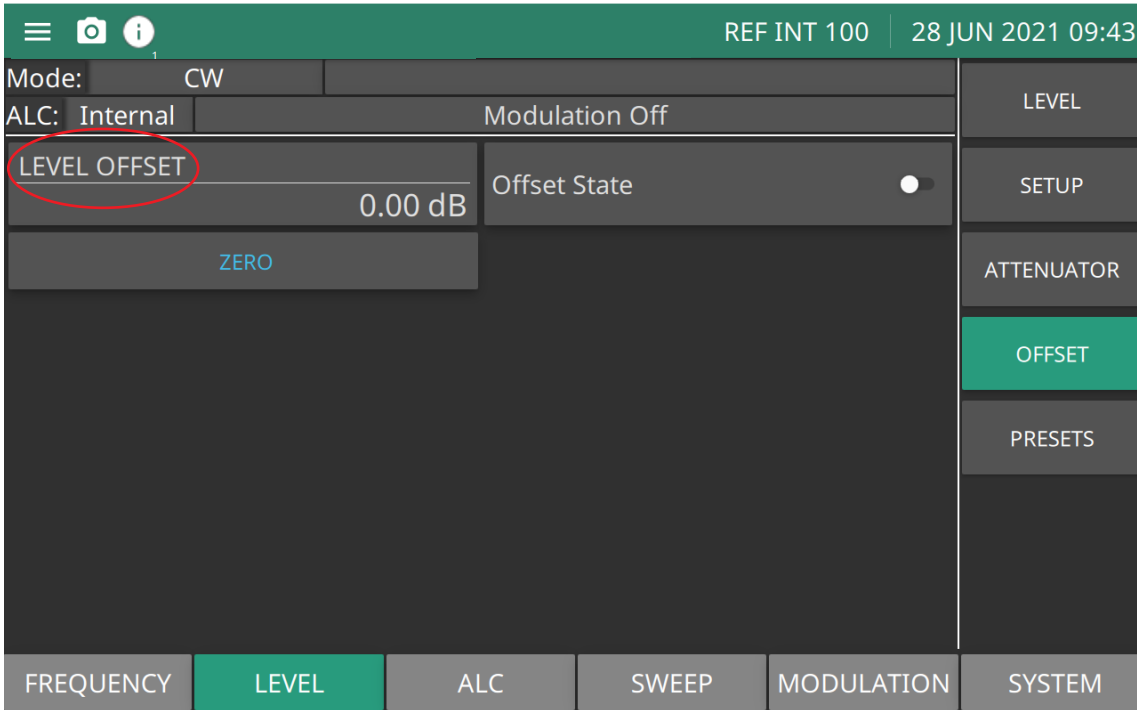


Figure 3-24. Level PRESETS Menu

LEVEL OFFSET Menu

The Level OFFSET menu provides a means to compensate for a test device on the signal generator's RF output at a 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 MG362x1A 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. The OFFSET menu provides power level adjustment for a device on the signal generator's output. The Offset menu is shown in [Figure 3-25](#).

Press: LEVEL | OFFSET



LEVEL OFFSET: The level offset parameter adjusts the displayed output level of the instrument. It does not affect the actual output level. Output level offset range: –100 dB to 100 dB

Offset State: Level offset state On/Off. Allows the user to turn on/off the offset without having to change the offset parameter.

ZERO: Set offset to zero.

Figure 3-25. OFFSET Menu

Edit the Offset Value

Enter an offset value and apply it to the displayed power level.

Press: LEVEL | OFFSET

Then press the LEVEL OFFSET parameter button. This opens the offset parameter for editing as shown in [Figure 3-26](#).

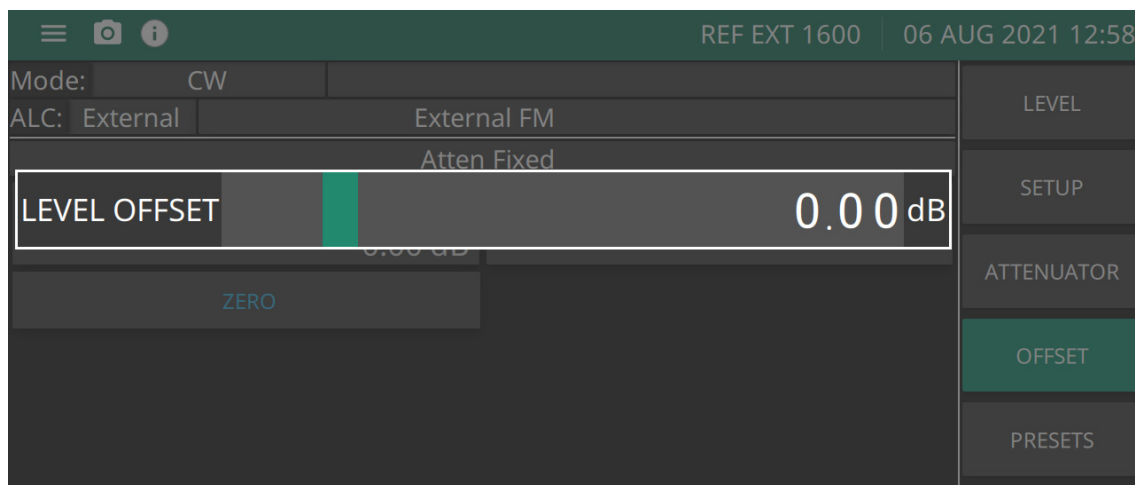


Figure 3-26. Edit Level Offset

Edit the current offset value using the cursor control keys, rotary data knob, or enter a new offset value using the keypad and appropriate termination soft key. Switch the Offset State on to apply the offset to the displayed power level. When Offset State is selected on, the message Offset On is displayed on the menu bar to remind you that a constant offset has been applied to the displayed power level as shown in [Figure 3-27](#).

Press ZERO to set the level offset to zero.

Press Offset State again to switch offset off. The Offset On message will disappear from menu bar.

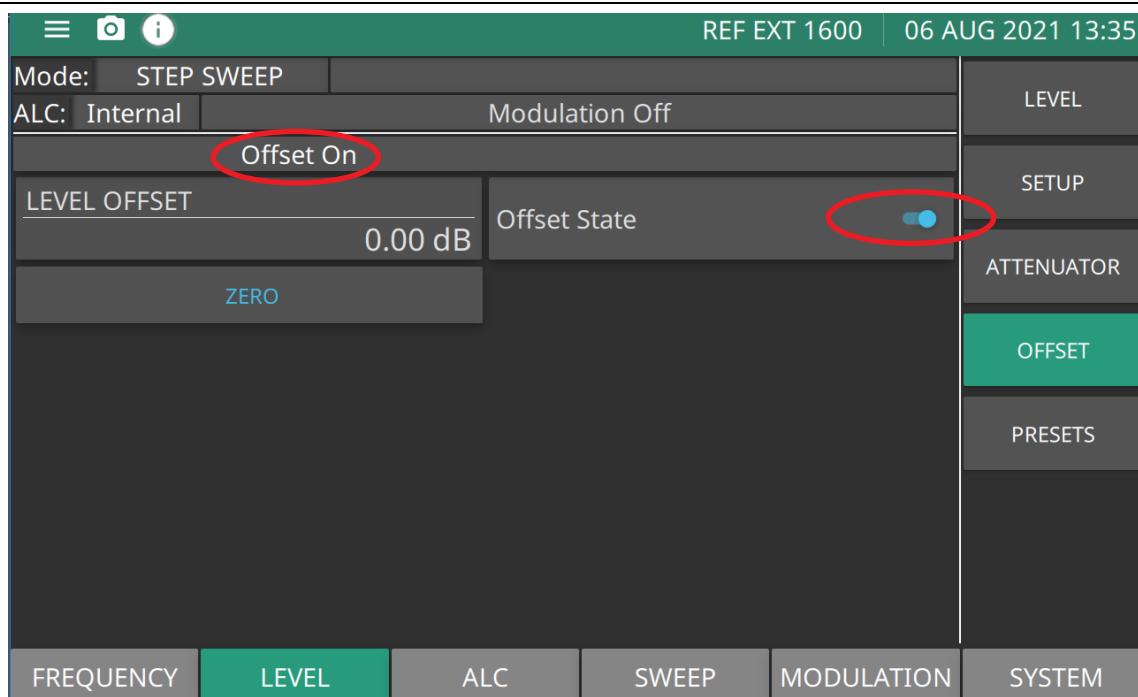


Figure 3-27. Level Offset On

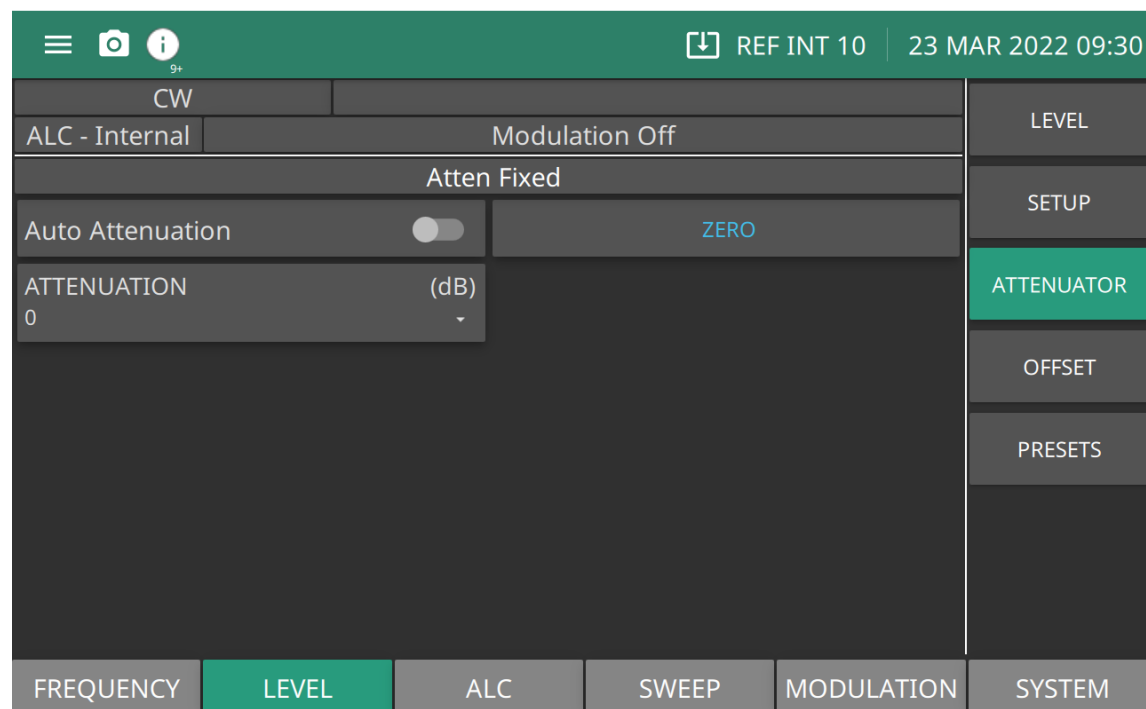
Step Attenuator (Option 2)

With step attenuators, the ALC and attenuator work in conjunction to provide leveled output power up to -110 dB. 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.

ATTENUATOR Menu

In MG362x1A signal generators equipped with Option 2 step attenuators, the ALC and attenuator work in conjunction to provide a leveled output power range of -130 dB. The ATTENUATOR menu is shown in [Figure 3-28](#). For more on power leveling and step attenuator settings, see “Power Level Operation” on [page 3-12](#).

Press: LEVEL | ATTENUATOR



Auto Attenuation: Toggles between coupled and decoupled attenuation mode. Turning on the toggle couples the step attenuator to the ALC system; setting off decouples the step attenuator from the ALC system. Notice that Atten Fixed status is displayed on the top as shown in Figure 3-28 when Auto Attenuation toggle is turned off.

ATTENUATION: Applies only to instruments equipped with an internal step attenuator Option 2. The attenuation drop-down is enabled only when the Auto Attenuation toggle is turned off. The step attenuator can be set in 10 dB increments.

ZERO: Set the attenuation to 0 dB. Only available in decoupled attenuation state achieved by turning off the Auto Attenuation toggle.

Figure 3-28. ATTENUATOR Menu

Decoupling the Attenuator

The signal generator provides a decouple function that allows decoupling of the step attenuator (if equipped) from the ALC system and a user level (flatness correction) calibration function that provides compensation for path-variations-with-frequency in a test setup. This menu provides a means to decouple the step attenuator from the ALC and set the attenuation in 10 dB steps.

Toggle the Auto Attenuation button to the off position as shown in [Figure 3-29](#). This allows the attenuator to become decoupled.

Press: LEVEL | ATTENUATOR | Auto Attenuation

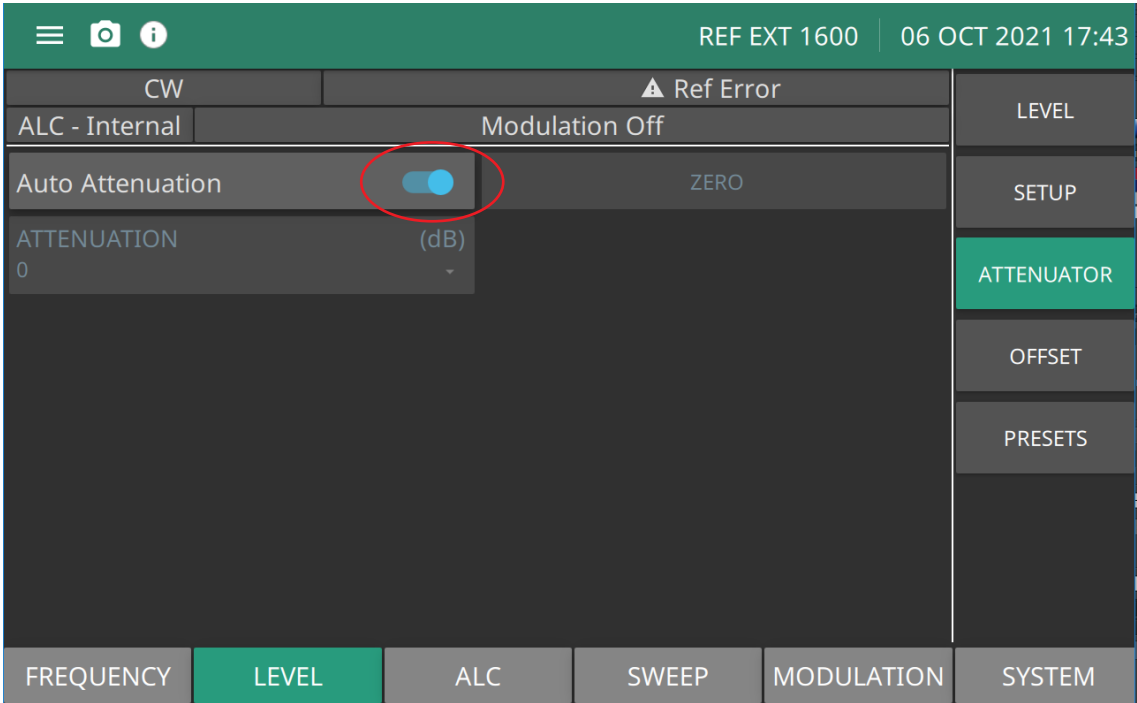


Figure 3-29. Attenuator Menu

Auto Attenuation

With AUTO ATTENUATION toggled on,
Press: ATTENUATION to display the decouple dialog of 10 dB steps to decouple the step attenuator in:
(10, 20, 30, 40, 50, 60, 70, 80, 90, or 100 dB) as shown in [Figure 3-30](#). Press the attenuation step to engage.
Press: LEVEL | ATTENUATOR | Auto Attenuation

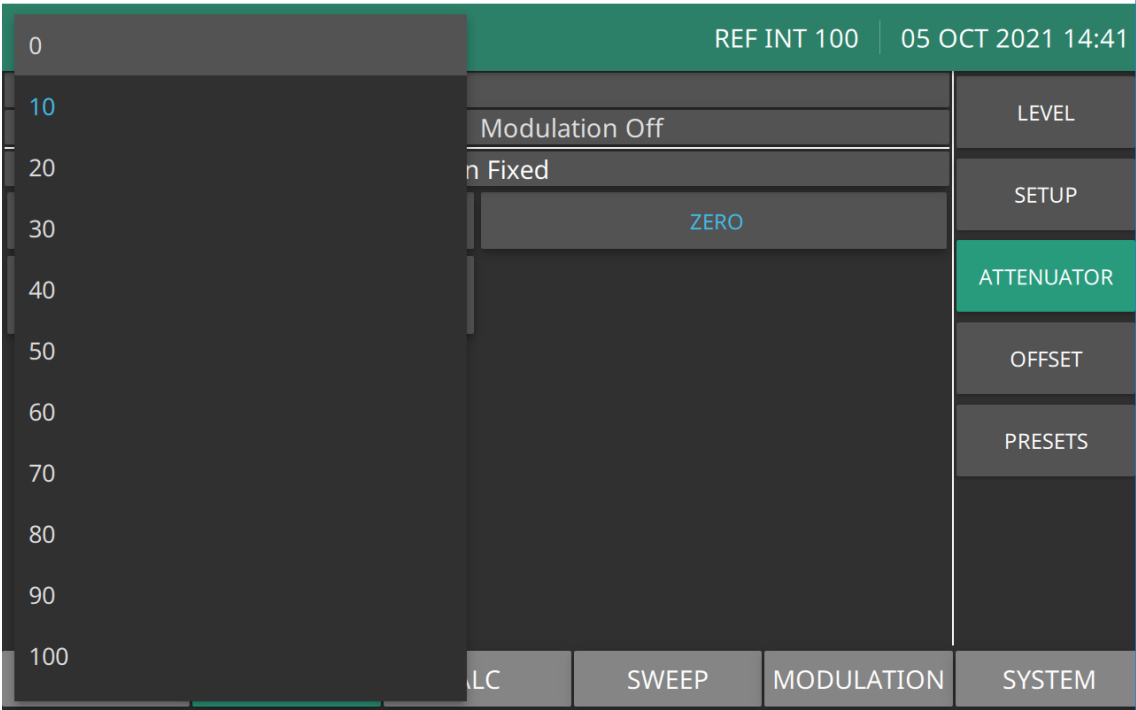


Figure 3-30. Attenuation Ranges

ZERO Menu

Press ZERO to couple the step attenuator to 0 dBm. When in a decoupled mode, pressing ZERO will set the step attenuator to 0 dBm. In this state, the signal generator can scroll linearly through the full range of available power.

3-7 Setting the ALC Control

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

This menu provides manual setting of the ALC Range for External Closed and Open Fixed Loops. This setting is used to configure particular ALC HW for either a High or Low user requested ALC range configuration. See [“Setting LEVEL DAC” on page 3-29](#).

ALC Menu

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 ALC LOOP CONTROL settings menu is shown in [Figure 3-31](#).

ALC Level Modes

Press the ALC menu from the main menu to set the ALC level mode by choosing either Internal, External or Fixed Gain from SOURCE drop-down as shown in [Figure 3-31](#).

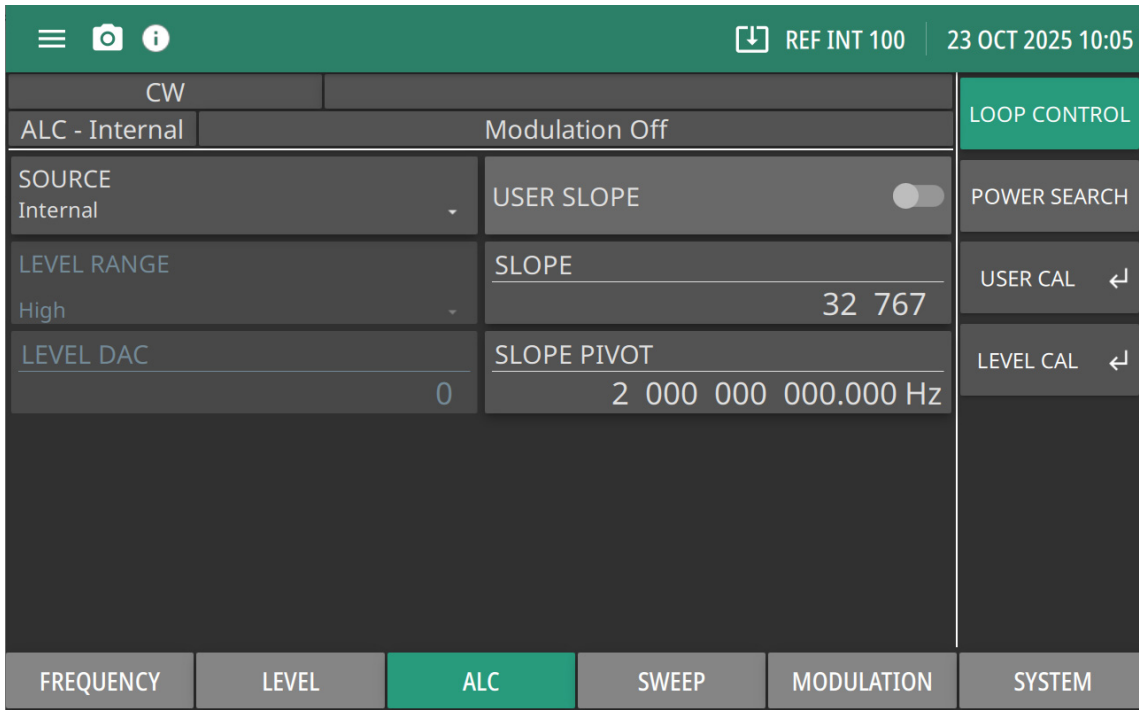


Figure 3-31. ALC Menu - Loop Control

SOURCE: Provides the following leveling settings:

- **Internal:** Leveling source is Internal. LEVEL DAC is not available. See [“Setting Internal Leveling”](#).
- **External:** Leveling source is External, LEVEL DAC is available. See [“Setting External Leveling”](#).
- **Fixed Gain:** Leveling source is Fixed. See [“Setting Fixed Gain” on page 3-28](#). LEVEL DAC control is available in when SOURCE Fixed Gain is selected.

LEVEL RANGE: Manual setting of the ALC Range for External Closed and Open Fixed Loops. Not available when SOURCE is set to Internal.

LEVEL DAC: Enabled In Fixed Gain Mode Only. Range is 0 to 65535.

USER SLOPE: Set the user slope function to on or off.

SLOPE: Set the power slope. Slope Adjustment range is 1 to 16383. See [“ALC Power Slope” on page 3-29](#).

SLOPE PIVOT: Set the slope pivot frequency point.

Figure 3-31. ALC Menu - Loop Control

Setting Internal Leveling

This is the normal default leveling mode. Output power is sensed by the MG362x1A's internal detector. The detector output signal is fed back to the ALC circuitry to adjust the output power level. Internal ALC is selected from the leveling menu.

To select internal ALC, press Internal. Pressing one of the other leveling menu soft keys External Detector or Fixed Gain will turn off internal leveling.

Setting External Leveling

In external leveling, the output power from the MG362x1A is detected by an external detector or power meter. The signal from the detector or power meter is returned to the ALC circuitry via the rear panel EXT ALC IN connector. The ALC adjusts the output power to keep the power level constant at the point of detection. To select the external ALC input from an external detector, press ALC | SOURCE External.

Setting Fixed Gain

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.

ALC Power Slope

The ALC power slope function lets you compensate for system, cable, and waveguide variations due to changes in frequency. This is accomplished by linearly increasing or decreasing power output as the frequency increases. The example shown in [Figure 3-32](#), displays how the power slope function provides you with the ability to set both the power slope and the pivot point. The ALC loop menu lets you activate the ALC power slope function.

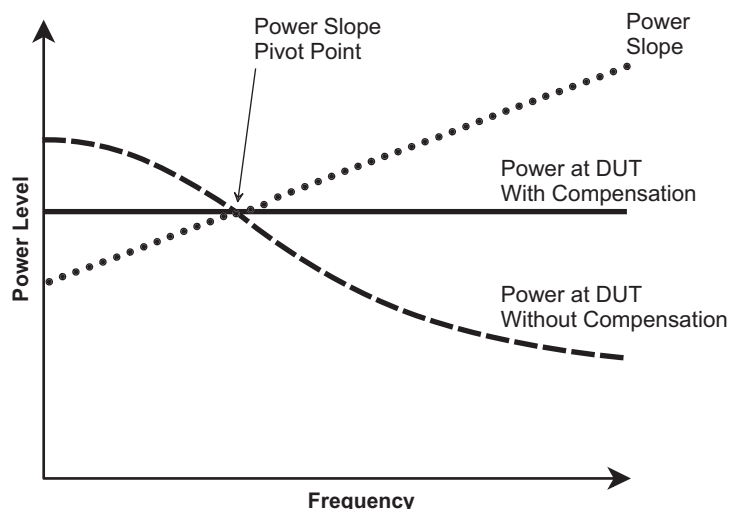


Figure 3-32. ALC Power Slope Example

Setting LEVEL DAC

Manual setting of the LEVEL DAC. This setting is used in conjunction with the manual attenuation setting to allow user control of the output power when in ALC Fixed Gain selection. The RF level DAC adjustable range is from a minimum output of 0 to a maximum output of 65535. To select the Fixed Gain ALC input from an external detector:

Press: ALC | SOURCE | Fixed Gain

Edit the level DAC by pressing LEVEL DAC, and use the control keys, rotary data knob, or enter a new power level DAC value using the keypad and press ENTER.

Setting Level Range

Used when the SOURCE is set to External or Fixed Gain. Sets all the Digital Step Attenuators in the Digital Down Converter, Switched Filter Module, and Frequency Extension Module to 0 for High Range and 10 for Low Range. Can be used when the RF step attenuation is manually set to 0 dB, allowing for a 10dB extension of range in high level range.

Loop Control

The ALC LOOP CONTROL menu is shown in [Figure 3-33](#). This menu provides manual setting of the ALC Range for External Closed and Open Fixed Loops. This setting is used to configure particular ALC HW for either a High or Low user requested ALC range configuration.

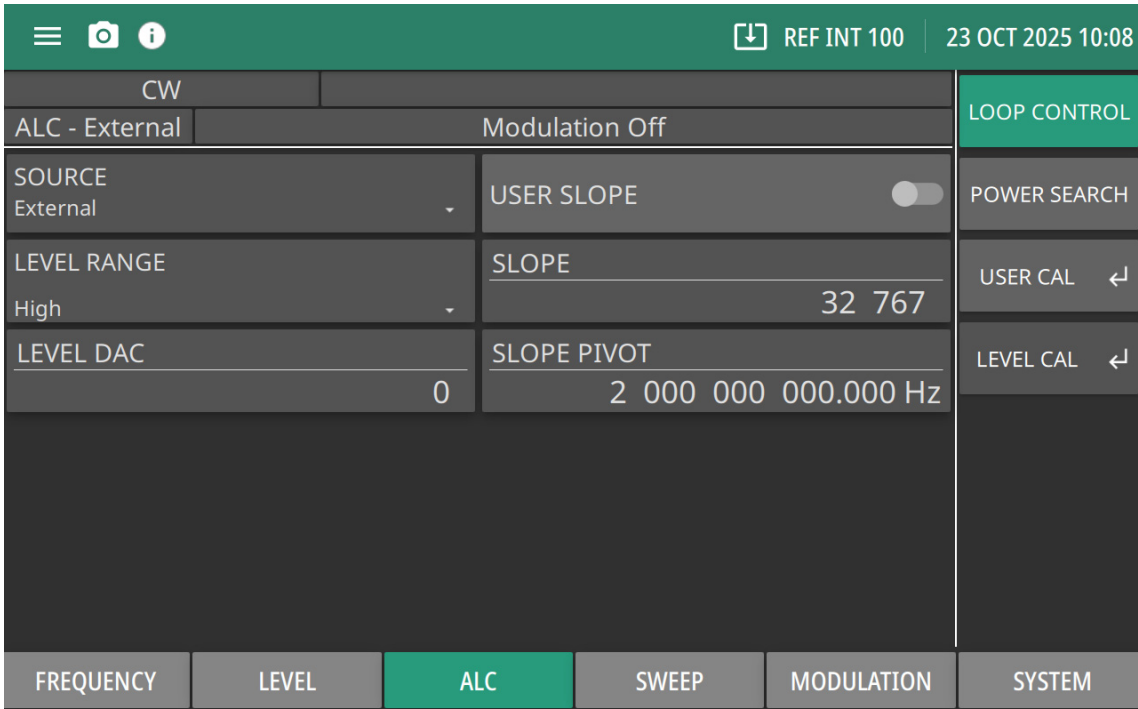


Figure 3-33. ALC - LOOP CONTROL Menu

SLOPE

Note

When Power Slope is selected ON, this status message is displayed on all menu displays to remind you that a power slope correction has been applied to the ALC.

Press SLOPE PIVOT to open the pivot point frequency parameter for editing. Edit the current frequency using the cursor control keys, rotary data knob, or enter a new value using the keypad and appropriate termination key. When you have finished setting the open parameter, close it by pressing Edit Pivot or by making another menu selection.

While monitoring the power level at the device-under-test (DUT), adjust the power slope and pivot point to level the power at the DUT. Press Slope On/Off again to deactivate the ALC power slope function.

User Cal Menu

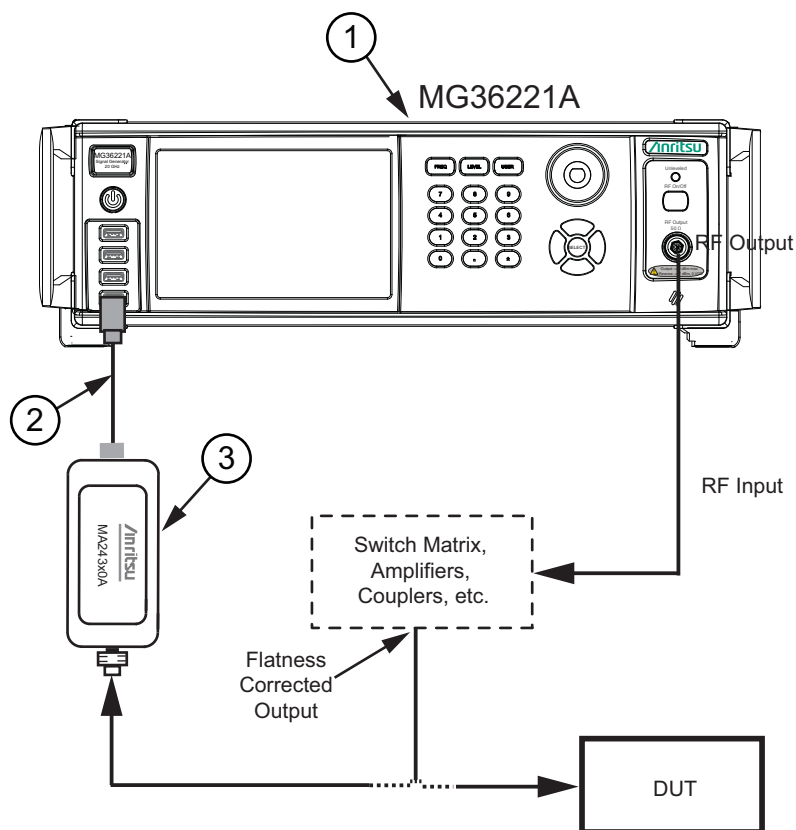
The User Cal (user power level flatness calibration) function provides a means to compensate for path variations with frequency that are caused by external switching, amplifiers, couplers, mixers, multipliers, dividers, and cables in the test setup. This is done by means of an entered power-offset table from a USB power sensor or calculated data. When user level flatness calibration is activated, the set power level is delivered at the point in the test setup where the calibration was performed. This “flattening” of the test point power level is accomplished by summing a power-offset word (from the power-offset table) with the signal generator's normal power level DAC word at each frequency point.

Up to ten user level flatness calibration power-offset tables, with a range of 2 to 3201 frequency points-per-table can be created and stored in the MG362x1A memory for recall.

The MG362x1A must be in CW frequency mode and fixed (non-swept) power level mode in order to create a power-offset table for user level flatness correction. Follow the steps below to create a power-offset table for user level flatness calibration, connect the equipment (shown in [Figure 3-34](#)) as follows:

1. Using a USB cable, connect the USB power sensor to the MG362x1A
2. Connect the power sensor to the point in the test setup where the corrected power level is desired.

Equipment Setup



1. MG36221A Rubidium
2. USB Type-A cable to connect the USB power sensor to MG36221A
3. MA24330A, 33 GHz power sensor or MA24350A, 50 GHz power sensor

Figure 3-34. Equipment Setup for Creating a Power-Offset Table

- 3. Place the signal generator in CW frequency mode by pressing **FREQUENCY | ENABLE CW MODE**.
- 4. Press **ALC** menu and select **Internal** from the **SOURCE** drop-down to place the MG362x1A in internal leveling mode. See [Figure 3-35](#).

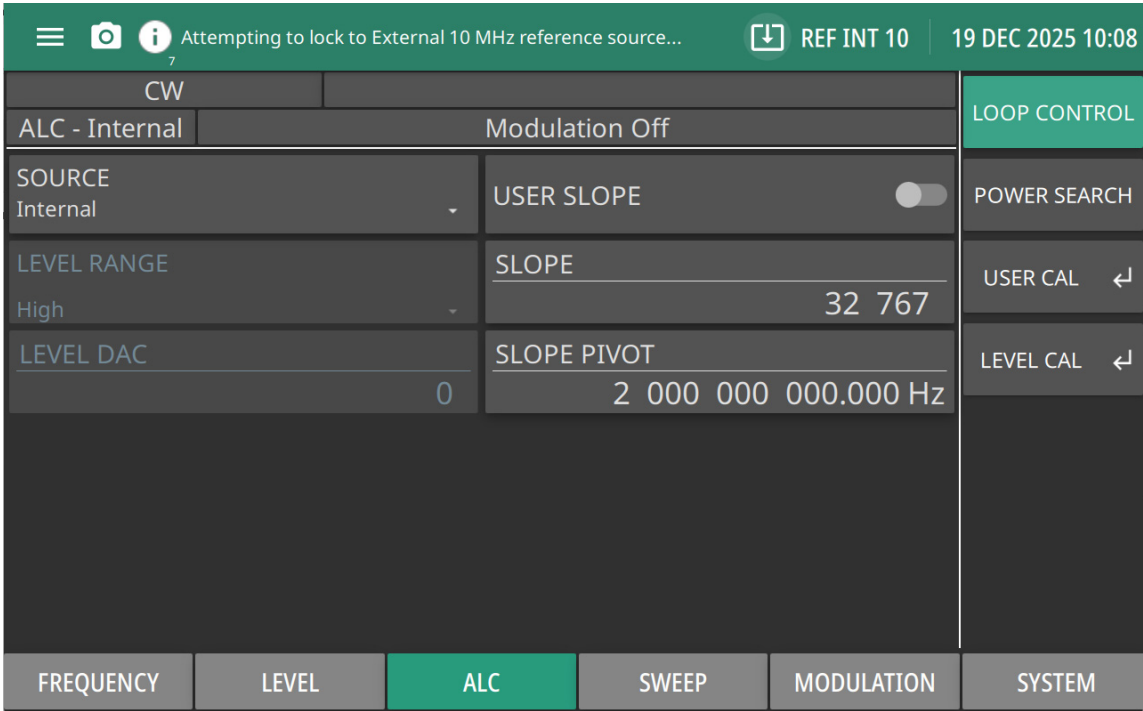


Figure 3-35. ALC Menu

- 5. Press **USER CAL** submenu, and select any one of the power-offset tables (User 1 to User 10) from **TABLE** drop-down. See [Figure 3-36](#).

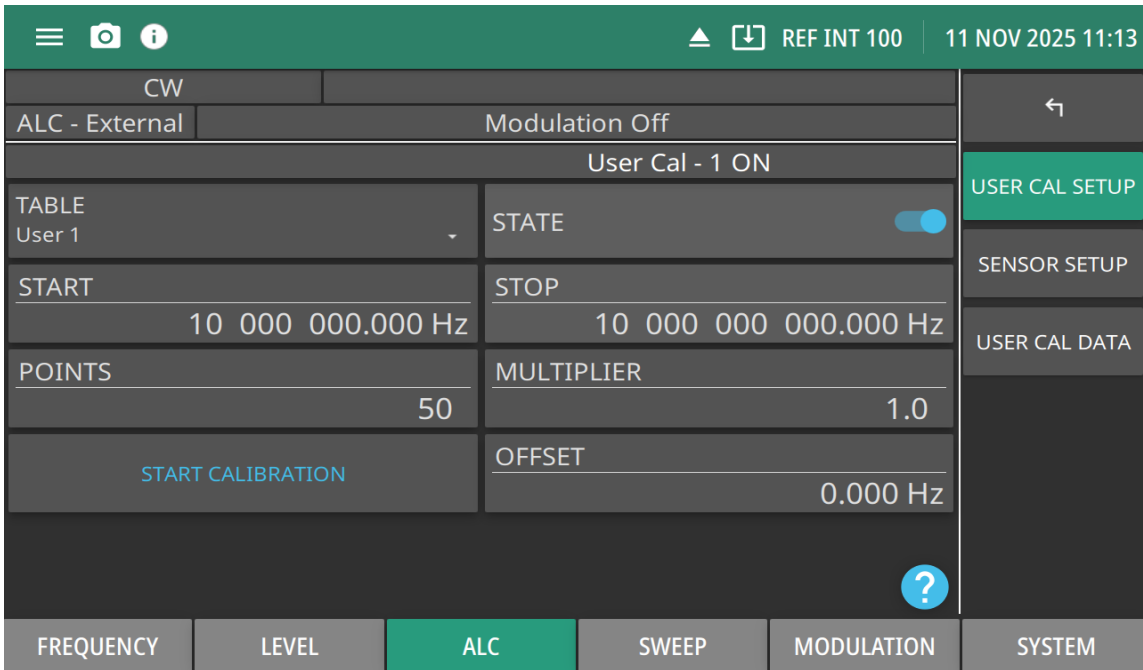


Figure 3-36. ALC - USER CAL Menu

- 6. Press START and STOP buttons to enter the start and stop frequencies of the connected device (e.g. amplifier, switch).
- 7. Press POINTS to enter the number of frequency points at which correction information is to be taken.
- 8. If any frequency scaling is necessary at the leveling point, press MULTIPLIER and enter the scaling factor. The range is 0.1 to 100.
- 9. If offset appears at the leveling point, press OFFSET and enter the offset frequency.
- 10. Now press START CALIBRATION to begin taking the power level correction information at each frequency point.
- 11. Turn on STATE toggle in order to apply the power-offset table. Note that when the State toggle is turned on, User Cal - 1 ON will be displayed on the top. See [Figure 3-36](#). The number displayed depicts the selected user cal table, in this case it is User 1 table.

Once the power-offset table has been created, it is stored in the instrument’s non-volatile memory. The power-offset table is now ready to be applied to the test setup. Disconnect the power sensor from the test setup.

Erasing the Power-Offset Tables from Memory

The power-offset tables are stored in non-volatile memory. Reset All is required to erase the contents of the tables and reprogram them with default data.

Note

RESET ALL overwrites all the information stored in the non-volatile memory with default values. This includes the frequency/power level sets used for list sweep mode.

To perform reset, press: SYSTEM | SETTINGS | RESET | RESET ALL

The contents of non-volatile memory have now been erased and reprogrammed with default data.

SENSOR SETUP

The sensor setup window displays the USB power sensor connected to the instrument as shown in [Figure 3-37](#).

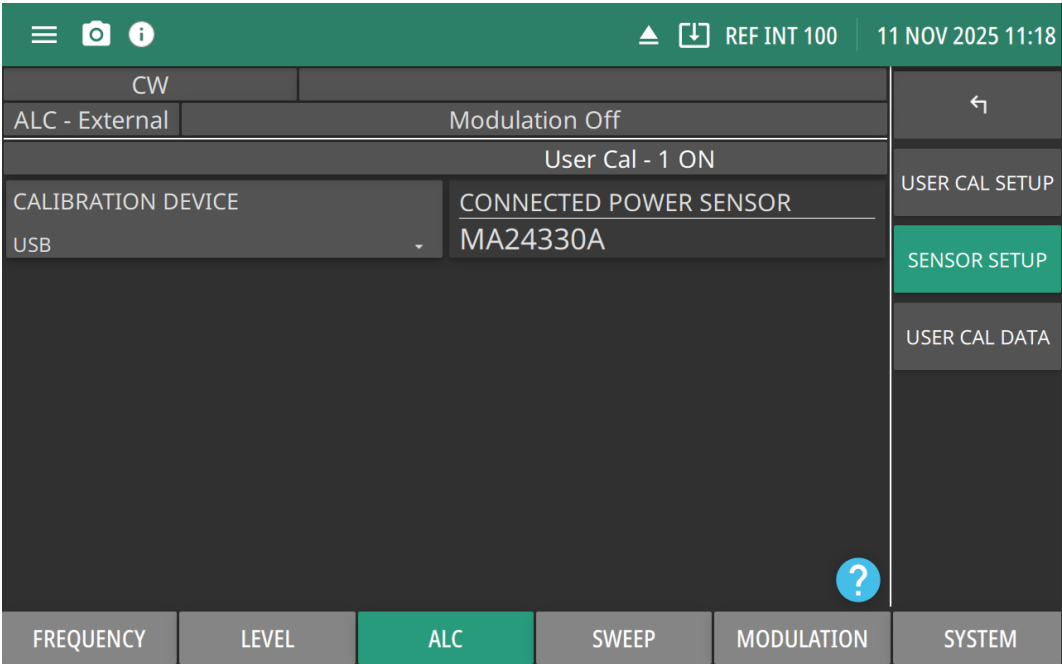


Figure 3-37. SENSOR SETUP Menu

To get a list of supported USB Power Sensors use the following SCPI command:

[:SOURce]:CORRection:PMETer:CATalog?

or

Press the question mark icon as shown in the [Figure 3-37](#) to view the list of supported USB power sensors as shown in [Figure 3-38](#).

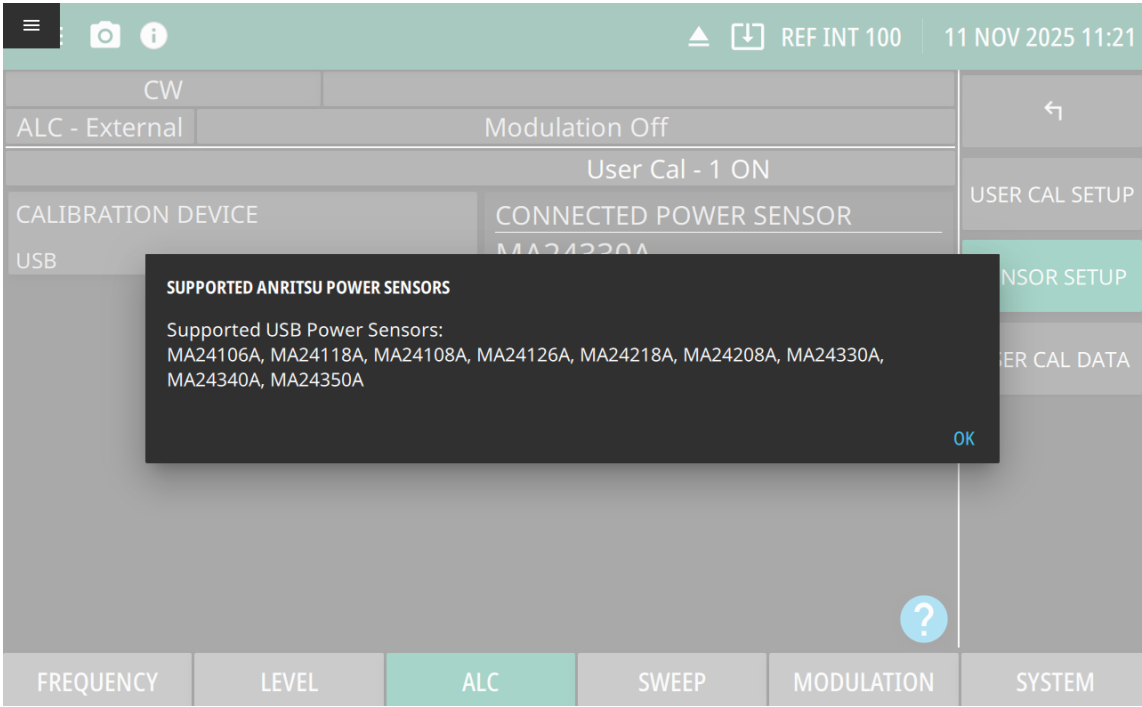


Figure 3-38. Supported Anritsu Power Sensors

USER CAL DATA

The USER CAL DATA window displays the currently selected user table and calibration info as shown in [Figure 3-39](#). Press IMPORT CALIBRATION button to import an already saved calibration file to the currently selected user table as shown in [Figure 3-40](#). Press EXPORT CALIBRATION button to export the calibration data and save as a .ulc file. Note that the calibration file can be either saved internally in the instrument memory, a USB memory device or an SD card.

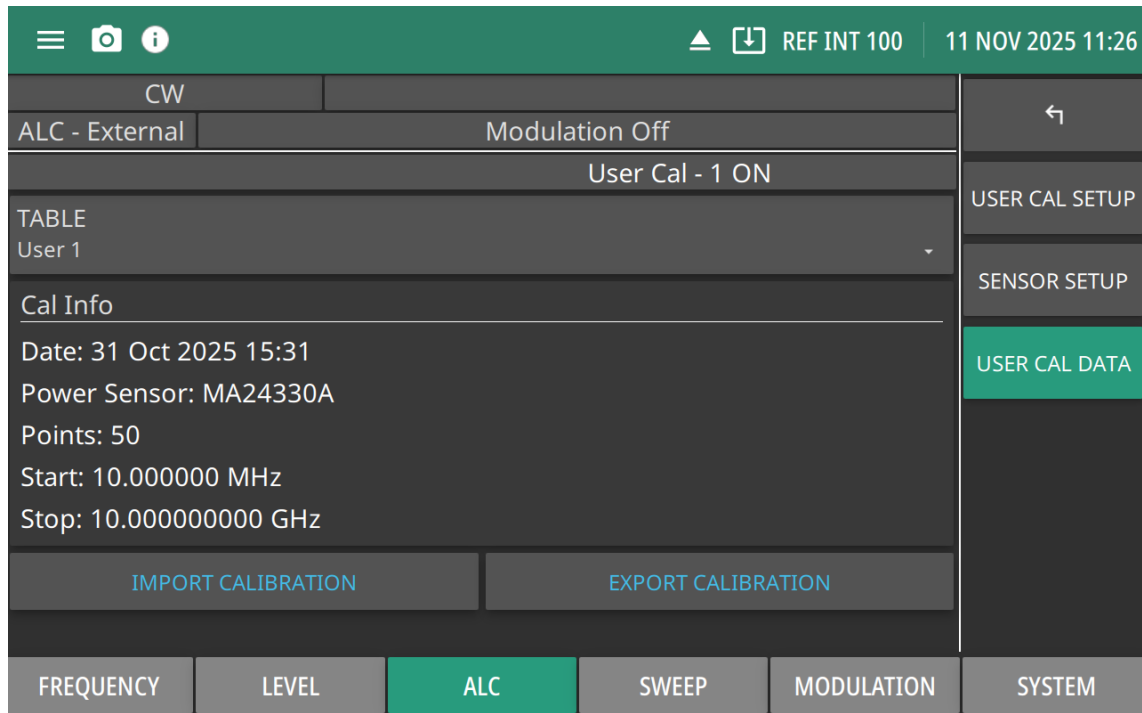


Figure 3-39. USER CAL DATA Menu

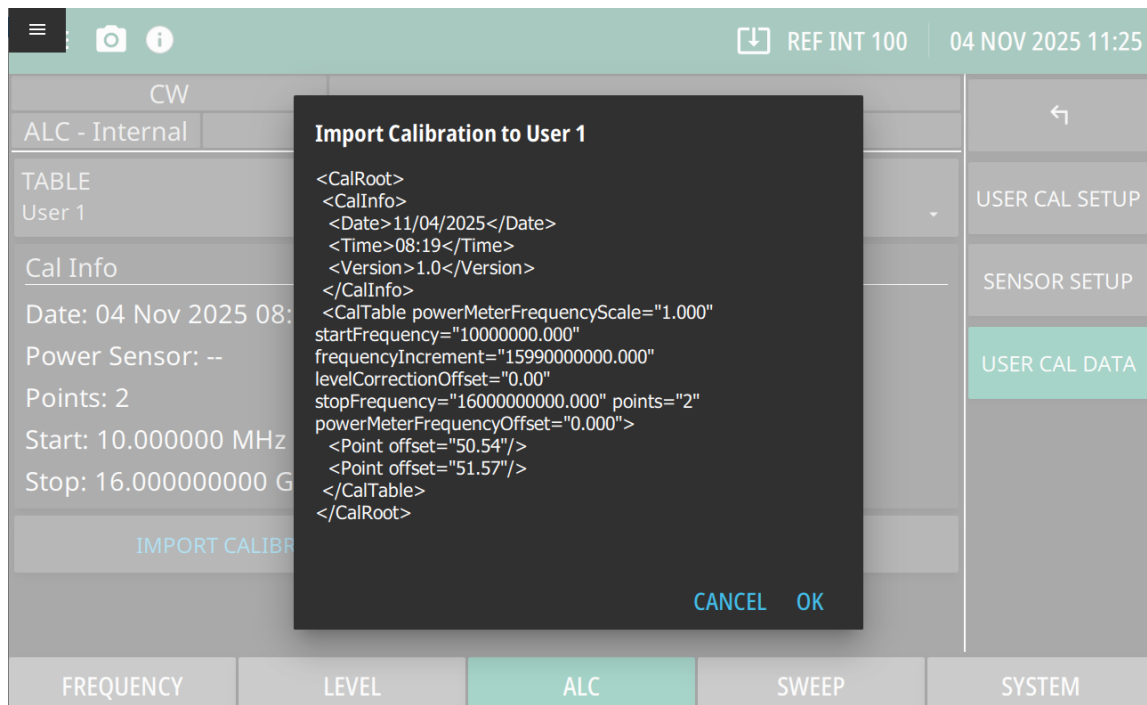
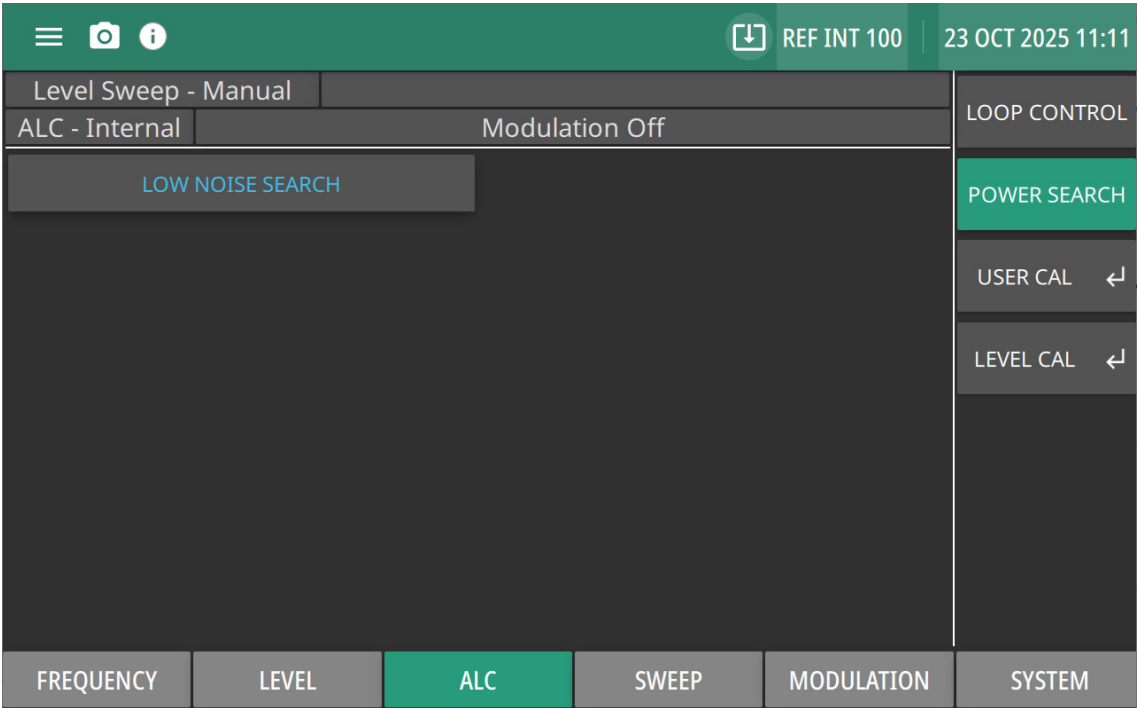


Figure 3-40. IMPORT CALIBRATION Dialog

POWER SEARCH Menu

The POWER SEARCH menu provides searching for ALC settings that give the best noise performance. The POWER SEARCH Menu is shown in [Figure 3-41](#).

Press: ALC | POWER SEARCH



LOW NOISE SEARCH: Searches for ALC settings that give the best noise performance.

Figure 3-41. POWER SEARCH Menu

3-8 On-site User Level Calibration (Option 18)

The on-site user level calibration menu calibrates the RF power level accuracy to –60 dBm. Power levels below –60 dBm are not calibrated but uses the Anritsu factory power level calibration table to maintain power level accuracy. Option 18 is not available for the MG36271A model.

Equipment Required

- USB Power Sensor MA24330A (10 MHz to 33 GHz). Use when calibrating a MG36221A.
- USB Power Sensor MA24350A (10 MHz to 50 GHz). Use when calibrating a MG36221A or MG36241A.
- 01-201 torque wrench set to 8 in/lb.
- 2000-2166-R, MG36221A/41A Option 18 kit consists of:
 - 1010-145-R, DC to 43.5 GHz, 50 Ω , 5W, K(f) to K(m) attenuator.
 - 33KFKF50C, DC to 43.5 GHz, 50 Ω , K(f) to K(f) adapter. Use when calibrating a MG36221A.
 - 34VFKF50A, DC to 43.5 GHz, 50 Ω , V(f) to K(f) adapter. Use when calibrating a MG36241A.

Level Calibration

The on-site user level calibration uses internally calibrated RF power level tables of the USB MA24330A/350A power sensor to calibrate the power level accuracy/flatness of the MG362x1A.

To Calibrate the Internal Level Cal

To calibrate the power level accuracy/flatness of the MG3621A/41A:

- See [“MG36221A ALC Level Calibration” on page 3-39](#).
- See [“MG36241A ALC Level Calibration” on page 3-40](#).
- See [“ATTENUATOR Level Calibration” on page 3-41](#) to calibrate to –60 dBm.

Caution

The output power of the MG362x1A can exceed rated power levels of test equipment. Use the 1010-145-R fixed attenuator when prompted in the internal level cal program to protect the RF test equipment from internal damage caused by excessive output power.

Press: ALC | LEVEL CAL

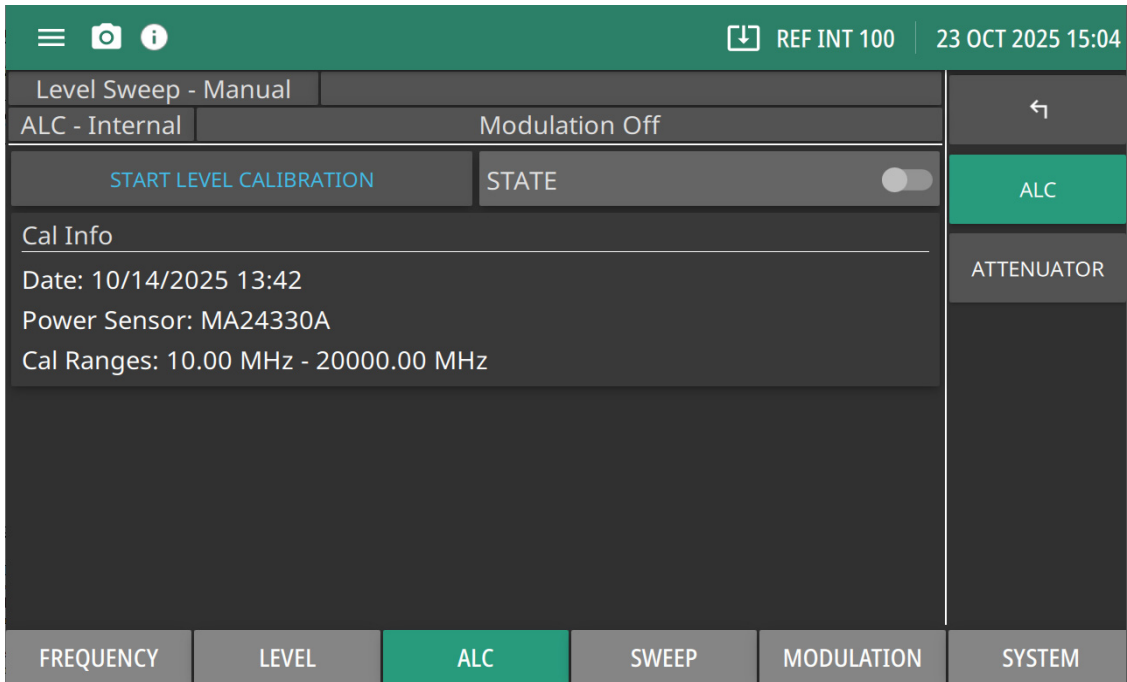


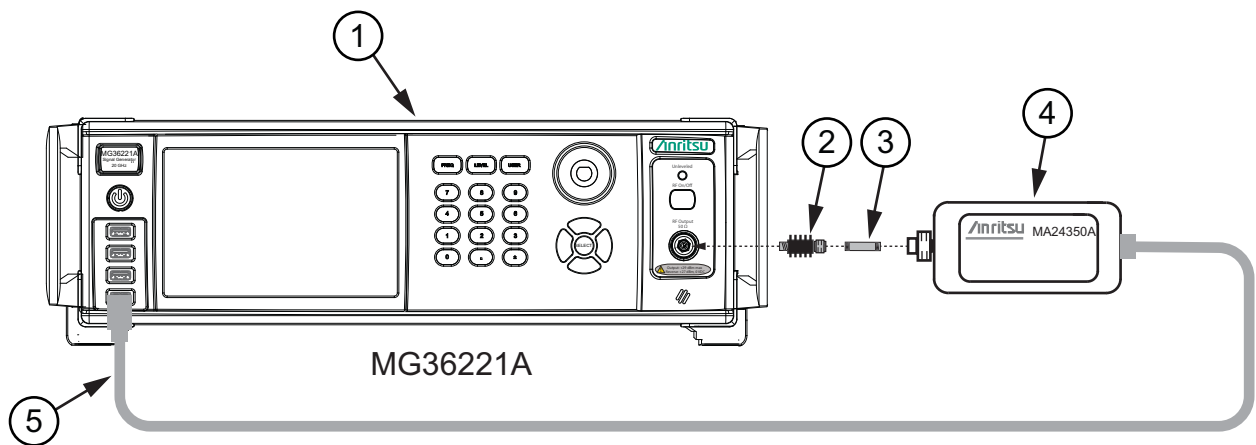
Figure 3-42. LEVEL CAL Menu

MG36221A ALC Level Calibration

The ALC level cal menu is used for all models with Option 2 and without Option 2. Use the calibration setup shown in [Figure 3-43](#).

Press: ALC | LEVEL CAL

1. Use a torque wrench to connect the adapter and 20 dB, 5W, fixed attenuation pad to the Rubidium RF output connector and to the MA24330A power sensor.
2. Connect the USB cable to the MG36221A front panel or rear panel USB Type-A slot.
3. Press START LEVEL CALIBRATION on the ALC menu shown in [Figure 3-42 on page 3-38](#).
4. Follow the prompts to complete the level cal.
5. If Option 2 is installed, continue to “[ATTENUATOR Level Calibration](#)” on page 3-41.



1. MG36221A
2. 1010-145-R, DC to 43.5 GHz, 50 Ω , 5W, K(f) to K(m) attenuator.
3. 33KFKF50C, DC to 43.5 GHz, 50 Ω , K(f) to K(f) adapter or 34VFKF50A, DC to 43.5 GHz, 50 Ω , V(f) to K(f) adapter (if using the MA24350A 50 GHz power sensor)
4. MA24330A, 33 GHz power sensor or MA24350A 50 GHz power sensor
5. USB Type-A cable

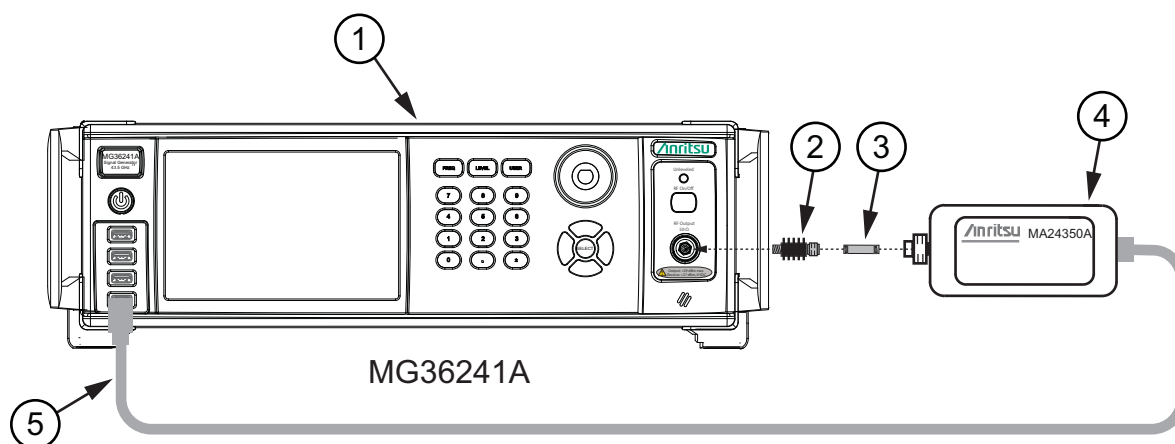
Figure 3-43. MG36221A Internal Level Calibration Setup

MG36241A ALC Level Calibration

The ALC level cal menu is used for all models with Option 2 and without Option 2. Use the calibration setup shown in [Figure 3-44](#).

Press: ALC | LEVEL CAL

1. Use a torque wrench to connect the adapter and 20 dB, 5W, fixed attenuation pad to the Rubidium RF output connector and to the MA24350A power sensor.
2. Connect the USB cable to the MG36241A front panel or rear panel USB Type-A slot.
3. Press START LEVEL CALIBRATION on the ALC menu shown in [Figure 3-42 on page 3-38](#).
4. Follow the prompts to complete the level cal.
5. If Option 2 is installed, continue to “[ATTENUATOR Level Calibration](#)” on page 3-41.



1. MG36241A
2. 1010-145-R, DC to 43.5 GHz, 50 Ω , 5W, K(f) to K(m) attenuator.
3. 34VFKF50A, DC to 43.5 GHz, 50 Ω , V(f) to K(f) adapter.
4. MA24350A, 50 GHz power sensor
5. USB Type-A cable

Figure 3-44. MG36241A Internal Level Calibration Setup

ATTENUATOR Level Calibration

Use the ALC level cal menu as described in “Level Calibration” on page 3-37 to calibrate the first calibration steps for units with Option 2. Then use the ATTENUATOR menu shown in Figure 3-45 to calibrate to power levels to –60 dBm.

Press: ALC | LEVEL CAL | ATTENUATOR

For the MG36341A

- 1. Use a torque wrench to connect the MA24350A USB power sensor RF connector directly to the MG362x1A RF output connector.
- 2. Go to Step 5 below.

For the MG36221A

- 3. Use a torque wrench to connect the MG36221A RF output connector to the K(f) to V(f) adapter.
- 4. Connect the RF V(f) end of the adapter to the RF V(m) connector of the MA24350A.
- 5. Connect the USB cable to the MG362x1A front panel or rear panel USB type-A slot.
- 6. Press START ATTENUATOR CALIBRATION on the ATTENUATOR menu shown in Figure 3-45.
- 7. Follow the prompts to complete the level cal.

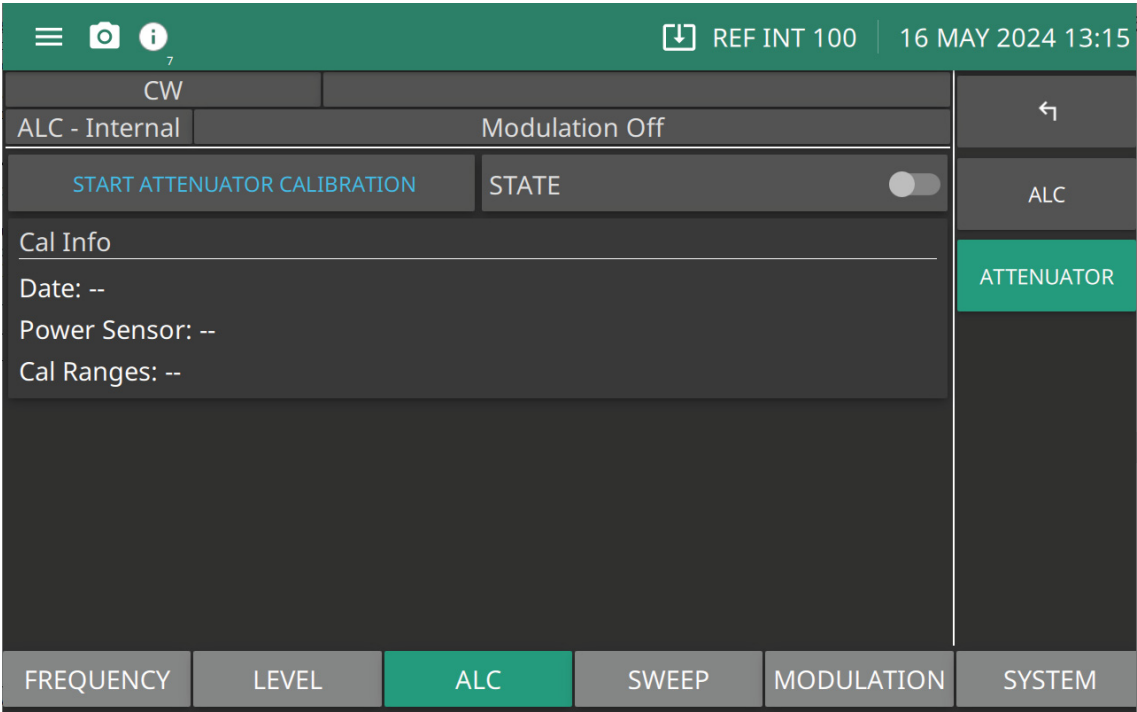


Figure 3-45. ATTENUATOR Menu

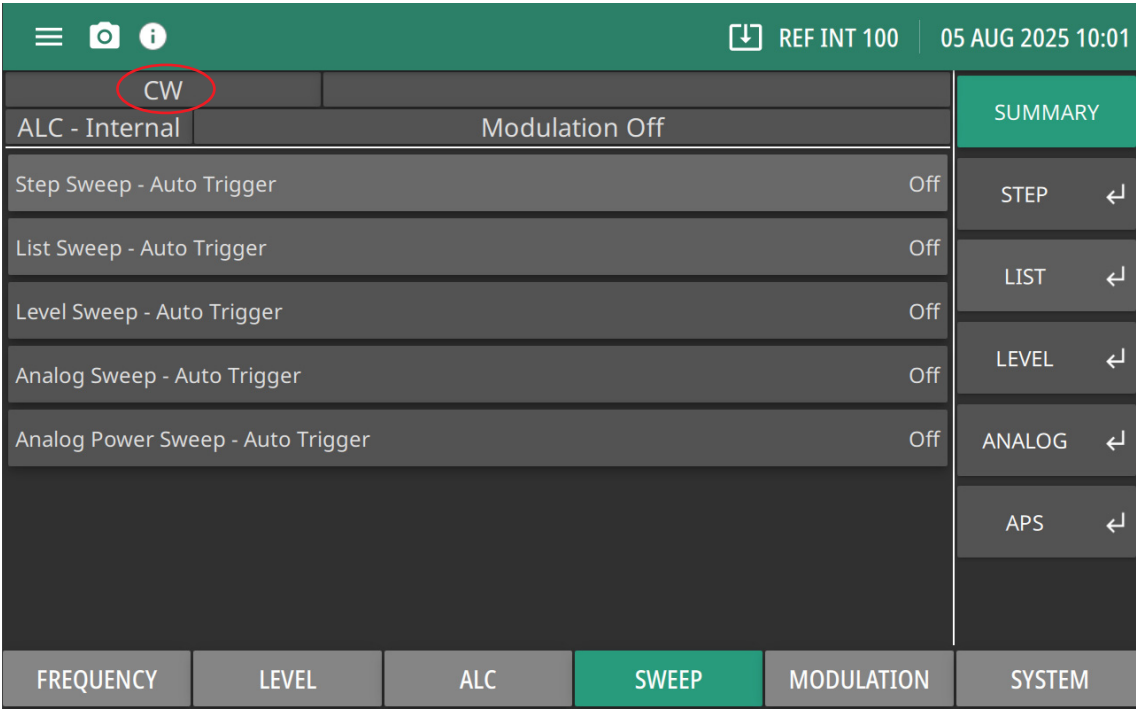
3-9 Frequency Sweep Operation

The signal generator can generate broad (full range) and narrow band sweeps across the frequency range of the instrument. The MG362x1A sweep modes includes analog sweep, step sweep, and list sweep. The SWEEP menu consists of following submenus:

- “Sweep Menu” on page 3-42
- “STEP” on page 3-43
- “LIST” on page 3-51
- “Level” on page 3-57
- “Analog Sweep (Option 6)” on page 3-63
- “Analog Power Sweep (APS) (Option 16)” on page 3-67

Sweep Menu

The SWEEP Menu provides the MG362x1A Sweep On or Off status for Step Sweep, List Sweep, Level Sweep, Analog Sweep (Option 6) and Analog Power Sweep (Option 16). Note the status bar displays CW when the Sweep submenus are set to off by default as shown in [Figure 3-46](#). But when the sweep toggle of the corresponding submenu is turned on, the status bar will display the sweep that is selected.



- Step Sweep:** See “[SETUP Menu](#)” on page 3-43.
- List Sweep:** See “[LIST](#)” on page 3-51.
- Level Sweep:** See “[LEVEL SWEEP Menu](#)” on page 3-57.
- Analog Sweep:** See “[STEP](#)” on page 3-43.
- Analog Power Sweep:** See “[Analog Sweep \(Option 6\)](#)” on page 3-63.

Figure 3-46. SWEEP Menu - Summary

STEP

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 points between the sweep start and stop frequencies, the step dwell time, and sweep trigger are controllable from the SWEEP main menus.

In linear step sweep, the sweep is linearly incremented (or decremented) by the step size from the start frequency to the stop frequency. Two ways to set the size of each step of the linear step sweep:

1. Set the step size: The step size frequency range is 9 kHz to the full frequency range of the instrument.
2. Set the number of points: The number of points range is 2 to 65535.

If the step size does not divide into the frequency range, the last step is truncated.

In logarithmic step sweep, step size increases logarithmically with the frequency and is determined by a logarithmic curve between the sweep start and stop frequencies and the number of points. The number of points ranges from 2 to 65535.

SETUP Menu

Pressing STEP from the SWEEP menu displays the SETUP menu. When the STEP SWEEP button is toggled on, the status bar displays Step Sweep - Single. Note that the sweep displayed at the status bar is dependent on the sweep selected in the TRIGGER menu. The sweep displayed at the status bar is dependent on the sweep selected from the SUMMARY menu or from the TRIGGER menu. See [“TRIGGER Menu” on page 3-48](#).

Press: SWEEP | STEP

Menu Icons				REF INT 10 03 MAY 2023 13:14	
Step Sweep - Single				←	
ALC - Internal		Modulation Off			
START		STOP		SETUP	
0.000 009 000 000 GHz		70.000 000 000 000 GHz			
STEP SIZE		NUMBER OF POINTS		TRIGGER	
0.070 070 061 062 GHz		1 000			
DWELL TIME		SWEEP DIRECTION		RANGE	
0.001 000 s		Up			
PRESET SWEEP RANGES		SWEEP TYPE			
F1-F2 F3-F4 F5-DF F6-DF		Linear			
		STEP SWEEP			
		[Toggle On]			
FREQUENCY		LEVEL		ALC	
		SWEEP		MODULATION	
				SYSTEM	

Figure 3-47. STEP - SETUP Menu

START: Set the start frequency of the step sweep.

STOP: Set the stop frequency of the step sweep.

STEP SIZE: Set the step size of the step sweep.

NUMBER OF POINTS: Set the number of points in a step sweep. Range is 2 to 65535.

DWELL TIME: Sets the sweep per point dwell time. Units are in seconds. Range is 1e-05 seconds to 99 seconds.

SWEEP DIRECTION: Sets the direction of the sweep up/down.

Up = sweeps from start to stop sweep.

Down = sweeps from stop to start sweep.

PRESET SWEEP RANGES: Selects a frequency sweep range preset.

Range: F1F2 | F3F4 | F5DF | F6DF

SWEEP TYPE: Sets the parameter for sweep type to Logarithmic or Linear sweep operation.

STEP SWEEP: Toggle step sweep on or off.

Figure 3-47. STEP - SETUP Menu

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 shown in [Figure 3-47](#), press START opens the start frequency parameter. Press STOP opens the stop frequency parameter. Edit the open frequency parameters. When complete, close the open parameter using a termination key. These are set as the start and stop frequencies for the sweep.

Setting the Step Size

Press STEP SIZE to open the step size parameter.

Open the parameter you wish to change, then edit the current value using the cursor control keys, the rotary data knob, or enter a new value using the key pad and appropriate termination soft key. When you have finished setting the open parameter, close it by pressing its menu soft key or make another menu selection.

In STEP SWEEP, the sweep is linearly incremented (or decremented) by the step size beginning with the start frequency to the stop frequency. 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 points. The step size range is 9 kHz to the full frequency range of the instrument. When the step DWELL TIME, STEP SIZE, or NUMBER OF POINTS is set, the sweep time equals:

Step Dwell time × Number of Points + 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. When complete, close the open parameter using a termination key.

Note

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

Number of Points

Sets the number of points in a stepped frequency sweep or stepped power sweep. Points and step are coupled values. Entering the value for one will cause the other to be recalculated per the following formula:

$$\text{points} = (\text{span} / \text{step}) + 1$$

Entering a new value or either parameter will not change the span. An error will be generated if the points entered results in a calculated step size less than the minimum resolution for a stepped frequency sweep or a stepped power level sweep. An error will also be generated if the entered step size results in the number of points exceeding its maximum.

Setting the NUMBER OF POINTS (Number of Steps)

The number of points range is 2 to 65535. 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 points is set:

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

Press the NUMBER OF POINTS button to open the step size parameter. Edit the open frequency parameter and close the open parameter using a termination key.

Note

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

Setting DWELL TIME

The dwell-time-per-step of the step sweep can be set for any time in the range of 10 μs to 99 s. When dwell-time-per-step, step size or number of points is set, the sweep time equals dwell-time-per-step times the number of points plus the total phase-locking time for all the step frequencies. If sweep time is set, then dwell-time-per-step is the result of the sweep time divided by the number of points.

The dwell time of the step sweep can be set for any time in the range of 10 μs to 99 s. When the step Dwell Time, Step Size, or Number of Points is set:

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

Press the DWELL TIME button to open the dwell time parameter. Edit the open frequency parameter. When you complete, close the open parameter using a termination key.

Setting PRESET SWEEP RANGE

To set the sweep range frequency parameters:

Press: SWEEP | STEP | PRESET SWEEP RANGE

The Sweep Range menu is shown in [Figure 3-49](#).

- **Press F1-F2:** Provides a frequency sweep between the start frequency, F1, and the stop frequency, F2.
- **Press F3-F4:** Provides a frequency sweep between the start frequency, F3, and the stop frequency, F4.
- **Press F5-DF:** Provides a symmetrical frequency sweep about the center frequency, F5. The sweep width is determined by the dF frequency parameter.
- **Press F6-DF:** Provides a symmetrical frequency sweep about the center frequency, F6. The sweep width is determined by the dF frequency parameter. The Delta Frequency can be applied to any F0 - F9 frequency.

Press a preset sweep range parameters as F1-F2, F3-F4, F5-F6, and DF (Delta Frequency).

Setting SWEEP DIRECTION

Sets the direction of the sweep as forward or reverse.

Up: Forward Sweep. Initiates the frequency sweep from the start frequency to stop frequency direction.

Down: Reverse Sweep. Initiates the frequency sweep from the stop frequency to start frequency direction.

Setting SWEEP TYPE

Set the type of stepped frequency sweep as Linear or Logarithmic:

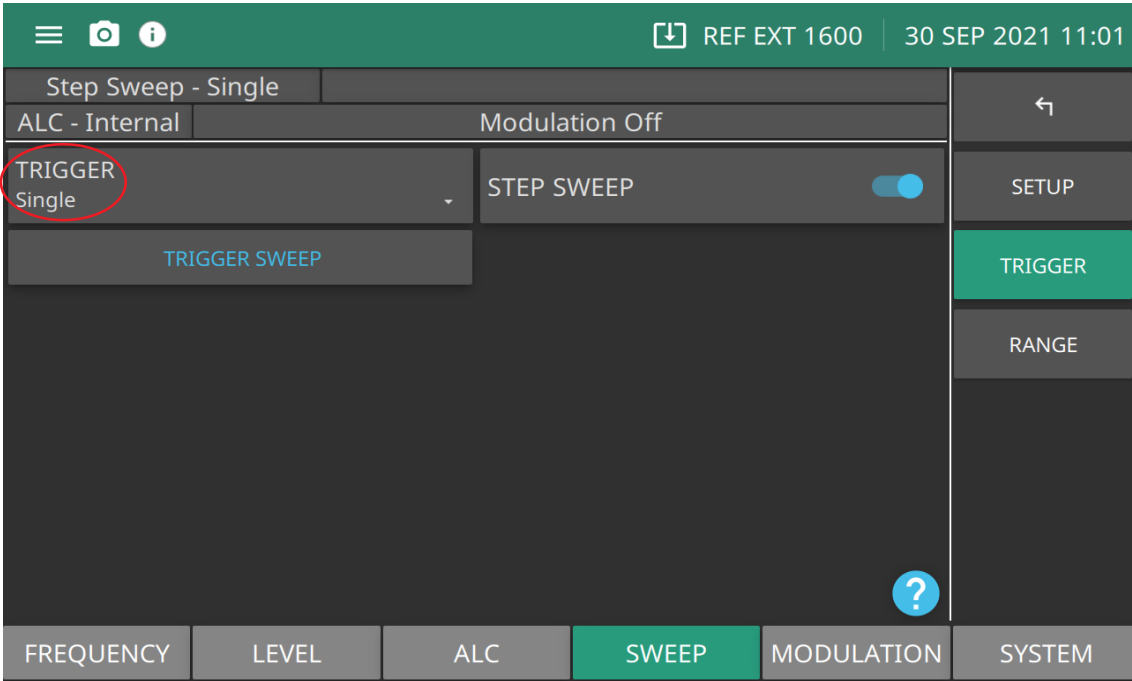
Linear: The frequency sweep is linearly incremented by the step size from the start frequency to the stop frequency. The size of each step is set using the STEP SIZE or NUMBER OF POINTS.

Logarithmic: Step size increases logarithmically with frequency and is determined by a logarithmic curve fitted between the sweep start/stop frequencies. The number of steps is set using the NUMBER OF POINTS.

TRIGGER Menu

The TRIGGER menu is shown in [Figure 3-48](#).

Press: SWEEP | STEP | TRIGGER. | TRIGGER



TRIGGER: Press to display the trigger types: Auto, Single, External, Manual, and Remote shown in [Figure 3-48](#) on page 3-46.

Step Sweep: Toggle step sweep on or off.

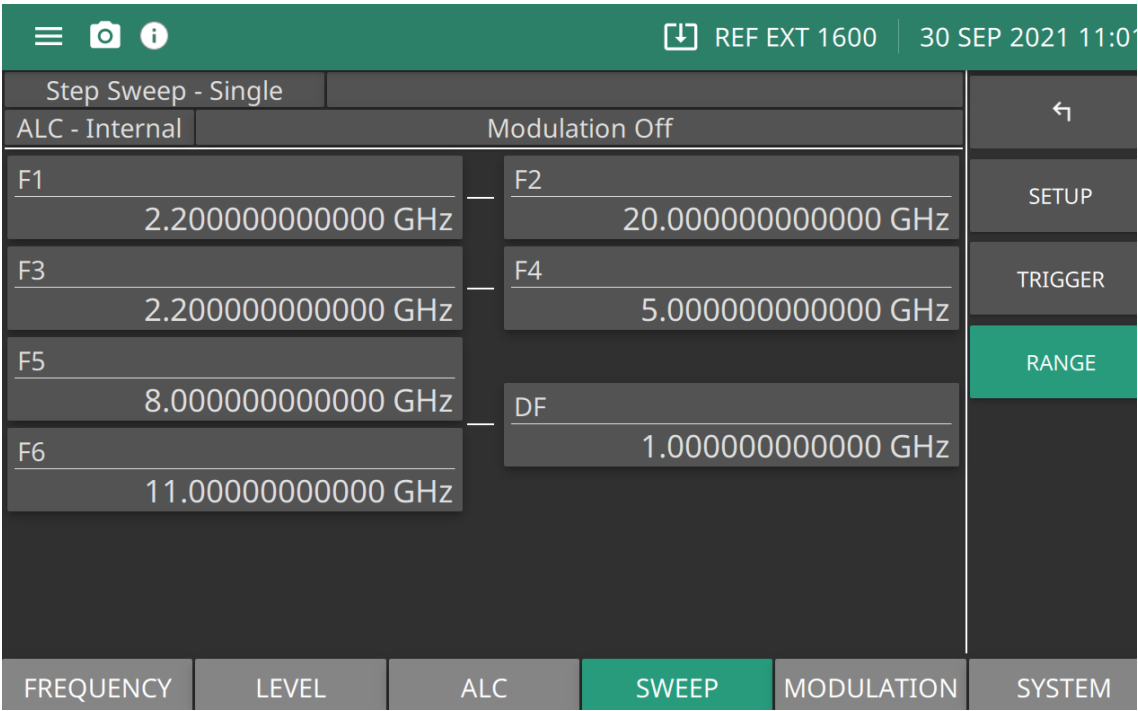
Trigger Sweep: Trigger a single sweep. Enabled only in single sweep trigger mode. When TRIGGER is set to Manual Sweep, the TRIGGER POINT button is enabled. See [“List Mode Sweep Trigger Types”](#) on page 3-53.

Figure 3-48. SWEEP TRIGGER Menu

RANGE Menu

The STEP RANGE menu provides frequency parameter range settings. The RANGE menu is shown in [Figure 3-49](#).

Press: SWEEP | STEP | RANGE



F1-F2: Frequency preset parameters. Sets as a pair when setting a sweep.

F3-F4: Frequency preset parameters. Sets as a pair when setting a sweep.

F5 dF: Frequency preset parameters. This sweep preset includes dF and delta Frequency preset.

F6-dF: Frequency preset parameters. This sweep preset includes dF and delta Frequency preset.

Figure 3-49. RANGE Menu

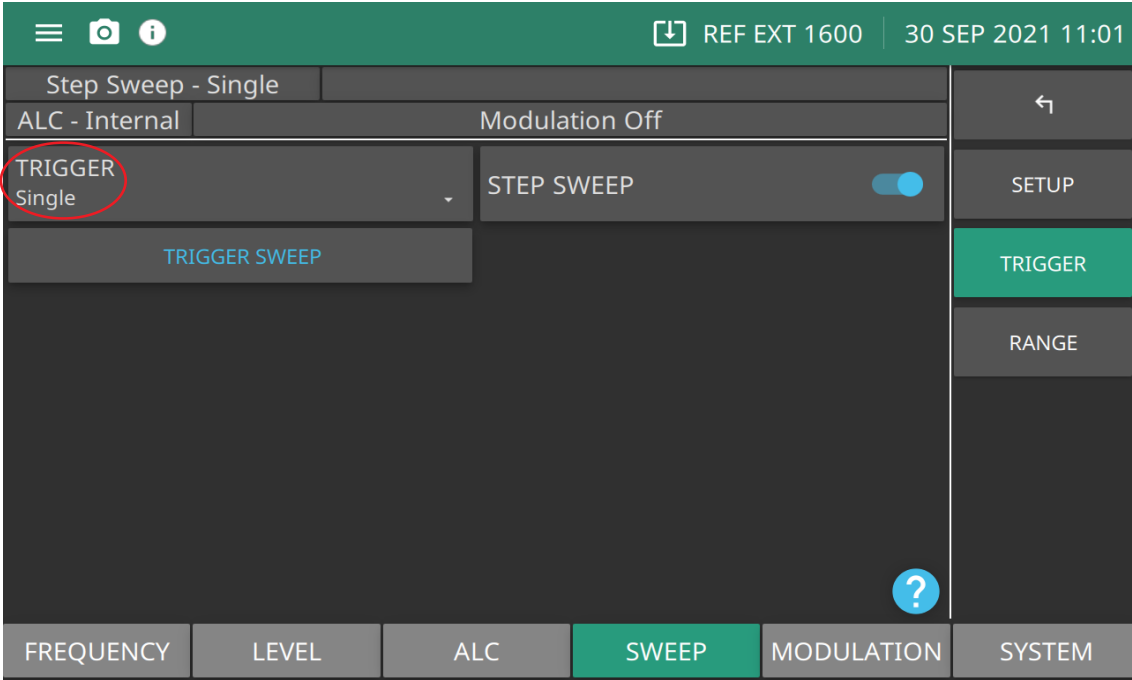
Starting a Step Sweep

Step sweep is initiated when the trigger sweep button is pressed as described below.

TRIGGER Menu

The TRIGGER menu is shown in [Figure 3-48](#).

Press: SWEEP | STEP | TRIGGER.| TRIGGER



TRIGGER: Press to display the trigger types: Auto, Single, External, Manual, and Remote shown in [Figure 3-52](#) on page 3-49.

Step Sweep: Toggle step sweep on or off.

Trigger Sweep: Trigger a single sweep. Enabled only in single sweep trigger mode. When TRIGGER is set to Manual Sweep, the TRIGGER POINT button is enabled. See [“List Mode Sweep Trigger Types”](#) on page 3-53.

Figure 3-50. SWEEP TRIGGER Menu

Sweep TRIGGER TYPES

Select the sweep type to generate. Press the TRIGGER button to display the sweep types shown in [Figure 3-51](#).

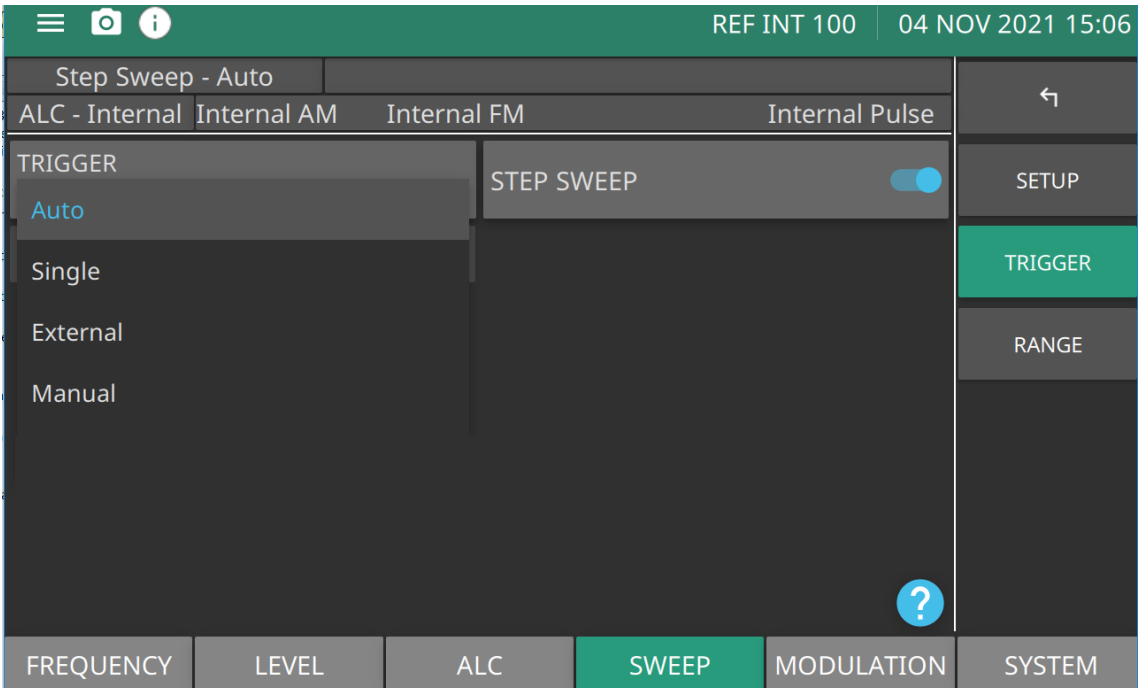


Figure 3-51. Press Sweep Trigger

Press the question mark icon to display the TRIGGER TYPES dialog shown in [Figure 3-52](#). The dialog provides a description of the sweep trigger types.

TRIGGER TYPES

Auto - Continuous sweep.
SCPI - TRIGger:MODE SWEep; TRIGger:SOURce IMMediate; INITiate:CONTinuous ON

Single - Single sweep. One sweep per trigger.
SCPI - TRIGger:MODE SWEep; TRIGger:SOURce BUS; INITiate:CONTinuous ON; Each *TRG will trigger one sweep.

External - Single sweep on an external trigger.
SCPI - TRIGger:MODE SWEep; TRIGger:SOURce EXTernal; INITiate:CONTinuous ON; A trigger on the external trigger input will trigger one sweep.

Manual - Single point on an up/dn key, knob, bus trigger, or external trigger.
SCPI - TRIGger:MODE POINT; TRIGger:SOURce BUS; INITiate:CONTinuous ON

- 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. The external sweep initiates when the TRIGGER SWEEP button is pressed.
- Single:** A single sweep starts when the TRIGGER SWEEP 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.
- Manual:** Single point on an up/down button, knob, bus trigger or external trigger.

Figure 3-52. TRIGGER TYPES

Initiate Step Sweep

To initiate an Auto or External sweep

1. Press Trigger Type.
2. Press Auto or External sweep.
3. Press the Step Sweep button to activate the sweep.

To initiate a Single sweep

1. Press Trigger Type.
2. Press Single.
3. Press TRIGGER SWEEP to activate the sweep. A single sweep is initiated each time the TRIGGER SWEEP button is pressed.

To initiate a Manual Sweep:

In manual sweep frequency mode, TRIGGER POINT button is displayed. Trigger Point is described in section [“TRIGGER SWEEP/TRIGGER POINT” on page 3-60](#). The output frequency can be manually tuned in phase-locked steps between the selected start and stop frequencies using the cursor control keys or rotary data knob. As the knob is turned or the cursor control, the current output frequency is incremented by the step size and displayed on the data display. The step size or number of points between the start and stop frequencies are controlled from the STEP SWEEP menu shown in [Figure 3-47 on page 3-43](#).

LIST

LIST sweep is a step sweep of preset frequency and level pairs. The pairs are defined in separate frequency and power levels. Sweeping is accomplished by defining start and stop indexes. List Mode provides two settings for creating a sweep:

- Points: The number of points (steps) per sweep parameter.
- Sweep: Set the sweep per point dwell time.

SETUP

The Sweep list index (0 through 3999) contains frequency/power level settings compiled into a list. Each frequency can have a different power level setting. The list sweep is defined by a list start index and list stop index. The list of up to 4000 frequency/power level sets is stored in non-volatile RAM to preserve any settings after the instrument is powered off. The list is not stored with the other setup information in the instrument.

The types of trigger modes available are described in [“Sweep TRIGGER TYPES” on page 3-49](#).

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.

Selecting LIST from the SWEEP menu displays the menu shown in [Figure 3-54](#). When the LIST SWEEP button is toggled on, the status bars displays List Sweep - Single. Note that the sweep displayed at the status bar is dependent on the sweep selected in the TRIGGER menu. See [“LIST TRIGGER Menu” on page 3-53](#).

Press: SWEEP | LIST

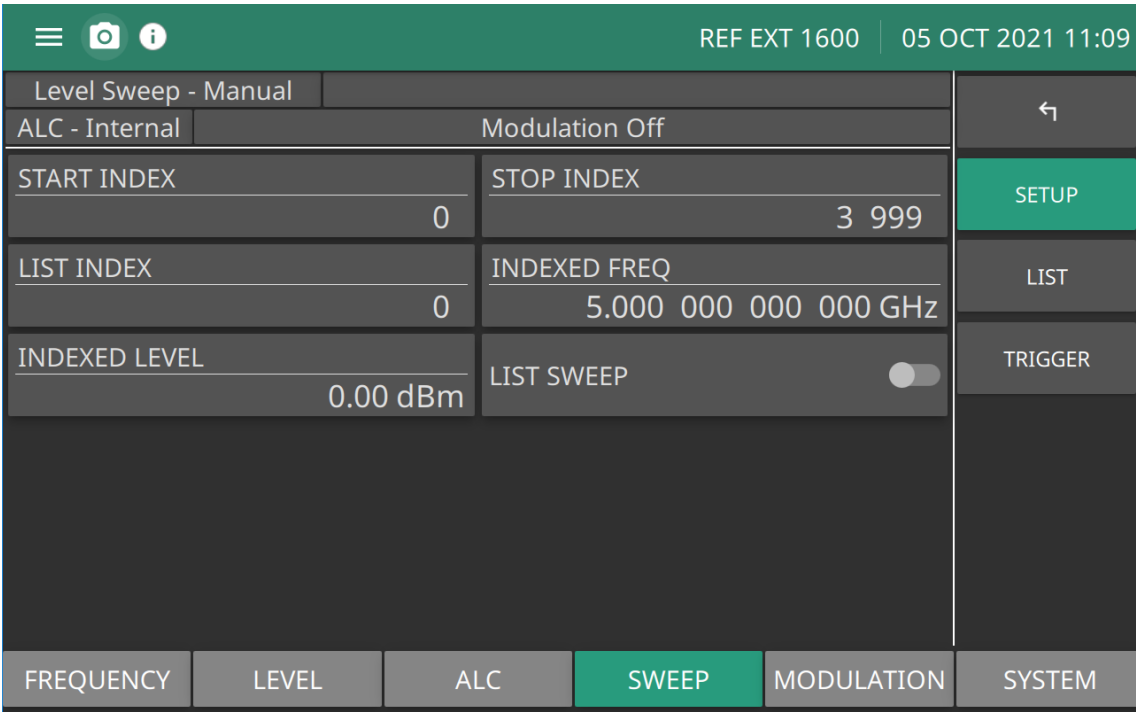
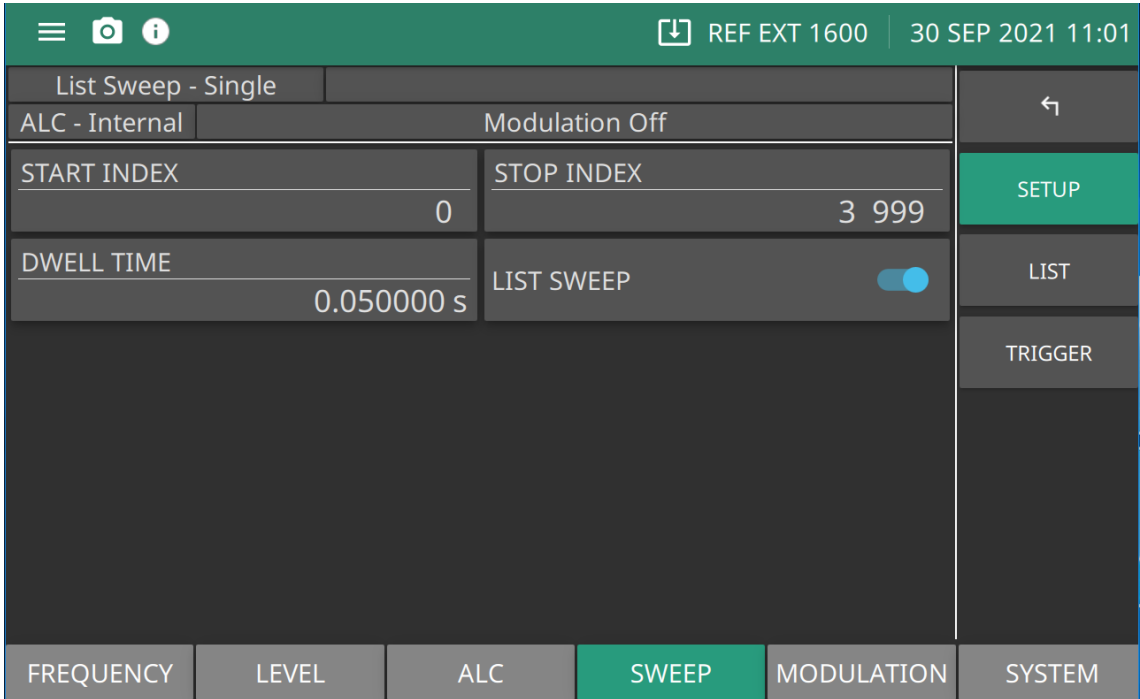


Figure 3-53. LIST TRIGGER - Set to Manual Sweep

- START INDEX:** Select the sweep start index. The Index (0 through 3999) is enabled in all trigger modes. See [“Editing the START INDEX” on page 3-52](#).
- STOP INDEX:** Select the sweep stop index. The Index (0 through 3999) is enabled in all trigger modes. See [“Editing the STOP INDEX” on page 3-52](#).
- LIST INDEX:** Press to type a single indexed frequency/level pair location (0 to 3999) to view in the Index List. See [“LIST - LIST Menu” on page 3-54](#).
- LIST SWEEP:** Toggle to activate or deactivate the list sweep.

Figure 3-53. LIST TRIGGER - Set to Manual Sweep



- START INDEX:** Select the sweep start index. The Index (0 through 3999) is enabled in all trigger modes.
- STOP INDEX:** Select the sweep stop index. The Index (0 through 3999) is enabled in all trigger modes.
- DWELL TIME:** Sets the dwell time at each sweep step. Units is in seconds.
- LIST SWEEP:** Toggle to activate or deactivate the list sweep.

Figure 3-54. LIST SETUP Menu

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. Press the Enter button when complete to close the parameter edit window.

Editing the STOP INDEX

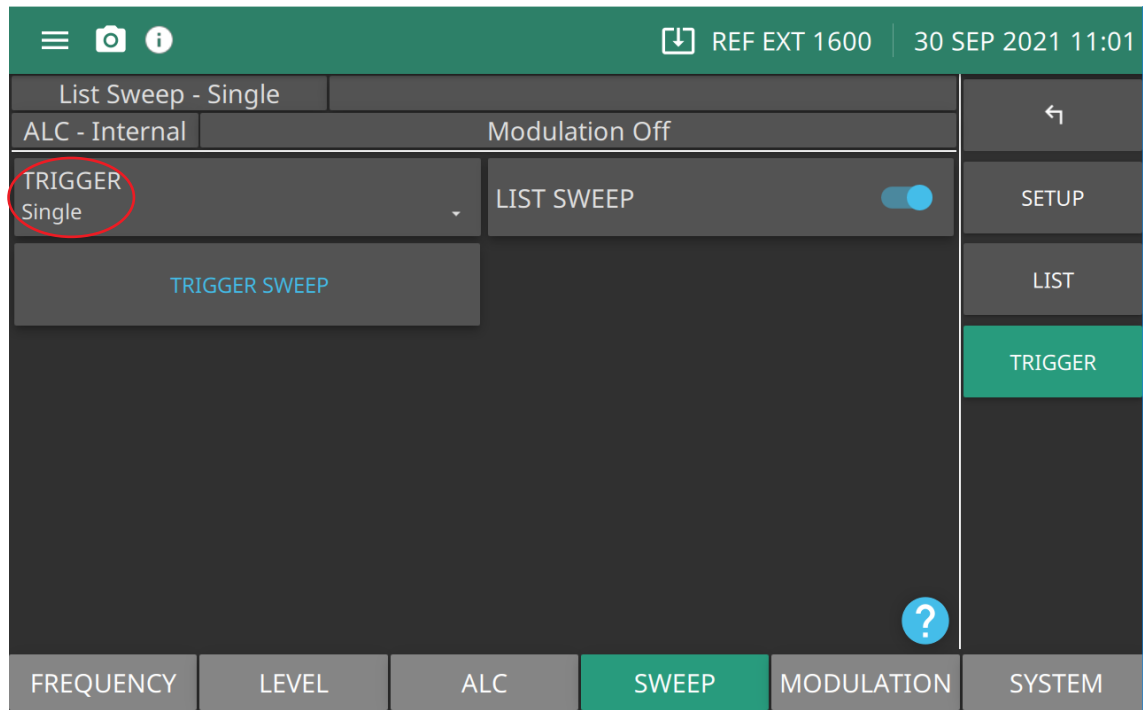
Press LIST STOP to open the stop index parameter field for editing. Edit the stop index using the cursor control keys, rotary data knob, or enter a new value using the keypad. Press the ENTER button when complete to close the parameter edit window.

LIST TRIGGER Menu

When manual trigger mode is selected, the list start index, list stop index, and dwell time parameter are not used. Instead, the list index is incremented or decremented by using the front panel cursor control keys. In manual trigger mode, the list index can also be incremented by using an external trigger input. Each trigger increments the list index by one.

After a reset, the list sweep defaults to manual trigger mode. The data display shows the trigger mode, list index, current frequency, and current power level. The list index specifies the current location within the list. When automatic, external, or single trigger mode is selected, the data display changes to show the trigger mode and list sweep start and stop index values only. The LIST TRIGGER menu is shown in [Figure 3-55](#).

Press: SWEEP | LIST | TRIGGER| TRIGGER



TRIGGER: Press to display the trigger types: Auto, Single, External, Manual, and Remote. Pressing the information icon at the bottom right of the screen shows the TRIGGER TYPES description dialog shown in [Figure 3-52 on page 3-49](#).

LIST SWEEP: Press to initiate a sweep of the List sweep parameters.

TRIGGER SWEEP: Trigger a single sweep. Enabled only in single sweep trigger mode.

Figure 3-55. SWEEP LEVEL TRIGGER Menu

List Mode Sweep Trigger Types

TRIGGER SWEEP: Sets a complete sweep upon receiving a trigger. Available in all sweeps except Manual Sweep.

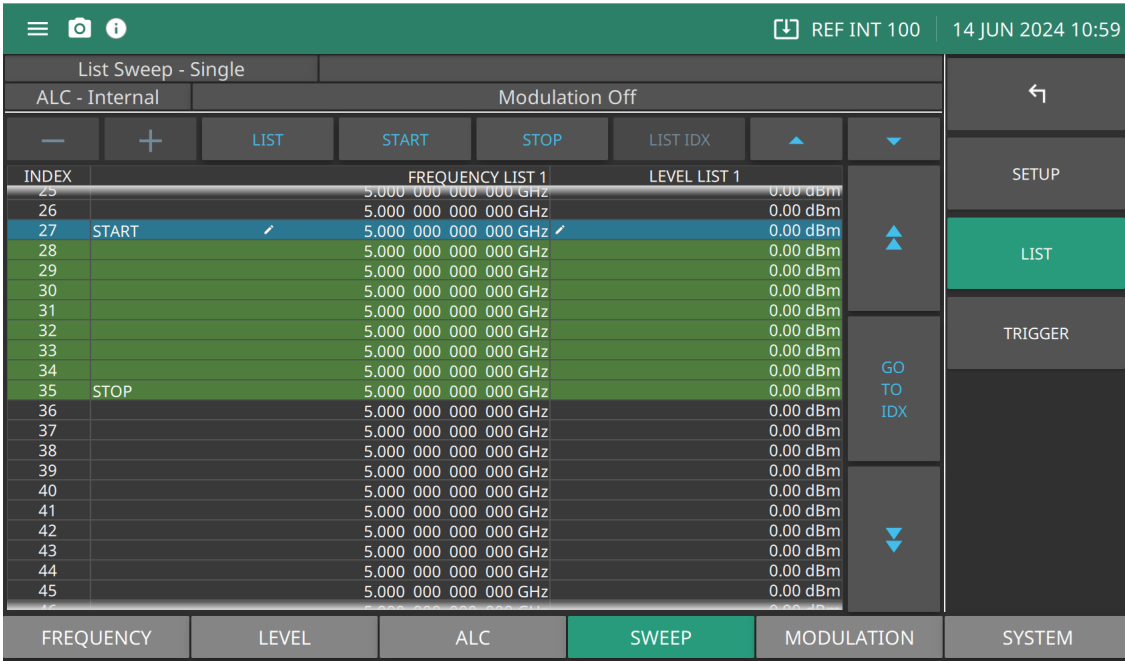
TRIGGER POINT: Active in Manual Trigger only. Each time the TRIGGER POINT button is pressed. the sweep advances to the next CW point in the sweep.

LIST - LIST Menu

The LIST - LIST MENU provides a list index that identifies each frequency/power level set in the list. The list sweep menu consists of a 4000 (0 to 3999) rows of listed start index and stop index. Scroll through the list and edit the paired frequencies and power levels. Use the cursor control keys to select a frequency or power level from the list.

The LIST menu is shown in [Figure 3-56](#).

Press: SWEEP | LIST | LIST



– : Select the index number of the frequency and level pair. Enabled only in manual trigger source.

+ : Selects the sweep start index. Enabled in all trigger modes.

EDIT FREQ: Selects the sweep stop index. Enabled in all trigger modes.

EDIT LEVEL: Sets the dwell time at each sweep step.

▲ or ▼: Scroll up or down per row.

GO TO IDX: Press double-arrow up to scroll up or double-arrow down to scroll down per page.

Figure 3-56. LIST Index Table

Press page up (blue double-up arrow) to scroll the displayed frequencies/levels to the previous page in the list. Press page down (blue double-down arrow) to scroll the displayed frequencies/levels to the next page in the list.

Select the index row (highlighted list index) and press either the EDIT FREQ 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.

The complete list of 4000 (0-3999) 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. Each list index can also be individually edited from the List Setup and List Type menus.

Editing the Current LIST

Press LIST 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. Press the Enter button when complete to close the annotated parameter window.

Editing the Current INDEXED FREQ

Press the EDIT FREQ 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. When finished setting the open parameter, close it by selecting a termination key.

Editing the Current INDEXED LEVEL

Press the EDIT LEVEL menu button to open the index frequency parameter field for editing. Edit the current list level using the cursor control keys, rotary data knob, or enter a new value using the keypad. When finished setting the open parameter, close it by selecting a termination key.

The SWEEP | LIST | LIST menu example in [Figure 3-56](#) shows the LIST START at 27, LIST STOP at 35. The green highlight rows show the list range and the blue highlight shows the current cursor location in the list.

The resulting List menu screen below in [Figure 3-57](#) displays the LIST START at 27 and LIST STOP at 35.



Figure 3-57. Set Up a List

COPY TO LIST

An easy method of entering frequency and power level information into the current list index is to copy the set parameters from the CW menu.

From the main FREQUENCY menu, press the FREQUENCY and LEVEL to edit the parameters. Then press the COPY TO LIST button shown in [Figure 3-58](#) to open the list index parameter. Once the frequency and power level information has been entered into the current list index, the list index is incremented by one.

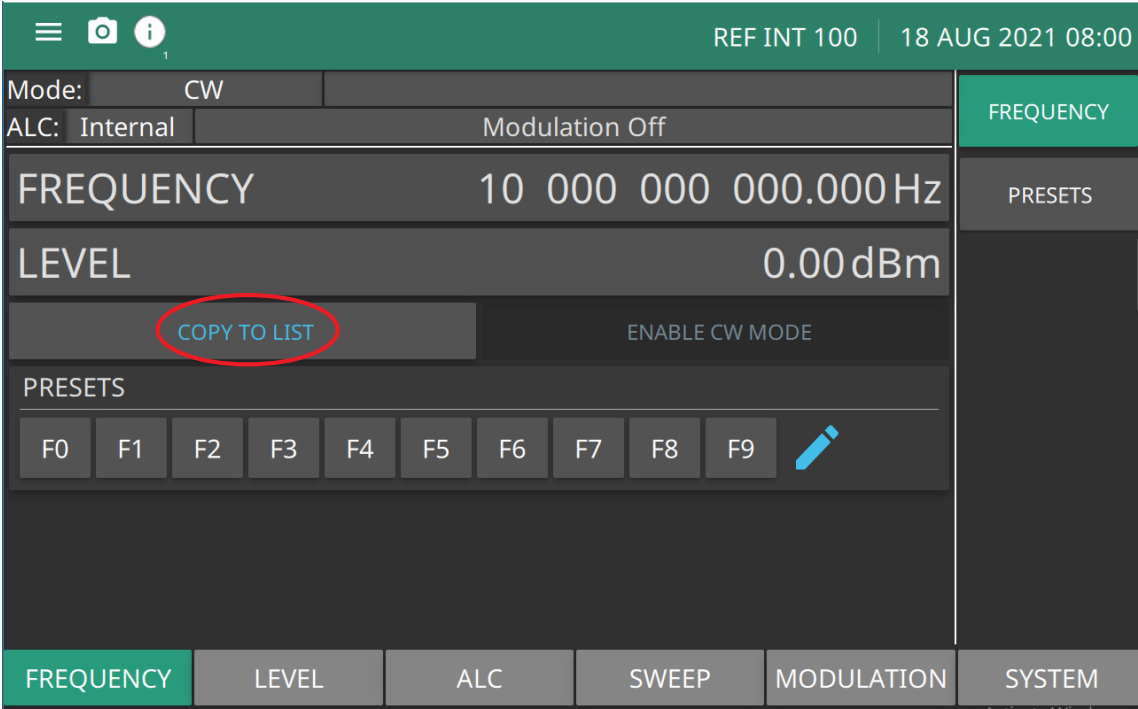


Figure 3-58. COPY TO LIST

Open the parameter you wish to change, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the key pad and appropriate termination soft key. When you have finished setting the open parameter, close it by pressing its menu soft key or by making another menu selection.

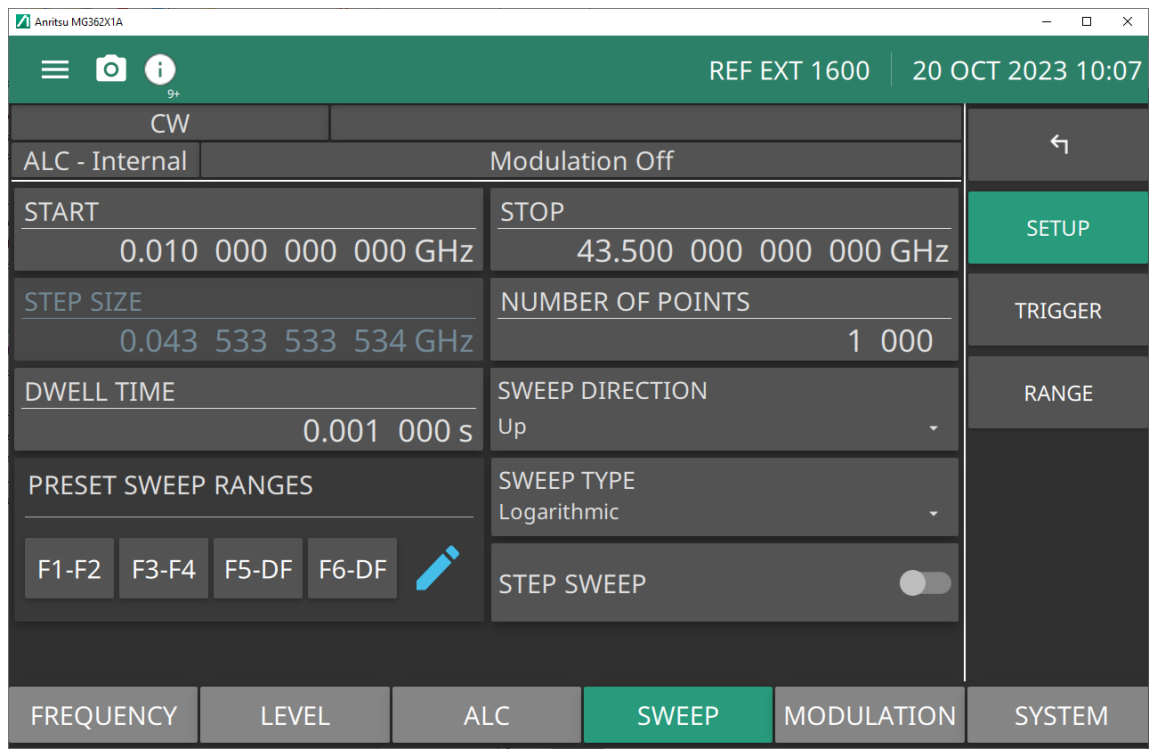
Level

The signal generator provides leveled output power sweeps at CW frequencies and in conjunction with frequency sweeps. Power level sweeps can be from a set to sweep from high level to a low level range or from a low to a high level range. Power level sweeps can be selected to be linear or logarithmic. Level sweep menus provide the sweep range, the step size, the dwell time-per-step, and the type of power sweep (linear or logarithmic), sweep direction, and sweep trigger.

LEVEL SWEEP Menu

The LEVEL Setup Menu is shown in [Figure 3-59](#).

Press: SWEEP | LEVEL | SETUP.



START: Set the start level of the step sweep.

STOP: Set the stop level of the step sweep.

STEP SIZE: Set step size in frequency increments per sweep. The step size and the number of points are interactive.

NUMBER OF POINTS: Set the number of points per sweep. The number of points and step size are interactive.

DWELL TIME: Sets the sweep per point dwell time. Units are in seconds.

SWEEP DIRECTION: Sets the direction of the sweep up/down.
Up = start to stop sweep. Down = stop to start sweep.

PRESET SWEEP RANGES: Selects a frequency sweep range preset.

Range: F1-F2 | F3-F4 | F5-DF | F6-DF | L1-L2 | L3-L4 | L5-L6 | L7-L8 | L9-L0

SWEEP TYPE: Sets the parameter for sweep type to logarithmic or linear sweep operation.

STEP SWEEP: Set to start or stop step sweep.

Figure 3-59. SWEEP LEVEL Menu

Setting CW Power Sweep, Step Size, and Dwell Time

To set the size of each step of the CW power sweep, set the step size or set the number of steps. The step size range is 0.01 dB (Log) or 0.001 mV (Linear) to 163 dB; the number of steps range is 1 to 10,000. The dwell time-per-step of the CW power sweep can be set for any time in the range of 1 ms to 99 sec. If the sweep crosses a step attenuator setting, there will be a sweep dwell of approximately 20 ms to allow setting of the step attenuator.

- Press DWELL TIME to open the dwell time-per-step parameter.
- Press STEP SIZE to open the step size parameter.
- Press NUMBER OF POINTS to open the number of steps parameter.

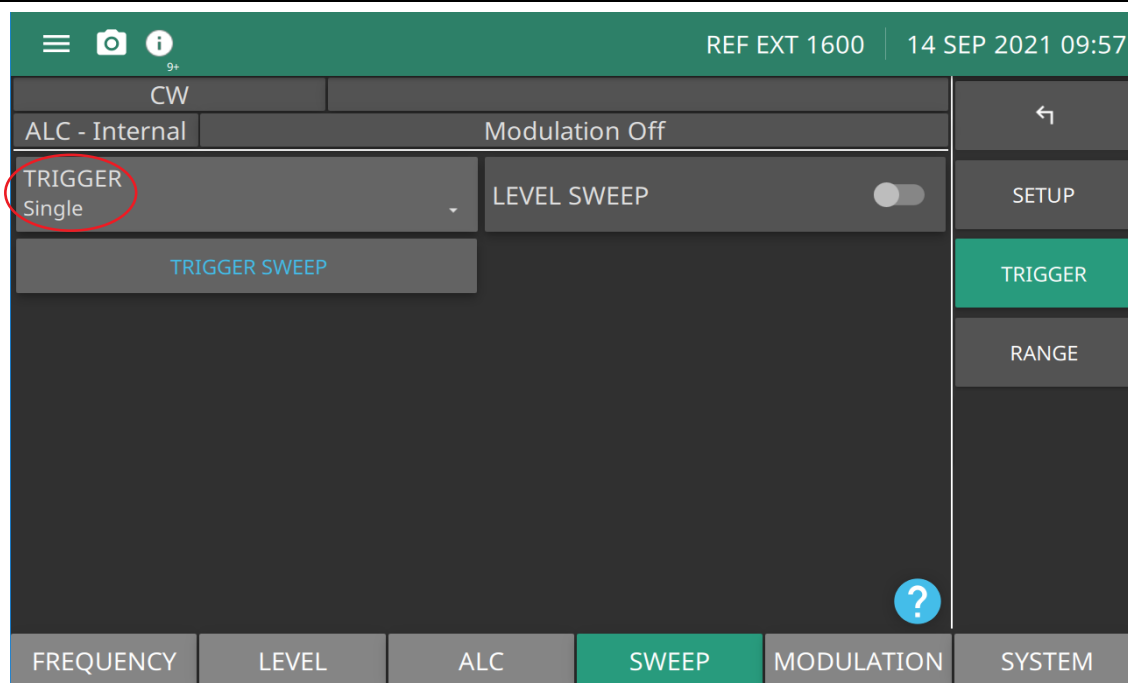
Press and edit the current value using the cursor control keys, rotary data knob, or enter a new value using the key pad and appropriate termination button. When you have finished setting the open parameter, close it by pressing its menu soft key or by making another menu selection.

Triggering a CW Power Sweep

In the CW power sweep mode, use the TRIGGER menu to sweep output power steps between any two power levels.

The Level Sweep Trigger menu is shown in [Figure 3-60](#),

Press: SWEEP | LEVEL | TRIGGER | TRIGGER



TRIGGER: Press to display the trigger types: Auto, Single, External, Manual, and Remote. Pressing the question mark icon at the bottom right of the screen displays the TRIGGER TYPES description dialog shown in [Figure 3-52](#) on page 3-49.

LEVEL SWEEP: Toggle to set level sweep on or off.

TRIGGER SWEEP: Available in single sweep only. Press to trigger a sweep.

Figure 3-60. SWEEP LEVEL TRIGGER Menu

The trigger types displayed are shown in [Figure 3-61](#). Press the information icon to display the TRIGGER TYPES dialog shown in [Figure 3-61](#).

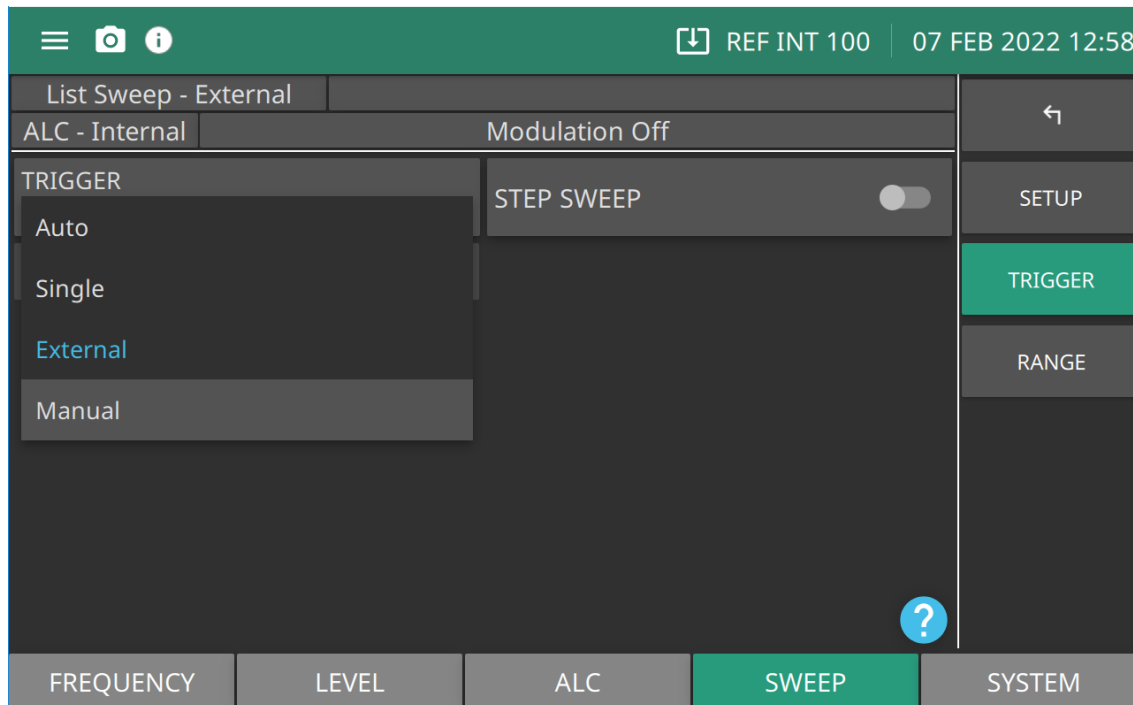


Figure 3-61. Level Sweep Trigger Types

Power Sweep Trigger Types

- **Auto:** Set automatic triggering
- **Single:** Set single sweep triggering
- **External:** Set external triggering
- **Manual:** Manual sweep is triggered when TRIGGER POINT is pressed. TRIGGER POINT button is available only when TRIGGER is set to Manual. See [“TRIGGER SWEEP/TRIGGER POINT” on page 3-60](#).

TRIGGER SWEEP/TRIGGER POINT

TRIGGER SWEEP: Available in all sweeps except Manual Sweep. See [Figure 3-62](#). Pressing TRIGGER SWEEP starts a single sweep. If a single CW power sweep is in progress, pressing TRIGGER SWEEP again aborts the sweep and resets to the beginning sweep point.

TRIGGER POINT: Active in Manual Trigger only and available in step sweep mode. See [Figure 3-63](#). Each time the TRIGGER POINT button is pressed, the sweep advances to the next CW point in the sweep. For example a step sweep set at 10 steps and starting at the beginning of the sweep, pressing the TRIGGER POINT advances to the second step. Pressing again advances the sweep to the third step. Pressing the TRIGGER POINT button ten times will complete the sweep and then will then start at the beginning of the sweep.

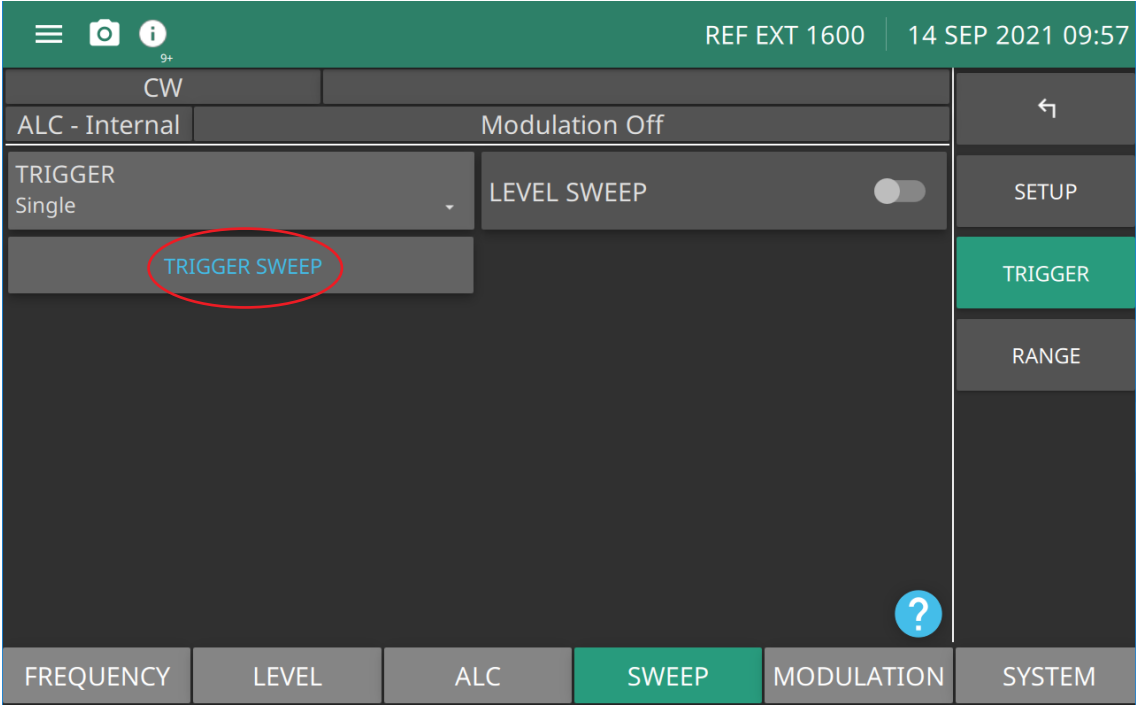


Figure 3-62. TRIGGER SWEEP Button

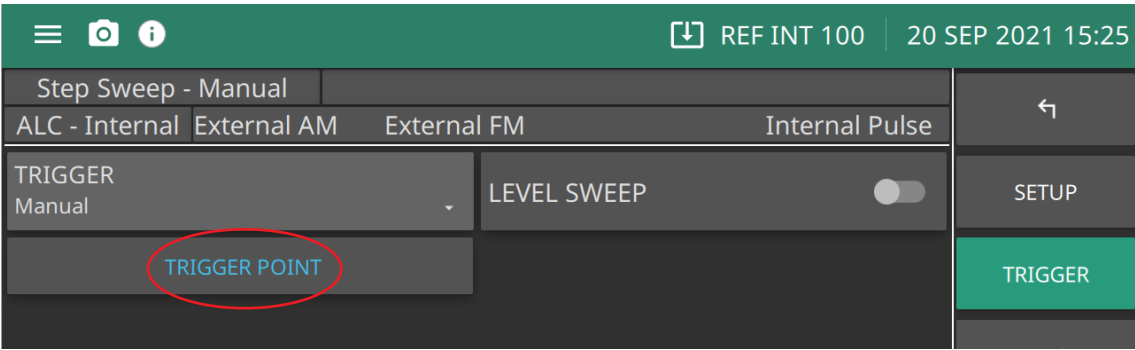
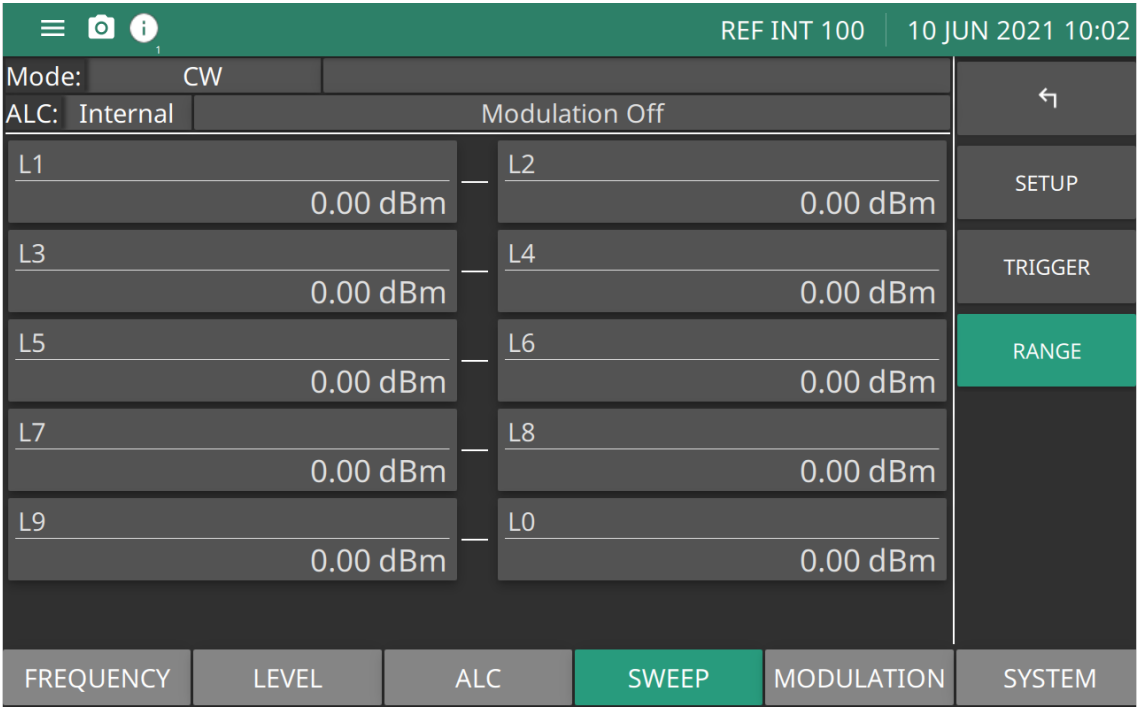


Figure 3-63. TRIGGER POINT Button

RANGE Menu

The LEVEL RANGE menu is shown in [Figure 3-64](#).

Press: SWEEP | LEVEL | RANGE



L1-L9: Level preset parameters

Figure 3-64. SWEEP LEVEL RANGE Menu

Setting a Power Level Sweep Range

Set a pair of preset power level sweep range parameters to sweep: L1-L2, L3-L4, L5-L6, L7-L8, L9-L0. Edit the current start and stop power level parameter values.

Entering New Start/Stop Power Levels

To edit the current power level sweep range, press the START or STOP power level parameter. Pressing L1, L3, L5, L7 or L9 opens the start power level parameter and L2, L4, L6 L8, L0 opens the stop power level parameter.

Edit the open power level parameter using the cursor control keys or the rotary data knob. When you are finished, close the open parameter by pressing its menu edit soft key or by making another menu selection.

From the SETUP menu shown in [Figure 3-65](#) press the desired PRESET SWEEP RANGES button and then toggle the LEVEL SWEEP button on to start the power level sweep.

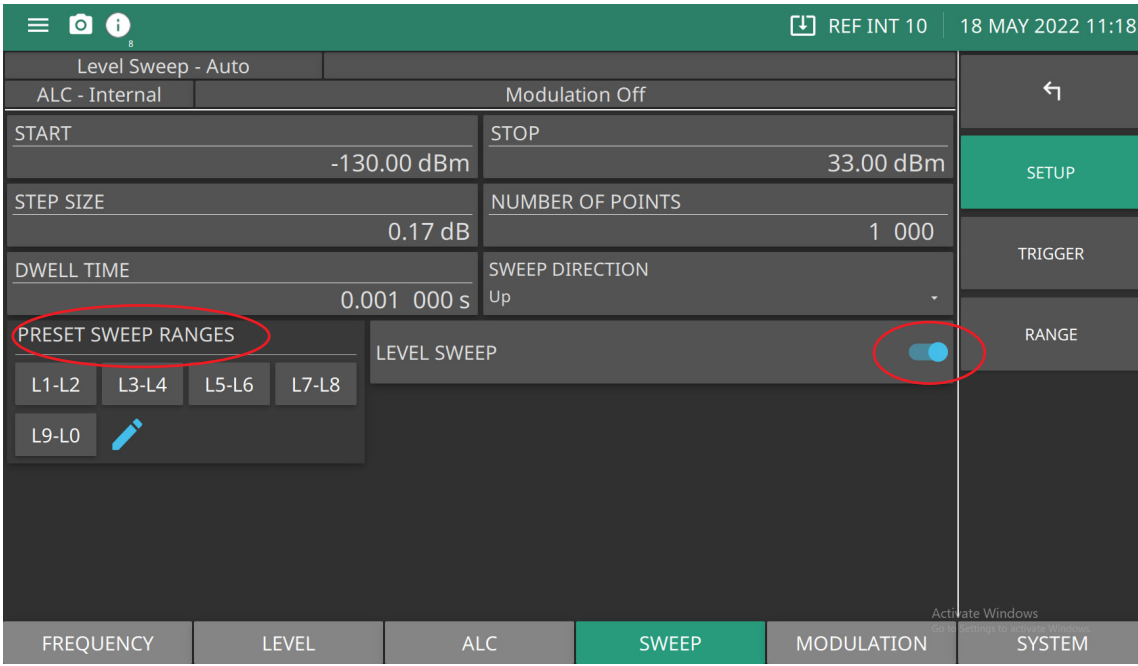


Figure 3-65. SWEEP LEVEL SETUP Menu

Setting SWEEP TYPE

Use the SWEEP TYPE menu to select a logarithmic or linear power level sweep and set the START and STOP power level parameters for each selected preset sweep range. Press SWEEP TYPE to display the Units menu and to select the power level units. When Log is selected, units are dBm or dBμV. When Linear is selected, units are mV. The units are displayed with the indicated power level to reflect your selection.

Analog Sweep (Option 6)

Analog sweep is available for the MG36221A and MG36241A models only. In analog sweep frequency mode, the MG36221A output frequency is swept between selected start and stop frequencies. Sweep width can be set from 1 MHz to the full frequency range of the signal generator. Sweep time can be set for any time in the range of 13 ms to 99 s. The lower frequency limit for analog sweeps is 10 MHz. When Option 6 is installed, CW Ramp and Markers are available. See “CW RAMP Menu” on page 3-6 and “Markers Menu” on page 3-7.

When the sweep width of the analog sweep is >100 MHz, the sweep is phase-lock corrected at both the start and stop frequencies and at each band switch point. When the sweep width is ≤100 MHz, only the center frequency is phase-lock corrected. The ANALOG SWEEP menu is shown in Figure 3-66.

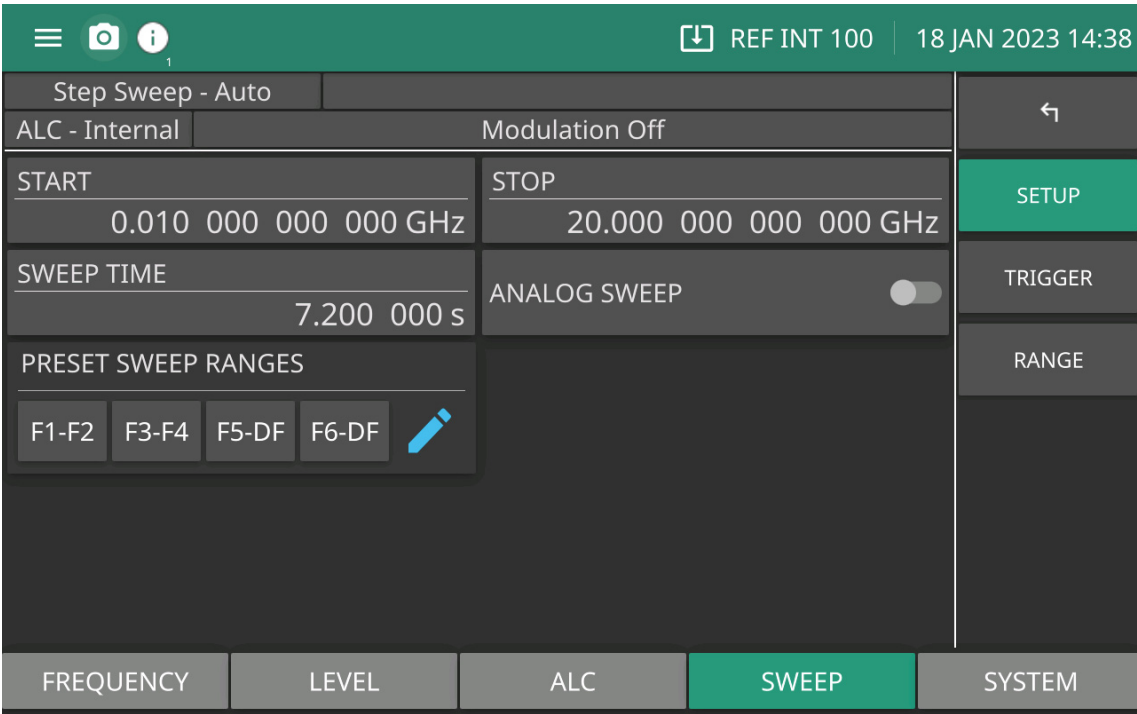


Figure 3-66. Analog Sweep

This menu lets you perform the following:

START: Set a start sweep frequency. See “Editing the Current Start/Stop Frequencies” on page 3-64.

STOP: Set a stop sweep frequency. “Editing the Current Start/Stop Frequencies” on page 3-64.

PRESET SWEEP RANGES: See “Setting Preset Sweep Ranges” on page 3-64.

ANALOG SWEEP Button: Turn analog sweep on or off.

SWEEP TIME: Set the sweep time. See “Setting Sweep Time” on page 3-64.

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 shown in [Figure 3-47](#), press START opens the start frequency parameter. Press STOP opens the stop frequency parameter. Edit the open frequency parameters. When complete, close the open parameter using a termination key.

Setting Preset Sweep Ranges

To set the sweep range frequency parameters:

Press: SWEEP | STEP | PRESET SWEEP RANGES

The Sweep Range menu is shown in [Figure 3-49](#).

- **Press F1-F2:** Provides a frequency sweep between the start frequency, F1, and the stop frequency, F2.
- **Press F3-F4:** Provides a frequency sweep between the start frequency, F3, and the stop frequency, F4.
- **Press F5-DF:** Provides a symmetrical frequency sweep about the center frequency, F5. The sweep width is determined by the dF frequency parameter.
- **Press F6-DF:** Provides a symmetrical frequency sweep about the center frequency, F6. The sweep width is determined by the dF frequency parameter. The Delta Frequency can be applied to any F0-F9 frequency.

Selecting one of the preset sweep range parameters F1-F2, F3-F4, F5-F6 and DF (Delta Frequency).

Setting Sweep Time

To set the analog sweep time, press SWEEP TIME.

Edit the current sweep time using the cursor control keys, the rotary data knob, or enter a new sweep time using the key pad and appropriate termination key. To close the open sweep time parameter once you have set the desired sweep time, press SWEEP TIME or make another menu selection.

To access the Analog Sweep Trigger menu from this menu, press TRIGGER. Set one of three trigger modes:

- Auto
- External
- Single

The trigger modes are described on in [“Sweep TRIGGER TYPES” on page 3-49](#).

Trigger Menu

The sweep trigger is selectable from the trigger menu. There are three modes of sweep triggering for analog and step frequency sweep—automatic, external, and single. Press the TRIGGER button to display the trigger types:

- **Auto (Automatic):** The sweep continually sweeps from its start frequency to its 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.
- **Single:** A single sweep starts when the trigger key is pressed. If a sweep is in progress when the key is pressed, it aborts and resets.

To access the Sweep Trigger menu (Figure 3-67) from either the Analog Sweep or Step Sweep menus, press: SWEEP | STEP | TRIGGER.

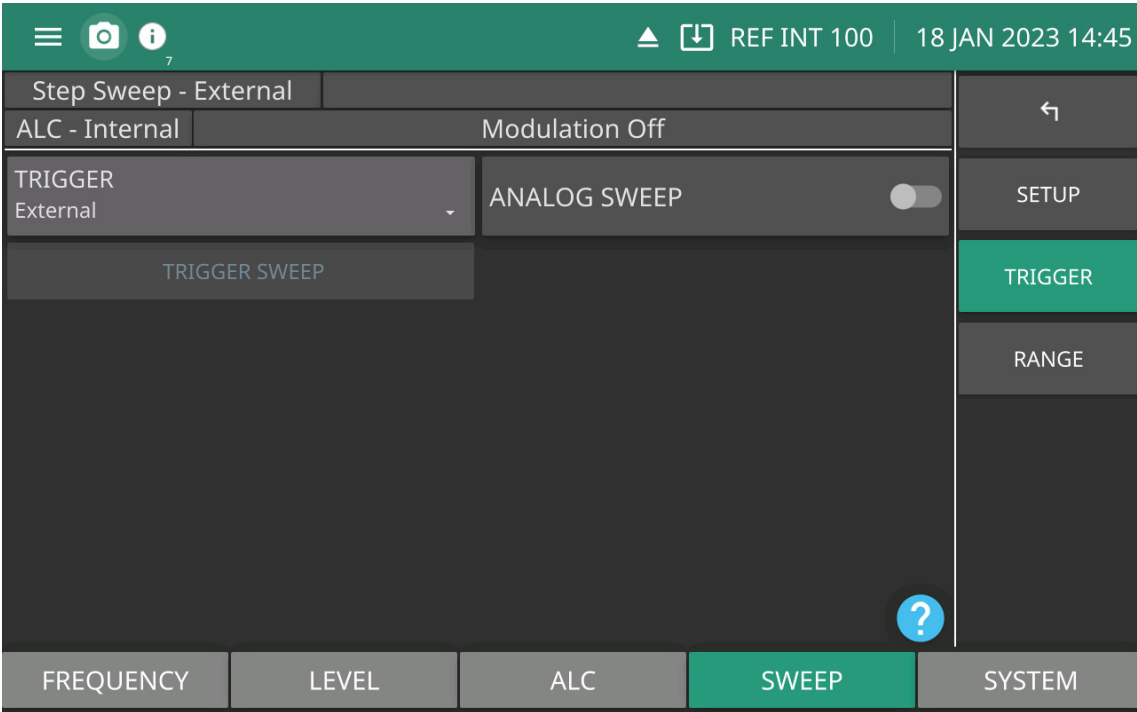


Figure 3-67. TRIGGER Menu

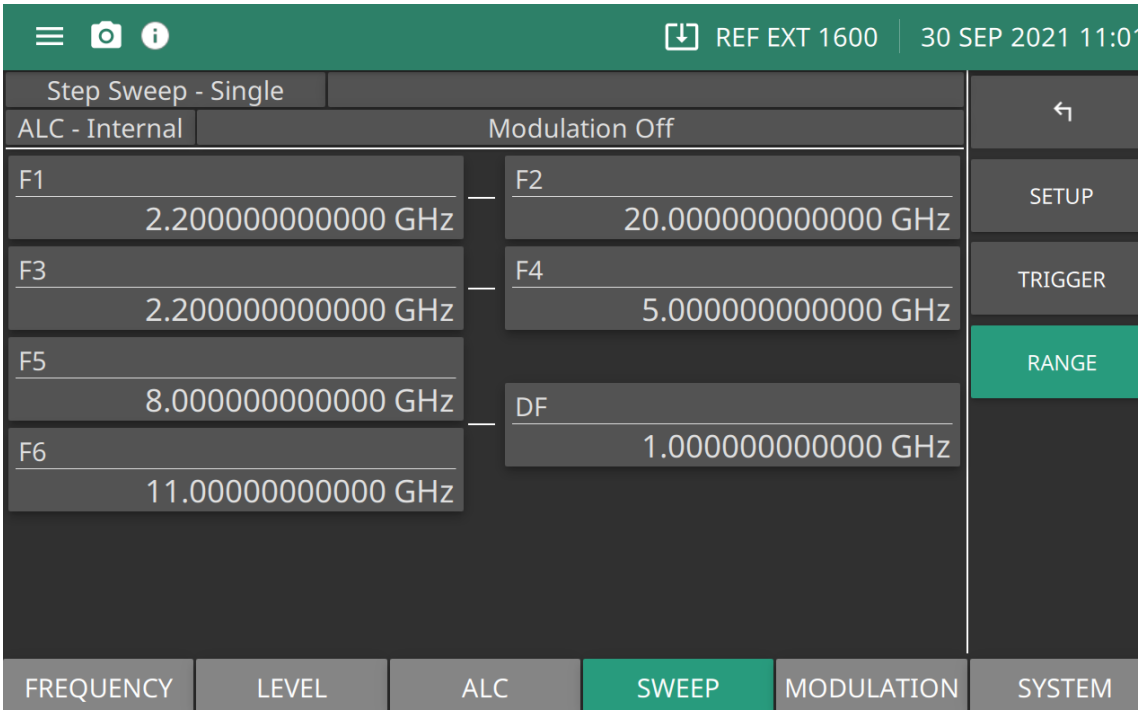
A message showing the sweep trigger mode selected appears on the right side of frequency title bar.

If you select the single sweep trigger mode, the menu display adds the menu soft key TRIGGER. Pressing TRIGGER starts a single sweep. If a single sweep is in progress, pressing TRIGGER causes the sweep to abort and reset.

RANGE Menu

The STEP RANGE menu provides frequency parameter range settings fro analog and step sweep modes. The RANGE menu is shown in [Figure 3-49](#).

Press: SWEEP | STEP | RANGE



F1-F2: Frequency preset parameters. Sets as a pair when setting a sweep.

F3-F4: Frequency preset parameters. Sets as a pair when setting a sweep.

F5 dF: Frequency preset parameters. This sweep preset includes dF and delta Frequency preset.

F6-dF: Frequency preset parameters. This sweep preset includes dF and delta Frequency preset.

Figure 3-68. STEP- RANGE Menu

Analog Power Sweep (APS) (Option 16)

Analog Power Sweep Option 16 is available on all models.

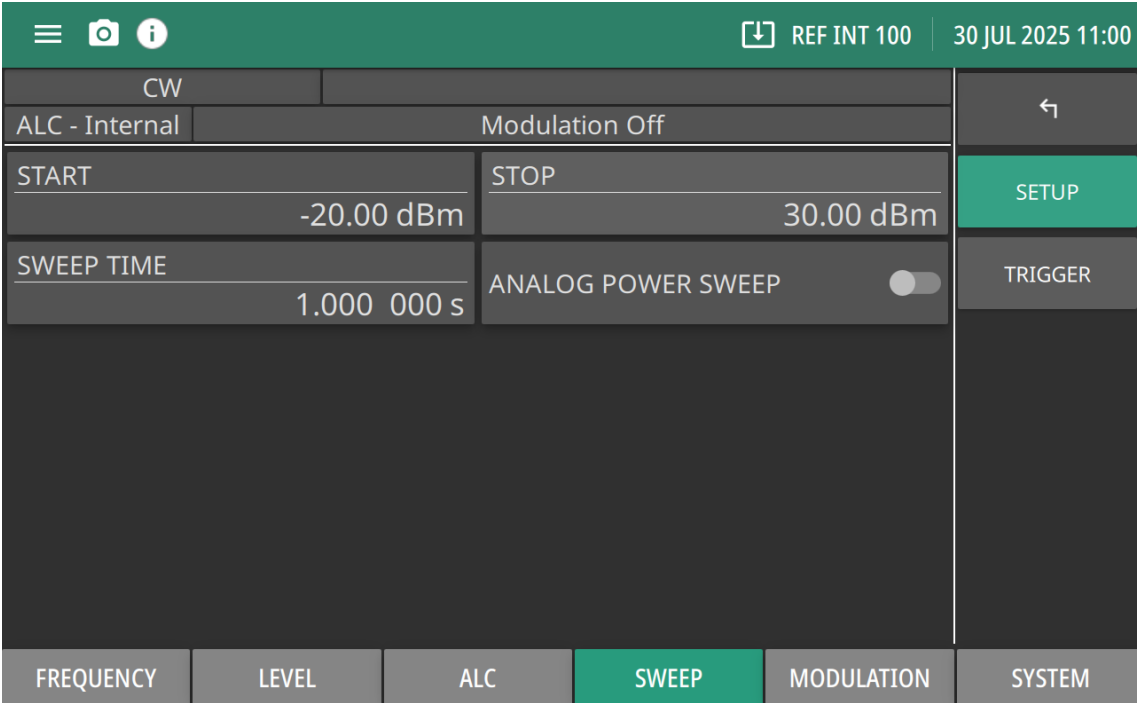
In Analog Power Sweep mode, the RF output power is swept between a selected start and stop power over a selected period of time. Frequency remains constant, at the current CW frequency setting value. The step size is also constant, at 0.01 dBm. The number of points and dwell time per point are both calculated automatically. The power levels can extend to the minimum and maximum output power of the device, and the sweep time can be any time from 10 milliseconds to 99 seconds, though sweeps over a wide range may have a longer minimum sweep time.

Analog Power Sweep can sweep much faster than a Step Sweep, and is significantly easier and more convenient to set up than a List Sweep. The Analog Power Sweep menu is shown in [Figure 3-69](#).

Press SWEEP | APS.

SETUP

By default Setup menu is displayed after pressing APS menu.



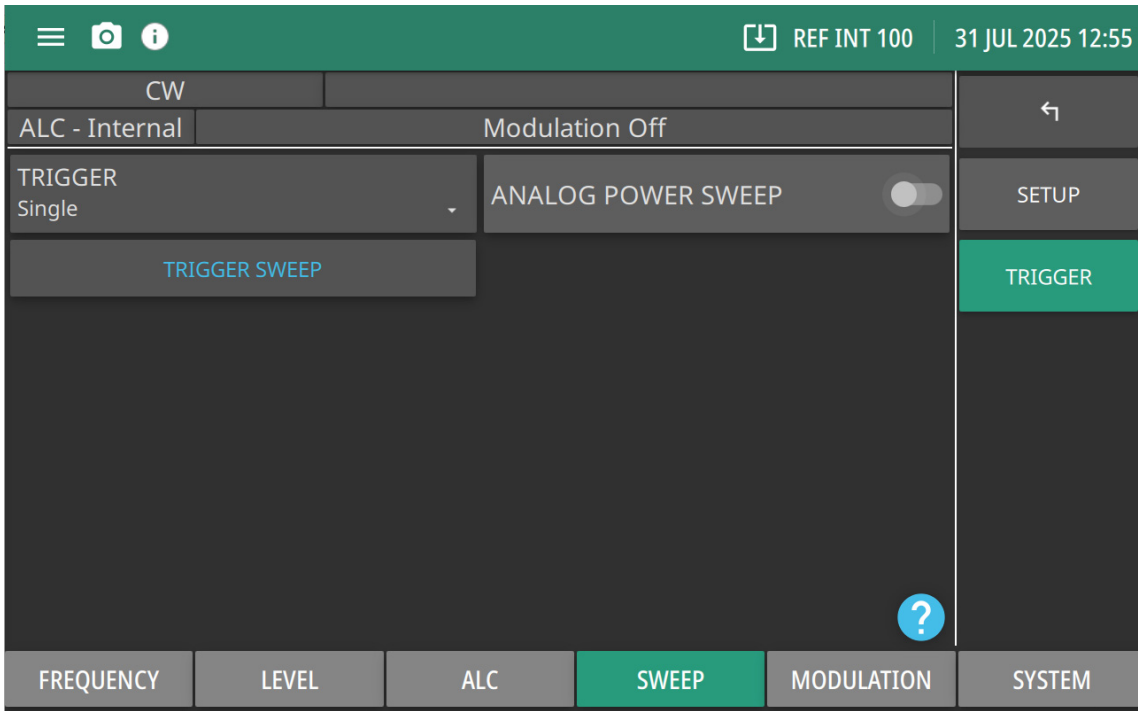
- START:** Sets the start power.
- STOP:** Sets the stop power.
- SWEEP TIME:** Sets the sweep time.
- ANALOG POWER SWEEP:** Turn on the toggle to enable analog power sweep. It is off by default.

Figure 3-69. Sweep - APS Setup Menu

TRIGGER

Analog Power Sweep menu also consists of Trigger menu as shown in [Figure 3-70](#).

Press APS | TRIGGER.



TRIGGER: Press to display the trigger types: Auto, Single, External, Manual, and Remote shown in [Figure 3-52](#) on page 3-49.

TRIGGER SWEEP: Trigger a single sweep. Enabled only in single sweep trigger mode. When TRIGGER is set to Manual Sweep, the TRIGGER POINT button is enabled. See [“List Mode Sweep Trigger Types”](#) on page 3-53.

ANALOG POWER SWEEP: Turn on the toggle to enable analog power sweep.

Figure 3-70. APS - Trigger Menu

3-10 Modulation

The signal generator provides Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (Φ M), and Pulse Modulation (PM) of the output signal using modulating signals from either the internal AM, FM, Φ M, and pulse generators or external sources that are TTL-compatible. FM and Φ M can not be on at the same time; therefore, only the AM, FM or Φ M, and Pulse Modulation modes can be active simultaneously. The following paragraphs provide descriptions and operating instructions for each modulation mode.

Note

Your 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.

- [“Amplitude Modulation” on page 3-69](#)
- [“Frequency Modulation” on page 3-75](#)
- [“Phase Modulation” on page 3-81](#)
- [“Pulse Modulation” on page 3-85](#)

Amplitude Modulation

The Amplitude Modulation menu provides amplitude modulation of the output signal using a modulating signal from both the internal AM generator and an external source. The signal generator has two AM operating modes: Linear AM and Log AM. In Linear AM mode, sensitivity is continuously variable from 0 %/V to 100 %/V. The amplitude of the RF output changes linearly as the AM input changes. In Log AM mode, sensitivity is continuously variable from 0 dB/V to 25 dB/V. The amplitude of the RF output changes exponentially as the AM input changes.

Setting AM SOURCE

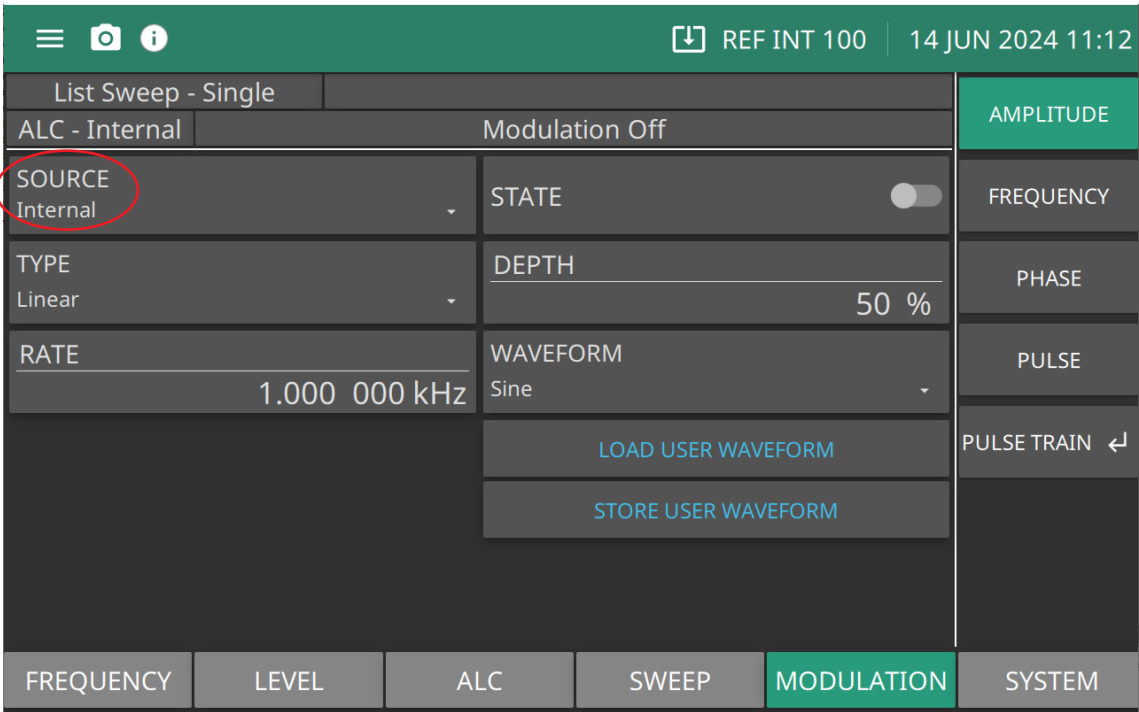
Press SOURCE to set the source of the modulating signal as Internal or External.

- Internal sets the modulating signal to the internal generator source.
- External sets the modulating signal to an external generator source connected to the rear panel AM IN BNC.

Amplitude Modulation Set to Internal

AM SOURCE set to Internal is shown in [Figure 3-71 on page 3-70](#).

Press MODULATION | AMPLITUDE | SOURCE | Internal



SOURCE: Set Internal or External Amplitude modulation.

STATE: Switch Internal Amplitude modulation on or off.

TYPE: Set to Logarithmic or Linear AM.

- **Logarithmic:** Displays the DEPTH button to set sensitivity in dB.
- **Linear:** Displays the DEPTH button to set sensitivity in %.

DEPTH: Numeric parameter active when AM Type is linear. Parameter is in percentage.

RATE : Edits the AM rate in Hz | kHz | MHz.

WAVEFORM: Select the internal AM waveform: Sine, Square, Positive Ramp, Negative Ramp, Gaussian Noise, Uniform Noise, Triangle.

LOAD USER WAVEFORM: Open the load dialog in the user defined location. Only available with Option 10.

STORE USER WAVEFORM: Open the save dialog in the user defined location. Only available with Option 10.

Figure 3-71. Amplitude Modulation Menu

Note Modulation status menus may display in this menu if previously left open. The examples in this manual are given relative to a system-reset state.

Setting TYPE (SOURCE Set to Internal)

Linear AM: Sets the modulation depth of the AM signal in the internal AM Linear mode. Depth is continuously variable from 0 %/V to 100 %/V. The amplitude of the RF output changes linearly as the AM input changes.

Logarithmic AM: Sets the modulation depth of the AM signal in the internal AM Log mode. Depth is continuously variable from 0 dB/V to 25 dB/V. The amplitude of the RF output changes exponentially as the AM input changes.

Setting TYPE (SOURCE Set to External)

Linear AM: Sensitivity is continuously variable from 0 PCT/V to 100 PCT/V. The amplitude of the RF output changes linearly as the AM input changes.

Logarithmic AM: Sensitivity is continuously variable from 0 dB/V to 25 dB/V. The amplitude of the RF output changes exponentially as the AM input changes.

Setting STATE

Press STATE to switch AM on or off. The Internal AM status display will reflect your selection as Internal On.

Setting RATE

Press RATE to open the AM Rate parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The AM rate range is 0.1 Hz to 1 MHz for sine wave and 0.1 Hz to 100 kHz for square, triangle, and ramp waveforms.

Reduce Rate**Note**

This warning message is displayed when the AM Rate is set >100 kHz for a non-sine wave modulating waveform. Amplitude modulation of the output signal will continue but the modulating waveform may be distorted.

Setting AM WAVEFORM

Press WAVEFORM to access the Modulation Waveform menu as shown in [Figure 3-72](#). Set the modulating waveform from the internal AM generator for the internal modulation function as:

- Gaussian Noise
- Negative Ramp
- Positive Ramp
- Square
- Sine
- Triangle Wave
- Uniform Noise

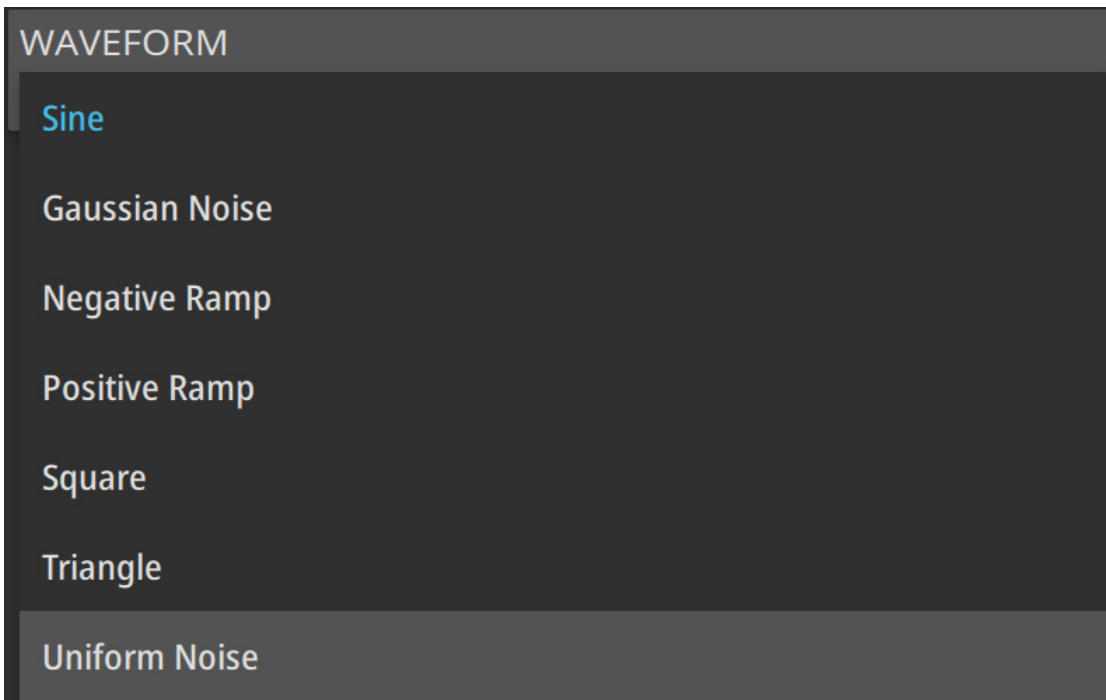


Figure 3-72. AM Modulation WAVEFORM Menu

For User defined Waveform (Option10), see [Appendix E, “Waveform Generator \(Option 10\)”](#).

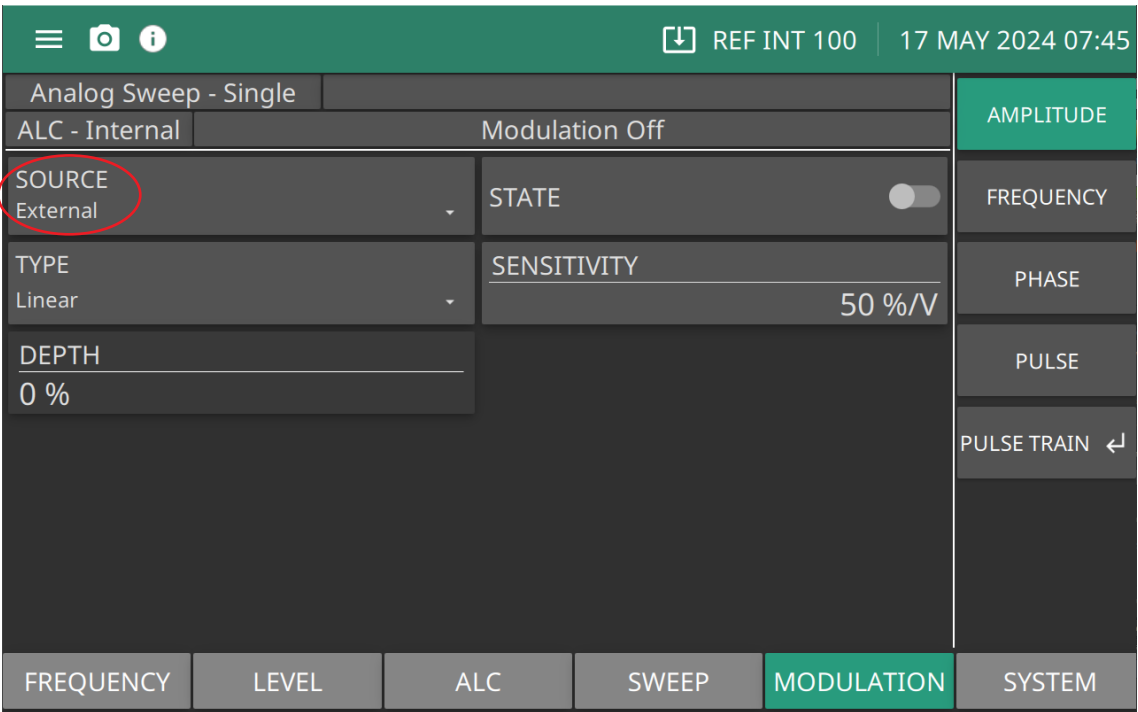
Amplitude Modulation Set to External

To provide amplitude modulation of the output signal using a modulating signal from an external source, first set up the external signal generator and connect it to the MG362x1A rear panel AM IN BNC connector.

This menu contains the external AM status window showing the current menu selections and the measured AM Depth. The AM depth measurement function measures the voltage of the external modulation signal and calculates the percentage modulation value.

AM SOURCE set to External is shown in [Figure 3-73](#).

Press MODULATION | AMPLITUDE | SOURCE | External.



SOURCE: Set Internal or External Amplitude modulation.

STATE: Switch external amplitude modulation on or off.

TYPE: : Set to Logarithmic or Linear AM.

- **Logarithmic:** Displays the DEPTH button to set sensitivity in dB.
- **Linear:** Displays the DEPTH button to set sensitivity in %.

SENSITIVITY: Available when SOURCE is set to External. Numeric parameter dB/V is active when AM Type is Logarithmic. Numeric value %/V is active when AM type is set to Linear.

DEPTH: Numeric parameter dB is active when AM Type is Logarithmic. Numeric value %/V is active when AM type is set to Linear.

Figure 3-73. External Amplitude Modulation Menu

Setting STATE

Press STATE to switch AM on and off. The External AM status display will display as External On or Off.

ERR**Note**

This error message is displayed when the external AM modulating signal exceeds the input voltage range. The message "Reduce AM Input Level" also appears at the bottom of the AM status display. AM is turned off until the modulating signal is within the input voltage range.

Setting SENSITIVITY

Press SENSITIVITY to open the AM Sensitivity parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The AM Sensitivity range is 0 %/V to 100 %/V in Linear and 0 dB/V to 25 dB/V in Log. To close the open AM Sensitivity parameter, press SENSITIVITY or make another menu selection.

Setting DEPTH

Press DEPTH to open the AM Depth parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key.

Frequency Modulation

The two internal FM operating modes are Locked and Unlocked. In the Locked and Unlocked modes, frequency modulation of the output signal is accomplished by summing the modulating signal into the FM control path of the YIG phase-lock loop.

If Locked is set, the YIG phase-locked loop is used in synthesizing the FM signal. If Unlocked is set, the YIG phase-lock loop is disabled and the FM signal is obtained by applying the modulating signal to the tuning coils of the YIG-tuned oscillator.

The (Source-Internal) Frequency Modulation menu is shown in [Figure 3-74](#). The (Source-External) Frequency Modulation menu is shown in [Figure 3-77 on page 3-79](#).

Press: MODULATION | FREQUENCY

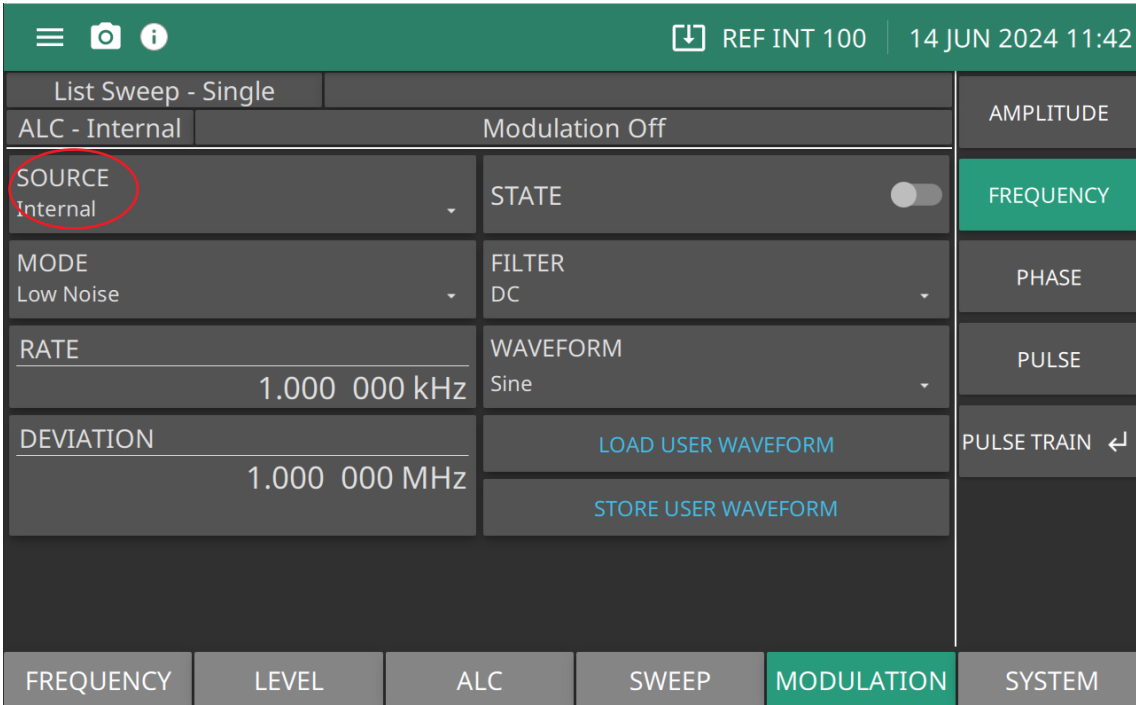
Setting FM SOURCE

Press SOURCE to set the source of the modulating signal as Internal or External.

- Internal sets the modulating signal to the internal generator source.
- External sets the modulating signal to an external generator source connected to the rear panel FM IN BNC.

Frequency Modulation Set to Internal

FM SOURCE set to Internal is shown in [Figure 3-74](#).
Press: MODULATION | FREQUENCY | SOURCE | Internal.



- SOURCE:** Set Internal or External modulation.
- STATE:** Switch frequency modulation on or off.
- MODE :** Set to Low Noise or Wide (Unlocked).
- FILTER:** Set the internal filter to DC, 63 Hz, or 1 kHz.
- RATE:** Open the FM Rate parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key.
- WAVEFORM:** Select the internal FM waveform: Sine Wave, Square Wave, Positive Ramp, Negative Ramp, Gaussian, Uniform Noise, Triangle Wave.
- DEVIATION:** Set the modulation deviation of the FM signal for the internal FM function.
Range is 10 Hz to 420000000 Hz. (Range is model dependent)
- LOAD USER WAVEFORM:** Open the load dialog in the user defined location.
- STORE USER WAVEFORM:** Open the save dialog in the user defined location.

Figure 3-74. Internal Frequency Modulation Menu

Setting Internal FM Source

Press SOURCE Internal to select the internal FM generator as the modulating signal source.

Setting STATE

Press STATE to switch FM on or off.

Setting MODE

Press MODE to set the FM Mode to Low Noise or Wide (Unlocked). Locked sets the YIG phase-locked loop to synthesize the FM signal. If Unlocked is set, the YIG phase-lock loop is disabled and the FM signal is obtained by applying the modulating signal to the tuning coils of the YIG-tuned oscillator.

Setting Filter

Press FILTER sets the high pass filter passband start frequency for the FM signal applied to the FM external input. Set DC for DC coupled, 63 Hz for a 63 Hz high pass filter, 1 kHz for a 1 kHz high pass filter as shown in [Figure 3-75](#).

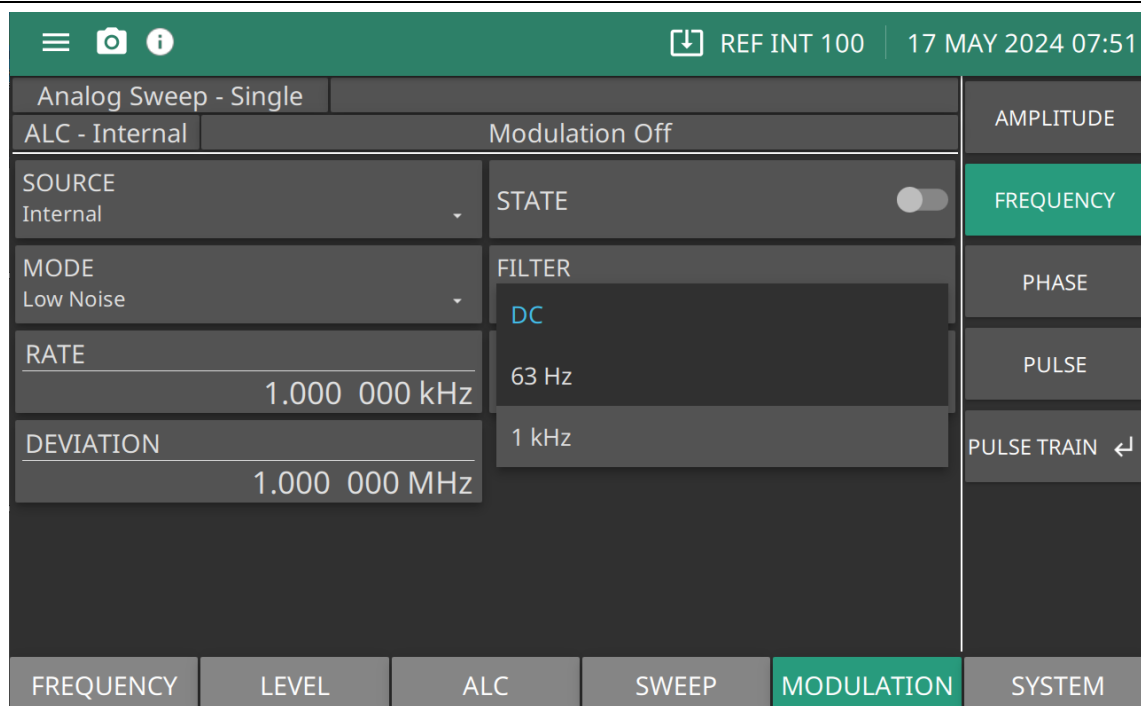


Figure 3-75. FM Filter

Setting RATE

Press RATE to open the FM rate parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The FM rate range for all waveforms is 0.001 Hz to 10 MHz.

Setting WAVEFORM

Press WAVEFORM to access the Modulation Waveform menu as shown in [Figure 3-76](#). Set the modulating waveform from the internal FM generator for the internal modulation function as:

- Gaussian Noise
- Negative Ramp
- Positive Ramp
- Square Wave
- Triangle Wave
- Uniform Noise

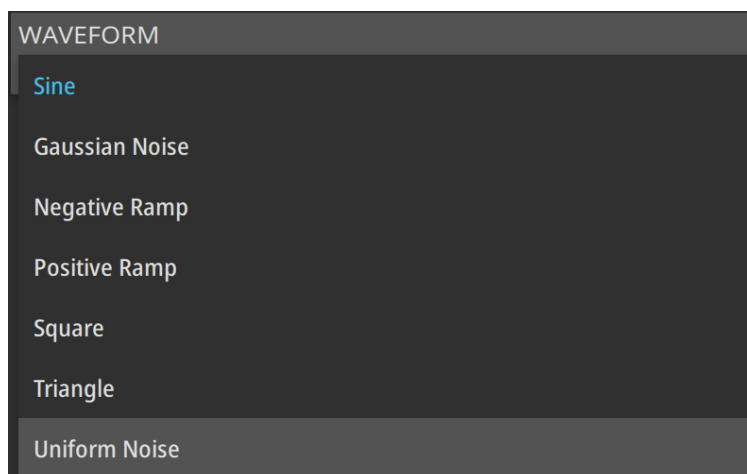


Figure 3-76. Frequency Modulation Waveforms

Setting DEVIATION

Press **DEVIATION** to open the FM Deviation parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key.

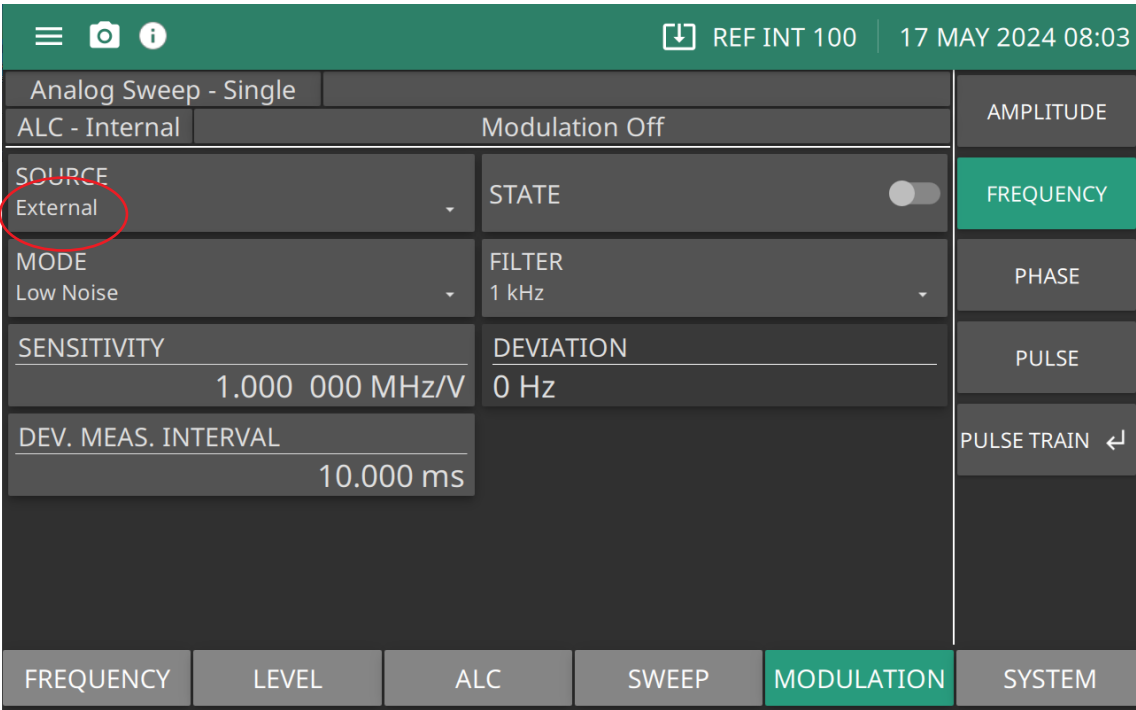
Frequency Modulation Set to External

The Frequency Modulation SOURCE set to External provides the modulating signal from an external source connected to the rear panel FM IN BNC connector.

This menu contains the external FM status window that shows the current menu selections and the measured FM Deviation (The FM deviation measurement function measures the voltage of the external modulation signal and calculates the peak frequency deviation).

The External FM menu is shown in [Figure 3-77](#).

Press: MODULATION | FREQUENCY | SOURCE | External



- SOURCE:** Set Internal or External modulation.
- STATE:** Toggle external frequency on or off.
- MODE:** Set Low Noise or Wide Unlocked mode
- FILTER:** Set to DC, 63 Hz, or 1 kHz high pass filtering.
- SENSITIVITY:** Range is -420000000 Hz/V to 420000000 Hz/V. (Range is model dependent)
- DEVIATION:** Set the modulation deviation of the FM signal for the internal FM function. Range is 10 Hz to 420000000 Hz. (Range is model dependent)
- DEV. MEAS. INTERVAL:** set the FM meter measuring interval. Range is 1e-06 seconds to 2 seconds.

Figure 3-77. External Frequency Modulation Menu

Setting STATE

Press STATE to switch external FM on and off.

Setting MODE

Sets the synthesis mode employed in generating the FM signal as Locked Low-Noise FM or Unlocked FM

If Locked low-noise is set, the YIG phase-locked loop is used in synthesizing the FM signal. If Unlocked is set, the YIG phase-lock loop is disabled and the FM signal is obtained by applying the modulating signal to the tuning coils of the YIG-tuned oscillator.

Setting COUPLING

Press COUPLING to set the coupling of the External FM input. DC allows for DC offsets to be applied to the external FM input. AC will remove DC offsets and low frequency noise from the external FM input.

Setting FILTER

Press FILTER sets the high pass filter passband start frequency for the FM signal applied to the FM external input. Set DC for DC coupled, 63 Hz for a 63 Hz high pass filter, 1 kHz for a 1 kHz high pass filter as shown in [Figure 3-75](#).

Setting SENSITIVITY

Press SENSITIVITY sets the FM sensitivity for the external FM function.

The FM Sensitivity range is -420000000 Hz/V to 420000000 Hz/V. (Range is model dependent)

Setting DEVIATION

Press DEVIATION to open the FM Deviation parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key.

Phase Modulation

The MG362x1A can provide phase modulation (Φ M) of the output signal using modulating signals from either its internal Φ M generator or an external source.

The MG362x1A has two Φ M operating modes—Narrow Φ M and Wide Φ M. In Narrow Φ M mode, the maximum Φ M deviation is the lesser of ± 3 radians or ± 5 MHz for DC to 8 MHz rates. In Wide Φ M mode, the maximum Φ M deviation is the lesser of ± 400 radians or ± 10 MHz for DC to 1 MHz rates.

Note FM and Φ M can not be active simultaneously. FM and Φ M share the same rear panel input connector and internal signal generator.

PHASE Modulation Set to Internal

Press MODULATION | PHASE | SOURCE | Internal

The Internal PHASE modulation menu is shown in [Figure 3-78](#).

Note FM and Φ M can not be active simultaneously. FM and Φ M share the same rear panel input connector and internal signal generator.

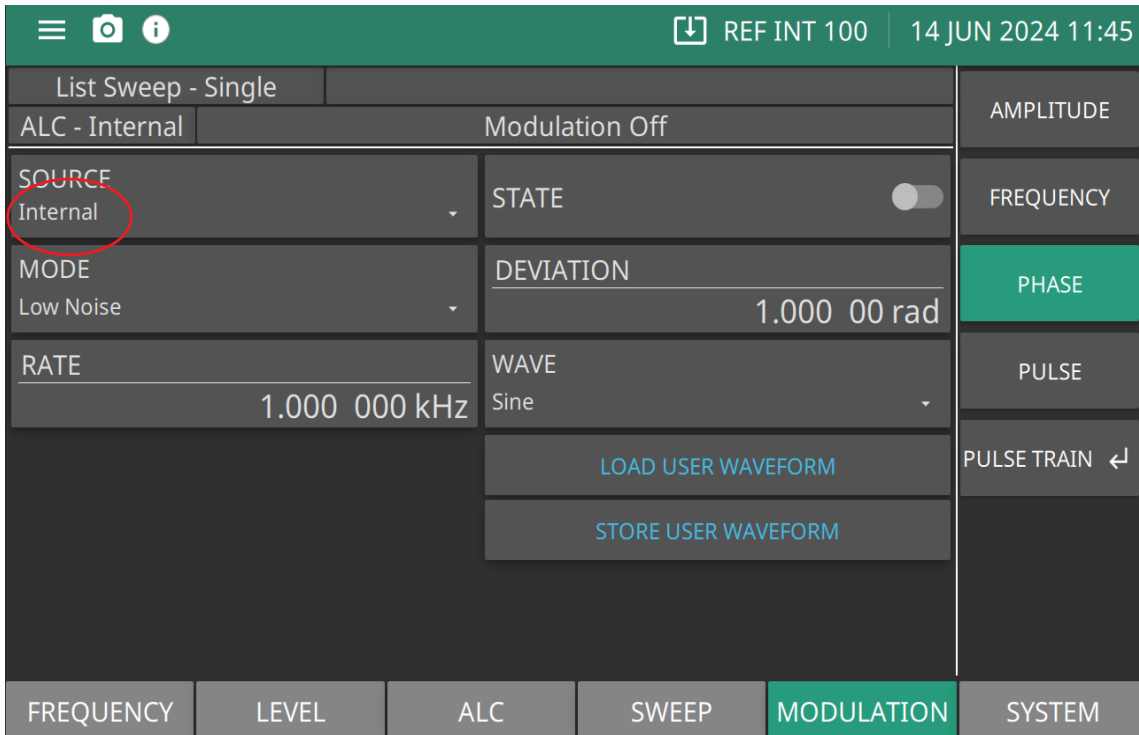


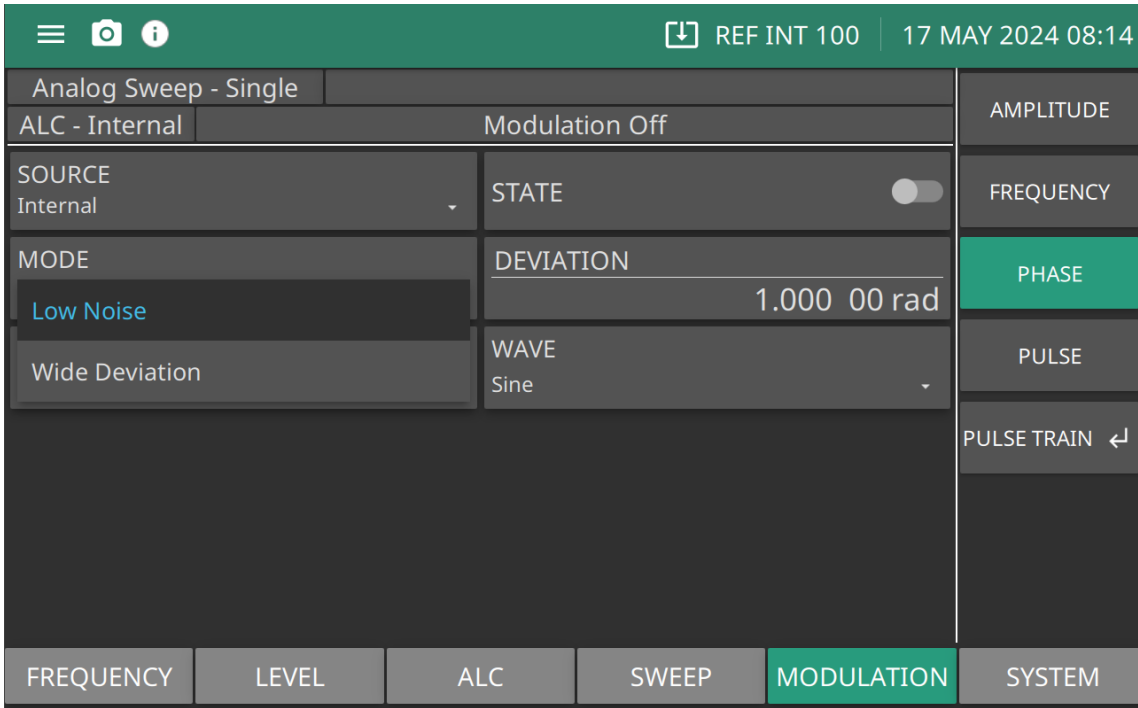
Figure 3-78. Internal Phase Modulation Menu

- SOURCE:** Set Internal or External Pulse Modulation
- STATE:** Switch internal phase modulation on or off.
- MODE:** Set to Low Noise or Wide Deviation.
- DEVIATION:** Set the phase deviation. See [“Setting Sensitivity and Deviation” on page 3-82](#).
- RATE:** Set the phase rate. See [“Setting Rate” on page 3-83](#)
- WAVE:** Set to waveform to Sine, Gaussian Noise, Negative Ramp, Positive Ramp, Square, Triangle, or Uniform Noise.
- LOAD USER WAVEFORM:** Open the load dialog in the user defined location.
- STORE USER WAVEFORM:** Open the save dialog in the user defined location.

Figure 3-78. Internal Phase Modulation Menu

Setting Mode

Press to set phase modulation to Low Noise or Wide Deviation as shown in [Figure 3-79](#).



- Low Noise:** See [“Setting Sensitivity and Deviation”](#)
- Wide Deviation:** See [“Setting Sensitivity and Deviation”](#)

Figure 3-79. Phase Mode

Setting Sensitivity and Deviation

The Low Noise Φ M mode allows a deviation range of 0.00001 radians to 25.1 radians, and a sensitivity range of ± 0.00001 RADS/V to ± 25.1 RADS/V. The Wide deviation Φ M mode allows a deviation range of 0.001 radians to 3220 radians, and a sensitivity range of -0.001 RADS/V to -3220 RADS/V OR +0.001 RADS/V to +3220 RADS/V.

Setting Rate

Press RATE to open the Φ M Rate parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The Φ M Rate range is 0.0001 Hz to 10 kHz.

Setting Waveform

Press WAVEFORM to access the Modulation Waveform Selection menu [Figure 3-80](#). This menu displays the modulation waveforms that are available from the Φ M generator.

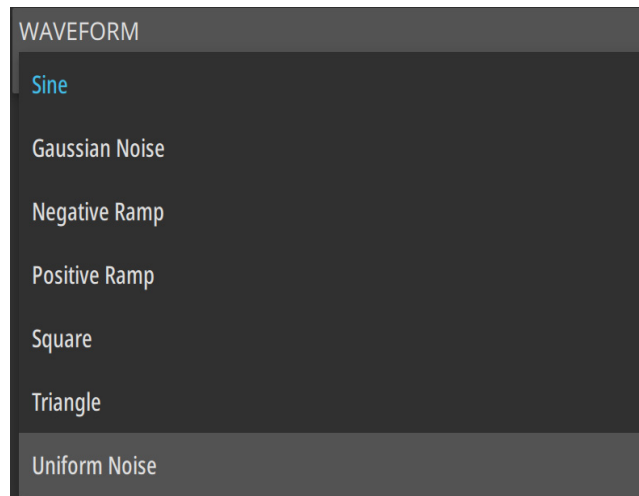


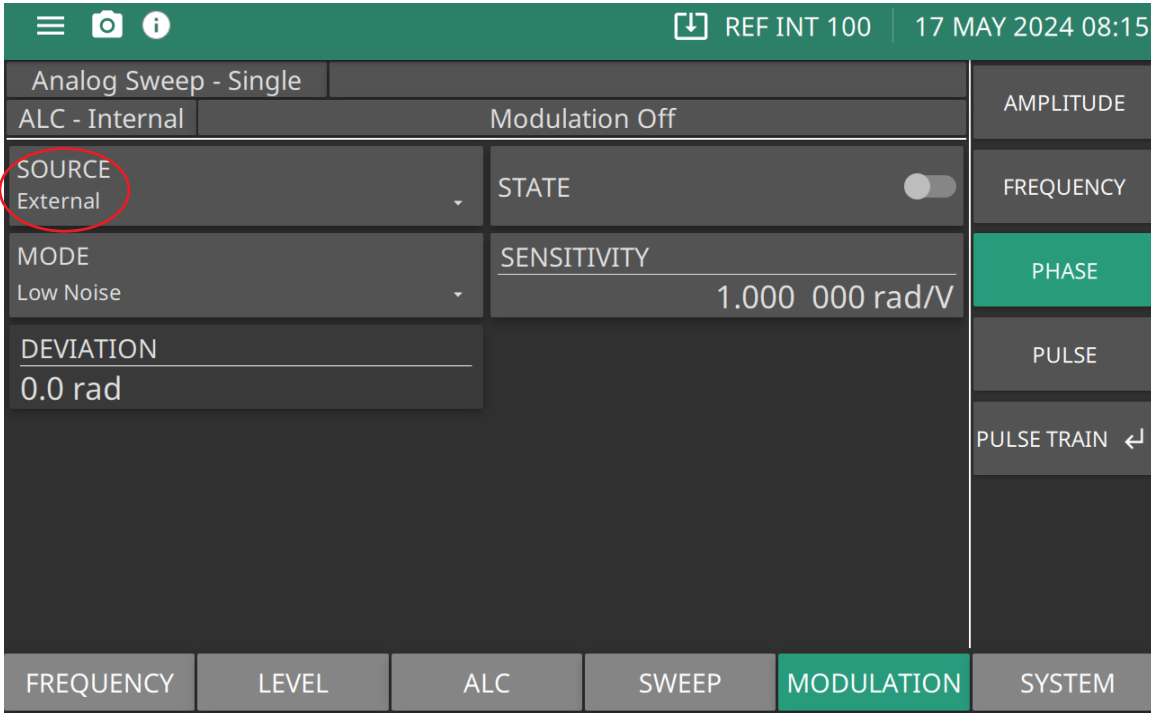
Figure 3-80. Phase Wave Selection

PHASE Modulation Set to External

To provide phase modulation of the output signal using a modulating signal from an external source, first set up the external signal generator and connect it to the MG362x1A rear panel FM IN BNC connector.

Press: MODULATION | PHASE | SOURCE | External

The Phase Modulation set to External is shown in [Figure 3-81](#).



- SOURCE:** Set to Internal or External Pulse Modulation.
- STATE:** Switch external phase on or off.
- MODE:** Set phase modulation to Low Noise or Wide Deviation as shown in [Figure 3-79](#).
- SENSITIVITY:** Set phase sensitivity. See [“Setting Sensitivity and Deviation” on page 3-84](#).
- DEVIATION:** Set Low Noise and Wide Deviation. See [“Setting Sensitivity and Deviation” on page 3-84](#).

Figure 3-81. External Phase Modulation Menu

This menu contains the external Φ M status window that shows the current menu selections and the measured Φ M deviation (The Φ M deviation measurement function measures the voltage of the external modulation signal and calculates the peak frequency deviation).

Setting Sensitivity and Deviation

Press SENSITIVITY to open the Φ M sensitivity parameter. Edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The Low Noise Φ M mode allows a deviation range of 0.00001 radians to 25.1 radians, and a sensitivity range of ± 0.0000391 RADS/V to ± 25.13 RADS/V. The Wide deviation Φ M mode allows a deviation range of 0.001 radians to 3220 radians, and a sensitivity range of -0.001 RADS/V to -3220 RADS/V OR +0.001 RADS/V to +3220 RADS/V.

Pulse Modulation

The MG362x1A provides pulse modulation of the output signal using modulating signals from either its internal pulse generator or an external source.

The internal pulse generator can be internally triggered, externally triggered, internally and externally triggered with delay. There is also a composite mode in which an external pulse is summed with the internal pulse to pulse modulate the output signal.

The (SOURCE set to Internal) PULSE Modulation menu is shown in [Figure 3-82 on page 3-86](#). The (SOURCE set to External) PULSE Modulation menu is shown in [Figure 3-88 on page 3-91](#).

Setting Pulse SOURCE

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.

Press SOURCE to set the source of the modulating signal as Internal or External.

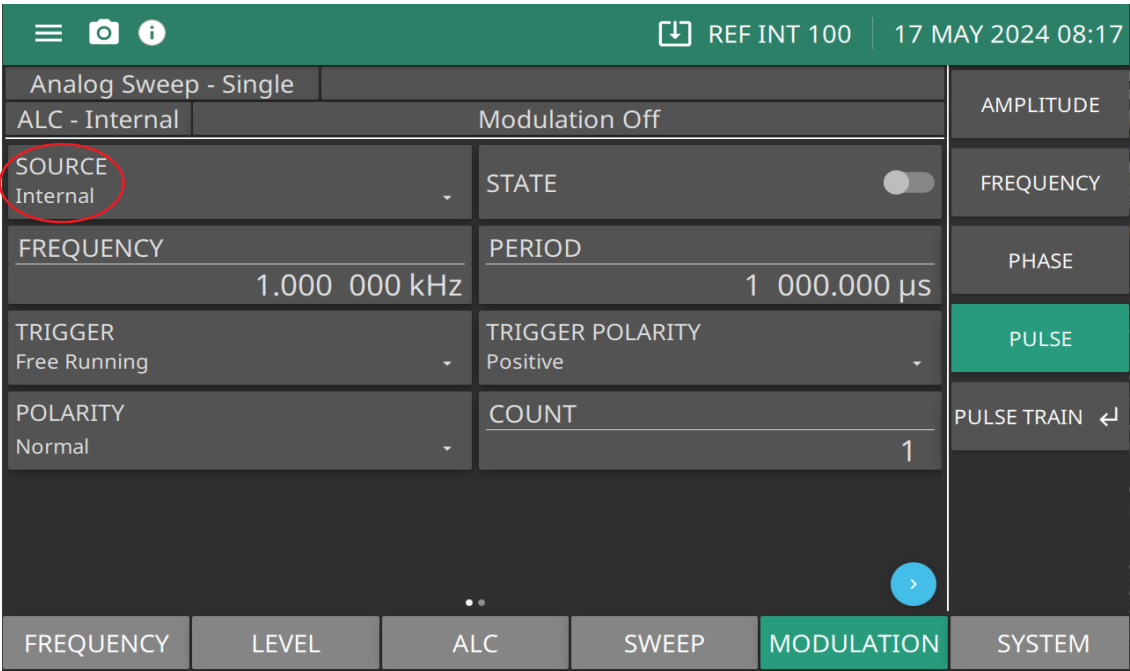
- Internal pulse generator provides a 100 MHz clock rate that produces higher resolution pulses and allows higher Pulse Repetition Frequencies (PRFs).
- External signals or pulses to trigger or gate the internal pulse generator can be applied to the rear panel PULSE TRIGGER IN connector.

PULSE Modulation Set to Internal

PULSE Modulation SOURCE set to Internal is shown in [Figure 3-82 on page 3-86](#).

Press MODULATION | PULSE | SOURCE | Internal

Pulse SOURCE Set to Internal



- SOURCE:** Set Internal or External pulse modulation.
- STATE:** Toggle internal pulse modulation on or off.
- FREQUENCY:** Set the pulse repetitive frequency (PRF). See [“Setting Period and \(PRF\) FREQUENCY”](#).
- PERIOD:** Set period in time (seconds). See [“Setting Period and \(PRF\) FREQUENCY”](#)
- TRIGGER:** Set Trigger to Free Running, Gated, Delayed, Triggered, Trgdelay (triggered delay), Composite. See [“Set TRIGGER” on page 3-89](#).
- TRIGGER POLARITY:** Set the polarity to Positive or Negative. See [“Trigger Polarity” on page 3-90](#).
- POLARITY:** Enter the trigger polarity as Normal or Inverted.
- COUNT:** Set the pulse count 1-4.
- Blue Arrow scrolls to the next page and shows the Pulse With Delay menu shown in [“Pulse Width-Delay Menu” on page 3-87](#).

Figure 3-82. Internal Pulse Menu

Setting Period and (PRF) FREQUENCY

The PERIOD and FREQUENCY (PRF) buttons are interactive. Changing one of these parameters will change the other. Edit the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. The frequency (PRF) range is 0.6 Hz to 25,000,000 Hz.

Press PERIOD to set the pulse period of the internal pulse generator to the value entered. Selecting Pulse Period represents the pulse period as time. The pulse period range is determined by the pulse generator clock rate. The period range is 1e-07 to 42 seconds.

Pulse Width-Delay Menu

Pressing the blue chevron in the lower corner of the screen as shown in [Figure 3-82 on page 3-86](#) displays the Pulse Width/Delay List menu [Figure 3-83](#) of the current Pulse Width (W1–W4) and Delay parameter settings.

Analog Sweep - Single		AMPLITUDE
ALC - Internal	Modulation Off	
DELAY 1	WIDTH 1	
200.000 μ s	100.000 μ s	
DELAY 2	WIDTH 2	PHASE
200.000 μ s	100.000 μ s	PULSE
DELAY 3	WIDTH 3	
200.000 μ s	100.000 μ s	PULSE TRAIN $\leftarrow$
DELAY 4	WIDTH 4	
200.000 μ s	100.000 μ s	
		
FREQUENCY	LEVEL	ALC
SWEEP	MODULATION	SYSTEM

Delay 1-4: Set the pulse delay for each pulse count selected from the Internal Pulse menu “Pulse SOURCE Set to Internal” on page 3-86. Range is 0 s to 42 s.

Width 1-4: Set the pulse width for each pulse count selected from the Internal Pulse menu “Pulse SOURCE Set to Internal” on page 3-86. Range is 1e-08 s to 42 s.

Figure 3-83. Pulse Width-Delay Menu

To change the current value of a parameter, use the cursor control keys to select the parameter, then press and enter the current value using the cursor control keys, rotary data knob, or enter a new value using the keypad and the appropriate terminator key. Press a terminator key to close the open parameter.

Setting Pulse Count

Press COUNT to type 1 (Single), 2 (Doublet), 3 (Triplet), or 4 (Quadruplet) pulse mode. Pulse COUNT of 3 (Triplet) is shown in [Figure 3-84](#). Press ENTER. The Internal Pulse Status display will show your selection.

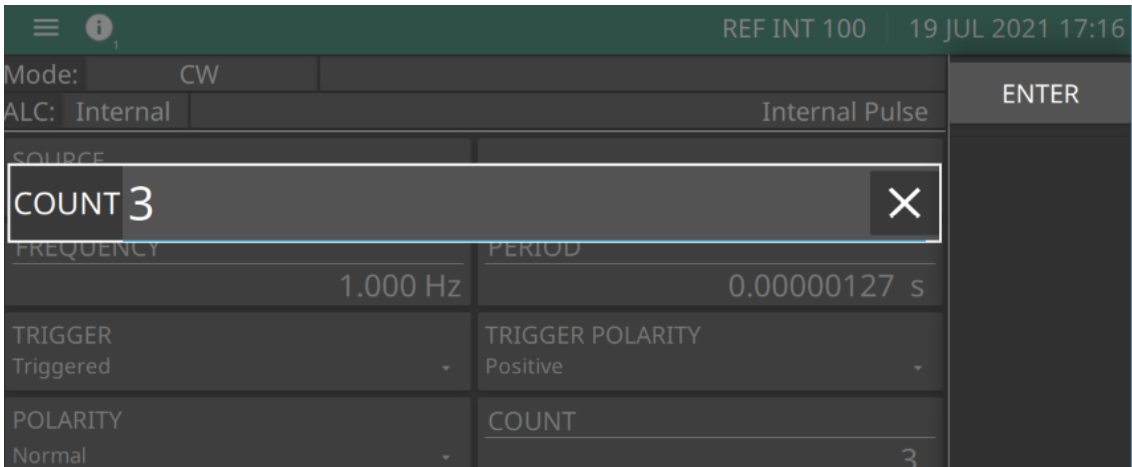


Figure 3-84. Pulse Count

Setting Count

Press COUNT to set the number of pulses generated by the internal pulse generator for each period of the pulsed waveform. The internal pulse generator has four pulse modes. Range is 1-4. Set COUNT to display 1 (single), 2 (doublet pulse), 3 (triplet pulse), and 4 (quadruplet pulse). Individual pulse widths WIDTH 1 (W1), WIDTH 2 (W2), WIDTH 3 (W3), and WIDTH 4 (W4) and delays DELAY 1 (D1), DELAY 2 (D2), DELAY 3 (D3), and DELAY 4 (D4) can be set for each of the pulses in a mode as shown in [Figure 3-85](#).

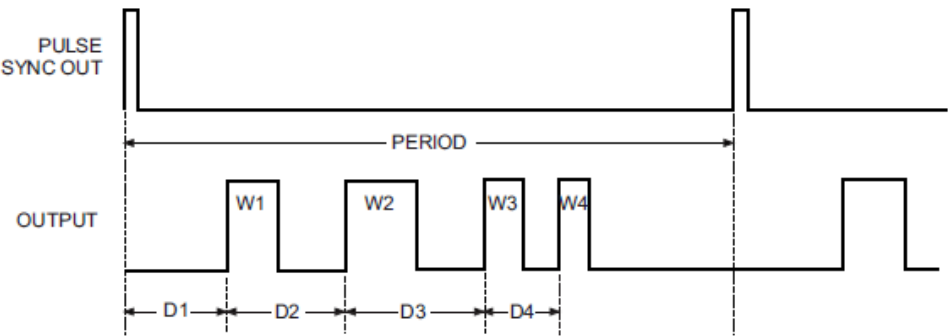


Figure 3-85. Pulse Mode

Set TRIGGER

From the additional Internal Pulse Status menu, press TRIGGER to access the Trigger Mode menu display shown in (Figure 3-86).

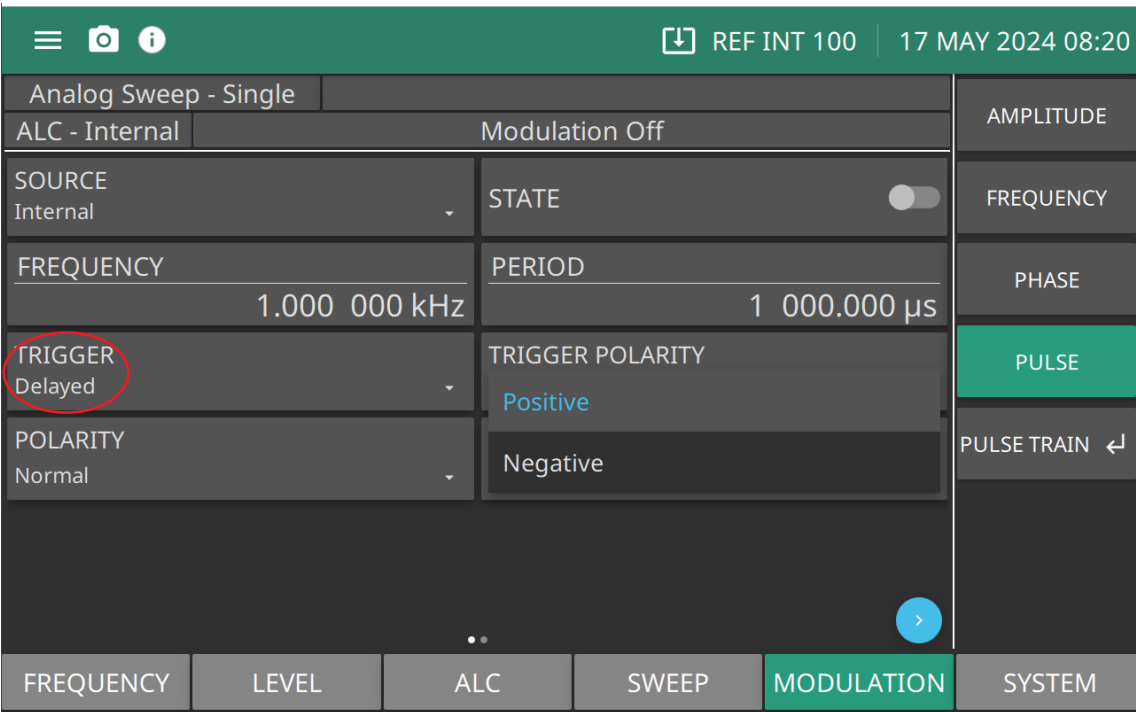


Figure 3-86. Trigger Mode Menu

This menu provides the triggering mode for the internal pulse generator. Each trigger mode is described in “Setting TRIGGER Waveforms” and shown in Figure 3-87 on page 3-90.

Setting TRIGGER Waveforms

Refer to and the descriptions below for the types of modulation waveforms.

Free Running: The pulse generator produces pulses at the internal PRF. Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms at the internal pulse repetition rate. Pulse delay is not available in this trigger mode.

Gated: an external pulse gates the internal pulse generator on and off. When gated on, the pulse generator produces a single pulse at the internal PRF.

Delayed: The pulse generator produces Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms at the internal pulse repetition rate.

Triggered: The pulse generator is triggered by an external trigger to produce Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms. Pulse delay is not available in this trigger mode.

Trigger with Delay: The pulse generator is triggered by an external trigger to produce Single, Doublet, Triplet, or Quadruplet pulse modulation waveforms delayed by pulse delay.

Composite: An external pulse triggers the internal pulse generator and also pulse modulates the output signal. The internal pulse generator produces a single pulse delayed by pulse delay1, which also pulse modulates the output signal.

Polarity

Press POLARITY to select the polarity of the signal that turns the RF on during pulse modulation, as follows:

Normal: Specifies positive-true operation; a TTL-high level will turn on the RF output signal.

Inverted: Specifies negative-true operation; a TTL-low level will turn on the RF output signal.

Trigger Polarity

Selects whether the internal pulse generator is triggered on the rising edge (positive) or falling edge (negative) of the external trigger signal.

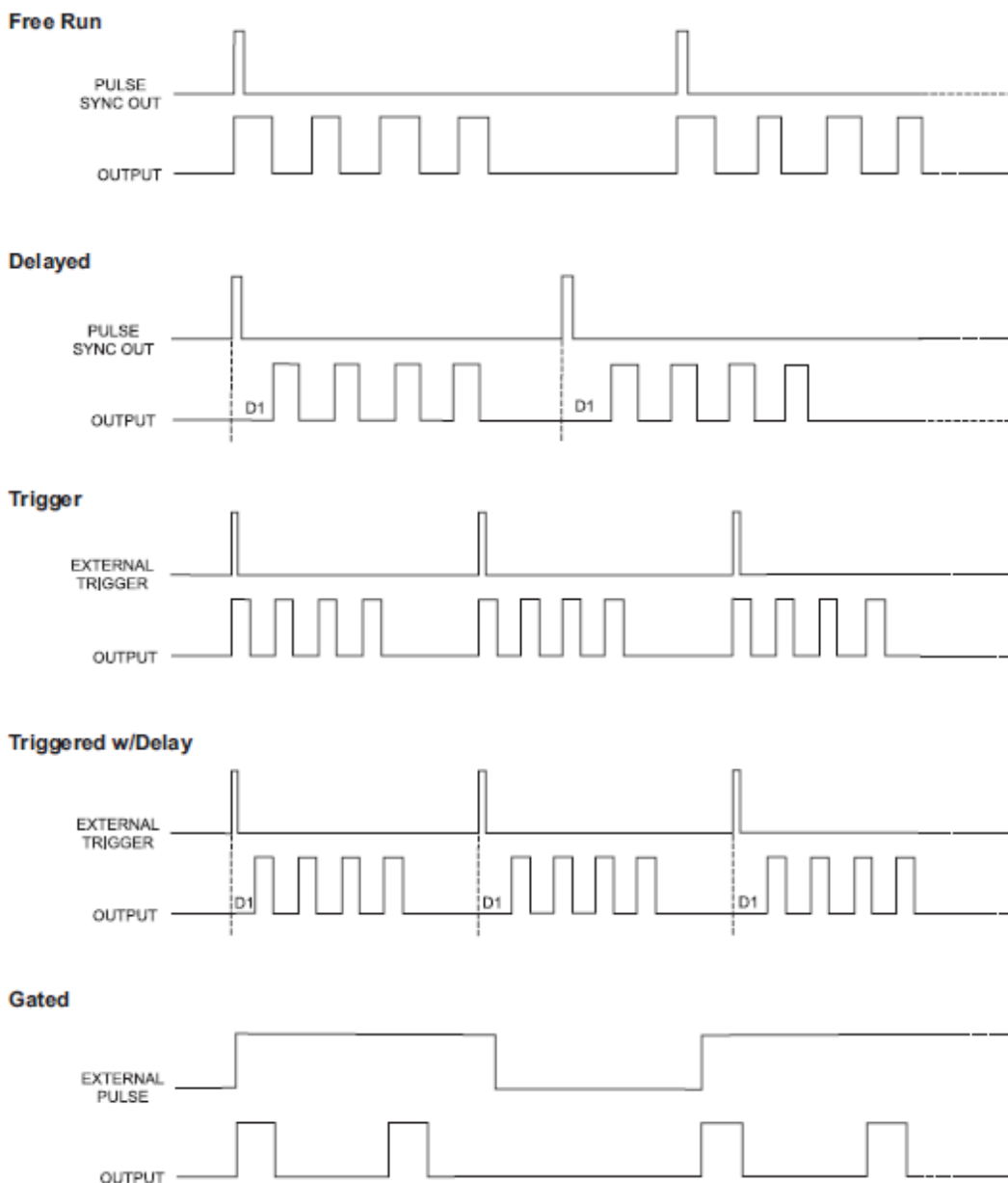


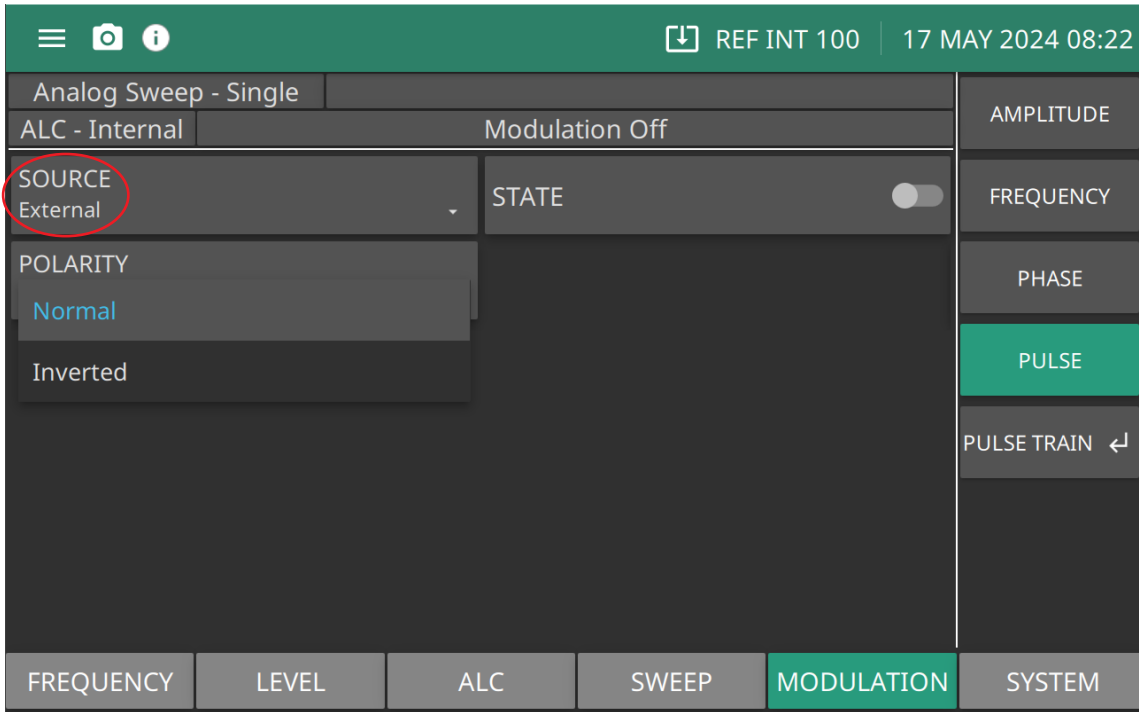
Figure 3-87. Modulation Waveforms

PULSE Modulation Set to External

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 MG362x1A rear panel PULSE IN BNC connector.

Press SOURCE from the menu shown in [Figure 3-88](#) and set to External.

Press: MODULATION | PULSE | SOURCE | External



SOURCE: Set Internal or External modulation

STATE: Switch external pulse modulation on or off

POLARITY: Set the trigger polarity as Normal or Inverted

Figure 3-88. External Pulse Menu

Setting Polarity

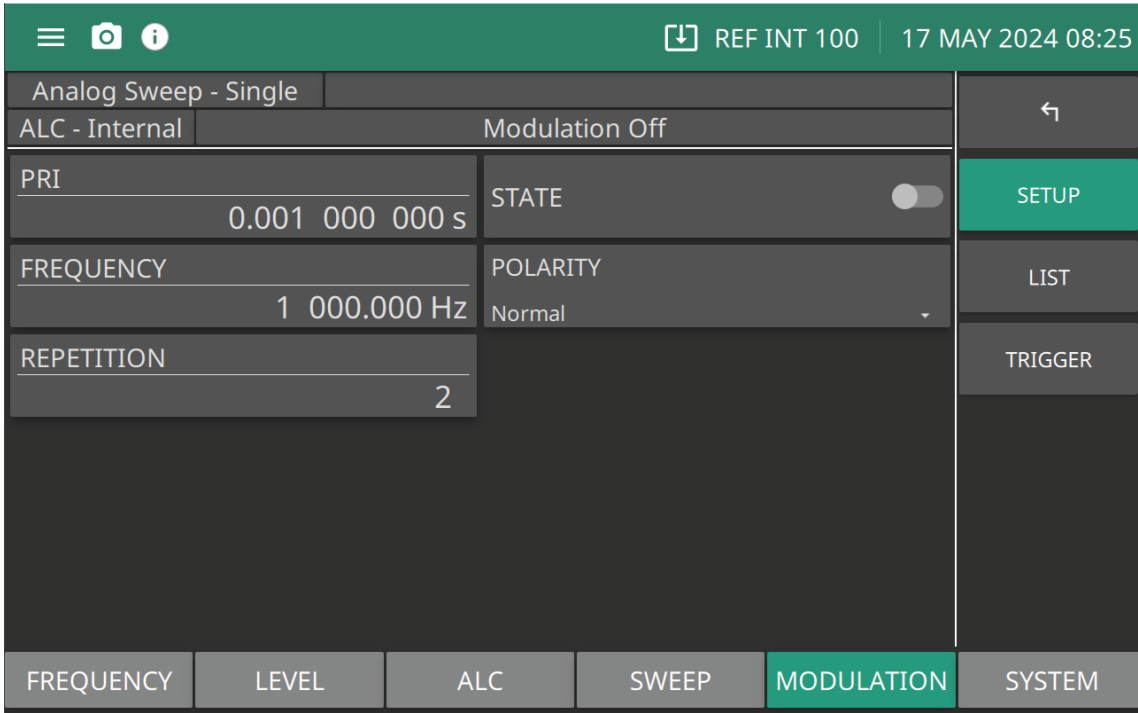
Press POLARITY and set the polarity of the signal that turns the RF on during pulse modulation.

- Normal specifies positive-true operation; a TTL-high level will turn on the RF output signal.
- Inverted specifies negative-true operation; a TTL-low level will turn on the RF output signal.

For proper operation, the period of the external pulse must be greater than the sum of the pulse repetition rate and pulse width of the internal pulse modulation waveform. 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 (MG362x1A rear panel) as a frequency reference for the external generator.

Pulse Train (Option 25)

The MG362x1A provides the pulse train generator option to simulate complex pulse radar signals. Pulse train is a file based data entry. Import an external pulse pattern file either from a USB memory stick or pluggable SDIO card. The external file should accommodate pulse pattern entries up to 2048. Each entry has three parameters: Pulse ON (in μ S), Pulse OFF (in μ sec) and the number of repetitions up to 65,535. The Pulse Train menu is shown in [Figure 3-89](#).



- PRI:** Set the pulse repetition interval (PRI) value. Range is 1 μ s to 42s
- STATE:** Set the pulse state to on or off
- FREQUENCY:** Set the pulse frequency with the pulse repetition to set the PRI. (The number of pulses of a repeating signal in a specific time)
- POLARITY:** Set the pulse polarity as Normal or Inverted.
- REPETITION:** Set the repetition rate. The repetition rate is the number of emitted pulses per second. Range is 2s to 100s

Figure 3-89. Pulse Train Menu

Pulse Polarity

Set the Polarity to Normal or Inverted as shown in [Figure 3-90](#). When set to Inverted the polarity has rising edges and slopes becoming falling edges and slopes. As well, falling edges and slopes become rising edges and slopes.

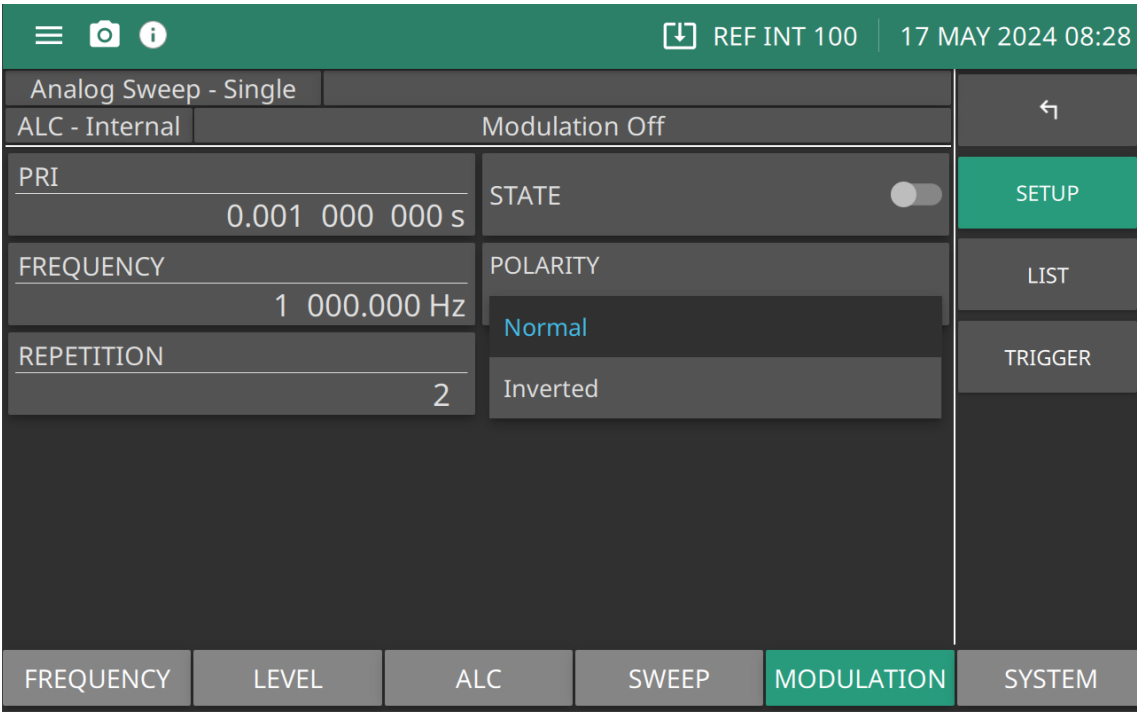
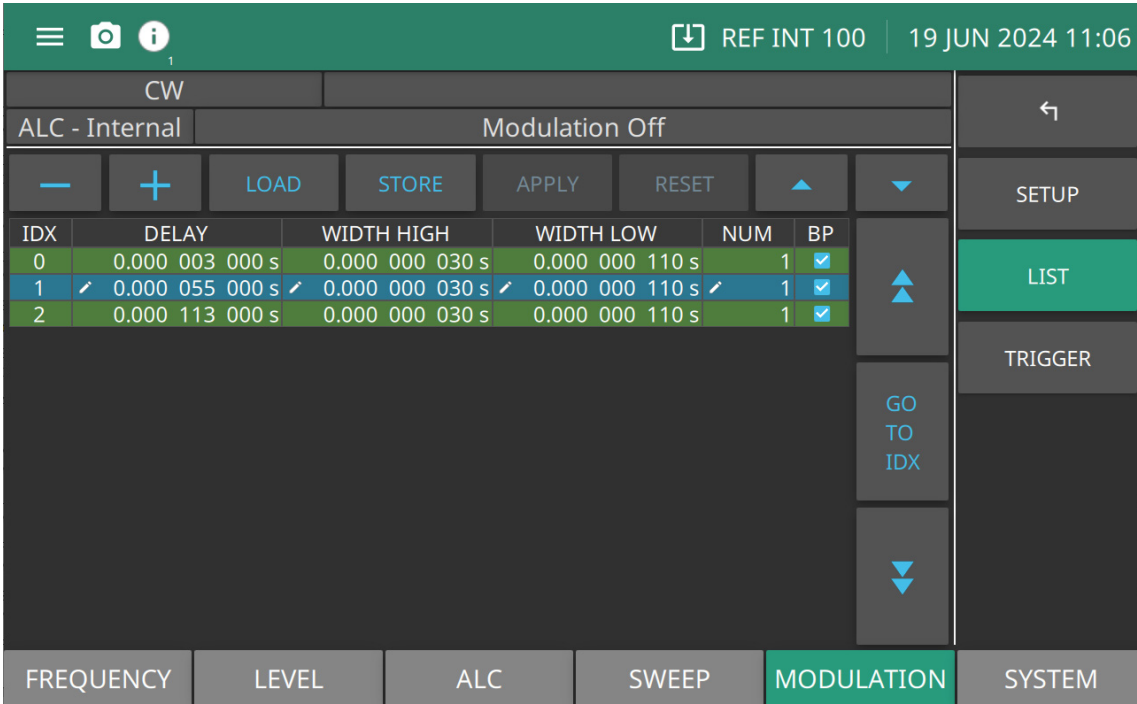


Figure 3-90. Pulse Polarity

Pulse Train LIST

The MG362x1A supports a file based data entry for functionalities such as List mode as shown in [Figure 3-91](#), The file format can be imported in to or out of popular spreadsheet programs such as excel. User can edit the entries in the file through the GUI. Each parameter can be edited by selecting the parameter in the list and then entering a value.



–: Click an index entry to highlight it as shown and press – to remove the entry from the List

+: Press to add an entry to the list.

LOAD: Press to open the import dialog.

STORE: Press to open the save dialog.

APPLY: Press to apply the pulse parameter settings made in the list.

RESET: Press to discard current edits.

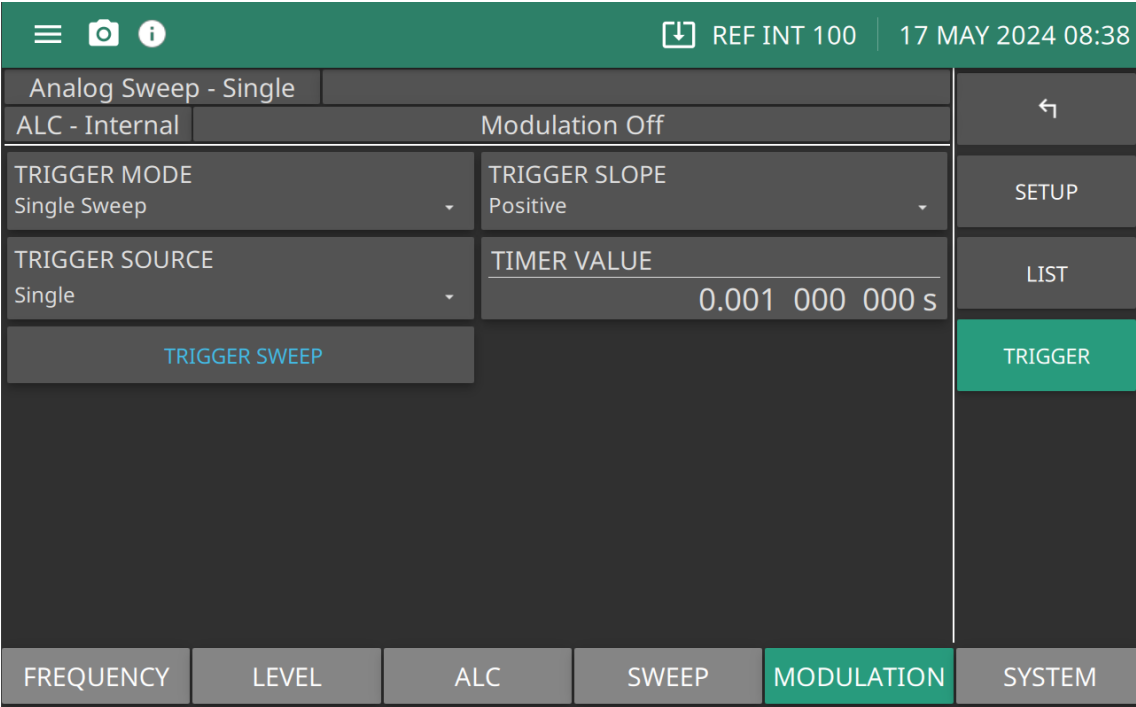
▲ or ▼: Scroll up or down per row.

GO TO IDX: Press double-arrow up to scroll up or double-arrow down to scroll down per page.

Figure 3-91. Pulse Train List Menu

Pulse Train Trigger

The Pulse Train TRIGGER menu is shown in [Figure 3-92](#).



TRIGGER MODE: Press to set a trigger mode function. See [Figure 3-93 on page 3-96](#).

TRIGGER SLOPE: Set the TRIGGER SLOPE to occur on the positive or negative side of the pulse.

TRIGGER SOURCE: Press to set the trigger source. See [Figure 3-94 on page 3-97](#)

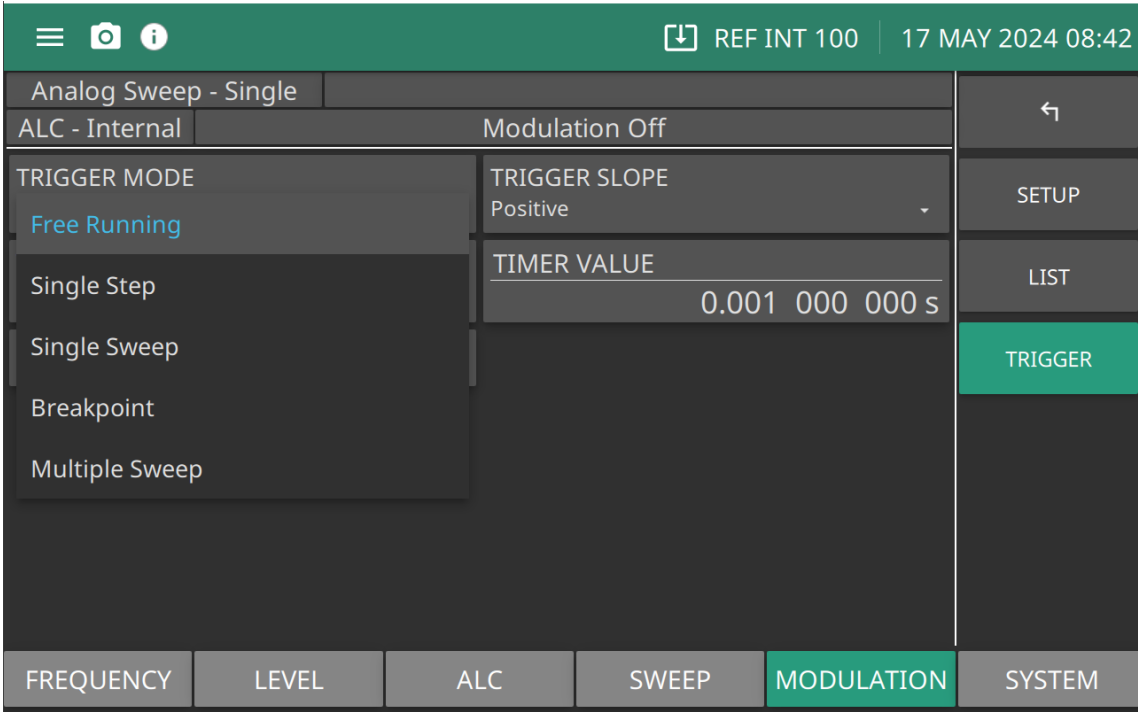
TIMER VALUE: Press to set a timer value. The timer value provides the length of the pulse in time.

TRIGGER SWEEP: Press to start a sweep as set in TRIGGER MODE

Figure 3-92. Pulse Train Trigger Menu

TRIGGER MODE

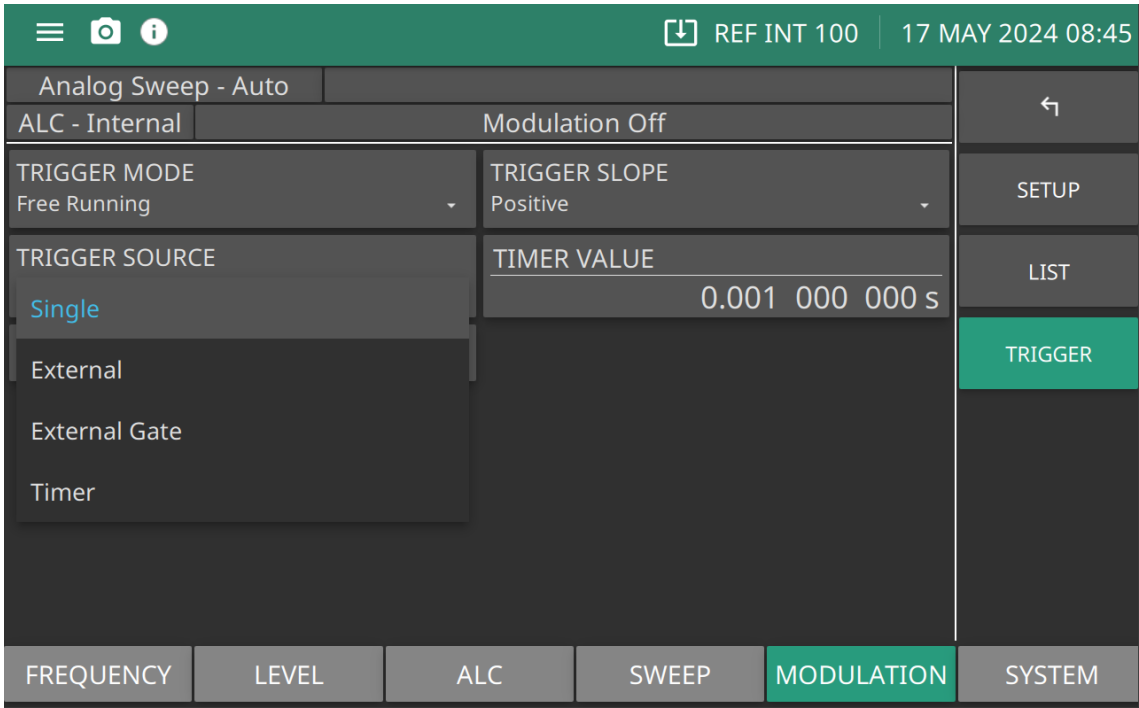
Press to set the TRIGGER MODE as shown in [Figure 3-93 on page 3-96](#).



- Free Running:** Set to free run. No trigger is required.
- Single Step:** Set to single step. Press TRIGGER SWEEP to step forward one pulse step.
- Single Sweep:** Set to single sweep. Each press of TRIGGER SWEEP sweeps forward one sweep.
- Breakpoint:** Sets the indices of breakpoints for the pulse burst system. The sweep type must be set to breakpoint for the breakpoints to have an effect. The data should be given as a comma-separated list of ascending indices, starting from 1, and ending at 2047. For example, a breakpoint on 1 will pause before the second burst, and on 2047 it will pause before the last burst.
- Multiple Sweep:** Add multiple sweep intervals of a set sweep pattern.

Figure 3-93. Pulse Train Trigger Mode

Pulse Train TRIGGER SOURCE Menu



- Single:** Press TRIGGER SWEEP provides a single-burst.
- External:** Sets the rear panel external pulse input as the trigger when TRIGGER SWEEP is pressed.
- External Gate:** Press TRIGGER SWEEP sets the external pulse gates of the internal pulse generator on and off. When gated on, the pulse generator produces a single-burst at the internal PRF.
- Timer:** Controls the delay between pulse burst triggers. Range is 10μsec to 100sec.

Figure 3-94. Pulse Train TRIGGER SOURCE menu

Phase Tracking

Phase tracking enables up to three MG362x1A units to phase track with a very high degree of stability. Phase tracking provides the following additional rear panel connectors to link internal reference signals together:

- **100 MHz Reference Output:** Provides the reference signal to drive up to two other MG362x1A instruments.
- **100 MHz Reference Input:** Accepts the 100 MHz reference signal from another MG362x1A. To enable two MG362x1A instruments to phase track with high stability, connect the instruments as shown in [Figure 3-95](#) using 50 Ω BNC cables and a 50 Ω BNC Tee:

The 100 MHz loopback must be connected on the reference synthesizer as shown. The above adjustment of phase will work successfully when generators are set to the same frequency or frequencies that are harmonically related. The frequencies must be set in advance of making all the adjustments of phase and if the frequencies are subsequently changed, then the process of phase adjustment must be repeated.

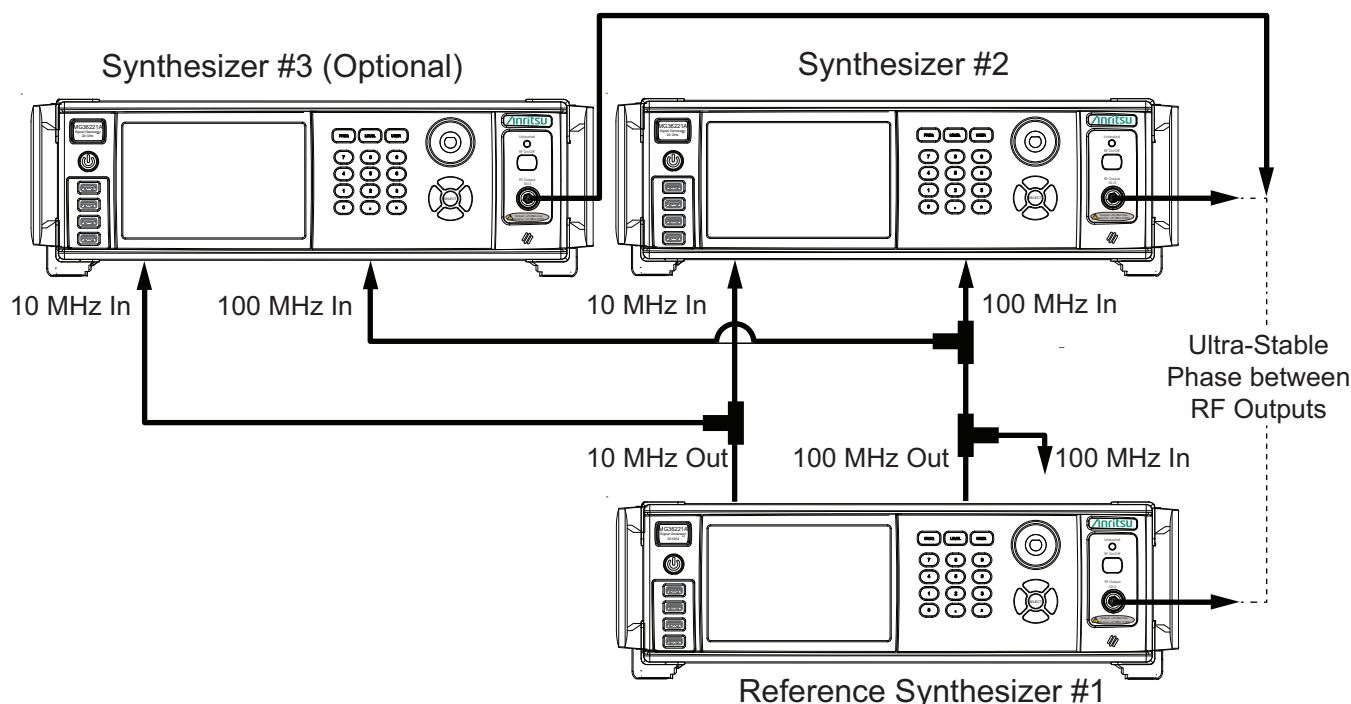


Figure 3-95. Phase Tracking Connections of Multiple MG362X1A Instruments

Once connected as shown in [Figure 3-95](#), connect an oscilloscope channel to each of the RF outputs from the signal generators to display the initial phase difference between the RF signals. Use the [“Phase Offset Menu”](#) on [page 3-5](#), adjust the phase offset of one of the units to achieve the desired phase relationship as shown on the oscilloscope. Once the desired phase relationship has been achieved, the Phase Offset value may be zeroed. This will not affect the phase shift of the RF output, but will establish the currently set phase as the reference value for all future entries of Phase Offset.

Note

The 100 MHz loopback must be connected on the reference synthesizer as shown. The above adjustment of phase will work successfully when generators are set to the same frequency or frequencies that are harmonically related. The frequencies must be set in advance of making all the adjustments of phase and if the frequencies are subsequently changed, then the process of phase adjustment must be repeated.

3-11 SYSTEM Menu

The SYSTEM menu provides the capability of browsing, saving, and recalling measurement or setup files.

SETUPS

Using SYSTEM SETUPS menu you can save, recall the setup files in addition to browse the internal files saved in the instrument.

SAVE SETUP

Once you have decided that an instrument setup should be retained for future use, press: SYSTEM | SAVE SETUP to save the current setup file onto instrument’s internal memory.

RECALL SETUP

To recall a previously saved setup:

- 1. Press SYSTEM | RECALL SETUP.
- 2. Select the file and Click Open.

The MG362x1A sets itself to the recalled configuration.

BROWSE FILES

To browse files saved in the internal memory:

- 1. Press SYSTEM | BROWSE FILES
- 2. Select the desired file and click Open.

The SYSTEM menu s displayed in [Figure 3-96](#).

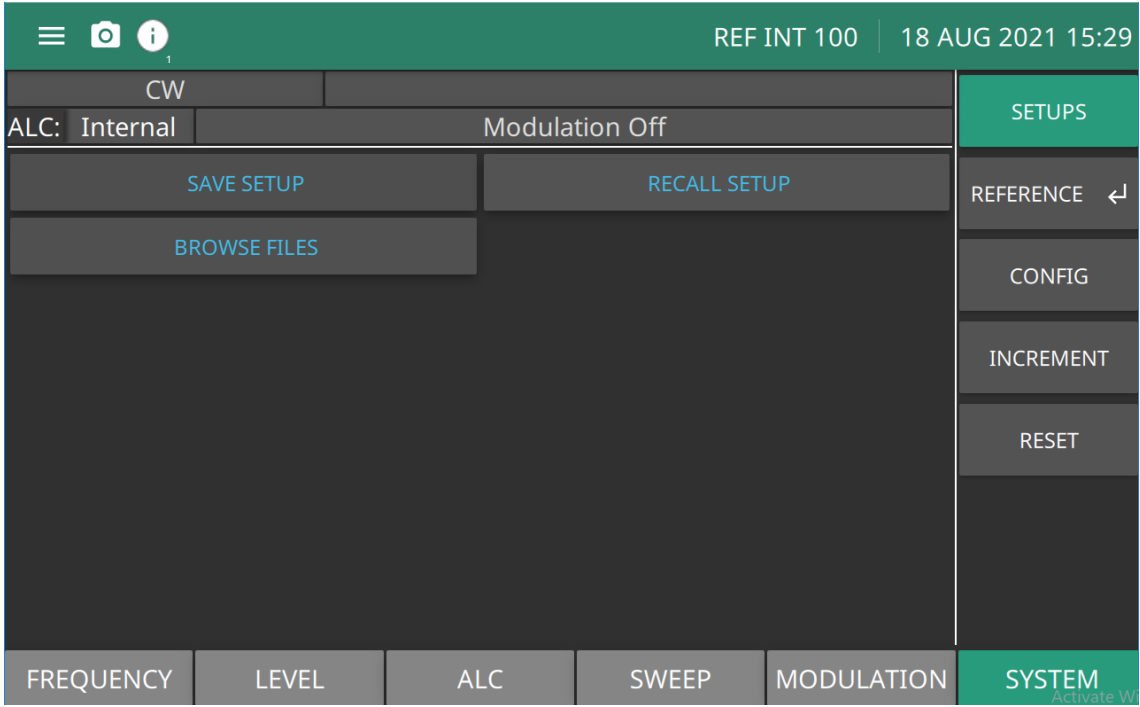


Figure 3-96. SYSTEM Menu

SAVE SETUP: Opens the Save file dialog.

RECALL SETUP: Opens the Recall file dialog.

BROWSE FILES: Opens the instrument file manager.

Figure 3-96. SYSTEM Menu

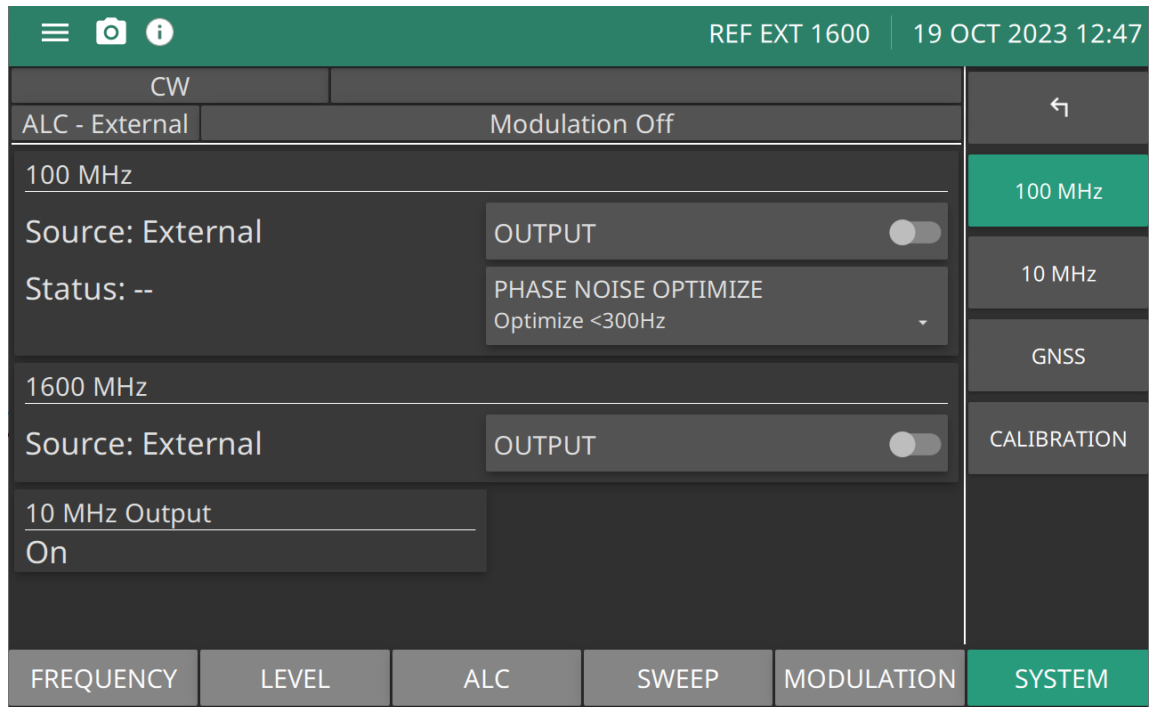
REFERENCE Menu

The reference calibration function provides calibration of the internal 10 MHz (Option 3) or 100 MHz references of the MG362x1A using an external 10 MHz, 0 to +10 dBm reference signal. (References available are Option dependent)

100 MHz

The 100 MHz menu is shown in [Figure 3-97](#). To calibrate the 100 MHz reference, see “[100 MHz Calibration \(Standard Reference\)](#)” on page 3-104. The menu display depends on the options ordered and external reference inputs. The menu below is the standard reference menu.

Press: SYSTEM | REFERENCE



SOURCE: Displays the 100 MHz reference source. The 100 MHz output to the rear panel BNC is active when the Output button is toggled on.

STATUS: Displays the reference oscillator lock status of the 100 MHz source. See “[100 MHz Status](#)”.

1600 MHz SOURCE: Displays the 1600 MHz reference source and status. The 1600 MHz output to the rear panel BNC is active when the Output button is toggled on.

10 MHz Output: The 10 MHz to the rear panel is set to on. There is no switch.

100 MHz OUTPUT: Switch the 100 MHz reference on or off.

PHASE NOISE OPTIMIZE: Switch the 100 MHz reference bandwidth between wide and narrow.

Optimize <300 Hz: Wide = Low Offset Phase Noise, nominal, optimize for < 300 Hz

Optimize >300 Hz: Narrow = High Offset Phase Noise, optimize for > 300 Hz

1600 MHz OUTPUT: Switch the 1600 MHz reference on or off.

Figure 3-97. 100 MHz Menu

100 MHz Status

Acquiring: Attempting to lock the 100 MHz to an external 10 MHz reference (Low Phase Noise and Ultra High Stability option is not installed) OR Attempting to lock the 100 MHz to the internal 10 MHz reference (Low Phase Noise and Ultra High Stability option is installed)

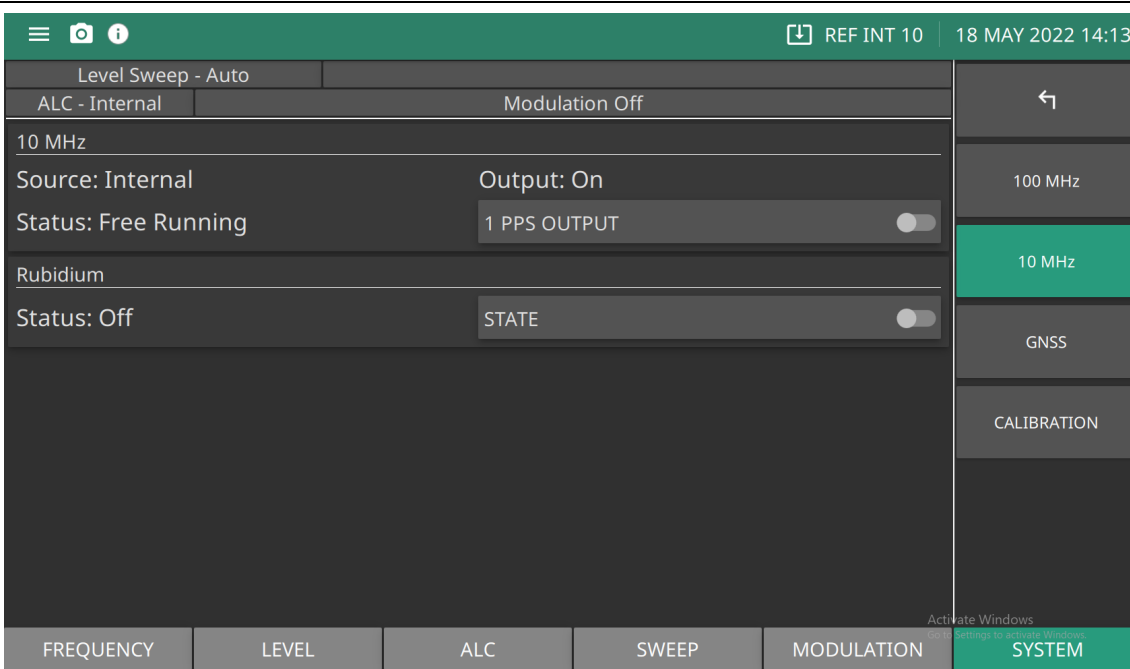
Locked: 100 MHz is locked to the external 10 MHz (Low Phase Noise and Ultra High Stability option is not installed) OR 100 MHz is locked to the internal 10 MHz reference (Low Phase Noise and Ultra High Stability option required)

Free: 100 MHz is free running

10 MHz Calibration With Option 66

The 10 MHz menu is shown in [Figure 3-98](#). Option 3 and Option 66, allows GNSS to calibrate the 10MHz frequency reference. The menu display depends on the options ordered and external reference inputs. On-site frequency calibration is accomplished by connecting the Rubidium MG362x1A signal generator's GNSS/GPS receiver to an outdoor antenna and locking to he satellite signal. The GNSS/GPS receiver provides a very stable and accurate 1PPS clock for recalibrating the internal time base.

Press SYSTEM | 10 MHz



- Source:** Displays the 100 MHz reference source. Internal, Internal 10 MHz set as the source
- Output:** Displays the 10 MHz 1PPS reference source and status. The 10 MHz 1PPS output to the rear panel BNC is active when the 1 PPS Output button is switched on.
- STATUS:** Displays the lock status of the 100 MHz source.
- Rubidium:** Displays the internal Rubidium status as Acquiring, Locked, or Off.
- State:** Set Rubidium state to on or off

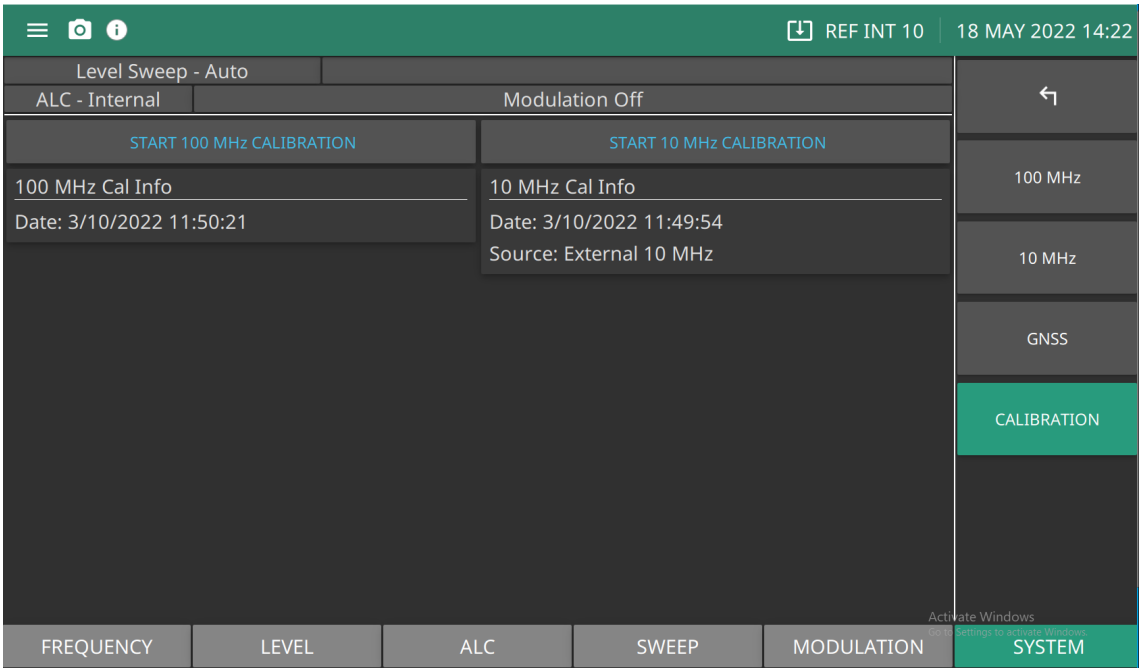
Figure 3-98. 10 MHz Menu

Calibration

The Calibration menu displays the standard 100 MHz calibration details plus 10 MHz cal info if Option 3 is installed.

Press: SYSTEM | REFERENCE | CALIBRATION
The CALIBRATION menu is shown in [Figure 3-99](#).

Note Before beginning calibration, allow the MG362x1A to warm-up for a minimum of 120 hours.



START CALIBRATION: Initiates the reference source calibration.

100 MHz and 10 MHz CALIBRATION DATE: Provides the last date a reference source calibration was successfully performed.

Figure 3-99. CALIBRATION Menu

100 MHz Calibration (Standard Reference)

To calibrate the 100 MHz internal reference:

1. To calibrate the 100 MHz internal reference, connect an external 10 MHz reference signal to the MG362x1A rear panel 10 MHz REF IN connector or a 1 PPS.
2. Press the START CALIBRATION button to display the dialog shown in [Figure 3-100](#).
3. Press CONTINUE to start the calibration. The status bar will display Reference Calibration in Progress. When complete, the CALIBRATION DATE will update.

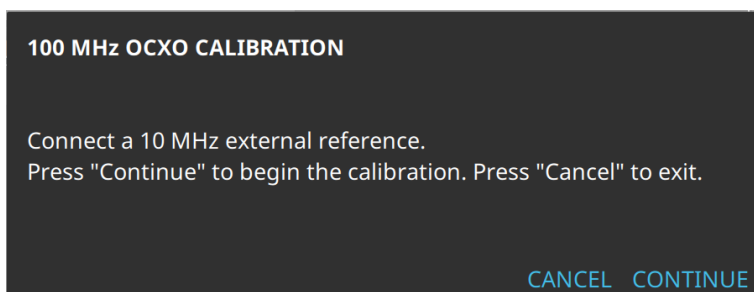


Figure 3-100. 100 MHz Calibration Dialog

10 MHz Calibration (Option 3)

To calibrate the 10 MHz internal reference:

1. Connect an external 10 MHz reference signal to the MG362x1A rear panel 10 MHz REF IN connector, or connect a 1PPS signal to the rear panel PPS BNC connector.
2. Press the START CALIBRATION button to display the dialog shown in [Figure 3-101](#).
3. Press CONTINUE to start the calibration. The status bar will display Reference Calibration in Progress. When complete, the CALIBRATION DATE will update.

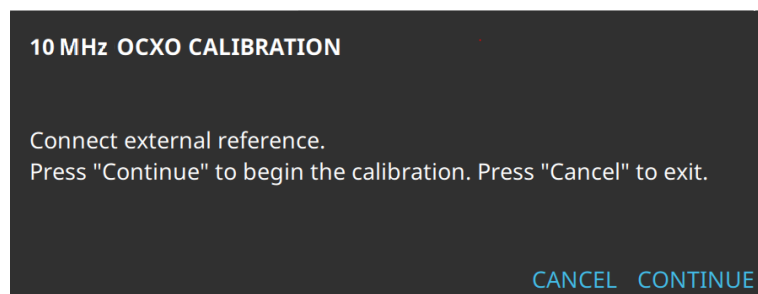
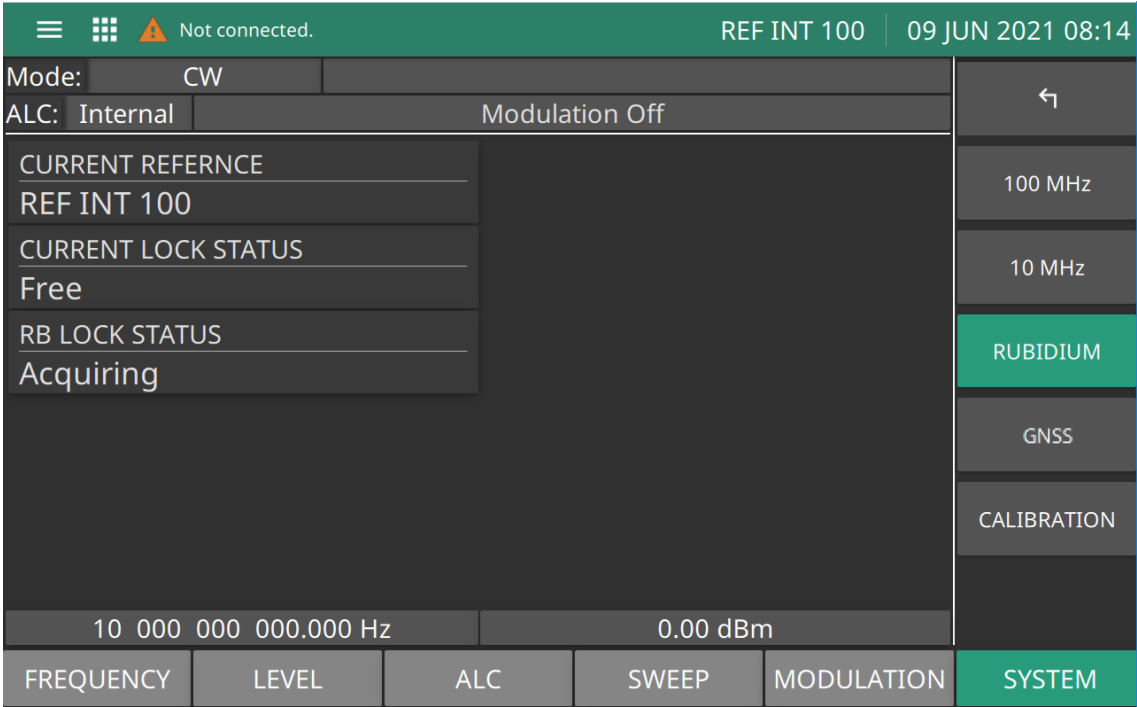


Figure 3-101. 10 MHz Calibration Dialog

RUBIDIUM Menu (Option 56)

The RUBIDIUM menu is shown in [Figure 3-102](#). The menu display depends on the options ordered and external reference inputs. The menu below includes Option 3 with Option 56.

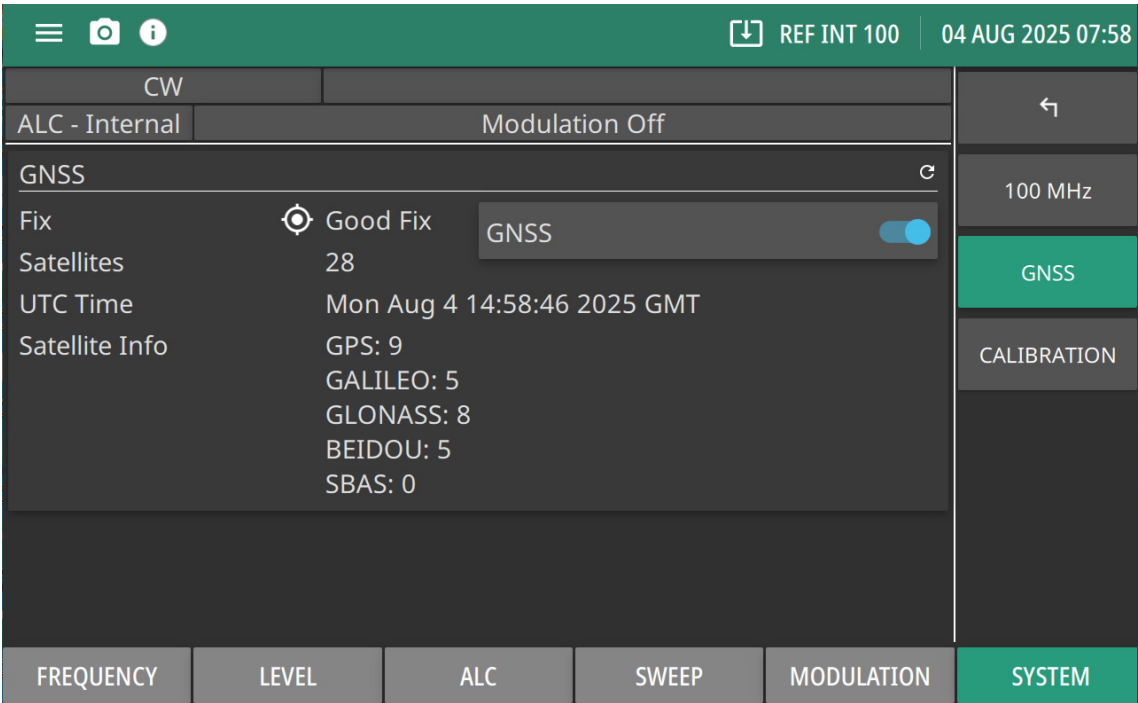


- Current Reference:** Displays the current active reference oscillator.
- Current Lock Status:** Displays the lock status of the reference oscillator as Free, Locked, or Not Locked.
- RB Lock Status:** Displays the lock status of the Rubidium as Acquiring, Locked, or Not Locked.

Figure 3-102. Rubidium Menu

GNSS Menu (Option 66)

The GNSS menu is shown in [Figure 3-103](#). On-site frequency calibration is accomplished by connecting the MG362x1A to a GNSS antenna via GNSS port to lock the satellite signal. The GNSS antenna provides a very stable and accurate 1PPS clock for recalibrating the internal time base.



GNSS: Turns on/off GNSS toggle. The GNSS fix status displays “Good Fix” or “No Fix”, total number of satellites, UTC time and types of positioned Satellites as satellite info.

Figure 3-103.GNSS Menu

Reference Status Conditions

This section describes the reference source types and lock condition indicators. The status conditions depend on the options installed.

Reference Oscillator Current Source

The title bar displays the source that is determining the RF output accuracy as described below:

REF EXT 1600: 1600 MHz external

REF EXT 100: 100 MHz external

REF EXT 1PPS: 1PPS external

REF EXT 10: 10 MHz external

REF INT RB: Internal 10 MHz Rubidium clock, Ultra Stable Rubidium Reference (Option 3) only.

REF INT 10: Internal 10 MHz free running, Low Phase Noise and Ultra High Stability (Option 3) only.

REF INT 100: Internal 100 MHz free running.

Note: For EXT 1PPS, EXT 10, or INT RB, the value may contain “Acquiring” instead of “REF” while the system is in the process of acquiring lock to this reference.

Reference Oscillator Lock Status

The reference oscillator lock condition is described below.

10 MHz Locked: Indicates the internal 10 MHz is locked to either an internal or external reference.

100 MHz Locked: 100 MHz can only be locked to the 10 MHz (Option 3).

Acquiring: Attempting to acquire lock to the reference source indicated by Low Phase Noise and Ultra High Stability (Option 3); or, attempting to acquire lock to an external 10 MHz reference when Low Phase Noise and Ultra High Stability (Option 3 is not installed).

Locked External: 100 MHz reference is locked to an external 10 MHz reference and Low Phase Noise and Ultra High Stability (Option 3 is not installed); or, 10 MHz reference is locked to an external reference, either 10 MHz or 1PPS with Low Phase Noise and Ultra High Stability (Option 3).

Locked Rubidium: 10 MHz reference is locked to an internal Rb reference Ultra Stable Rubidium Reference (Option 56).

Free Running: 100 MHz reference is free running Low Phase Noise and Ultra High Stability (Option 3 is not installed); or, 10 MHz reference is free running Low Phase Noise and Ultra High Stability (Option 3).

Error External: 100 MHz reference can't lock to a connected external 10 MHz input Low Phase Noise and Ultra High Stability (Option 3 not installed); or, 10 MHz reference can't lock to a connected external reference, either 10 MHz or 1PPS (Low Phase Noise and Ultra High Stability (Option 3).

Error Rubidium: 10 MHz reference can't lock to the internal Rb reference Ultra Stable Rubidium Reference (Option 56) installed.

Error GPS: 10 MHz reference can't lock to the internal GPS reference 1PPS. GNSS/GPS Atomic Clock Receiver (Option 6).

Reference Oscillator 100 MHz Lock Status

The 100 MHz reference lock status is described below:

Acquiring: Attempting to lock the 100 MHz to an external 10 MHz reference. Low Phase Noise and Ultra High Stability (Option 3); or, attempting to lock the 100 MHz to the internal 10 MHz reference. Low Phase Noise and Ultra High Stability (Option 3)

Locked: 100 MHz is locked to the external 10 MHz. Low Phase Noise and Ultra High Stability (Option 3 is not installed); or, 100 MHz is locked to the internal 10 MHz reference. Low Phase Noise and Ultra High Stability (Option 3).

Free: 100 MHz is free running

Error: 100 MHz is unable to lock to a connected 10 MHz. Low Phase Noise and Ultra High Stability (Option 3 is not installed); or, 100 MHz is unable to lock to the internal 10 MHz reference, Low Phase Noise and Ultra High Stability (Option 3).

Reference Oscillator GPS Lock Status

Requires GNSS/GPS Atomic Clock Receiver (Option 66). The GPS reference 1PPS lock status is described below:

Locked: The GNSS reference is locked

Acquiring: The GPS reference is acquiring lock

Off: The GPS module is turned off

Error: The GPS reference is unable to acquire lock

Reference Oscillator Rubidium Lock Status

Requires Low Phase Noise and Ultra High Stability (Option 3) and Ultra Stable Rubidium Reference (Option 56). The Rubidium reference lock status is described below:

Locked: The RB internal TCXO is locked to the vapor chamber.

Acquiring: The RB internal TCXO is acquiring lock to the vapor chamber.

Error: The RB internal TCXO is unable to acquire lock to the vapor chamber.

Reference Loop Bandwidth

The MG362x1A provides a user selectable external reference loop bandwidth. Bandwidths of 10 Hz, 30 Hz, 100 Hz, or 300 Hz can be selected from the front panel system configuration menu. Selecting a narrower bandwidth provides greater immunity from reference related phase noise; however, reference tracking will not be optimal. Selecting a wider bandwidth increases phase tracking of the external reference; however, it also increases the susceptibility to reference noise.

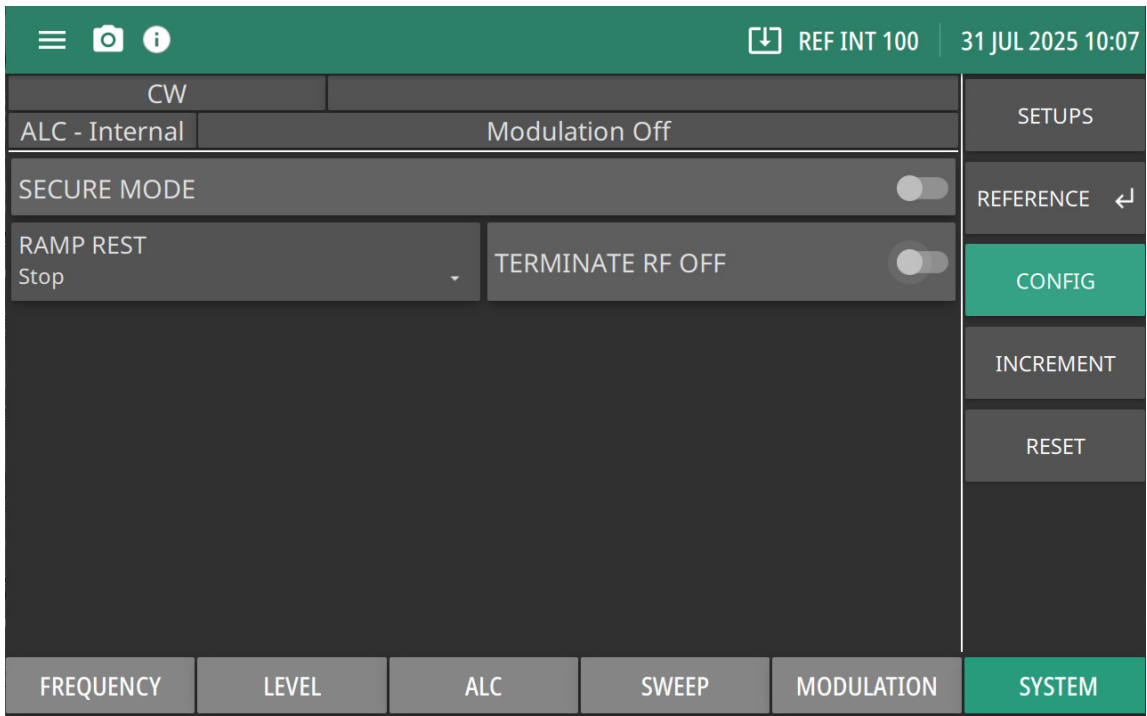
To select an external reference loop bandwidth, first connect the external 10 MHz reference signal to the MG362x1A rear panel 10 MHz REF IN connector.

After selecting the external reference loop bandwidth, the setting is shown in the Configure Rear Panel menu.

Note	MG362x1A phase noise specifications apply only when an external reference is not connected.
-------------	---

CONFIG

The Config menu is shown in [Figure 3-104](#).



SECURE MODE: Turn Secure Mode on by sliding the toggle to the right.

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

Start: Sets the sweep to rest at the bottom of the sweep ramp.

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

TERMINATE RF OFF: Turns on TERMINATE RF OFF when toggle is turned on.

Figure 3-104. CONFIG Menu

Secure Mode

If the Secure Mode is turned on the frequency, power level, and modulation parameters in the front panel display are blanked. The instrument continues to function normally.

Switch Secure Mode Off by pressing RESET and click PRESET. Restores the front panel display of all frequency, power level, and modulation parameters. See [“RESET” on page 3-112](#).

TERMINATE RF OFF

When the Terminate RF Off is disabled the instrument will behave as usual. The attenuator will not move from its current value.

When Terminate RF Off is enabled, Turning RF off will override the attenuator to apply 40 dB of attenuation, which will lower the output power of the instrument. This will mask any unintentional low-power output while RF is off.

When RF is re-enabled, regardless of if you enabled RF with the setting toggled, the attenuator will be restored to the user's configured setting, or the auto attenuation value if auto attenuation is enabled.

Frequency Scaling

Set a reference multiplier value and apply it to all frequency parameters. The reference multiplier can be any value between 0.1 and 18. Changing the multiplier value changes the entered and displayed frequencies, but does not affect the output of the signal generator. For example:

- Frequency scaling set to 4
- CW frequency set to 20 GHz
- MG362x1A output is 5 GHz (20 GHz ÷ 4)

Note	Resetting the MG362x1A sets the frequency scaling reference multiplier value to 1.
-------------	--

Press Frequency Scaling [FRS] to open the reference multiplier parameter, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the data entry key pad and the terminator soft key. To close the open multiplier parameter, press Frequency Scaling or make another menu selection. **Terminate RF Off**

Press Terminate RF Off [TR1] to select 40 dB (minimum) of attenuation when RF is switched off in units with a step attenuator (Option 2) installed. This provides a better output source match. The display will reflect Yes to indicate the 40 dB of attenuation is applied. Press Terminate RF Off [TR0] again to select 0 dB of attenuation when RF is switched off. The display will reflect No to indicate 0 dB of attenuation is applied.

Note	The Terminate RF Off selection is only available in units with Option 2 (Step Attenuator).
-------------	--

Press < Previous to return to the main Configure RF menu display.

INCREMENT

The INCREMENT menu provides an increment setting size for editing frequency and power level. The increment feature is a GUI function and affects only the Instrument UI or the remote UI.

Press: SYSTEM | INCREMENT

Increment Size

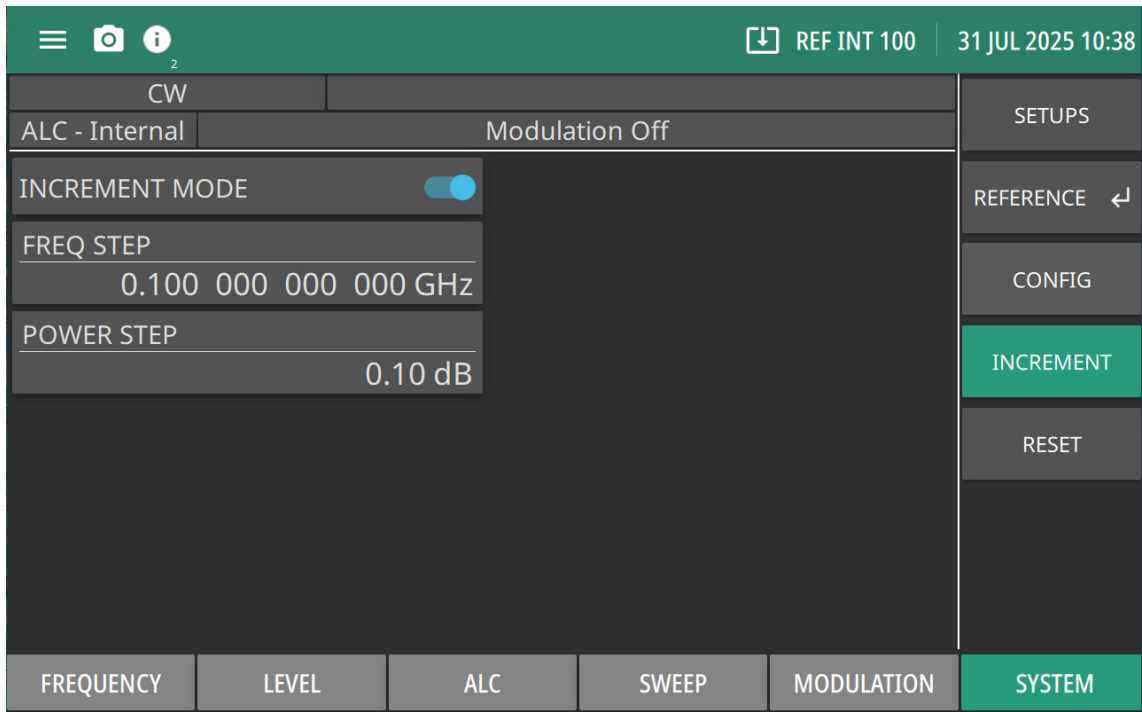
Set the incremental size for editing CW frequencies and fixed power level. When the increment mode is set to on, these parameter values will increase or decrease by the set amount each time the front panel

▲ or ▼ pad is pressed or the rotary data knob is turned clockwise or counter-clockwise. This menu also lets you turn the increment mode on and off.

Open a parameter to be changed, then edit the current value using the cursor control keys, rotary data knob, or enter a new value using the key pad and appropriate termination key. When you have finished setting the open parameter, close it by pressing its menu soft key or by making another menu selection.

The increment size set provides the default frequency and power level change when using the keypad arrow keys or the rotary knob of the MG369x1A.

Press the Increment Mode slider to turn the increment mode on as shown in [Figure 3-105](#). Press Increment Mode again to turn it off.



INCREMENT MODE: Activates FREQUENCY STEP and POWER STEP increment size settings when toggled on.

FREQUENCY STEP: Press to open the frequency increment size parameter. Range is 1 Hz to 10 MHz

POWER STEP: Press to open the power level increment size parameter. Range is 1 dB to 10 dB.

Figure 3-105.INCREMENT Menu

RESET

The RESET menu is shown in [Figure 3-106](#).

Erasing Stored Setups

The front panel setups are stored in non-volatile memory. A Factory Reset is required to erase the contents of the setups and reprogram them with default data.

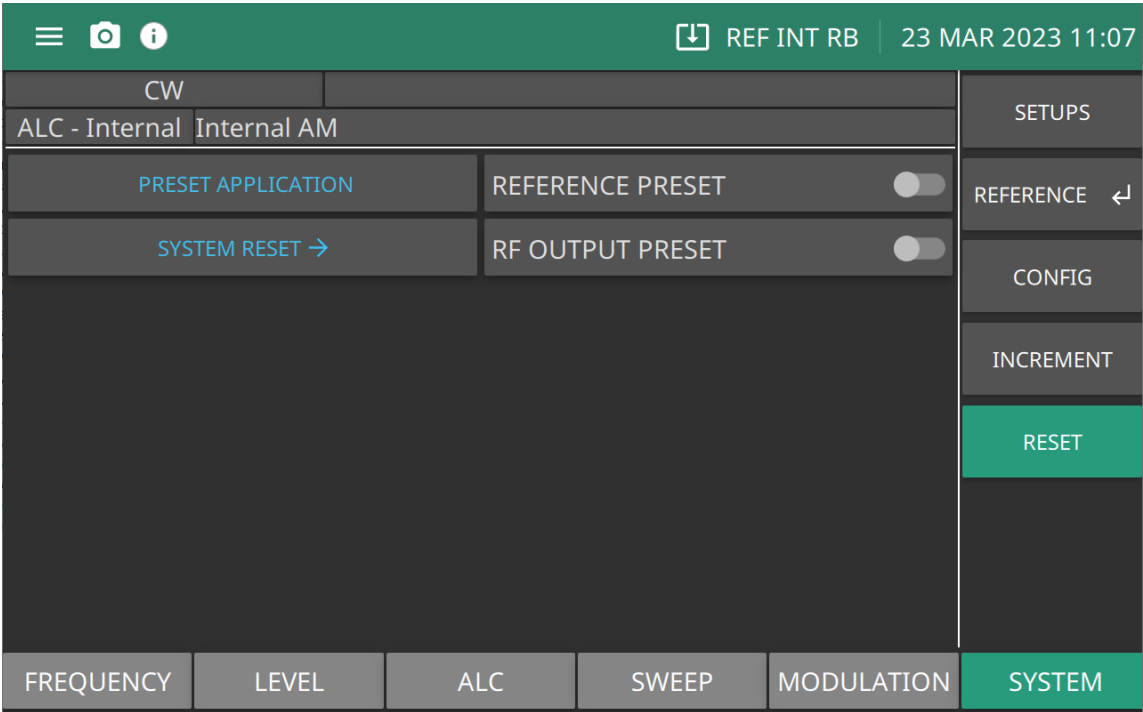
Note

The Factory Reset function overwrites all information stored in the non-volatile memory with default values. This includes the table of 2000 frequency/power level sets used for the list sweep mode and the five power-offset tables used for the user level flatness correction function.

To perform a Reset All

Press: SYSTEM | RESET | SYSTEM RESET | RESET ALL

RESET ALL will perform a Factory Reset and delete all user files and system files from the internal memory. The instrument will reset to a default state. For a description of the RESET menu, see [“RESET Settings” on page 2-37](#).



- PRESET APPLICATION:** Performs a system reset. Switch REFERENCE PRESET On or Off
- SYSTEM RESET:** Provides access to FACTORY RESET, FILE RESET, and RESET ALL. Switch RF OUTPUT PRESET On or Off. The function of these buttons are described in [“RESET Settings” on page 2-37](#).
- REFERENCE PRESET:** Set to reinitialize all MG362x1A reference inputs and outputs.
- RF OUTPUT PRESET:** Switch to set RF on or off after a preset is performed.

Figure 3-106.RESET Menu

Chapter 4 — Operation Verification

4-1 Introduction

This chapter contains three operation verification tests that can be used to verify the Rubidium MG362x1A series 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 MG362x1A technical data sheet (P/N:11410-00928) for performance specifications.

4-2 Test Records

[Table 4-1](#) and [Table 4-2](#), contain test record forms that can be photocopied and used to record the results of operational verification tests of your MG362x1A. These tables are included as part of the operational verification test procedures and contain test information for all MG362x1A models.

4-3 Initial MG362x1A Checkout

Before starting the operation verification tests in this chapter, perform an initial checkout of the MG362x1A 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 On

Connect the MG362x1A to the power source. Toggle the rear panel AC input connector switch to the ON position. Press the front panel power button. This automatically places the signal generator in operation (front panel power on LED button turns green). During power-on, the signal generator loads its operating program, and then returns to the specified power on setup file.

Warm-up Time

Power on the MG362x1A and allow at least one hour of warm-up time before performing operational verification testing. This will ensure stable operation of the instrument.

Self Test

Next, perform a self test of the MG362x1A to ensure proper operation of the instrument's internal assemblies. To perform a self test, press the System Menu | DIAGNOSTICS | SELF TEST. See [“SELF TEST” on page 2-41](#). Error conditions detected during self test must be corrected before continuing.

4-4 Presetting the MG362x1A

The signal generator should be preset to the factory-selected default parameters before continuing operation and verification testing. Factory Reset 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.

Press: System Menu | FILES. Name the setup file to be saved and press SAVE.

To access the RESET ALL menu shown in [Figure 4-1](#) and set to factory default:

Press: SYSTEM | RESET | SYSTEM RESET | RESET ALL

or

Press: System Menu | SETTINGS | RESET | RESET ALL

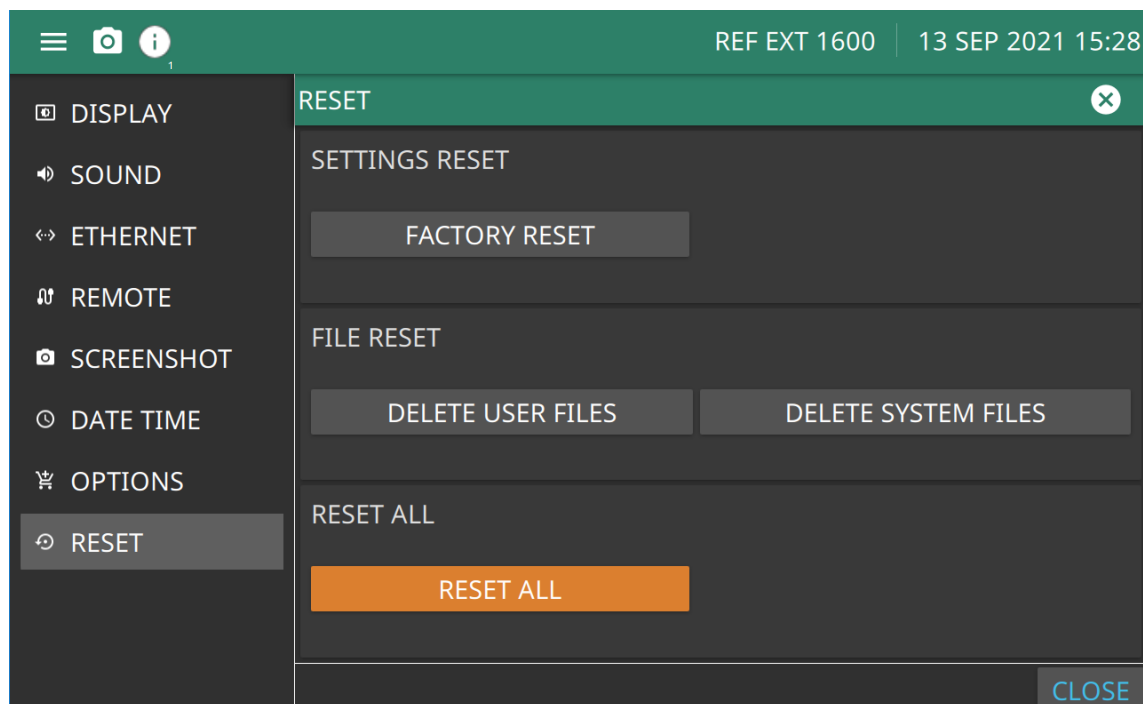


Figure 4-1. Reset Menu

4-5 Frequency Synthesis Test

The following test verifies that the CW frequency output of the MG362x1A under test is within tolerance. [Table 4-1](#) contains a standard test record that you can copy and use to record test results for this test.

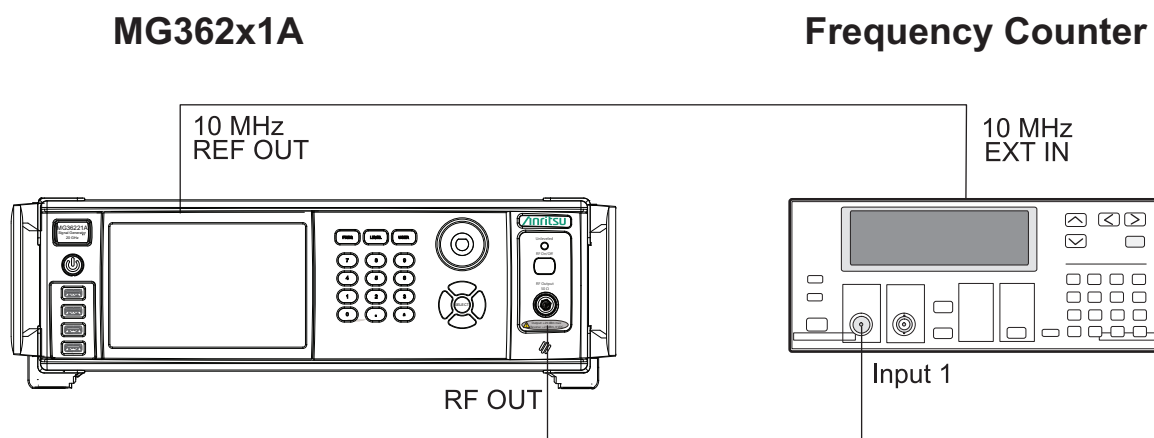


Figure 4-2. Setup for Frequency Synthesis Test

The following procedure tests the tolerance of the CW frequency output.

1. Connect the equipment shown in [Figure 4-2](#) as follows:
 - a. Connect the MG362x1A rear panel 10 MHz REF OUT to the Frequency Counter 10 MHz External Reference input.
 - b. Connect the MG362x1A RF OUTPUT to the Frequency Counter RF Input 1.
2. Set up the MG362x1A as follows:
 - a. Upon preset, the FREQUENCY menu is displayed with frequency and set to default values.
 - b. Press FREQUENCY to open the current frequency parameter for editing.
 - c. Set the first test frequency in [Table 4-1](#).
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 FREQUENCY to the next test frequency.
6. Record the frequency counter reading and calculate the difference between the test frequency and the measured value.
7. Repeat steps [5](#) and [6](#) until all of the test frequencies in [Table 4-1](#) have been recorded.

Table 4-1. Frequency Synthesis Test Record

Model MG362x1A	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 is ± 10 Hz.		

4-6 Level Accuracy and Flatness Test

The following tests verify that the accuracy and flatness of the MG362x1A meet specifications. [Table 4-2](#) contains test records that you can copy and use to record test results. These tests use an Anritsu ML243xA Power Meter with a MA247xD power sensor. If you use another power meter and power sensor, consult your product's user guide for proper test setup and operation.

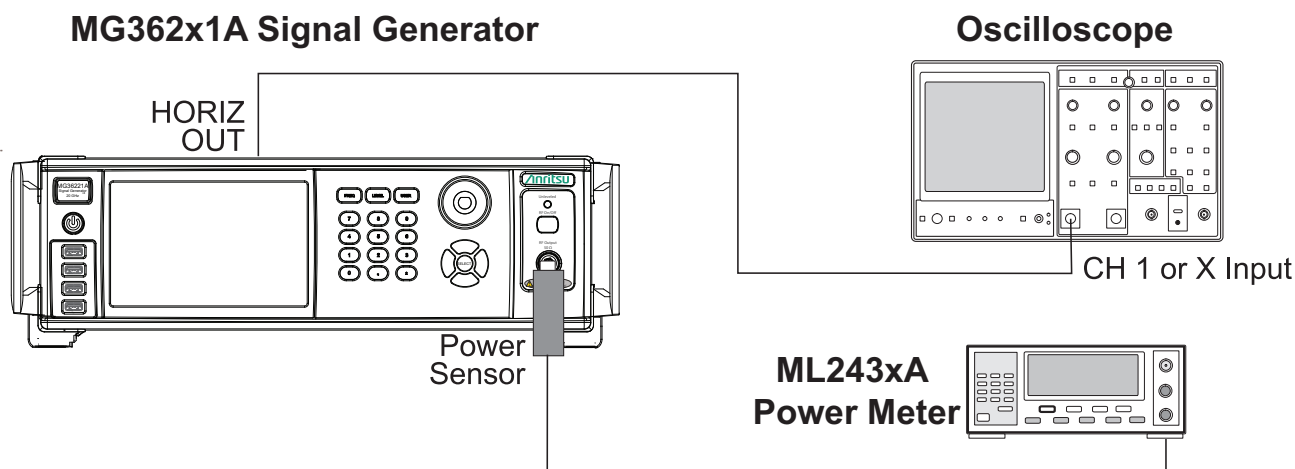


Figure 4-3. Equipment Setup for Accuracy and Flatness Tests

Caution

The MG362x1A is capable of output s 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 4-3](#) 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 MG362x1A.
 - e. Set up the maximum V/GHz range by pressing:
Setup | StopF
and enter the maximum frequency of the MG362x1A.
 - 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 MG362x1A (use a fixed attenuator when measuring s above +19 dBm).

3. Connect the special AUX I/O interface cable (Anritsu PN 806-97) to the MG362x1A 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.

4-7 Accuracy Test Procedure

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

1. Set up the MG362x1A as follows:
 - a. Reset the instrument by pressing System Menu | SETTINGS | RESET | FACTORY RESET. Upon preset, the FREQUENCY menu is displayed with frequency and set to default values.

Note

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

- b. Press FREQUENCY button to open the current frequency parameter for editing.
 - c. Set the frequency to the CW frequency listed in [Table 4-2](#).
 - d. In the same menu screen, press the LEVEL button to open the current parameter for editing and set LEVEL to the maximum specified noted in the data sheet (use a fixed attenuator when measuring above +19 dBm).
2. Measure the output 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 LEVEL to the next test 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 for the current CW frequency.
6. Repeat steps 1 through 5 for all CW frequencies [Table 4-2](#).

Table 4-2. Accuracy Test Record

Model MG362x1A		Serial Number:		Date:	
Accuracy ^a (CW Frequency = 500 MHz)		Accuracy ^a (CW Frequency = 5.0 GHz)		Accuracy ^a (CW Frequency = 15.0 GHz)	
Set Power (dBm)	Measured Power (dBm)	Set Power (dBm)	Measured Power (dBm)	Set Power (dBm)	Measured Power (dBm)
		+23 ^a			
		+22 ^b			
		+21 ^b			
		+20 ^b			
+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	

a.Ensure that a fixed attenuator is used to protect the power sensor from input overload.

4-8 Flatness Test Procedure

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

1. Set up the MG362x1A as follows for a step sweep flatness test:
- a. Reset the instrument by pressing System Menu | SETTINGS | RESET | RESET ALL. Upon reset, the FREQUENCY menu is displayed with frequency set to default values.

b. Press FREQUENCY button to open the current frequency parameter for editing as shown in [Figure 4-4](#).



Figure 4-4. Frequency Menu - Setting CW Frequency

- c. Set the frequency to the CW frequency as shown in [Table 4-2](#).
- d. In the same menu screen, press the LEVEL button to open the current parameter for editing and set LEVEL to the maximum specified noted in the data sheet (use a fixed attenuator when measuring s above +19 dBm). Refer to [Figure 4-4](#).

- e. Press SWEEP menu and touch STEP submenu as shown in [Figure 4-5](#).

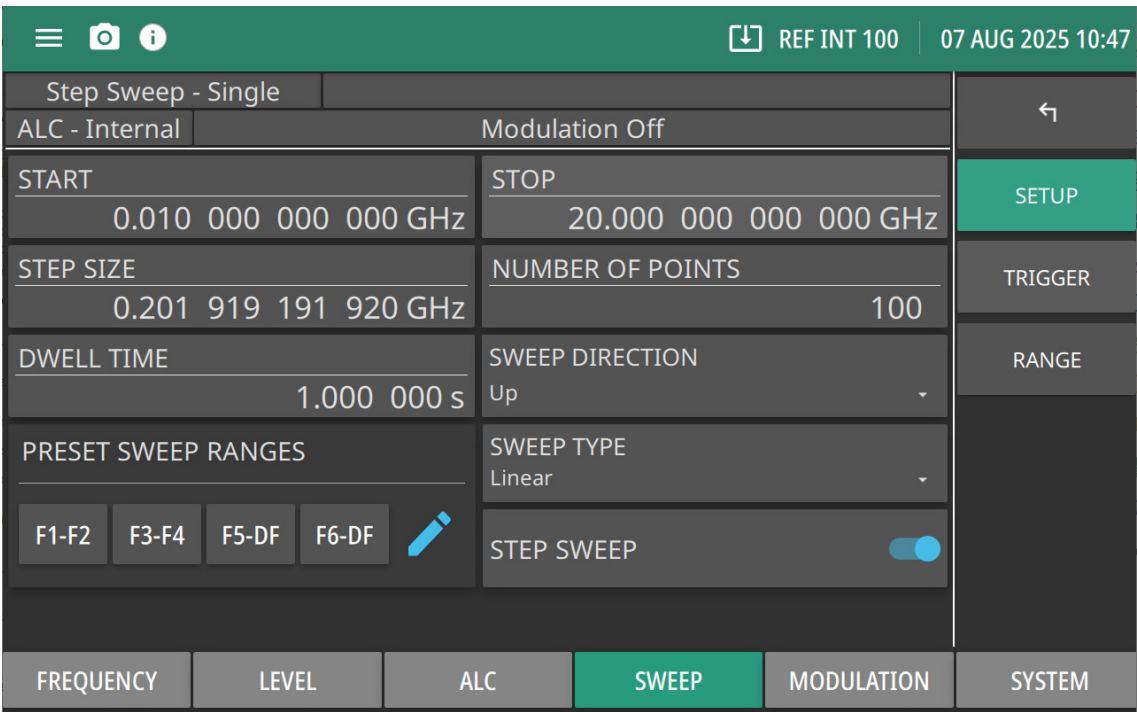


Figure 4-5. Sweep Menu - Step (Setup)

- f. Press START button to set the start frequency to the lowest frequency.
 - g. Press STOP button to set the stop frequency of the instrument to the maximum frequency for perform full sweep.
 - h. Set the DWELL TIME to 1 second, or to a time that is comfortable between recordings.
 - i. Set the NUMBER OF POINTS to 100.
 - j. Turn on the STEP SWEEP toggle to start sweeping.
2. Press TRIGGER | TRIGGER SWEEP as shown in [Figure 4-6](#).

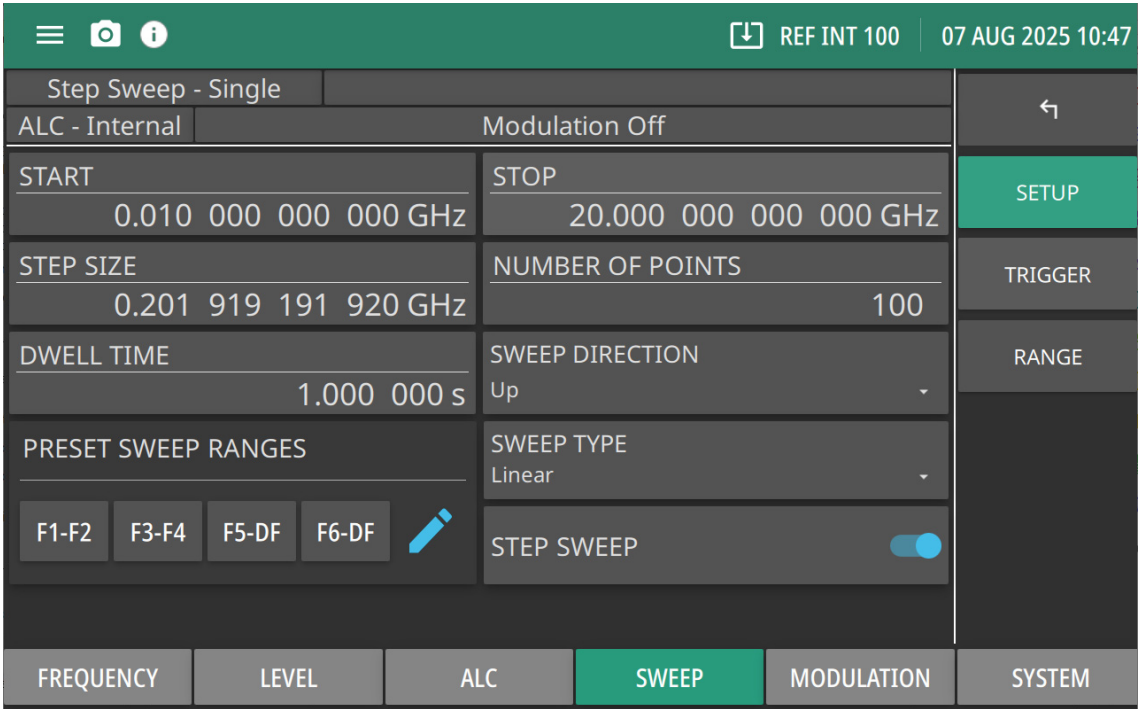


Figure 4-6. Sweep Menu - Step (Trigger)

- 3. As the MG362x1A sweeps through the full frequency range, observe the maximum and minimum power meter readings and record the values on the test record.

Appendix A — Software Installation

A-1 Install MG362x1A

The MG362x1A software provides remote access to a network connected instrument and displays the same MG362x1A user interface, instrument controls, and live measurement data on the computer screen. The software also allows you to load setup data from saved files.

PC Requirements

Minimum computer requirements are listed below:

- Intel Core i5 or higher processor
- 8 GB RAM
- Windows 10, 64-bit
- 1 GB disk space
- Open GL (ES) 2.0 support
- Display resolution 1280 x 800
- Ethernet (for connecting to an MG362x1A instrument)

Installation

1. Download the MG362x1A software from the product page:

<https://www.anritsu.com/en-us/test-measurement/products/mg362x1a>

2. Launch the MG362x1A executable file and follow the on-screen instructions after selecting YES to the User Account Control dialog.

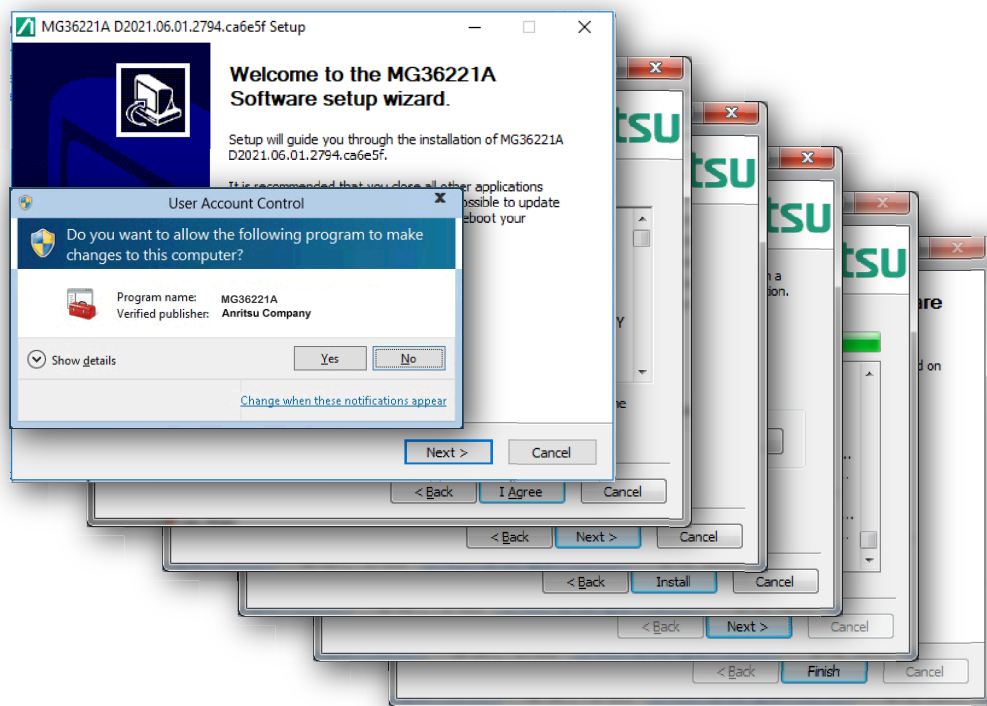


Figure A-1. MG362x1A Installation

SETUP

Setup parameters for Step Sweep, Level Sweep, and List Sweep can be adjusted.

PRESET

Preset functions will preset the selected items and suppressed recalled measurement data.

A-2 FILE (File Management)

The Windows file manager is used for all file operations when connected to an instrument. The FILE menu buttons will display the Windows Save As or Recall File dialogs; the FILES system menu will launch Windows Explorer. Note that files cannot be recalled from nor written to a connected instrument.

Appendix B — Updating Firmware

B-1 Updating Firmware on the MG362x1A

Update with the latest MG362x1A firmware version using the MG362x1A WEB UPDATES menu or a USB memory stick loaded with the latest firmware version.

Use the MG362x1A WEB UPDATES Menu

1. Apply power to the MG362x1A.
2. Verify the MG362x1A is connected to the network and has been given an IP address. See [“SETTINGS Menu” on page 2-26](#).
3. Touch the front panel menu sequence as: 3-Line Menu | SYSTEM INFORMATION | SOFTWARE
4. Touch the WEB UPDATES button to the on position as shown in [Figure B-1](#) to automatically check the for Anritsu website for updates.

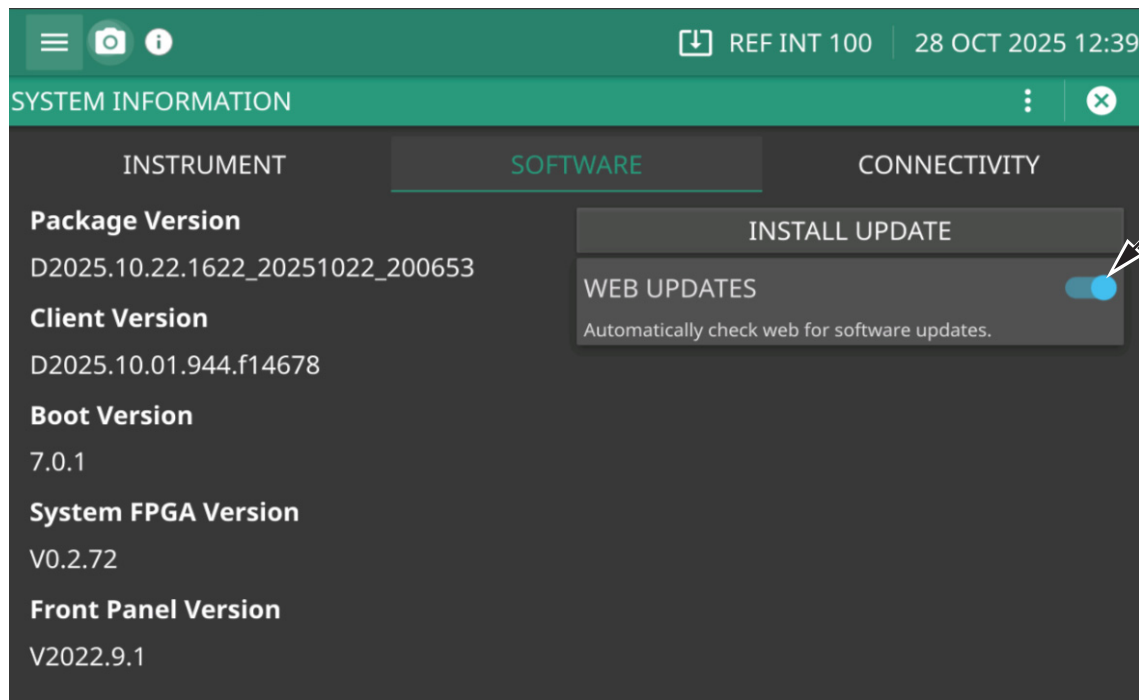


Figure B-1. Web Updates Button

If an update is available, the software update icon will appear on the taskbar as shown in [Figure B-2](#).



Figure B-2. Software Update Icon

5. Touch the software update icon to display the SOFTWARE UPDATE window as shown in [Figure B-3](#).

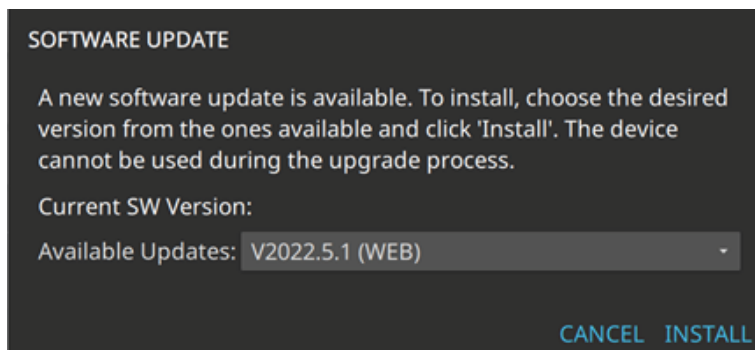


Figure B-3. Software Update Dialog

6. Touch the Available Updates drop down. If multiple versions of MG362x1A firmware are available, select the correct firmware version.
7. Touch INSTALL.
8. The SOFTWARE UPDATE PROGRESS dialog is displayed as shown in [Figure B-4](#). The installation process may take a few minutes to complete.
9. When the software upgrade is complete, touch RESTART INSTRUMENT.

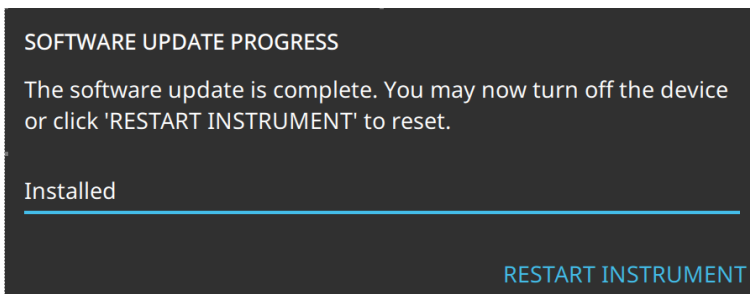


Figure B-4. Software Update Progress Dialog

10. The MG362x1A will reboot with the updated firmware installed.
11. Verify that the Package Version firmware as shown in [Figure B-1 on page B-1](#) shows the most recent version firmware is installed.

The WEB UPDATES button can remain in the on position to alert of future firmware updates when the MG362x1A is connected to the Web. When a new update is available, the software update icon will display on the taskbar as shown in [Figure B-2](#).

Use a USB Memory Device

1. Apply power to the MG362x1A.
2. Download an updated MG362x1A firmware file to a USB memory device. Go to the Anritsu MG362x1A firmware download page at:
<https://www.anritsu.com/en-us/test-measurement/support/downloads/software/dwl20700>
The file will be a .rauch file type.
3. Insert the USB memory device containing the firmware update into the MG362x1A USB slot located on the front panel or rear panel of the instrument. When the memory device is inserted, the software update icon will appear at the top of the touch-screen as shown [Figure B-2](#).
4. Touch the software update icon to display the SOFTWARE UPDATE window shown in [Figure B-3](#).

5. Touch the Available Updates drop down. If multiple versions of MG362x1A firmware are available, select the correct firmware version.
6. Touch INSTALL.
7. The SOFTWARE UPDATE PROGRESS dialog is displayed as shown in [Figure B-4 on page B-2](#). The installation process may take a few minutes to complete.
8. When the software upgrade is complete, touch RESTART INSTRUMENT. The MG362x1A will reboot with the updated firmware installed.
9. Verify the Package Version firmware, as shown in [Figure B-1 on page B-1](#), shows the most recent version firmware is installed.
10. Remove the USB memory device.

Appendix C — Software Option Upgrades

C-1 Introduction

To obtain a software option upgrade, the user will be required to save and send a configuration file of the MG362x1A to an Anritsu sales representative. Use the following procedure to export the MG362x1A configuration file and to import the options upgrade.

C-2 Upgrade Procedure

Upgrading software options on MG362x1A consists of two main steps:

1. Export and send the unit's configuration file to Anritsu.
2. Import the new license file provided by Anritsu.

Exporting a Software Configuration File

Exporting the configuration file:

1. Insert a FAT-32 formatted USB memory device into the instrument. If using the remote GUI, insert the USB memory device into the PC.
2. Open the System menu from the upper left 3-bar icon.
3. Use the “[OPTIONS Settings](#)” on page 2-36 to save the instruments configuration file.
4. Navigate to Settings > Options menu.
5. Touch SAVE CONFIG at the lower left of INSTALLED OPTIONS.
6. Save the configuration file to a USB memory device, preserving the default filename. The filename will be in the format of MG362x1A_XXXXXXX.config on the USB drive when the operation is complete.
7. Email the file to your Anritsu Customer Service representative at: <https://www.anritsu.com/contact-us>.

Importing Software License

Importing a new license file:

1. After receiving a new license file from Anritsu, place the file on the USB memory device in the top (root) level. Not in any directory.
2. Insert the FAT-32 formatted USB memory device into the instrument. If using the remote GUI, insert the USB memory device into the PC.
3. Open the System menu from the upper left 3-bar icon.
4. Navigate to Settings > Options menu
5. Touch ENABLE OPTIONS USING FILE at the lower right of INSTALLED OPTIONS.

The instrument GUI (or remote GUI) will search for a valid license file on the USB memory device and apply the changes to the system.

Reboot the instrument and ensure all changes are applied.

Appendix D — Instrument Messages

D-1 Introduction

This appendix provides a list of instrument error messages, their meaning and a sample self-test log. If any error condition persists, contact your local Anritsu Service Center (<http://www.anritsu.com/contact-us>).

The MG362x1A signal generator displays the following message types:

- “Self-Test Messages” indicating self-test pass or fail conditions.
- “Informational Messages” such as rebooting instrument.
- “Warning Messages” such as a temperature high warning.
- “Error Messages” such as an internal instrument fault.

Messages have the following display characteristics:

- Transient messages appear briefly and then fade away.
- Persistent messages remain on the display and require user intervention to correct the condition.
- Some messages are logged but not displayed, such as messages in the event log.
- Messages may be displayed either in the toolbar or in a pop-up window.

D-2 Error Messages

Lock Error

In Toolbar, Log, Persistent

ALC unleveled

In Toolbar, No Log, Persistent

Power sweep setup error %1

In Toolbar, Log, Persistent

Power sweep setup error

In Toolbar, Log, Persistent

User level calibration table #%1 is invalid

In Toolbar, Log, Transient

ALC noise floor optimization complete

In Toolbar, No Log, Transient

RF Output Reset complete

In Toolbar, No Log, Transient

OCXO drift detected. Perform a 10 MHz reference calibration with an accurate external reference

In Toolbar, Log, Transient

Pulse configuration error %1

In Toolbar, Log, Transient

Reduce AM Input Level

In Toolbar, Log, Persistent

Reduce FM Input Level

In Toolbar, Log, Persistent

Reduce PM Input Level

In Toolbar, Log, Persistent

Reduce FM Deviation

In Toolbar, Log, Persistent

Reduce PM Deviation

In Toolbar, Log, Persistent

Reduce AM Rate

In Toolbar, Log, Persistent

Reduce FM Rate

In Toolbar, Log, Persistent

Reduce PM Rate

In Toolbar, Log, Persistent

ALC unlevelled

In Toolbar, No Log, Persistent

D-3 Informational Messages

Reference Cold

In Toolbar, No Log, Transient

No application loaded. Factory reset required

In Toolbar, Log, Persistent

Rebooting Instrument

In Toolbar, No Log, Transient

Rebooting instrument into Recovery mode

In Toolbar, No Log, Transient

Attempt to reboot instrument into Recovery mode failed

In Toolbar, Log, Transient

Presetting Instrument

In Toolbar, No Log, Transient

Preset Completed

In Toolbar, No Log, Transient

Resetting Instrument

In Toolbar, Log, Transient

Reset Completed

In Toolbar, Log, Transient

External reference detected – switching reference source to external%1

In Toolbar, Log, Transient

External reference disconnected – switching reference source to internal%1

In Toolbar, Log, Transient

External reference disconnected – switching reference source to Internal High%1

In Toolbar, Log, Transient

External reference disconnected – switching reference source to GNSS%1

In Toolbar, Log, Transient

Could not lock to external reference – check connection and try again%1"

In Toolbar, Log, Transient

GPS reference detected – acquiring GPS%1

In Toolbar, Log, Transient

GPS reference acquired – switching reference source to GPS

In Toolbar, Log, Transient

GPS reference disconnected – switching reference source to Internal%1

In Toolbar, Log, Transient

GPS reference no longer available – switching reference source to Internal High%1

In Toolbar, Log, Transient**Internal High reference no longer valid – switching frequency reference source to Internal%1**

In Toolbar, Log, Transient

Internal High reference no longer valid – switching time reference source to Internal"

In Toolbar, Log, Transient

GNSS reference detected – switching time reference source to GNSS

In Toolbar, Log, Transient

GNSS reference no longer available – switching time reference source to Internal High

In Toolbar, Log, Transient

Could not lock to internal reference

In Toolbar, Log, Persistent

Software update files found on USB

In Toolbar, No Log, Transient

USB drive %1 ejected

In Toolbar, No Log, Transient

Failed to connect to %1

In Toolbar, No Log, Transient

Successfully connected to %1

In Toolbar, No Log, Transient

Connecting to %1

In Toolbar, No Log, Persistent

File saved successfully %1

In Toolbar, No Log, Transient

File save failed %1

In Toolbar, No Log, Transient

File recalled successfully

In Toolbar, No Log, Transient

File does not exist

In Toolbar, No Log, Transient

Memory Full

In Toolbar, No Log, Transient

Memory Full

In Toolbar, No Log, Popup

Options %1 are not valid for the currently installed firmware version. The device might not function properly

In Toolbar, No Log, Persistent

Options upgraded. Please restart the instrument to use new features

In Toolbar, No Log, Transient

Error %1

In Toolbar, Log, Transient

File %1 import successfully

In Toolbar, No Log, Transient

File %1 export successfully

In Toolbar, No Log, Transient

Save failed. File size exceeds save limits. Adjust setup and try again

In Toolbar, Log, Transient

D-4 Warning Messages

Temperature High Warning

In Toolbar, Log, Persistent

Shutdown Temperature Reached

Popup, Log, Persistent

Save failed. File size exceeds save limits. Adjust setup and try again

In Toolbar, Log, Transient

D-5 Self-Test Messages

The MG362x1A signal generator has built-in diagnostics that allow you to run a built-in self test. The test results can be viewed on the screen and saved to a log file. To run self test, use the “[System Menu](#)” to access DIAGNOSTICS, then select SELF TEST and RUN SELF TEST. Below is a sample list of self tests with passing results:

Table D-1. System Messages

Name	Type	Actual	Expected	Tolerance	Status
System voltage	Voltage	13.02 V	13.00 V	4.00 V	pass
+1.0V digital supply	Voltage	0.99 V	1.00 V	0.10 V	pass
+3.3V digital supply	Voltage	3.28 V	3.30 V	0.33 V	pass
+5.0V digital supply	Voltage	5.00 V	5.00 V	0.50 V	pass
+1.8V digital supply	Voltage	1.83 V	1.80 V	0.18 V	pass
+0.85V PS transceiver AVCC	Voltage	0.84 V	0.85 V	0.09 V	pass
+1.8V PS transceiver AVTT	Voltage	1.80 V	1.80 V	0.18 V	pass
+2.5V DDR SODIMM supply	Voltage	2.49 V	2.50 V	0.25 V	pass
+1.2V DDR SODIMM supply	Voltage	1.20 V	1.20 V	0.12 V	pass
+0.85V FPGA core supply	Voltage	0.85 V	0.85 V	0.09 V	pass
CPU Temperature	Temperature	37.40 C	50.00 C	50.00 C	pass

Table D-2. SG Messages

Name	Type	Actual	Expected	Tolerance	Status
MOD +2.5V supply	Voltage	2.49 V	2.50 V	0.25 V	pass
MOD +3.3V supply	Voltage	3.31 V	3.30 V	0.33 V	pass
ALC	Temperature	59.56 C	30.00 C	60.00 C	pass
YIG	Temperature	40.25 C	30.00 C	60.00 C	pass
SWF +2.5V supply	Voltage	2.48 V	2.50 V	0.25 V	pass
SWF +3.3V supply	Voltage	3.33 V	3.30 V	0.33 V	pass
SWF +5.0V supply	Voltage	5.02 V	5.00 V	0.50 V	pass
SWF +8.0V supply	Voltage	8.07 V	8.00 V	0.80 V	pass
SWF +10.0V HP supply	Voltage	9.65 V	10.00 V	1.00 V	pass
SWF +28.0V supply	Voltage	27.68 V	28.00 V	2.80 V	pass
SWF -2.5V HP supply	Voltage	-2.52 V	-2.50 V	0.25 V	pass
SWF -5.0V HP supply	Voltage	-5.06 V	-5.00 V	0.50 V	pass
SWF -32.0V HP supply	Voltage	-31.80 V	-32.00 V	3.20 V	pass
SWF -37.0V HP supply	Voltage	-36.41 V	-37.00 V	3.70 V	pass
SWF -3.3V HP supply	Voltage	-3.38 V	-3.30 V	0.33 V	pass
SWF ALC1 current monitor	Current	0.05 A	0.40 A	0.40 A	pass
SWF ALC2 current monitor	Current	0.32 A	0.40 A	0.40 A	pass
SWF DA1 current monitor	Current	0.41 A	0.40 A	0.40 A	pass
SWF DA2 current monitor	Current	0.00 A	0.40 A	0.40 A	pass

Table D-2. (Continued)SG Messages

Name	Type	Actual	Expected	Tolerance	Status
SWF PA1 current monitor	Current	0.30 A	0.70 A	0.70 A	pass
SWF PA2 current monitor	Current	0.25 A	0.70 A	0.70 A	pass
SWF PA3 current monitor	Current	0.50 A	0.70 A	0.70 A	pass
SWF Temperature	Temperature	32.00 C	30.00 C	60.00 C	pass
Frequency Extension Module Not Available in MG36221A	Voltage	0.00 V	0.00 V	0.00 V	pass
REG +13V Main Voltage	Voltage	13.04 V	13.00 V	1.30 V	pass
REG +6.0V Standby	Voltage	6.01 V	6.00 V	0.60 V	pass
REG +1.5V supply	Voltage	1.52 V	1.50 V	0.15 V	pass
REG +3.3V supply	Voltage	3.35 V	3.30 V	0.33 V	pass
REG +3.9V supply	Voltage	4.03 V	3.90 V	0.39 V	pass
REG +6.0V supply	Voltage	6.02 V	6.00 V	0.60 V	pass
REG +9.0V supply	Voltage	9.18 V	9.00 V	0.90 V	pass
REG +10.0V supply	Voltage	10.18 V	10.00 V	1.00 V	pass
REG +15.0V supply	Voltage	15.10 V	15.00 V	1.50 V	pass
REG +16.0V supply	Voltage	16.59 V	16.00 V	1.60 V	pass
REG +24.0V supply	Voltage	24.22 V	24.00 V	2.40 V	pass
REG +25.0V supply	Voltage	26.24 V	25.00 V	2.50 V	pass
REG +30.0V supply	Voltage	30.13 V	30.00 V	3.00 V	pass
REG -6.0V supply	Voltage	-5.86 V	-6.00 V	0.60 V	pass
REG -16.0V supply	Voltage	-15.76 V	-16.00 V	1.60 V	pass
REG -15.0V supply	Voltage	-14.61 V	-15.00 V	1.50 V	pass
REG -30.0V supply	Voltage	-28.59 V	-30.00 V	3.00 V	pass
REG -40.0V supply	Voltage	-38.39 V	-40.00 V	4.00 V	pass
REG -6.0V standby	Voltage	-5.81 V	-6.00 V	0.60 V	pass
REG -13.0V standby	Voltage	-12.57 V	-13.00 V	1.30 V	pass
Overall Status	Info value				pass

Appendix E — Waveform Generator (Option 10)

E-1 Introduction

The waveform generator uses the modulation capabilities of the synthesized signal generators to enable users to create and generate complex modulation of the RF output. The waveform generator is only available in the PC application, the instrument does not support Tool menu.

E-2 Program Installation

When Option 10 is installed into the MG362x1A, the Waveform Generator is opened from the TOOLS menu and is displayed as shown in [Figure E-1](#).

3-layer icon | TOOLS | WAVEFORM

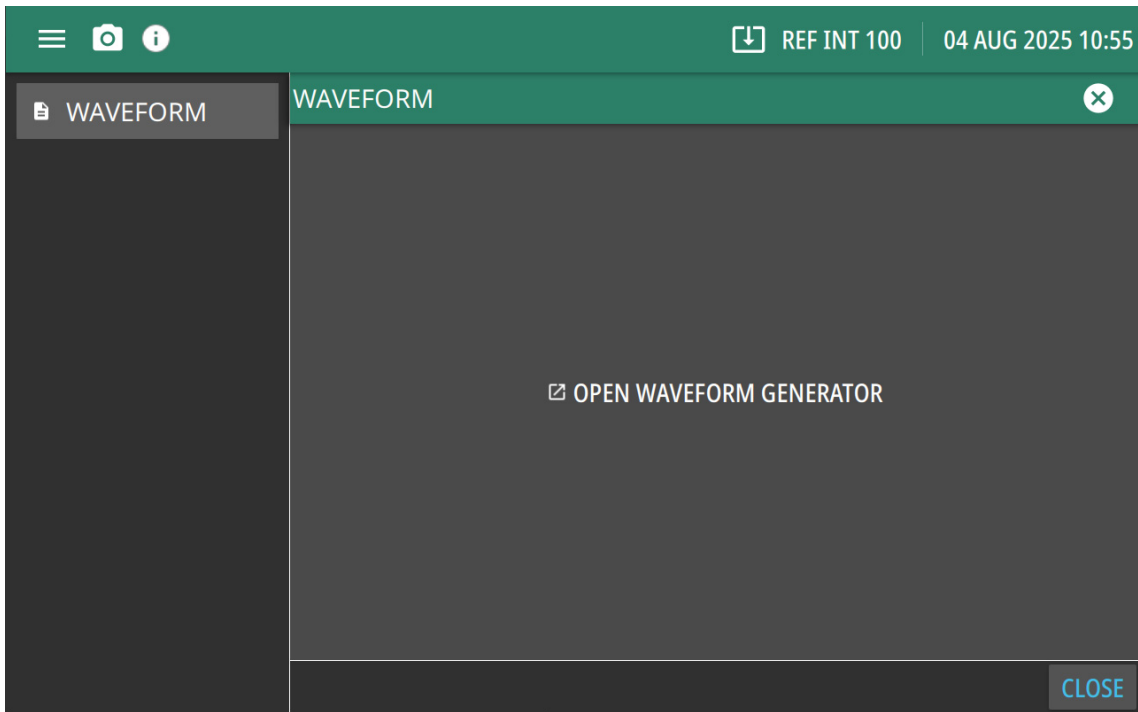
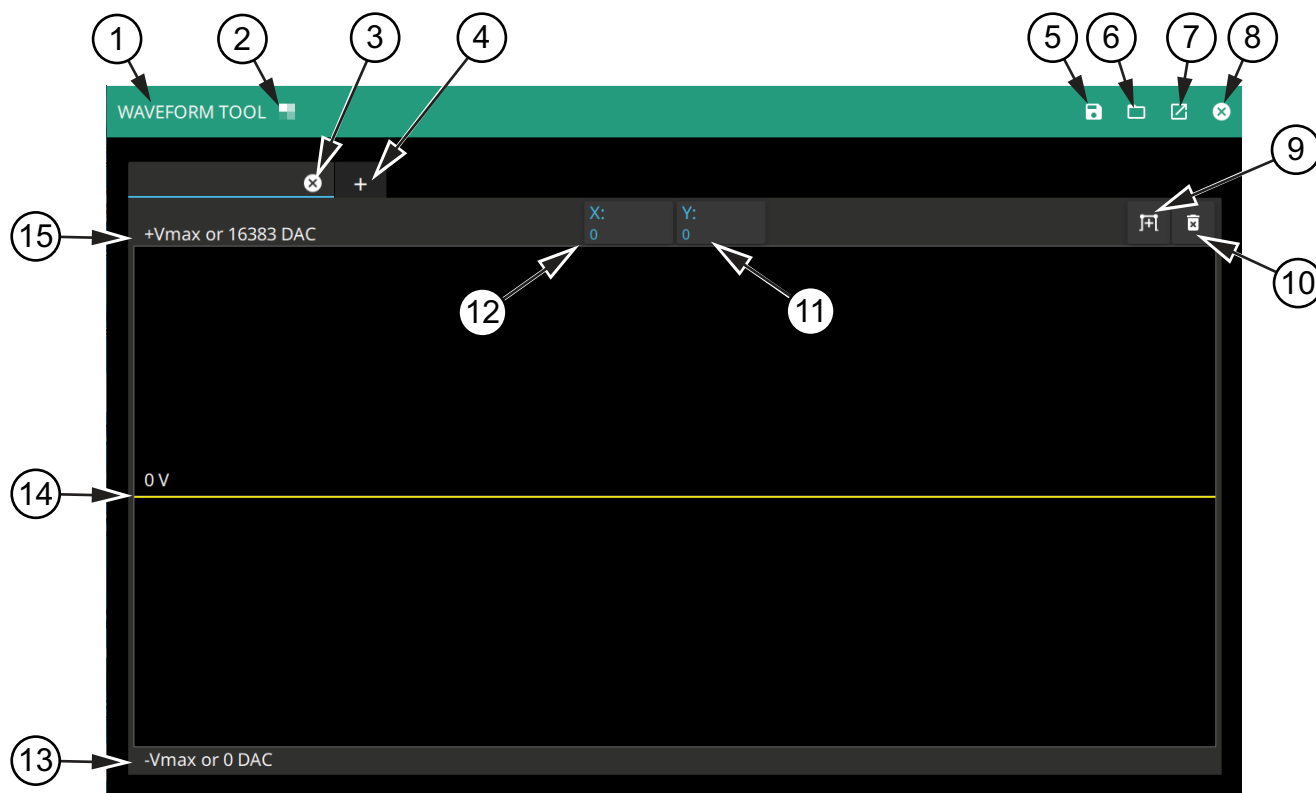


Figure E-1. Open Waveform Generator

E-3 Waveform Tool

Press the WAVEFORM GENERATOR button displays the WAVEFORM TOOL screen shown in [Figure E-2](#).



1. WAVEFORM TOOL - Title of waveform generator screen
2. Window Theme - Press to choose the color theme as either default or light.
3. Press to remove the current tab.
4. Press to add additional tabs.
5. Press to open the SAVE WAVEFORM dialog. The file will be saved as a .wav file.
6. Press to open the OPEN WAVEFORM folder that has been designated to save .wav files.
7. Press to Open Externally. This will detach the screen from the MG362x1A GUI so the user interface is available. See [“Open Externally” on page E-9](#).
8. Press to close the WAVEFORM TOOL window
9. Press to open the ADD DISCRETE VALUE. See [“Press NEW to open a new tab and retain the current graph in the current tab.” on page E-10](#).
10. Press to clear the waveform in the current tab or open a new tab. See [“Clear Graph” on page E-10](#).
11. Displays the Y value. Press to show the numerical keypad to change the value as shown in [“Manually Change X and Y values” on page E-8](#).
12. Displays the X value. Press to show the numerical keypad to change the value as shown in [“Manually Change X and Y values” on page E-8](#).
13. Shows the minimum $-V_{max}$ or 0 DAC value.
14. 0 V line
15. Shows the maximum $+V_{max}$ or 16383 DAC value.

Figure E-2. WAVEFORM TOOL

E-4 Drawing or Editing a Waveform

The Complex Modulation Waveform Editor program provides two methods of drawing or editing a waveform—the drag method and the discrete value method.

Place Coordinate

Click a point on the 0V line to obtain two coordinates as shown in [Figure E-3](#). The values shown in the X and Y tabs are X:0, Y:0. Click the X to the right of the highlighted point removes both points.

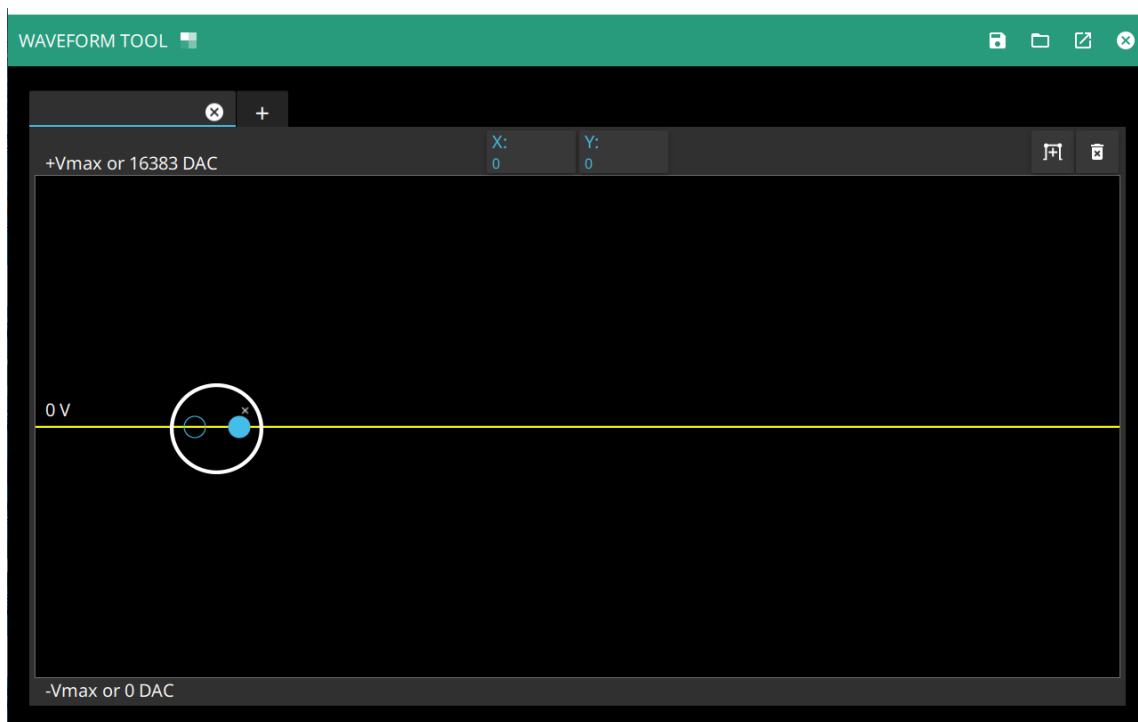


Figure E-3. Click 0V Line

The Drag Method

Click the highlighted coordinate and move it to a desired location in the window as shown in [Figure E-4](#). The X and Y tabs values track the coordinate location on the plot.

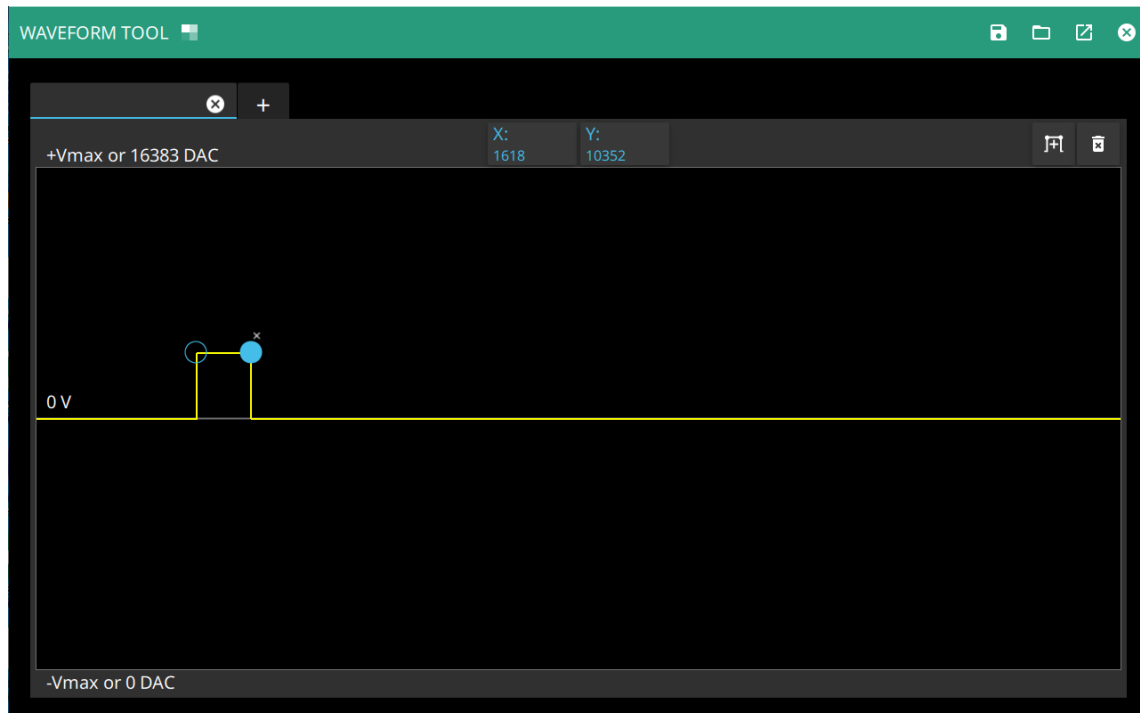


Figure E-4. Manually Move Coordinate

Drag the highlighted coordinate to expand the waveform as shown in [Figure E-5](#). Continue to press the highlighted coordinate shows the X,Y coordinate values in parenthesis. The same values are tracked at the X and Y tabs.

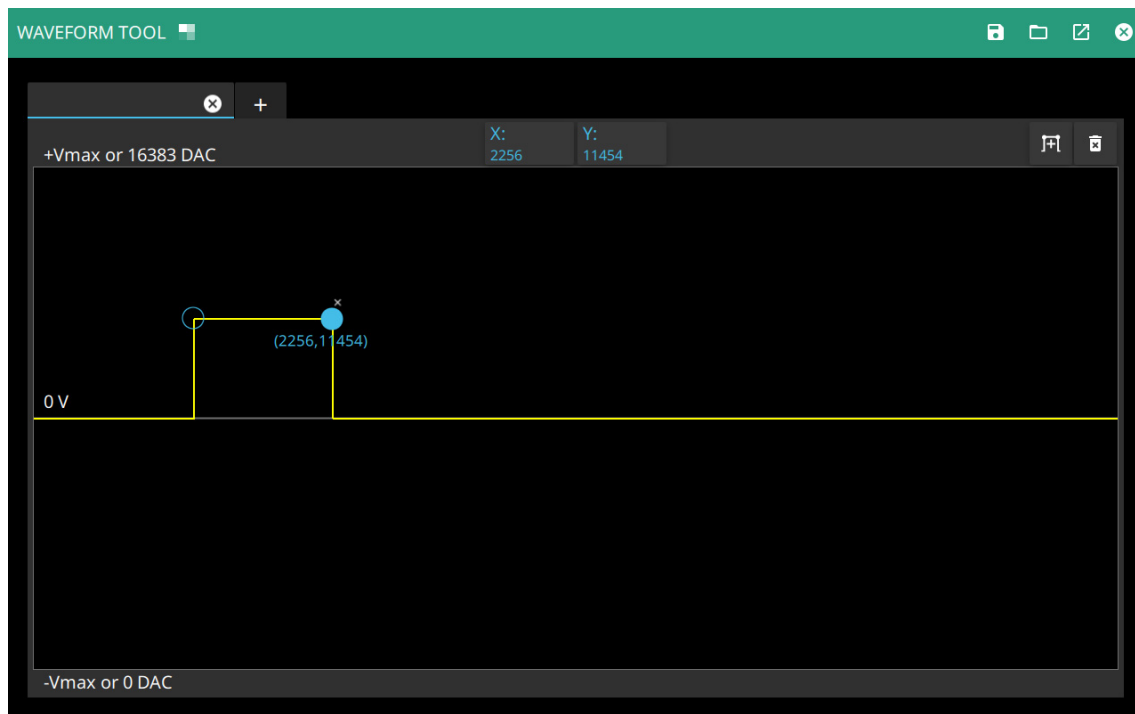
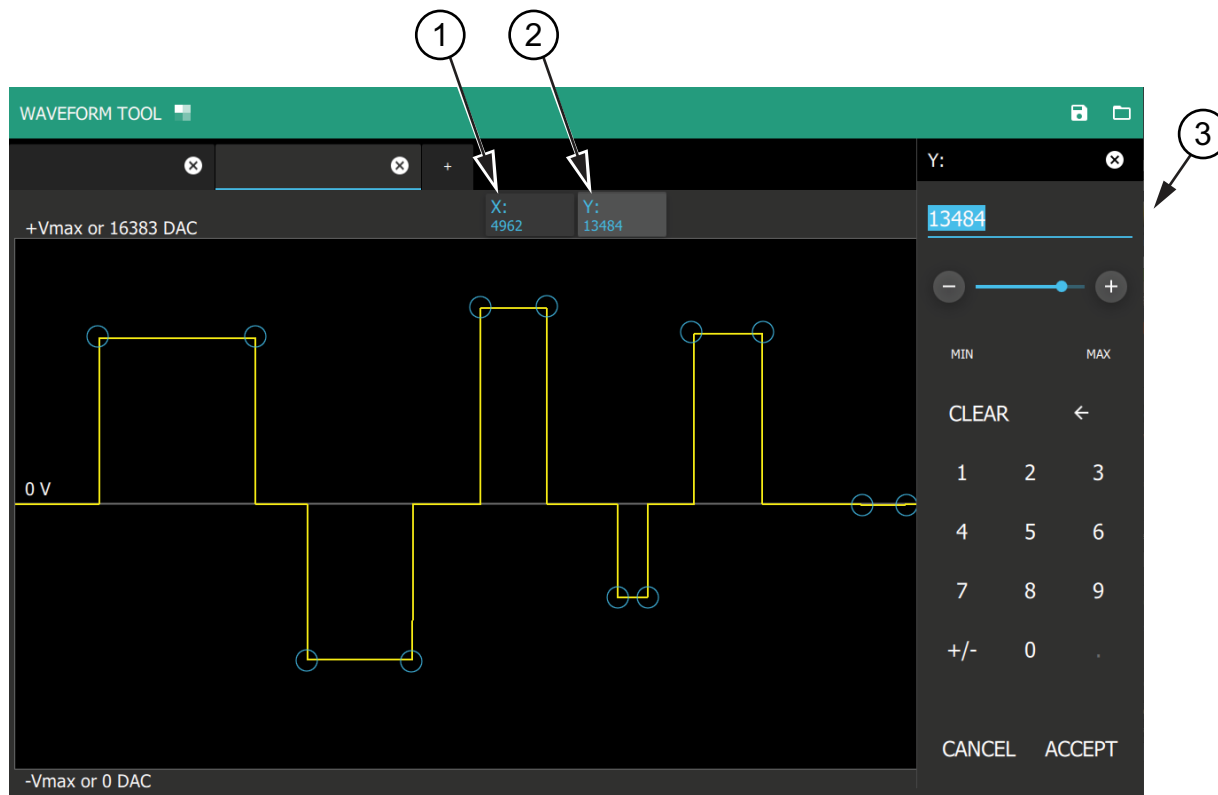


Figure E-5. Expand Waveform

Continue to add waveform coordinates by clicking at the 0V line and expanding the values either positively or negatively.

Use the X and Y tabs to enter values. The waveform coordinates can be entered using the numerical keypad as shown in [Figure E-9](#). Here the Y tab is pressed and the numerical value entered will be the Y coordinate for the waveform location.



1. X Value Tab
2. Y Value Tab
3. Numerical Keypad.

Figure E-6. Change X and Y Value

Add Points

Add points on the graph as shown in [Figure E-7](#).

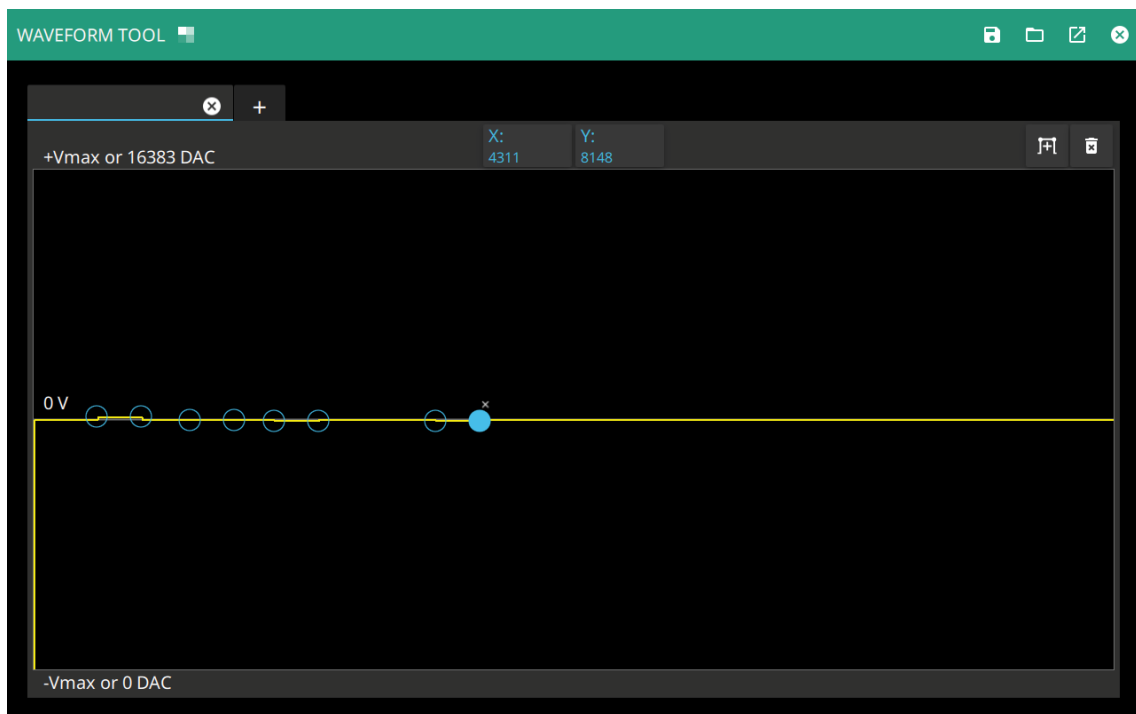


Figure E-7. Add Points

A drag point can only be moved as far left or right as the drag points next to it. The drag points at the two ends of the waveform can not be moved left or right, only up and down as shown in [Figure E-8](#).

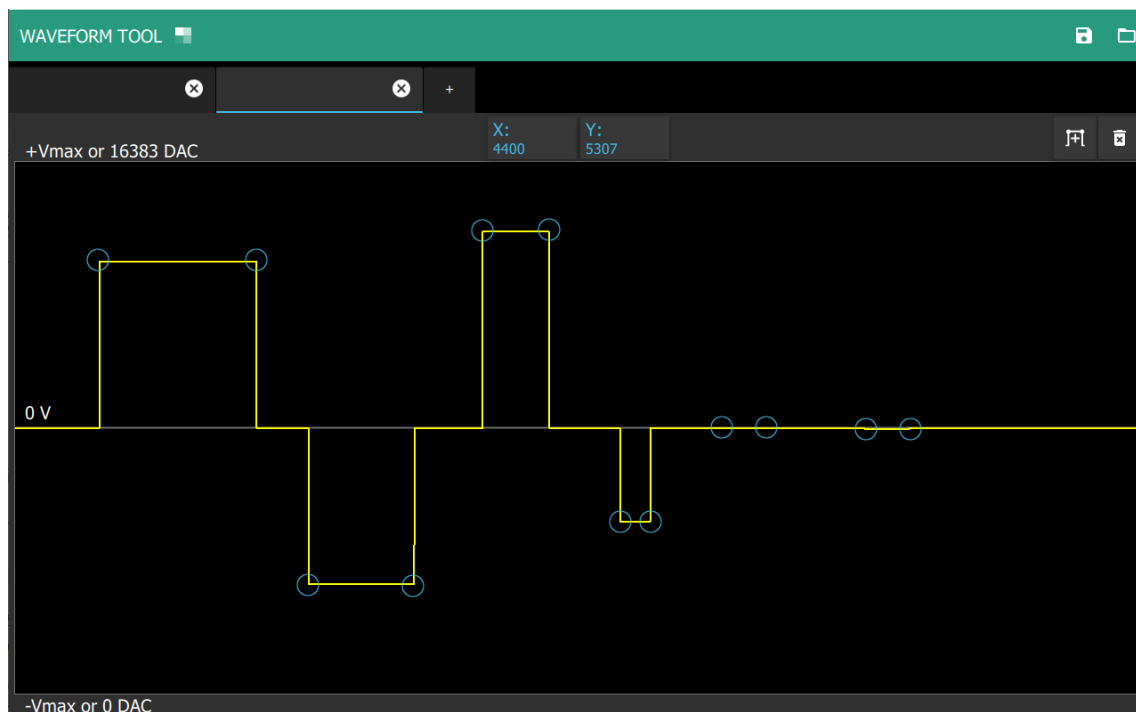


Figure E-8. Drag and Move Points

Manually Change X and Y values

Change the X and Y values by pressing the X or Y value tab shown in [Figure E-6](#).

- 1. Press the X or Y coordinate to display the numerical keypad.
- 2. Use the slider to change the value or type a new value.
- 3. Press ACCEPT

The changed coordinate value will show as a change in the value in the waveform display.

E-5 Add Discrete Value Method

The discrete value method shown in [Figure E-9](#) allows a specific value to be set to a range of waveform entries. Once the data is entered, the value is reflected in the waveform drawing. The value entered into the VALUE (0-16383) range sets the Y value. The Value entered into the left tab of the RANGE (0-8191) range is the first X value coordinate. The second value entered into the $\leq X \leq 0$ is the second X value of the waveform.

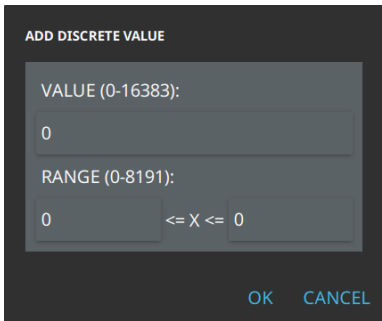
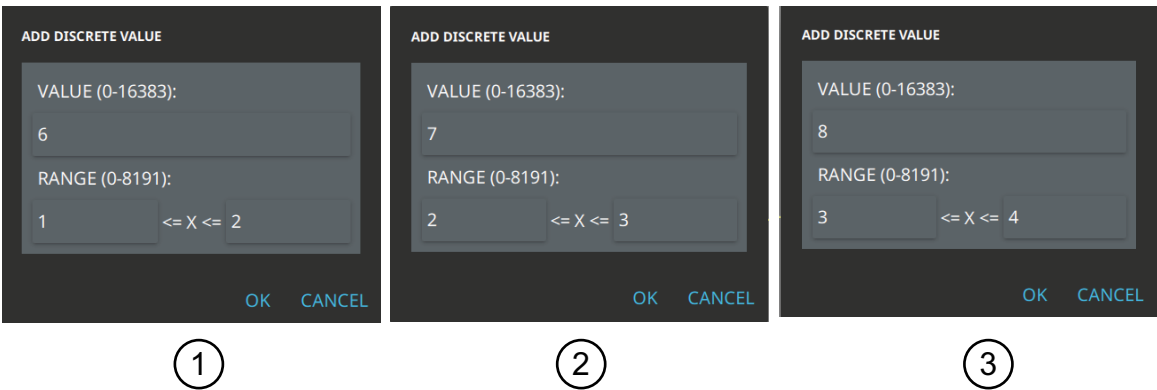


Figure E-9. Add Discrete Value

To smoothen edges or to create a waveform that appears rounded will require many points to be added to the waveform graph. An example of starting to draw a curve waveform is shown in [Figure E-10](#). Continueingon in the pattern shown will provide a linear line upwards. Add variation by decreasing the values in the ADD DISCRETE VALUE dialog.



- 1. Starting Point: Y Value = 6, $\leq X = 1$, $\leq 1 = 2$
- 2. 2nd Point: Y Value = 7, $\leq X = 2$, $\leq X = 3$
- 3. 3rd Point: Y Value = 8, $\leq X = 3$, $\leq 1 = 4$

Figure E-10. Use Discrete Method to Draw Curve

Open Externally

Press the OPEN EXTERNALLY button provides the user a tool to detach the Waveform Generator screen and move to another monitor and allow the user to continue to use the Rubidium UI as shown in

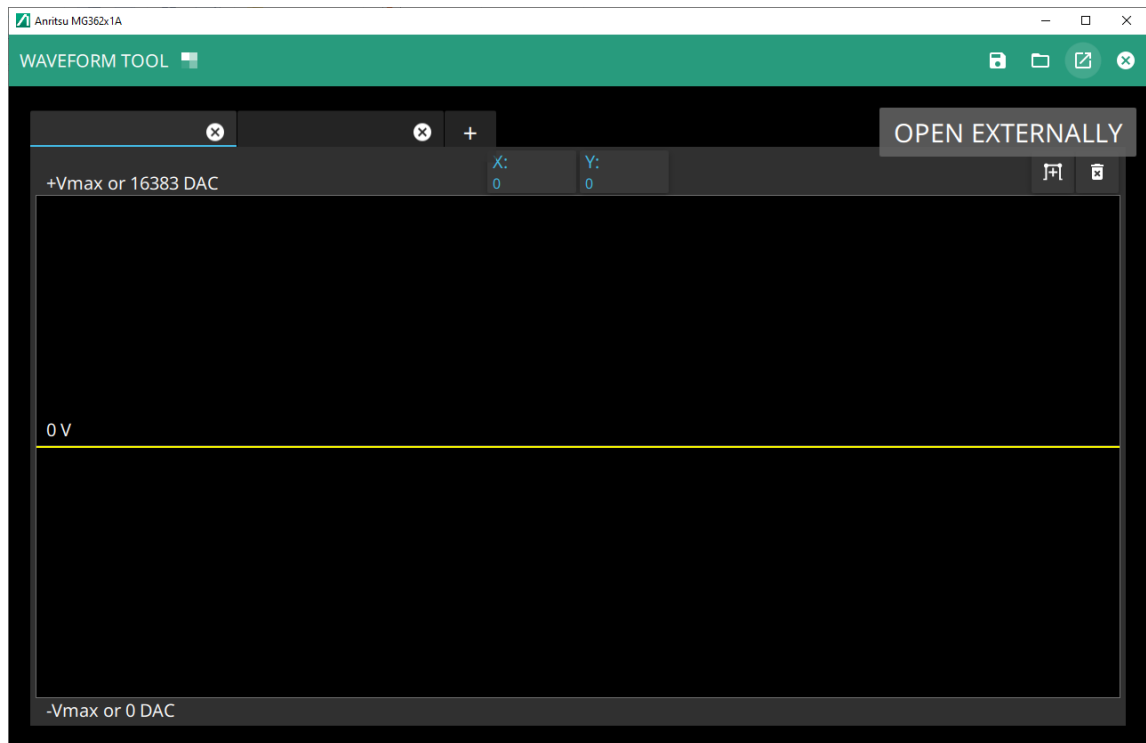


Figure E-11. Open Externally

Detach and move waveform generator screen to allow the MG362x1A GUI to be available as shown in [Figure E-12](#).

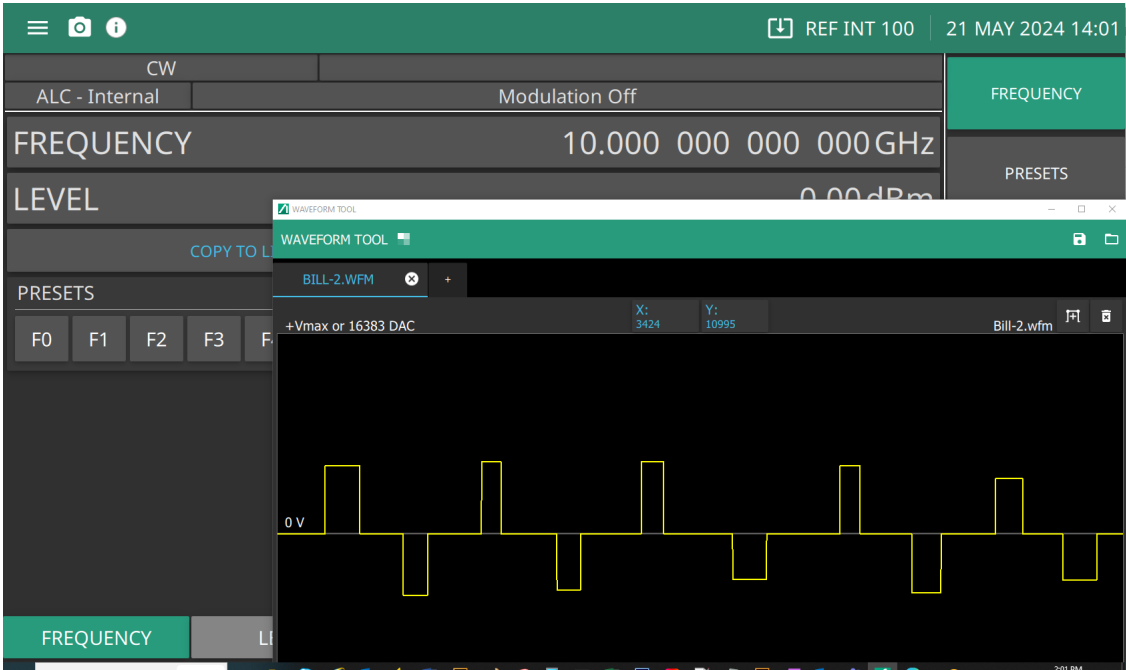


Figure E-12. Open Externally - Detached Screen

Clear Graph

The CLEAR GRAPH dialog is shown in [Figure E-13](#).
Press CANCEL to not make any changes to the waveform generator screen.
Press CURRENT to clear the current screen.
Press NEW to open a new tab and retain the current graph in the current tab.

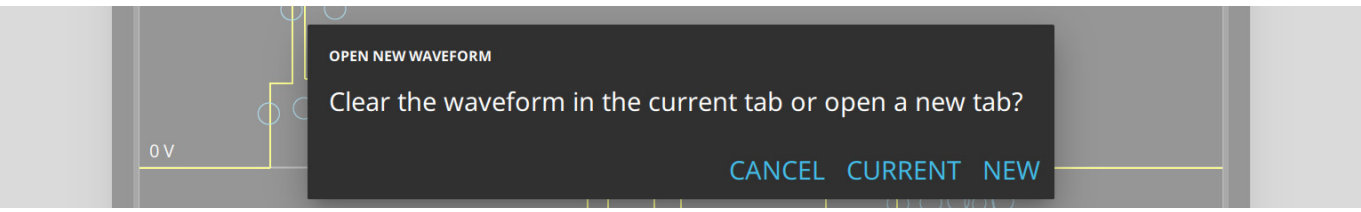


Figure E-13. CLEAR GRAPH Dialog

Appendix F — Rack Mount Assembly (Option 1)

F-1 Introduction

The rack mounting kit (Option 1) contains a set of track slides, mounting ears, and front panel handles for mounting the Rubidium MG362x1A into 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.

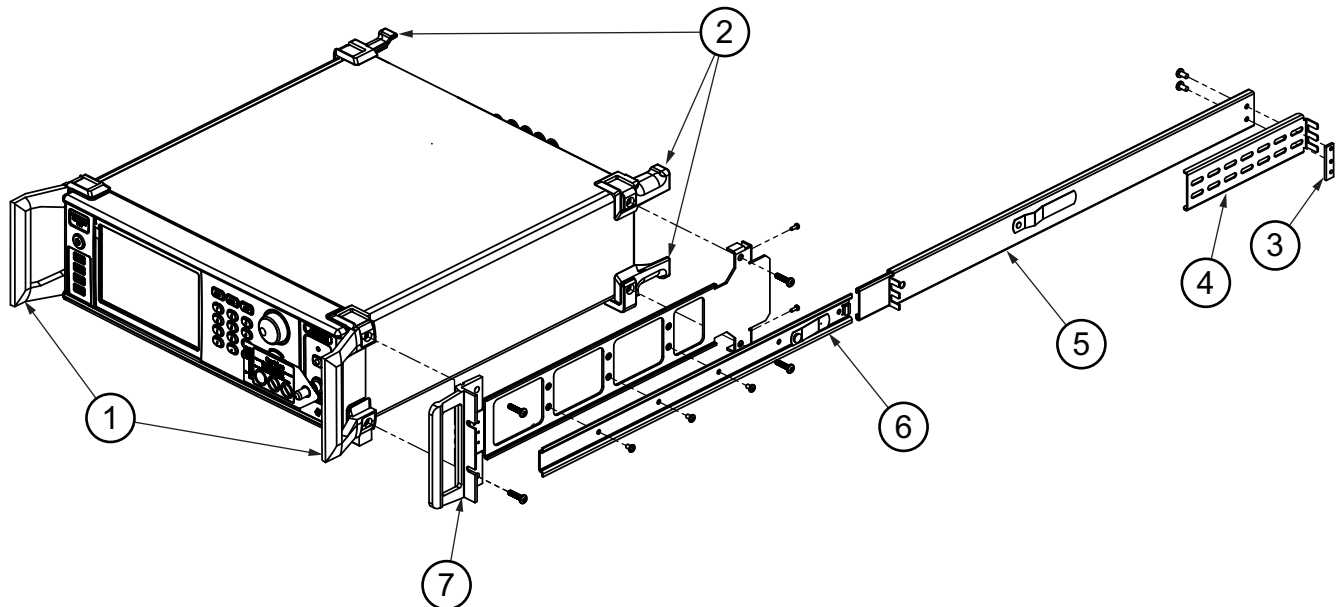
Note

If installing into a rack mount console, the rack mount must be grounded and furnished with a manual power shutoff.

Remove Hardware

Refer to [Figure F-1](#) and 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 (7) 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 (1) from the rear of the instrument. Retain the screws.



- | | |
|----------------------|-------------------------|
| 1. Front Handles (2) | 5. Outer Slide Assembly |
| 2. Rear Feet (4) | 6. Inner Slide Assembly |
| 3. Nut Bar | 7. Rack Mount Bracket |
| 4. Extension Bracket | |

Figure F-1. 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.

Install Hardware

Refer to the rack mount kit. Use this procedure to install the two rack mounts slides to both the left and right sides of the instrument.

1. Install the rack mount brackets (6) to the instrument.
2. Remove the inner slide assemblies (5) from the outer slide assemblies (4).
3. Install the side inner slide assemblies (5) onto the instrument case.
4. Install the extension brackets (3) onto the outer slide assemblies using the screws and nut bars (2).
5. Insert two green-headed screws through the holes in the slide assemblies behind the handle and into the metric tapped holes in the side of the instrument.
6. Insert two green-headed screws through the holes near the rear of the slide assemblies and into the metric tapped holes in the side of the instrument.
7. Insert the two SAE threaded screws (removed from the feet) through the tabs on the rear of the slide assemblies and into the rear panel of the instrument.
8. Using the Phillips screwdriver, tighten all screws holding the left side slide assemblies to the instrument chassis.
9. 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.



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