Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this instrument.

Before applying power to this instrument:

• Read and understand the safety and operational information in this manual.

• Apply all the listed safety precautions.

• Verify that the voltage selector at the line power cord input is set to the correct line voltage. Operating the instrument at an incorrect line voltage will void the warranty.

• Make all connections to the instrument before applying power.

• Do not operate the instrument in ways not specified by this manual or by B&K Precision.

Failure to comply with these precautions or with warnings elsewhere in this manual violates the safety standards of design, manufacture, and intended use of the instrument. B&K Precision assumes no liability for a customer's failure to comply with these requirements.

Category rating

The IEC 61010 standard defines safety category ratings that specify the amount of electrical energy available and the voltage impulses that may occur on electrical conductors associated with these category ratings. The category rating is a Roman numeral of I, II, III, or IV. This rating is also accompanied by a maximum voltage of the circuit to be tested, which defines the voltage impulses expected and required insulation clearances. These categories are:

Category I (CAT I): Measurement instruments whose measurement inputs are not intended to be connected to the mains supply. The voltages in the environment are typically derived from a limited-energy transformer or a battery.

Category II (CAT II): Measurement instruments whose measurement inputs are meant to be connected to the mains supply at a standard wall outlet or similar sources. Example measurement environments are portable tools and household appliances.

Category III (CAT III): Measurement instruments whose measurement inputs are meant to be connected to the mains installation of a building. Examples are measurements inside a building's circuit breaker panel or the wiring of permanently-installed motors.

Category IV (CAT IV): Measurement instruments whose measurement inputs are meant to be connected to the primary power entering a building or other outdoor wiring.

Electrical Power

This instrument is intended to be powered from a CATEGORY II mains power environment. The mains power should be 115 V RMS or 230 V RMS. Use only the power cord supplied with the instrument and ensure it is appropriate for your country of use.

⚠WARNING **Do not use this instrument in an electrical environment with a higher category rating than what is specified in this manual for this instrument.**

⚠WARNING **You must ensure that each accessory you use with this instrument has a category rating equal to or higher than the instrument's category rating to maintain the instrument's category rating. Failure to do so will lower the category rating of the measuring system.**

Ground the Instrument

⚠WARNING **To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical safety ground. This instrument is grounded through the ground conductor of the supplied, three-conductor AC line power cable. The power cable must be plugged into an approved three-conductor electrical outlet. The power jack and mating plug of the power cable meet IEC safety standards.**

⚠WARNING **Do not alter or defeat the ground connection. Without the safety ground connection, all accessible conductive parts (including control knobs) may provide an electric shock. Failure to use a properly-grounded approved outlet and the recommended three-conductor AC line power cable may result in injury or death.**

⚠WARNING **Unless otherwise stated, a ground connection on the instrument's front or rear panel is for a reference of potential only and is not to be used as a safety ground. Do not operate in an explosive or flammable atmosphere.**

Environmental Conditions

This instrument is intended to be used in an indoor pollution degree 2 environment. The operating temperature range is 0°C to 40°C and 20% to 80% relative humidity, with no condensation allowed.

Measurements made by this instrument may be outside specifications if the instrument is used in non-office-type environments. Such environments may include rapid temperature or humidity changes, sunlight, vibration and/or mechanical shocks, acoustic noise, electrical noise, strong electric fields, or strong magnetic fields.

⚠ WARNING	**Do not operate the instrument in the presence of flammable gases or vapors, fumes, or finely-divided particulates.**

⚠ WARNING	**The instrument is designed to be used in office-type indoor environments. Do not operate the instrument** • **In the presence of noxious, corrosive, or flammable fumes, gases, vapors, chemicals, or finely-divided particulates.** • **In relative humidity conditions outside the instrument's specifications.** • **In environments where there is a danger of any liquid being spilled on the instrument or where any liquid can condense on the instrument.** • **In air temperatures exceeding the specified operating temperatures.** • **In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.** • **In environments with restricted cooling air flow, even if the air temperatures are within specifications.** • **In direct sunlight.**

Do not operate instrument if damaged

⚠**WARNING** If the instrument is damaged, appears to be damaged, or if any liquid, chemical, or other material gets on or inside the instrument, remove the instrument's power cord, remove the instrument from service, label it as not to be operated, and return the instrument to B&K Precision for repair. Notify B&K Precision of the nature of any contamination of the instrument.

⚠**WARNING** Hazardous voltages may be present in unexpected locations in circuitry being tested when a fault condition in the circuit exists.

Clean the instrument only as instructed

⚠**WARNING** Do not clean the instrument, its switches, or its terminals with contact cleaners, abrasives, lubricants, solvents, acids/bases, or other such chemicals. Clean the instrument only with a clean dry lint-free cloth or as instructed in this manual. Not for critical applications

Do not touch live circuits

WARNING

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified service-trained maintenance personnel who are aware of the hazards involved when the instrument's covers and shields are removed. Under certain conditions, even with the power cord removed, dangerous voltages may exist when the covers are removed.

To avoid injuries, always disconnect the power cord from the instrument, disconnect all other connections (for example, test leads, computer interface cables, etc.), discharge all circuits, and verify there are no hazardous voltages present on any conductors by measurements with a properly-operating voltage-sensing device before touching any internal parts. Verify the voltage-sensing device is working properly before and after making the measurements by testing with known-operating voltage sources and test for both DC and AC voltages.

Do not attempt any service or adjustment unless another person capable of rendering first aid and resuscitation is present.

General Safety

WARNING

Do not insert any object into an instrument's ventilation openings or other openings.

WARNING

This instrument is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Servicing

⚠ **WARNING**	**Do not substitute parts that are not approved by B&K Precision or modify this instrument. Return the instrument to B&K Precision for service and repair to ensure that safety and performance features are maintained.**
⚠ **WARNING**	**Fuse replacement must be done by qualified service-trained maintenance personnel who are aware of the instrument's fuse requirements and safe replacement procedures. Disconnect the instrument from the power line before replacing fuses. Replace fuses only with new fuses of the fuse types, voltage ratings, and current ratings specified in this manual or on the back of the instrument. Failure to do so may damage the instrument, lead to a safety hazard, or cause a fire. Failure to use the specified fuses will void the warranty.**
⚠ **WARNING**	**Only qualified, service-trained personal who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.**

For continued safe use of the instrument

- Do not place heavy objects on the instrument.

- Do not obstruct cooling air flow to the instrument.

- Do not place a hot soldering iron on the instrument.

- Do not pull the instrument with the power cord, connected probe, or connected test lead.

- Do not move the instrument when a probe is connected to a circuit being tested.

Compliance Statements

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)
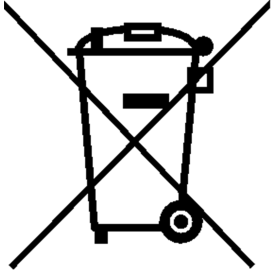
This product is subject to Directive 2002/96/EC of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

Safety Symbols

| Symbol	Description
⚠WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a hazardous situation which, if not avoided, will result in minor or moderate injury.
⚠	Refer to the text near the symbol.
⚡	Electric Shock hazard
∼	Alternating current (AC)
⏚	Chassis ground
⏚	Earth ground
⎓	Indicates the In position of the power switch when instrument is ON.
⎓	Indicates the Out position of the power switch when instrument is OFF.
NOTICE	Indicates practices not related to physical injury.
C E	Indicates the instrument complies with all the relevant European Legal Directives.
⑩	Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Ten years is the expected useful life of the product.

Table 1   Safety Symbols

Contents

Introduction

1.1 Product Overview

4078C   4079C

Figure 1.1   407xC Series

The BK Precision 4078C and 4079C are versatile dual channel arbitrary waveform generator. This generator is capable of generating arbitrary waveforms with 16-bit resolution and length up to 4,000,000 points. Users can create arbitrary waveforms directly from the front panel using the generator's built-in waveform editing functions or load arbitrary waveforms via the instrument's remote interfaces.

In addition to the large waveform memory, the generator offers AM, FM, PM, PWM, BPSK and FSK modulation along with sweep, burst, and flexible triggering capabilities.

The instrument can be remotely operated via the USBTMC, LAN, or GPIB (IEEE-488.2) interface supporting SCPI commands.

1.2 Features

- 16-bit, 250 MSa/s, and up to 4M points arbitrary waveform generator

- Generate Sine and square waveforms up to 50 MHz (4078C: 30 MHz, 4079C: 50 MHz)

- Color 4.3 " LCD display

- AM, FM, PM, PWM, BPSK and FSK modulation functions

- Fully programmable ARB waveforms with internal Wave Editor

- Store/recall up to 49 different instrument setups

- Standard USBTMC and LAN, optional GPIB Interface

- SCPI-compliant command set

1.3 Contents

Please inspect the instrument mechanically and electrically upon receiving it. Unpack all items from the shipping carton, and check for any obvious signs of physical damage that may have occurred during transportation. Report any damage to the shipping agent immediately.

Save the original packing carton for possible future reshipment. Every power supply is shipped with the following contents:

- 1 x Function generator instrument

- 1 x AC Power Cord

- 1 x Certificate of Calibration

- 1 x Test Report

NOTICE   Ensure the presence of all the items listed above.
Contact the distributor or B&K Precision if anything is missing.

1.4 Dimensions

The 407XC seires dimensions are approximately:

213 mm x 88 mm x 300 mm (8.4" x 3.5" x 12") (W x H x D).
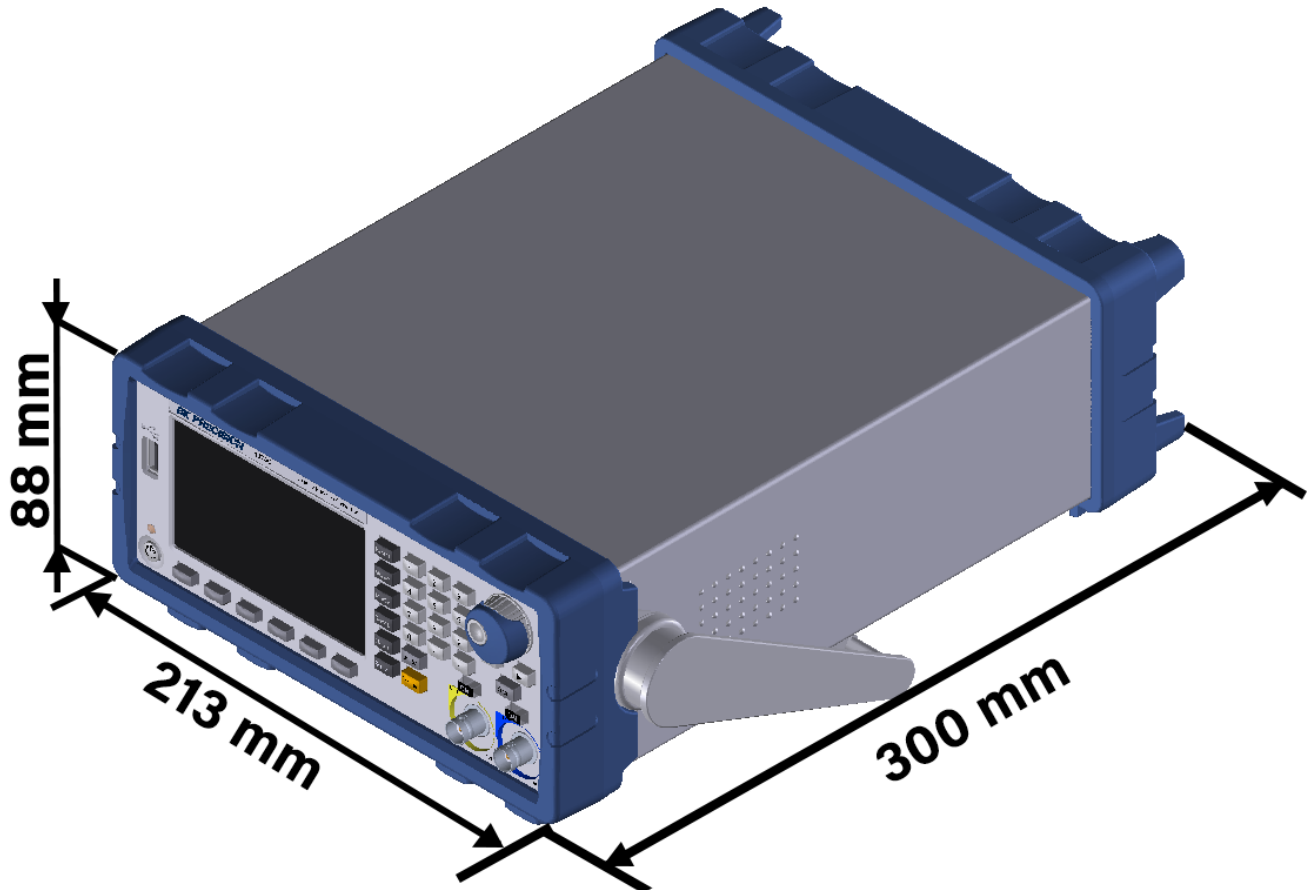
Figure 1.2   Dimensions

1.5 Rackmount Installation

The instrument can be installed in a standard 19-inch using the optional rackmount kit.

NOTICE

Remove the carrying handle before mounting the instrument. To remove the handle, grasp the handle by its sides, pull outwards, and rotate it until the arrow on the handle and the arrow on the plastic ears are in opposite directions. Then pull the handle outward.

1.6 Front Panel
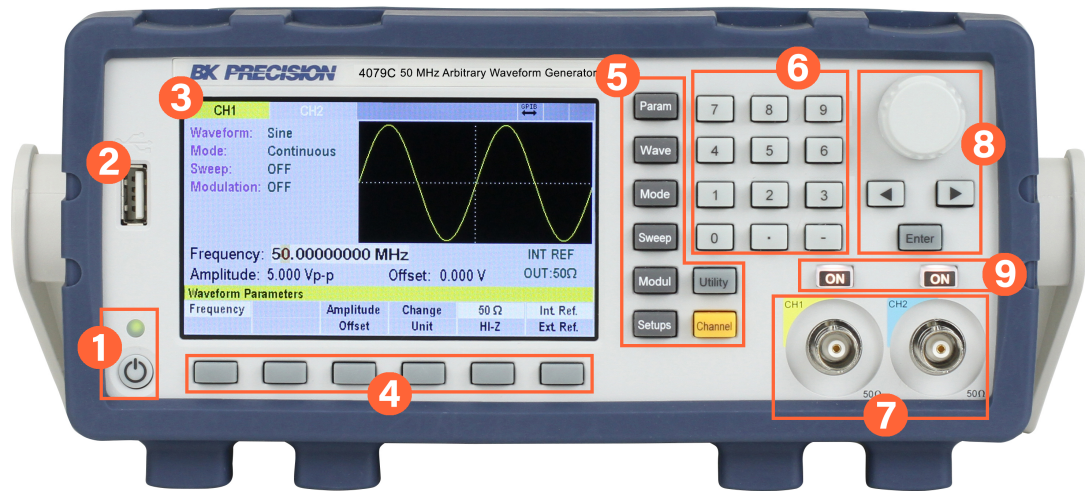
Figure 1.3   Front Panel

Item	Name	Description
1	Power Button and LED	Switch the instrument between normal operation mode and screen-saver mode. The LED indicates power is on. Green indicates normal operation. Amber indicates display is in screen-saver mode.
2	USB Host Port	USB port used to connect flash drives.
3	Display	Visual presentation of the device function and measurements. See **section 3.5** for details.
4	Soft Keys	See **section 3.2** for details.
5	Menu Keys	See **section 3.1** for details.
6	Numeric Keypad	Used to enter precise values.
7	BNC Connectors	Channel 1 and Channel 2 outputs.
8	Navigation Keys	Used to navigate menus or configure parameters.
9	Output Buttons	Enable/Disable the state of the corresponding channel.

Table 1.1   Front Panel

1.7 Rear Panel
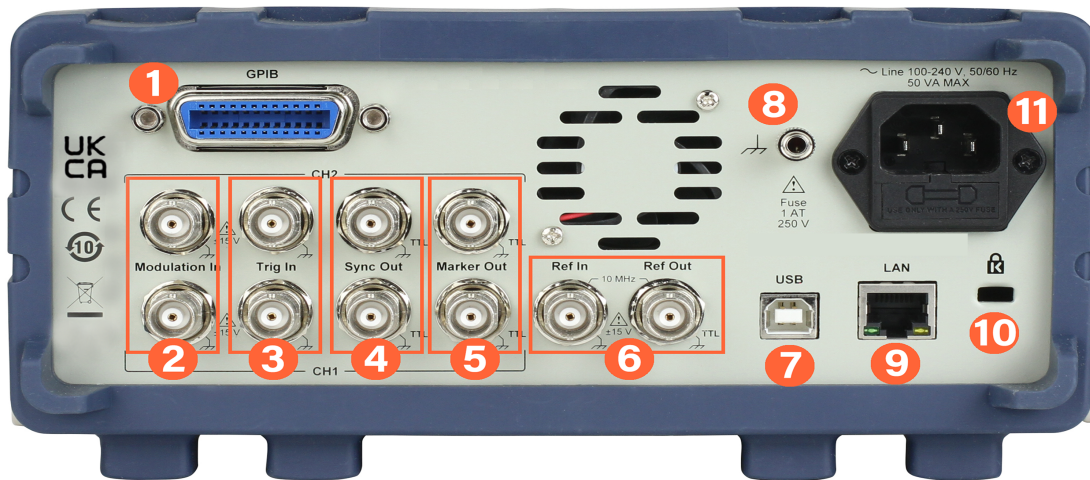
Figure 1.4   Rear Panel

Item	Name	Description
1	GPIB Interface	GPIB interface connector. (Optional)
2	Modulation In	Input of an external signal to be used as modulating signal. (2.5 Vpp for 100% modulation 1 kΩ input impedance DC to 50 kHz bandwidth)
3	Trigger In	Input of an external signal to be used as the triggering signal. (TTL Compatible, Maximum rate: 20 MHz, Minimum width: 20 ns Input
4	Sync Out	TTL pulse at programmed frequency, 50 Ω impedance
5	Marker Out	Positive TTL pulse, user programmable in arbitrary waveform, 50 Ω impedance
6	REF In/Out	10 MHz clock for synchronization, TTL, 50 Ω impedance (In: > 1 kΩ impedance, > 1 Vpp)
7	USB interface	Connect a USB type B to type A to remotely control the unit. (USBTMC and USBVCP connector)
8	Chassis ground	Provides a zero potential voltage reference and a dissipation point for interference, transient voltages and static.
9	LAN interface	LAN interface connector Left LED indicates activity. Right LED indicates link integrity.
9	Kensington security slot	Lock the instrument to a fixed location using the security lock via thelock hole. Lock is not included.
11	AC power input & fuse box	Houses the IEC 320 connector and the fuse.

Getting Started

2.1 Preliminary Information

Before getting started, please inspect the instrument mechanically and electrically upon receiving it. Unpack all items from the shipping carton, and check for any obvious signs of physical damage that may have occurred during transportation. Report any damage to the shipping agent immediately.

Save the original packing carton for possible future reshipment. Every power supply is shipped with the following contents:

Review Safety Information

This power system is a Safety Class 1 instrument, which means it has a protective earth terminal. That terminal must be connected to earth ground through a power source equipped with a ground receptacle.

Refer to the **Safety Summary** page at the beginning of this guide for general safety information. Before installation or operation, check the power system and review this guide for safety warnings and instructions. Safety warnings for specific procedures are located at appropriate places throughout this manual.

Observe Environmental Conditions

The environmental conditions of the power system are documented under Environmental Characteristics. The unit should only be operated indoors in a controlled environment.

The dimensions of your instrument as well as an outline diagram are also documented under Specifications. A fan cools the power system by drawing air through the sides and exhausting it out the side and back. The instrument must be installed in a location that allows sufficient space at the sides and back of the unit for adequate air circulation

⚠ **WARNING** **Do not operate the instrument in the presence of flammable gases or fumes.**

Verify AC Input Voltage

Verify and check to make sure proper AC voltages are available to power the instrument. The AC voltage range must meet the acceptable specification as explained in **section 2.2**.

Self Adjust

At power-on, the waveform generator performs a diagnostic self-test procedure to check itself for errors. If it finds an error, an error code and text will appear in the display window. Other error codes appear when you enter an invalid front-panel setting. For more information on error codes, see the Self Test Error Table. When the waveform generator finishes the diagnostic self-test routine, it enters the local state (LOCS) and assumes power-on default settings.

2.2 Input Power and Fuse Requirements

The AC input on the back of your unit is a universal AC input. It accepts nominal line voltages in the range of 100 VAC to 240 VAC. The frequency can be 50/60 Hz. The maximum rated input power is 50 VA.

⚠ **WARNING**

FIRE HAZARD Use only the power cord that was supplied with your instrument. Using other types of power cords may cause overheating of the power cord, resulting in fire.

SHOCK HAZARD The power cord provides a chassis ground through a third conductor. Be certain that your power outlet is of the three-conductor type with the correct pin connected to earth ground.

Before connecting the power cord to the IEC 320 connector on the rear panel of the uint, be sure that the power switch is in the OFF position and verify that the AC power cord, including the extension line, is compatible with the rated voltage/current and that there is sufficient circuit capacity for the waveform generator. Once verified, connect the cable firmly.

2.3 Fuse Replacement

The fuse is accessible through the rear panel beneath the IEC 320 connector. A 1 A at 250V, UL/CSA approved slow blow fused is required.

Table 2.1 shows the fuse requirements.

Model	Fuse Specification
4078C -4079C	1 A at 250V

Table 2.1   Fuse Specification

⚠️**WARNING**   **No power should be applied to the instrument while replacing the fuse. Disconnect all cables connected to the instrument before proceeding.**

Fuse Replacement Procedure

Step 1. Locate the fuse box in the rear panel beneath the IEC 320 connector. (See **figure 1.4**)

Step 2. Insert a small flathead screwdriver into the fuse box slit to slide out the fuse box as illustrated in **figure 2.1**.

Step 3. Check the fuse to determine if it must be replaced.
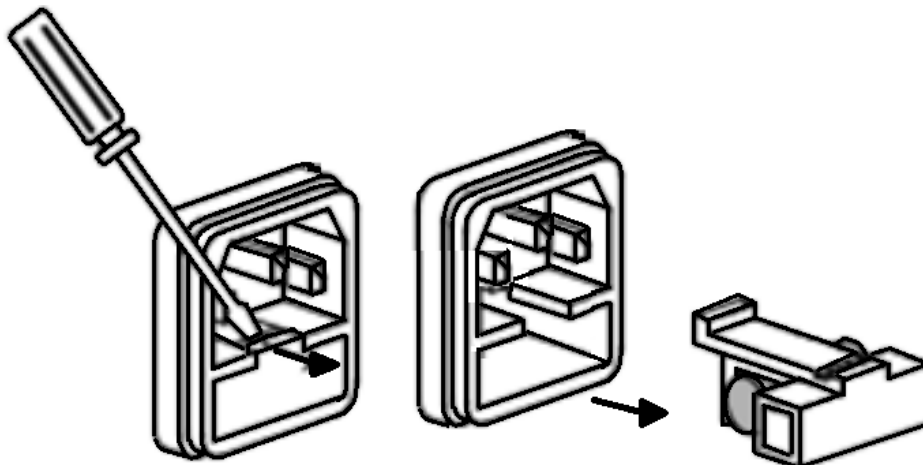
Figure 2.1   Fuse Removal

2.4 Output Connections

The waveform generator output circuits are protected against short circuit or nominal accidental voltages applied to the main output connector. The output circuits operate as a 50 Ω voltage source working into a 50 Ω load. At higher frequencies, a non-terminated or improperly terminated output may cause aberrations on the output waveform. In addition, loads with an impedance less than 50 Ω will reduce the waveform amplitude, while loads with an impedance greater than 50 Ω will increase waveform amplitude.

Excessive distortion or aberrations caused by improper termination are less noticeable at lower frequencies, especially with sine and triangle waveforms. To ensure waveform integrity, follow these precautions:

– Use good quality 50 Ω coaxial cable and connectors.

– Make all connections tight and as short as possible.

– Use good quality attenuators, if it is necessary to reduce waveform amplitudes applied to sensitive circuits.

– Use termination or impedance-matching devices to avoid reflections.

– Ensure that attenuators and terminations have adequate power handling capabilities.

If there is a DC voltage across the output load, use a coupling capacitor in series with the load. The time constant of the coupling capacitor and load must be long enough to maintain pulse flatness.

2.4.1 Impedance Matching

If the waveform generator is driving a high impedance, such as a 1 MΩ input impedance (paralleled by a stated capacitance) of an oscilloscope vertical input, connect the transmission line to a 50 Ω attenuator, a 50 Ω termination and to the oscilloscope input. The attenuator isolates the input capacitance of the device and terminates the waveform generator properly.

2.5 Self Test Errors

One or multiple of the errors listed in **table 2.1** will be displayed if the self-test did not complete successfully.If any of these errors occur, please contact B&K Precision.

Error Message on Display	Description
Out of Range	Attempt to set variable out of instrument limits.
Setting Conflict	Can't have this parameter set with some other.
Trig Rate Short	Internal trigger rate too short for wave/burst.
Empty Location	Attempt to restore nonexistent setting.
SCALE too high	Attempt to set scale too high for current dot value
Protected Ram	Attempt to write to protected ARB memory range.
Ram Error	Error in testing RAM.
Must divide by 4	Predefined wave length must be divisible by 4.
Must divide by 2	Predefined wave length must be divisible by 2.

Table 2.2   Self Test Errors

2.6 Output Check

Follow the steps below to do a quick check of the settings and waveform output.

1. Turn on the instrument and set the instrument to default settings. To set to default, press **Setups**, press **Recall** and select **0**, then **Enter**. The instrument will set both channels with the following parameters:

    Waveform Shape: **Sine**
    Frequency: **1.000000000 kHz**
    Amplitude: **5 .000 Vpp**
    Offset: **0.000 Vdc**
    Phase: **0.0 °**
    Output Impedance: **50 Ω**

2. Connect the BNC output of CH1 into an oscilloscope.

3. Press the **ON** button on top of CH1 output BNC to turn on the output and observe a sine wave with the parameters above.

4. Press the **Frequency** button in the menu and use the rotary knob or the numeric keypad to change frequency. Observe the changes on the oscilloscope display.

5. Press the **Amplitude** button in the menu and use the rotary knob or the numeric keypad to change the amplitude. Observe the changes on the oscilloscope display.

6. Press the **Offset** option in the menu and use the rotary knob or the numeric keypad to change the DC offset. With the oscilloscope set for DC coupling, observe the changes on the display.

7. Now, connect the BNC output of CH2 into an oscilloscope and follow steps 3 to 6 to check its output.

Operation Instructions

3.1 Menu Keys

The menu keys select the main menus for displaying or changing a parameter, function or mode. For more information about each menu or mode click on the corresponding button above.

- PARAM
- MODE
- MODUL

- WAVE
- SWEEP
- SETUPS
- Utility

3.2 Soft Keys

The unit has six soft keys, which are located beneath the screen.
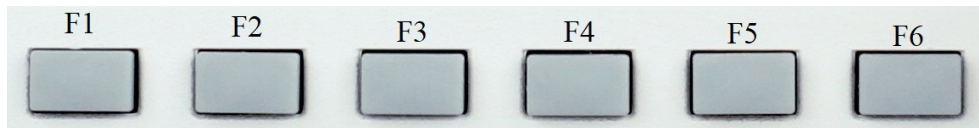
Figure 3.1   Soft Keys

Each key selects the corresponding function. Functions will vary depending on the current menu or display. Certain warning displays and menus will require the sofkeys to proceed. These displays will state to press a **F** key as shown in figure **3.2**. The F keys are the softkeys starting at **(F1)**, the key furthest left, and ending at **(F6)**, the key furthest to the right.
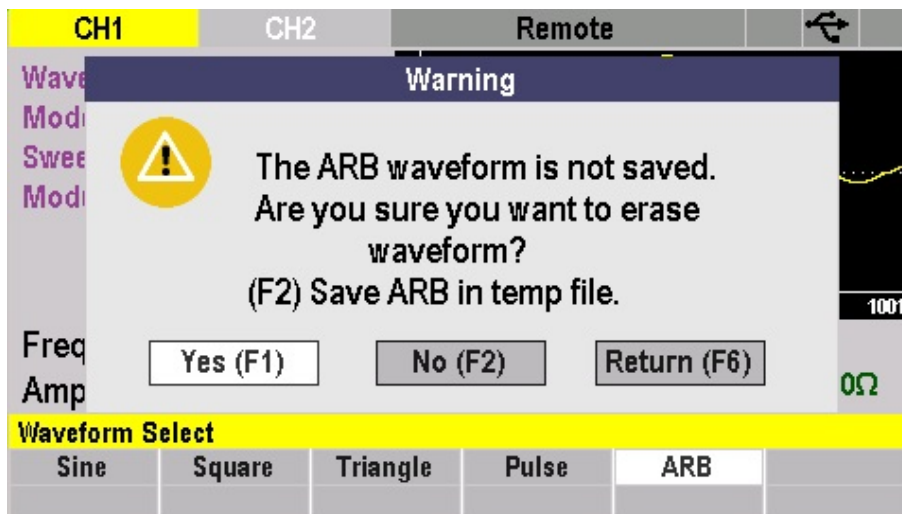
Figure 3.2   Warning

3.3 Numeric Keys

The numeric keys allow the configuration of various parameters. Using the numeric keys provides a fast and precise input.

Figure 3.3   Numeric Keys

If the numeric keypad is used to enter a value the unit of the value can be chosen by selecting the softkey corresponding to the desired unit.

3.4 Output Control

The ON buttons toggles the outputs **On/Off** of the corresponding channel. When output is enabled, the ON button will light up with a white LED.
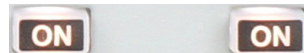
Figure 3.4   Output Keys

Both outputs can be enabled at the same time, but only the parameters of the chosen channel can be viewed and configured at a time.

– To toggle between channels press the CHANNEL button.

– The **Channel** seleceted can be viewed in the top left section of the display.

3.5 Display

The display contains five components.
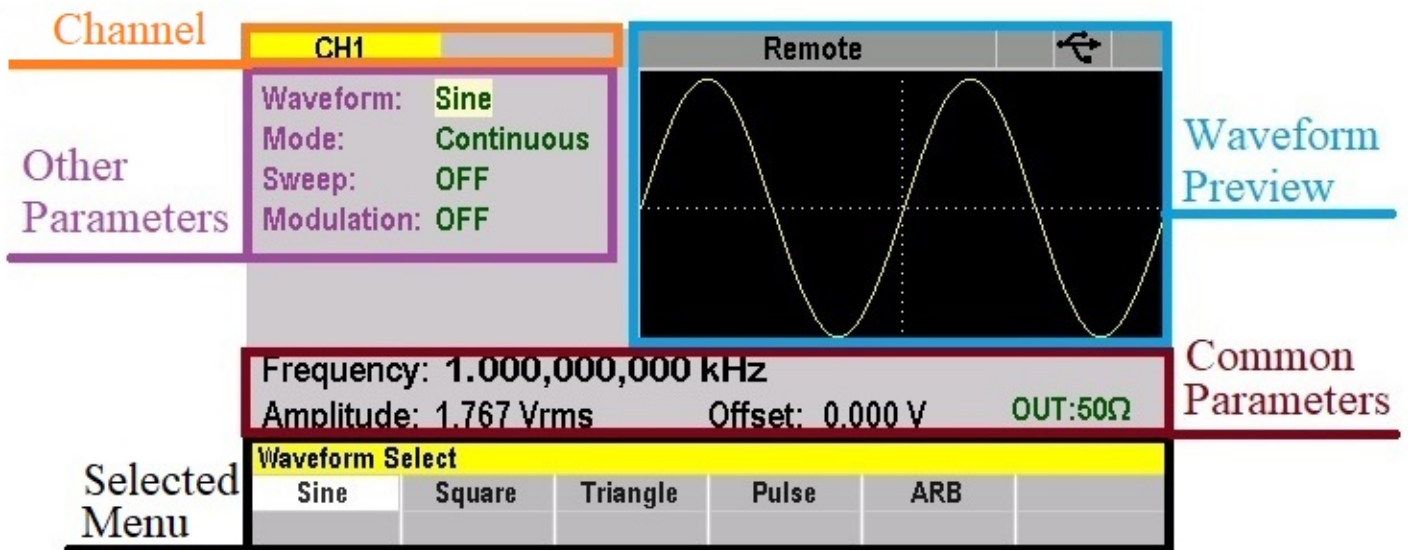
Figure 3.5 Display

Chanel

The **Channel** can be seen in the top left portion of the screen. When **CH1** is selected the CH1 section will be displayed and highlighted in yellow. See figure **3.5**.

When in **CH2** is selected the CH2 section will be highlighted in skyblue. See figure **3.6**.
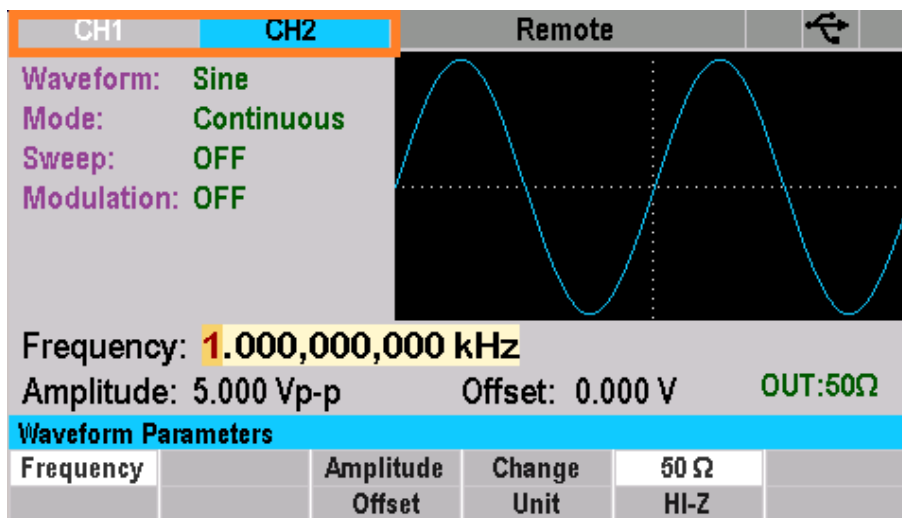
Figure 3.6 CH2 Display

Other Parameters

The **Other Parameters** section displays the parameters available in the current set settings. This does not include the **Common Parameters** of the waveforms.
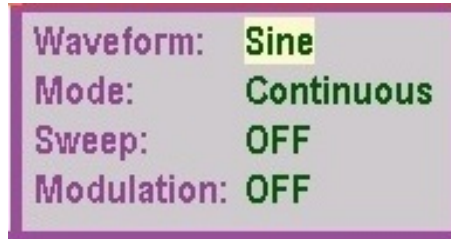
Figure 3.7   Other Parameters

In figure **3.7** the current chosen settings are a sine wave. Despite currently being in the **Waveform Menu**, **Other Parameters** demonstrates that Mode, Sweep, and Modulation are applicable and can be configure with the sine wave.

Waveform Preview

Waveform Preview provides a view of the waveform based on the set parameters.
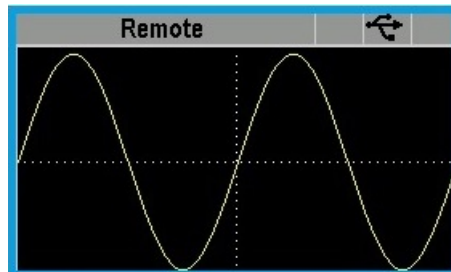
Figure 3.8   Waveform Preview

Common Parameters

Displays the parameters that are shared by all the waveforms. To edit these parameters press the PARAM key and use the Selected Menu section to select the parameter to be edited.
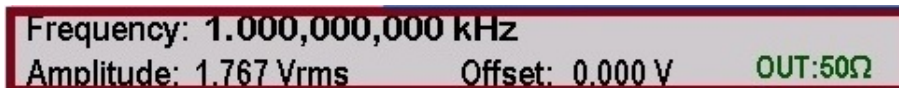
Figure 3.9   Common Parameters

Selected Menu

Selected Menu Displays the available settings in the selected menu. This option will vary based on the menu. To select a setting use the corresponding softkey.

Figure 3.10 Selected Menu

PARAM Key

The **PARAM** key opens the **Waveform Parameters Menu**.

Select the parameter to be set. Depending on the chosen waveform the available parameters may change. The common parameters such as: frequency, amplitude, offset and internal impedance will always be available regardless of the waveform chosen.

To view the parameters available for each waveform view the chapter of desired waveform. View the available waveforms in the **Wave Key** section.
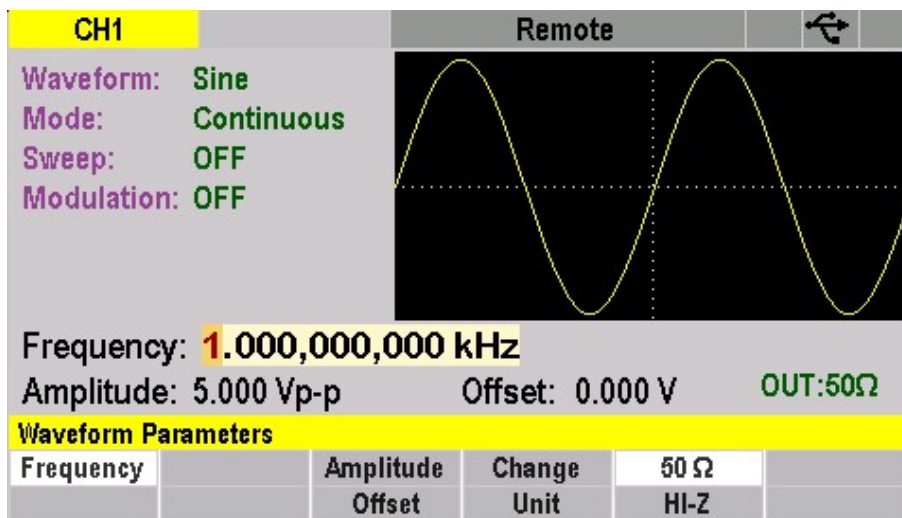
Figure 4.1   Frequency

WAVE Key

Press the **WAVE** button to enter the **Waveform Select Menu**.

Press the corresponding softkey to select one of the available waveforms.

- **Sine**

- **Square**

- **Triangle**

- **Pulse**

- **ARB**
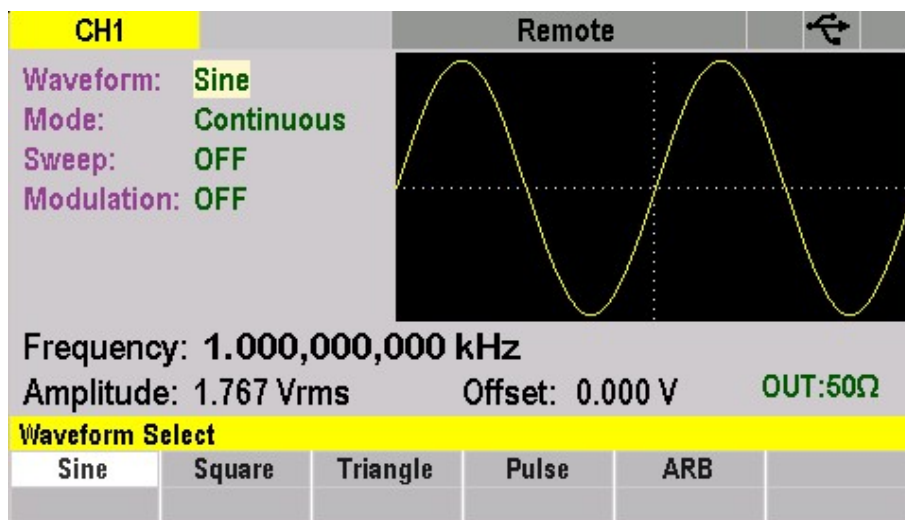
For more information on each waveform click on the corresponding waveform listed above.

Sine Wave

Press the WAVE button then use the softkey **F1** to select **Sine**. The screen shown in figure **6.1** will be displayed. The parameters available for sine waveforms include frequency, period, amplitude, high level, low level, offset, and phase.
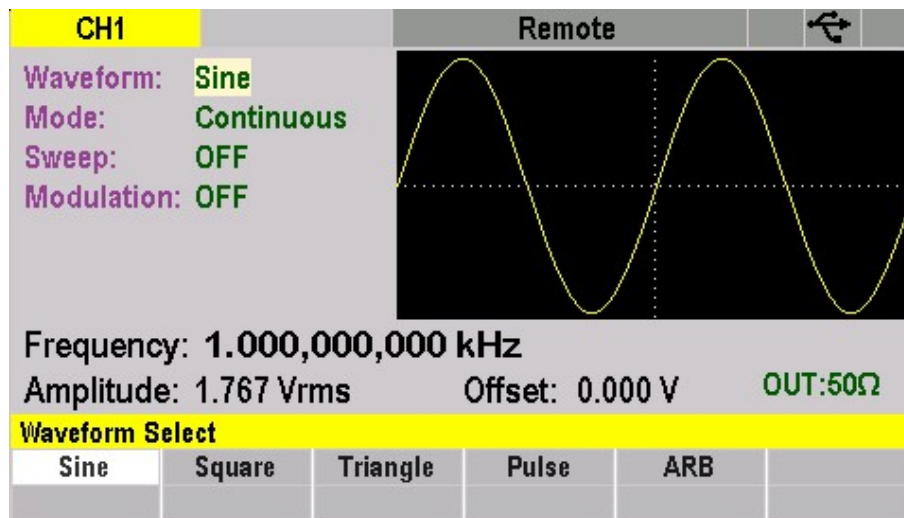
Figure 6.1   Sine

Parameter	Description
Frequency	Set the signal frequency.
Amplitude	Set the signal amplitude.
Offset	Set the signal offset.
Change Unit	Change the unit of the amplitude.
50 Ω/ HI-Z	Change the impedance.
Int. Ref./Ext. Ref.	Change the reference of the unit.

Table 6.1   Sine Wave Parameters

6.1 Frequency

Frequency is one of the most important parameters of basic waveforms. For different instrument models and waveforms, the available ranges of frequency are different. The 4078C has a range of 1 μ(Hz) to 30 MHZ, while the 4079C has a range of 1 μ(Hz) to 50 MHZ.

To select the **Sine Waveform**: Press the WAVE button then use the softkey **F1** to select **Sine**.

To configure the frequency of the waveform:

- Press the PARAM button then use the softkey to select **Frequency**.

    – The frequency shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Input the desired frequency.

- Use the numeric keypad to input the parameter value directly, and press the corresponding softkey to select the parameter's unit.

    – **MHz**   – **KHz**   – **Hz**   – **mHz**

- Or use the arrow keys to select the digit to be edit, and then use the knob to change its value.

Note:

When using the numeric Keypad to enter the value, the navigating
arrow keys cannot be used to move across already inputted values.

6.2 Amplitude

To set the amplitude:

Press the PARAM button then use the softkey to select **Amplitude**.

- – The amplitude shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Press the **Amplitude** softkey again to switch into the **Amplitude** parameter if **Offset** was the chosen parameter
  (the current operation is highlighted in a white color).

- Input the desired amplitude.

  - – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    - **Vp-p**   – **mVp-p**   – **Vrms**   – **mVrms**   – **dBm**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

6.3 Offset

The default value is 0 Vdc.

To set the offset:

Press the **PARAM** button then use the softkey to select **Offset**.

- – The offset shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Press the **Offset** softkey again to switch into the **Offset** parameter if **Amplitude** was the chosen parameter
  (the current operation is highlighted in a white color).

- • Input the desired amplitude.

  - – Use the numeric Keypad to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

    – **V**   – **mV**

- • Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

6.4 Change Unit

Press the corresponding softkey, **F4**, to toggle between the units of the **Amplitude**:

    – **Vp-p**   – **dBm**   – **mVrms**

6.5 50 Ω/ HI-Z

Selects the amplitude voltage value based on the two different impedance termination (i.e. if connected to oscilloscope with 1MΩ input impedance, generator will display the correct amplitude value for 1MΩ termination when HI-Z is selected 50 ohm path to match impedance and avoid reflections and other mismatch effects).

To set the internal impedance:

Press the PARAM button then use the softkey to select **50 Ω/ HI-Z**.

*   Toggle the **50 Ω/ HI-Z** softkey to switch between 50Ω and HI-Z. (The current operation is highlighted in a white color).

6.6 Int. Ref./Ext. Ref.

Selects internal or external reference source (the external reference must be connected to the rear panel Ref In connector).

Press the PARAM button then use the softkey to select Int. Ref./Ext. Ref..

–   Toggle the Int. Ref./Ext. Ref. softkey to switch between internal reference and External reference. (The current operation is highlighted in a white color).

Square Wave

Press the [WAVE] button then use the softkey **F2** to select **Square**. The screen shown in figure **7.1** will be displayed.

The parameters available for the Square waveforms include frequency, period, amplitude, high level, low level, offset, and duty cycle.
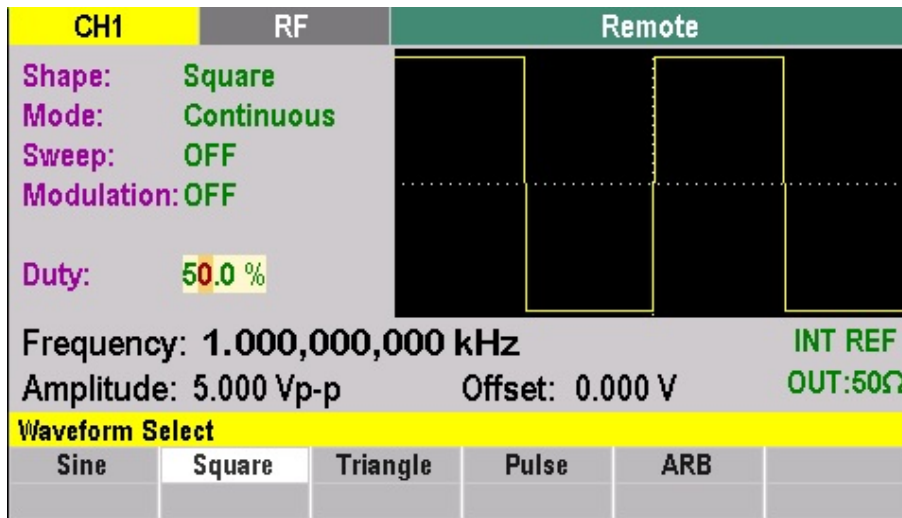
Figure 7.1   Square Wave

Parameter	Description
Duty Cycle	Set the duty cycle.
Frequency	Set the signal frequency.
Amplitude	Set the signal amplitude.
Offset	Set the signal offset.
Change Unit	Change the unit of the amplitude.
50 Ω/ HI-Z	Change the impedance.
Int. Ref./Ext. Ref.	Change the reference of the unit.
Duty Cycle	Change the duty cycle.

Table 7.1   Square Wave Parameters

7.1 Duty Cycle

To set the duty cycle:

Press the `WAVE` button then use the softkey to select **Square**.

* The duty cycle can be found between the **Other Paramaters** and **Common Parameters** sections.
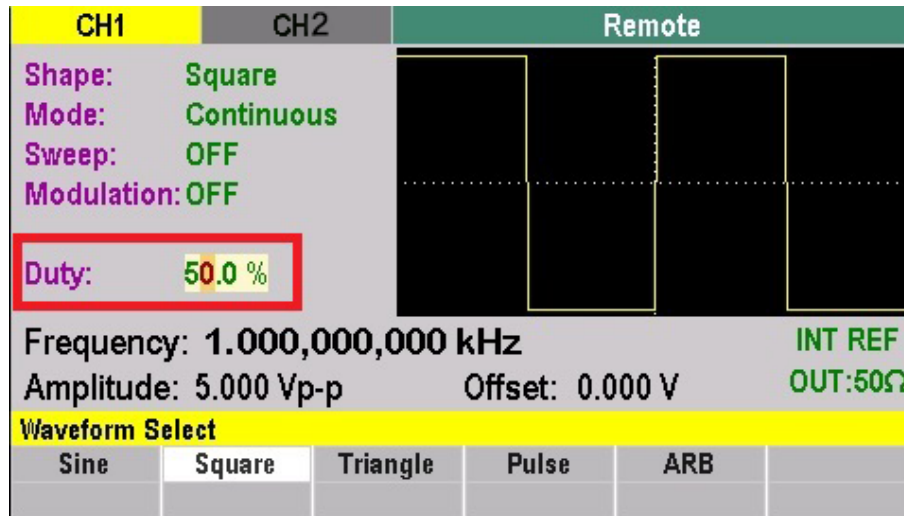
Figure 7.2   Duty Cycle

  – Use the numeric keypad to input the parameter value directly and press `Enter`

  – Or use the rotary knob to adjust the current duty cycle.

7.2 Frequency

Frequency is one of the most important parameters of basic waveforms. For different instrument models and waveforms, the available ranges of frequency are different. The 4078C has a range of 1 μ(Hz) to 30 MHZ, while the 4079C has a range of 1 μ(Hz) to 50 MHZ. The default frequency is 1 kHz.

To select the **square Waveform**: Press the `WAVE` button then use the softkey to select **square**.

To configure the frequency of the waveform:

* Press the `PARAM` button then use the softkey to select **Frequency**.

  – The frequency shown on the screen when the instrument is powered on is the default value or the set value of last power down.

* Input the desired frequency.

- Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

  – **MHz**   – **KHz**   – **Hz**   – **mHz**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Note:

When using the numeric Keypad to enter the value, the left arrow key cannot be used to move the cursor backward and edit the value of the previous digit.

7.3 Amplitude

To set the amplitude:

Press the PARAM button then use the softkey to select **Amplitude**.

  – The amplitude shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Press the **Amplitude** softkey again to switch into the **Amplitude** parameter if **Offset** was the chosen parameter
(the current operation is highlighted in a white color).

- Input the desired amplitude.

  – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

  – **Vp-p**   – **mVp-p**   – **Vrms**   – **mVrms**   – **dBm**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

7.4 Offset

The default value is 0 Vdc.

To set the offset:

Press the PARAM button then use the softkey to select **Offset**.

  – The offset shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Press the **Offset** softkey again to switch into the **Offset** parameter if **Amplitude** was the chosen parameter
  (the current operation is highlighted in a white color).

- Input the desired amplitude.

  – Use the numeric Keypad to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

    – **V**   – **mV**

7.5 Change Unit

Press the corresponding softkey, **F4**, to toggle between the units of the **Amplitude**:

    – **Vp-p**   – **dBm**   – **mVrms**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

7.6 50 Ω/ HI-Z

Selects the amplitude voltage value based on the two different impedance termination (i.e. if connected to oscilloscope with 1MΩ input impedance, generator will display the correct amplitude value for 1MΩ termination when HI-Z is selected 50 ohm path to match impedance and avoid reflections and other mismatch effects).

To set the internal impedance:

Press the PARAM button then use the softkey to select **50 Ω/ HI-Z**.

• Toggle the **50 Ω/ HI-Z** softkey to switch between 50Ω and HI-Z. (The current operation is highlighted in a white color).

7.7 Int. Ref./Ext. Ref.

Selects internal or external reference source (the external reference must be connected to the rear panel Ref In connector).
Press the PARAM button then use the softkey to select Int. Ref./Ext. Ref..

– Toggle the Int. Ref./Ext. Ref. softkey to switch between internal reference and external reference. (The current operation is highlighted in a white color).

Triangle Wave

Press the WAVE button then use the softkey **F2** to select **Triangle**. The screen shown in figure **8.1** will be displayed. The parameters available for the Triangle waveforms include duty cycle frequency, amplitude, and offset.
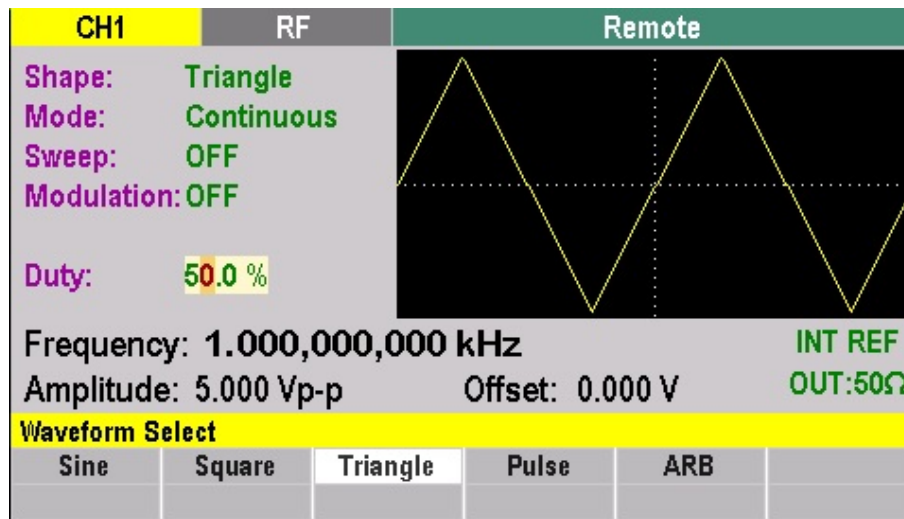
Figure 8.1   Triangle Wave

Parameter	Description
Duty Cycle	Set the duty cycle.
Frequency	Set the signal frequency.
Amplitude	Set the signal amplitude.
Offset	Set the signal offset.
Change Unit	Change the unit of the amplitude.
50 Ω/ HI-Z	Change the impedance.
Int. Ref./Ext. Ref.	Change the reference.

Table 8.1   Triangle Wave Parameters

8.1 Duty Cycle

To set the duty cycle:

Press the WAVE button then use the soft key to select **Square**.

*   The duty cycle can be found between the **Other Paramaters** and **Common Parameters** sections.
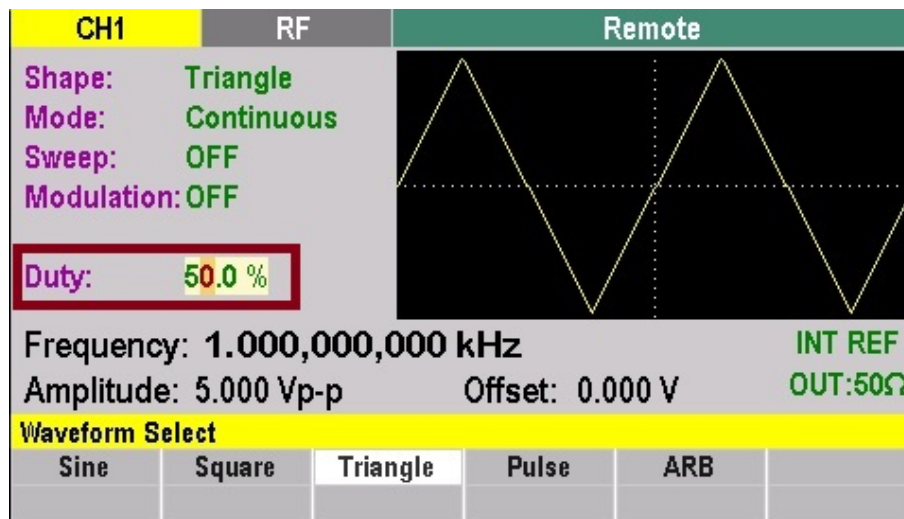
Figure 8.2   Duty Cycle

– Use the numeric keypad to input the parameter value directly and press Enter

– Or use the rotary knob to adjust the current duty cycle.

8.2 Frequency

Frequency is one of the most important parameters of basic waveforms. For different instrument models and waveforms, the available ranges of frequency are different. The 4078C has a range of 1 μ(Hz) to 30 MHZ, while the 4079C has a range of 1 μ(Hz) to 50 MHZ. The default frequency is 1 kHz.

To select the **triangle Waveform**: Press the WAVE button then use the soft key to select **triangle**.

To configure the frequency of the waveform:

*   Press the PARAM button then use the soft key to select **Frequency**.

    – The frequency shown on the screen when the instrument is powered on is the default value or the set value of last power down.

*   Input the desired frequency.

- Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    – **MHz**   – **KHz**   – **Hz**   – **mHz**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Note:

> When using the numeric Keypad to enter the value, the left arrow key cannot be used to move the cursor backward and edit the value of the previous digit.

8.3 Amplitude

To set the amplitude:

Press the PARAM button then use the soft key to select **Amplitude**.

- – The amplitude shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Press the **Amplitude** softkey again to switch into the **Amplitude** parameter if **Offset** was the chosen parameter
  (the current operation is highlighted in a white color).

- Input the desired amplitude.

    – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    – **Vp-p**   – **mVp-p**   – **Vrms**   – **mVrms**   – **dBm**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

8.4 Offset

The default value is 0 Vdc.

To set the offset:

Press the PARAM button then use the soft key to select **Offset**.

- – The offset shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- Press the **Offset** softkey again to switch into the **Offset** parameter if **Amplitude** was the chosen parameter (the current operation is highlighted in a white color).

- Input the desired amplitude.

- – Use the numeric Keypad to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

  - – **V**   – **mV**

- Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

8.5 Change Unit

Press the corresponding softkey, **F4**, to toggle between the units of the **Amplitude**:

  - – **Vp-p**   – **dBm**   • **mVrms**

8.6 50 Ω/ HI-Z

Selects the amplitude voltage value based on the two different impedance termination (i.e. if connected to oscilloscope with 1MΩ input impedance, generator will display the correct amplitude value for 1MΩ termination when HI-Z is selected 50 ohm path to match impedance and avoid reflections and other mismatch effects).

To set the internal impedance:

Press the **PARAM** button then use the soft key to select **50 Ω/ HI-Z**.

- Toggle the **50 Ω/ HI-Z** softkey to switch between 50Ω and HI-Z. (The current operation is highlighted in a white color).

8.7 Int. Ref./Ext. Ref.

Selects internal or external reference source (the external reference must be connected to the rear panel Ref In connector).

Press the **PARAM** button then use the soft key to select Int. Ref./Ext. Ref..

– Toggle the Int. Ref./Ext. Ref. softkey to switch between **internal reference** and **external reference**. (The current operation is highlighted in a white color).

Pulse Wave

The Pusle waveforms consists of a period/frequency, pulse width, rise time, and a fall time.

Press the `WAVE` button then use the softkey **F4** to select **Pulse**. The screen shown in figure **9.1** will be displayed. The parameters available for the Pulse waveforms include frequency/period, amplitude, offset, width,edge,lead trail, and fast edges.
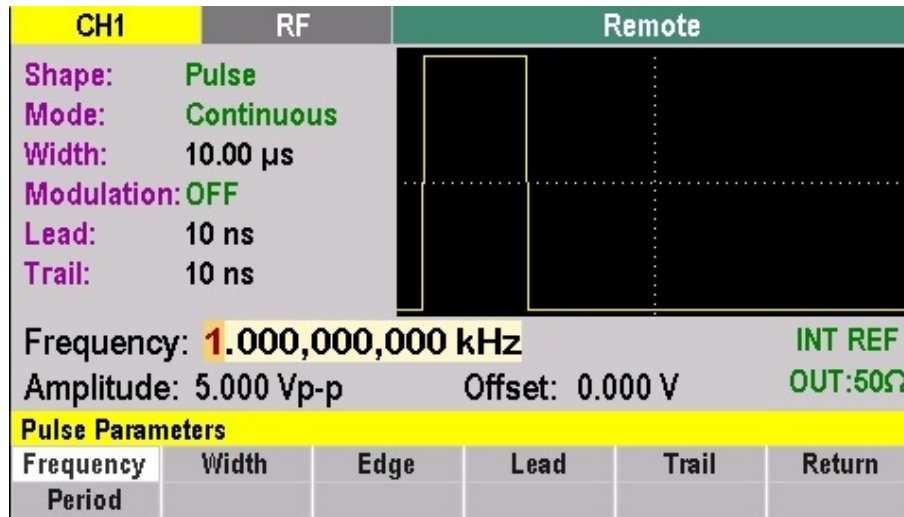
Figure 9.1   Pulse Wave

Parameter	Description
Frequency/Period	Set the signal frequency or period.
Width	Set the pulse width for the Pulse waveform.
Edge	Set the edge for the Pulse waveform.
Lead/Trail	Set the lead/trial for the Pulse waveform.
Fast Edges	Enable fast edge.
Amplitude/	Set the signal amplitude or high level.
Offset	Set the signal offset or low level.

Table 9.1   Pulse Wave Parameters

9.1 Frequency / Period

Frequency is one of the most important parameters of a basic waveforms. For different instrument models and waveforms, the available ranges of frequency are different. The 4078C has a range of 1 µ(Hz) to 30 MHZ, while the 4079C has a range of 1 µ(Hz) to 50 MHZ. The default frequency is 1 kHz.

To configure the frequency or period of the waveform:

Press the **WAVE** button then use the soft keys to select **Pulse › Frequency**.

- – The frequency shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Toggle between **Period** and **Frequency** by pressing softkey corresponding to **Frequency/Period**.

    - – The current value for the waveform's Period will now displayed in inverse color.

- • Input the desired frequency/Period.

    - – Use the numeric keyboard to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

    - – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Note:

When using the numeric keyboard to enter the value, the left arrow key can be used to move the cursor backward and delete the value of the previous digit.

9.2 Width

The pulse width represents the time from the 50% threshold of the rising edge of the pulse to the 50% threshold of the next falling edge.
To selects the width of the pulse:

Press the WAVE button then use the soft key to select **Pulse > Width**.

- – The width shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Input the desired width.

- – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    - – **s**   – **ms**   – μ**s**   – **ns**

- – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

9.3 Edge

To select equal Rise (Leading edge) and Fall (Trailing edge) times of the pulse:
Press the WAVE button then use the soft key to select **Pulse > Edge**.

- – The edge shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Input the desired edge.

- – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    - – **s**   – **ms**   – μ**s**   – **ns**

- – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

9.4 Lead/Trial

To selects different Rise and Fall times of the Pulse:

Press the `WAVE` button then use the soft key to select **Pulse > Lead/Trial**.

– The rise and fall time shown on the screen when the instrument is powered on is the default value or the set value of last power down.

• Toggle between **Lead** and **Trial** by pressing softkey corresponding to **Lead/Trial**.

• Input the desired rise and fall time.

– Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

– **s**   – **ms**   – μ**s**   – **ns**

– Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

9.5 Fast Edges

To set the lead and trail times to the fastest available time (5 ns):

– Press the `WAVE` button then use the soft key to select **Pulse > Fast Edge**.

9.6 Amplitude

To set the amplitude:

Press the PARAM button then use the soft key to select **Amplitude**.

- – The amplitude shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Press the **Amplitude** softkey again to switch into the **Amplitude** parameter if **Offset** was the chosen parameter (the current operation is highlighted in a white color).

- • Input the desired amplitude.

  - – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    - – **Vp-p**   – **mVp-p**   – **Vrms**   – **mVrms**   – **dBm**

9.7 Offset

The default value is 0 Vdc.

To set the offset:

Press the PARAM button then use the soft key to select **Offset**.

- – The offset shown on the screen when the instrument is powered on is the default value or the set value of last power down.

- • Press the **Offset** softkey again to switch into the **Offset** parameter if **Amplitude** was the chosen parameter
  (the current operation is highlighted in a white color).

- • Input the desired amplitude.

  - – Use the numeric Keypad to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

  - – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

    - – **V**   – **mV**

9.8 Change Unit

Press the corresponding softkey, **F4**, to toggle between the units of the **Amplitude**:

- **Vp-p**
- **dBm**
- **mVrms**

9.9 50 Ω/ HI-Z

Selects the amplitude voltage value based on the two different impedance termination (i.e. if connected to oscilloscope with 1MΩ input impedance, generator will display the correct amplitude value for 1MΩ termination when HI-Z is selected 50 ohm path to match impedance and avoid reflections and other mismatch effects).

To set the internal impedance:

Press the PARAM button then use the soft key to select **50 Ω/ HI-Z**.

- Toggle the **50 Ω/ HI-Z** softkey to switch between 50Ω and HI-Z. (The current operation is highlighted in a white color).

9.10 Int. Ref./Ext. Ref.

Selects internal or external reference source (the external reference must be connected to the rear panel Ref In connector).
Press the PARAM button then use the soft key to select Int. Ref./Ext. Ref..

- Toggle the Int. Ref./Ext. Ref. softkey to switch between internal reference and external reference. (The current operation is highlighted in a white color).

ARB Wave

The Arb signal consists of two types: the system's built-in waveforms and the user-defined waveforms. Built-in waveforms are stored in the internal non-volatile memory.

Press the WAVE button then use the softkey **F5** to select **ARB**. The screen shown in figure **10.1** will be displayed. The parameters available for the ARB waveforms include: **frequency, rate, load temp, amplitude, offset, save temp, settings, and edit**.
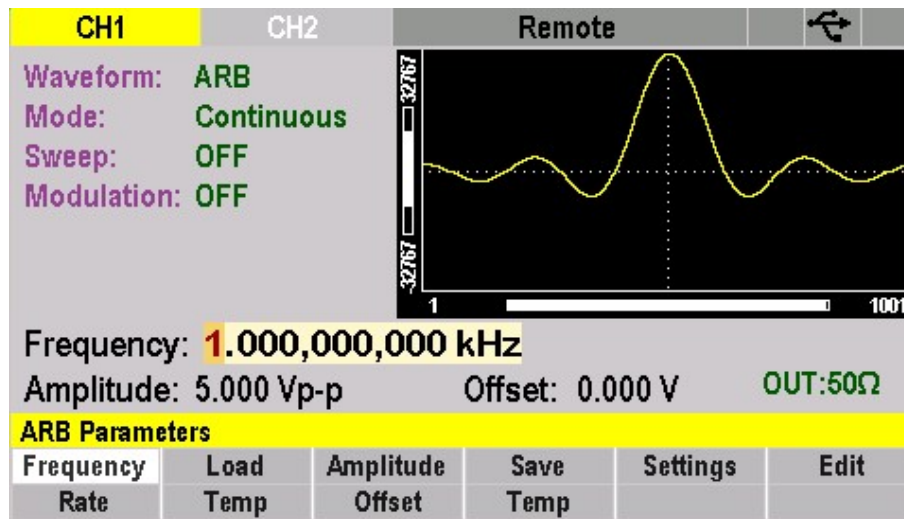

Figure 10.1 ARB Wave

Parameter	Description
Frequency	Set the signal frequency.
Rate	Set the duty cycle for the ARB waveform.
Load Temp	Load a waveform template.
Amplitude	Set the signal amplitude.
Offset	Set the signal offset.
Save Temp	Save the set parameters of the waveform as a template.
Settings	Enter the arbitrary waveform settings.
Edit	Edit the arbitrary wave,
50 Ω/ HI-Z	Change the impedance.
Int. Ref./Ext. Ref.	Change the reference of the unit.

Table 10.1 ARB Wave Parameters

10.1 Frequency

Frequency is one of the most important parameters of basic waveforms. For different instrument models and waveforms, the available ranges of frequency are different. The 4078C has a range of 1 μ(Hz) to 30 MHZ, while the 4079C has a range of 1 μ(Hz) to 50 MHZ. The default frequency is 1 kHz.

To select the **ARB Waveform**: Press the WAVE button then use the soft key to select **ARB**.

To configure the frequency of the waveform:

1. Press the PARAM button then use the soft key to select **ARB > Frequency**.

    –   The frequency shown on the screen when the instrument is powered on is the default value or the set value of last power down.

2. Input the desired frequency.

3. Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

    – **MHz**   – **KHz**   – **Hz**   – **mHz**

4. Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Note:

> When using the numeric Keypad to enter the value, the left arrow key cannot be used to move the cursor backward and edit the value of the previous digit.

10.2 Rate

Selects and displays the Point Rate (Arb Mode Only). The Rate parameter governs the rate at which waveform points are executed, and thus the frequency of the waveform output. When you set this parameter, the waveform generator will keep that execution rate for all waveform lengths until it is changed. To set the rate:

1. Press the WAVE button then use the soft key to select **ARB** > **Rate**.

   – The rate shown on the screen when the instrument is powered on is the default value or the set value of last power down.

2. Press the **Frequency/Rate** softkey again to switch into the **Rate** parameter if **Frequency** was the chosen
   parameter (the current operation is highlighted in a white color).

3. Input the desired rate.

4. Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

       – **s**   – **ms**   – μ**s**   – **ns**

5. Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

10.3 Save Temp

To save a waveform temporarily:

Press the WAVE button then use the soft key to select **ARB** > **Save Temp**.

The information will be saved in volatile memory. The information will be retained temporarly but will be lost after boot up or NISPOM.

10.4 Load Temp

To load an arbitrary waveform that was temporarily save:

Press the WAVE button then use the soft key to select **ARB** > **Load Temp**.

10.5 Amplitude

To set the amplitude:

1. Press the PARAM button then use the soft key to select **Amplitude**.

   – The amplitude shown on the screen when the instrument is powered on is the default value or the set value of last power down.

2. Press the **Amplitude** softkey again to switch into the **Amplitude** parameter if **Offset** was the chosen parameter (the current operation is highlighted in a white color).

3. Input the desired amplitude.

   – Use the numeric keypad to input the parameter value directly, and press the corresponding key to select the parameter unit.

   – **Vp-p**   – **mVp-p**   – **Vrms**   – **mVrms**   – **dBm**

The following equation represents the relative output amplitude voltage relationship between the front-panel amplitude peak-to-peak setting and the data point values in ARB waveform memory:

$$Output\ Voltage = \frac{Amplitude\ pp\ setting\ *\ data\ point\ value}{65536} + Offset$$

Where 65536 is the total data point value range in waveform memory.

Front Panel	Data Point	Relative Output
4 Vp-p	- 8191	- 1 V
5 Vp-p	32767	+ 2.5 V
5 Vp-p	16384	+1.25 V
5 Vp-p	0	0 V (offset voltage)
9 Vp-p	- 32767	- 4.5 V

Figure 10.2   Output Voltage Examples

10.6 Offset

The default value is 0Vdc.

To set the offset:

1. Press the PARAM button then use the soft key to select **Offset**.

    – The offset shown on the screen when the instrument is powered on is the default value or the set value of last power down.

2. Press the **Offset** softkey again to switch into the **Offset** parameter if **Amplitude** was the chosen parameter (the current operation is highlighted in a white color).

3. Input the desired amplitude.

    – Use the numeric Keypad to input the parameter value directly, and press the corresponding softkey to select the parameter unit.

    – **V**   – **mV**

4. Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

10.7 50 Ω/ HI-Z

Selects the amplitude voltage value based on the two different impedance termination (i.e. if connected to oscilloscope with 1MΩ input impedance, generator will display the correct amplitude value for 1MΩ termination when HI-Z is selected 50 ohm path to match impedance and avoid reflections and other mismatch effects).
To set the impedance:

1. Press the PARAM button then use the soft key to select **50 Ω/ HI-Z**.

    – Toggle the **50 Ω/ HI-Z** softkey to switch between 50Ω and HI-Z. (The current operation is highlighted in a white color).

10.8 Int. Ref./Ext. Ref.

Selects internal or external reference source (the external reference must be connected to the rear panel Ref In connector).

1. Press the PARAM button then use the soft key to select **Int. Ref./Ext. Ref.**.

   – Toggle the Int. Ref./Ext. Ref. softkey to switch between Internal reference and external reference. (The current operation is highlighted in a white color).

10.9 Settings

To enter the **Arbitrary Settings Menu**:

Press the WAVE button then use the soft key to select **ARB > Settings**.

In the **Arbitrary Settings Menu** the following parameters can be configured:

- **Start**
- **Length**
- **Marker**
  - Mark Addr
  - Mark Len
  - Full Screen
- **Delete Temp**

10.9.1 Start

To selects the starting address of the arbitrary waveform:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Start/Length** softkey to toggle between **Start** and **Length**. (The current operation is highlighted in a white color).

3. Input the starting address.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

10.9.2 Length

To selects the length of the arbitrary waveform:

1. Press the **WAVE** button then use the soft key to select **ARB** ⟩ **Settings**.

2. Press the **Start/Length** softkey to toggle between **Start** and **Length**. (The current operation is highlighted in a white color).

3. Input the starting address.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

Note:

The maximum Length allowed depends on model.

10.9.3 Marker

The marker output feature generates a positive TTL level output signal at the points specified by address and length.

To selects the marker output address of the signal:

1. Press the **WAVE** button then use the soft key to select **ARB** ⟩ **Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

The following parameters are available in the **Marker Menu**:

- **Mark Addr**
- **Mark Len**
- **On/Off**
- **Full Screen**

name: images/Waveforms/marker output address

file: images/Waveforms/marker output address

state: unknown
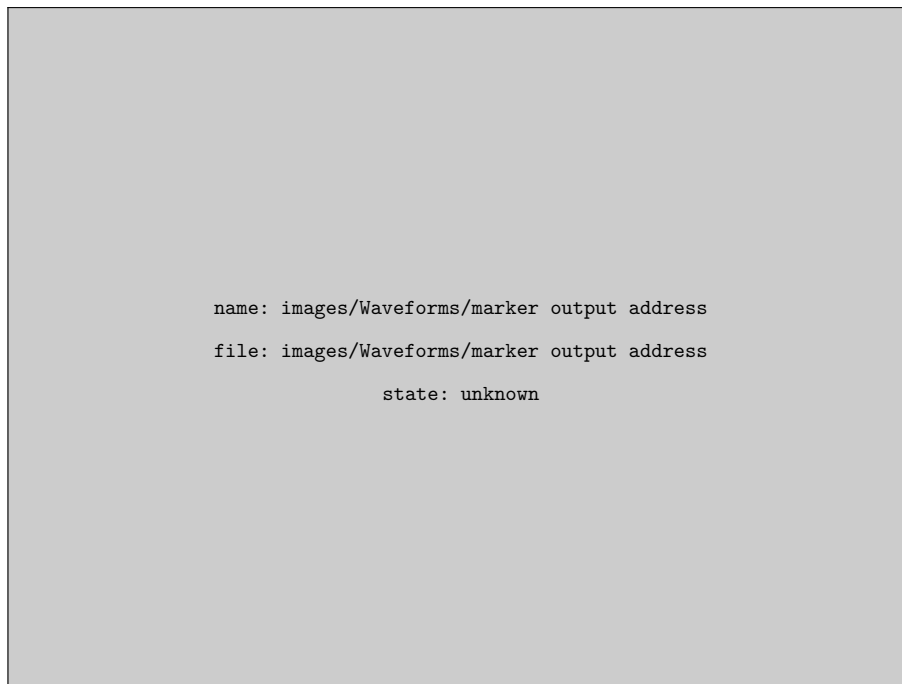
Figure 10.3   Marker Output Address

Mark Address

To set a marker on the waveform:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Mark Addr** softkey to set the address of the marker.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

Note:

The range of the Mark Addr will vary based on the length of the waveform.

Mark Len

To set the range of the marker:

1. Press the `WAVE` button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Mark Len** softkey to set the address of the marker.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

On/Off

To toggle the marker on and off:

1. Press the `WAVE` button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Mark Len** softkey to set the address of the marker.

4. Press the **On/Off** softkey to toggle the marker **On** and **Off**. (The selected function will be highlighted in white.)

Note:

The maximum Length allowed to be set for marker is 4000, regardless of the length of the waveform.

Full Screen

Full Screen will allow to see the Marker with larger resolution and marker location on the waveform.

To select full screen view and enter the **Full Screen Menu**:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter full screen mode and **Full Screen Menu**.


```
name: images/waveforms/Full Screen Mode
file: images/waveforms/Full Screen Mode
            state: unknown
```
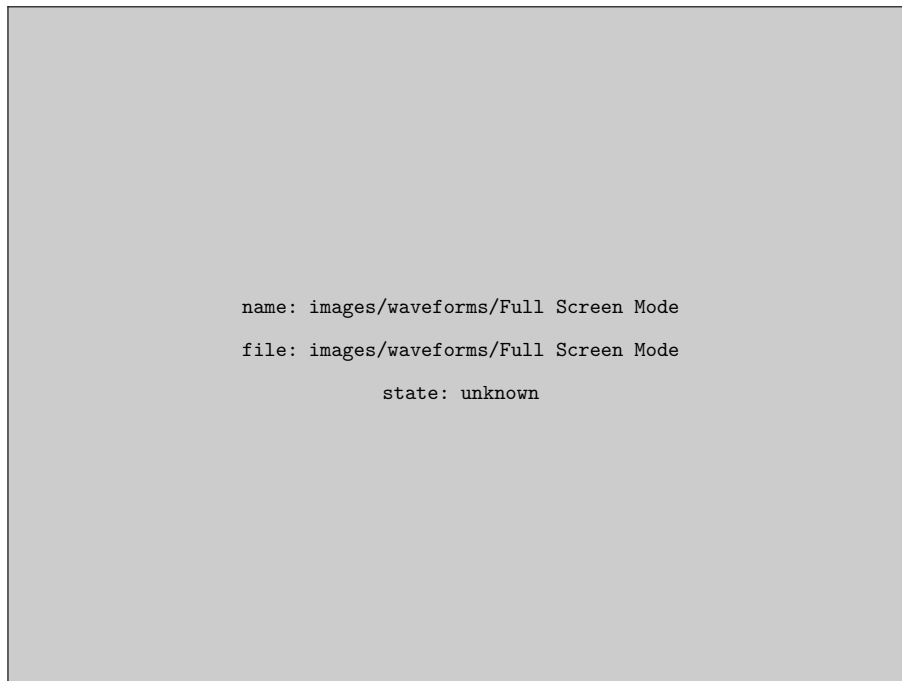
Figure 10.4   Full Screen Mode

10.9.1 Full Screen Menu

The **Full Screen Menu** contains the following settings:

- **Mark Addr**
- **Mark Len**
- **On/Off**
- **Navigation**

Mark Address

To set a marker on the waveform:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Mark Addr** softkey to set the address of the marker.

    – Use the numeric keypad to input the parameter value directly.

    – Or use the rotary knob to change its value.

Note:

The range of the Mark Addr will vary based on the length of the waveform.

Mark Len

To set the range of the marker:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Mark Len** softkey to set the address of the marker.

    – Use the numeric keypad to input the parameter value directly.

    – Or use the rotary knob to change its value.

On/Off

To toggle the marker on and off:

1. Press the WAVE button then use the soft key to select **ARB ⟩ Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **On/Off** softkey to toggle the marker **On** and **Off**.

Note:

The maximum Length allowed to be set for marker is 4000, regardless of the length of the waveform.

Show/Hide

Toggle the Marker and its parameters. Hiding the marker and its parameters allows for a complete view of the waveform in **Full Screen Mode**. To toggle the marker:

1. Press the WAVE button then use the soft key to select **ARB ⟩ Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Show/Hide** softkey to toggle the marker and the box displaying its parameters.

10.9.1 Navigation

To enter the **Navigation Menu**:

1. Press the WAVE button then use the soft key to select **ARB ⟩ Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

The **Navigator Menu** contains the following settings:

- **Zoom X**
- **Zoom Y**
- **Pan X**
- **Pan Y**
- **Reset**

Zoom X

To zoom in horizontally:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

5. Press the **Zoom X** softkey.

   – Use the rotary knob to zoom in (clockwise) and out (clockwise).

   – Select Coarse/Fine to determine how zoom x is affected.

Zoom Y

To zoom in vertically:

1. Press the WAVE button then use the soft key to select **ARB > Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

5. Press the **Zoom Y** softkey.

   – Use the rotary knob to zoom in (clockwise) and out (clockwise).

   – Select Coarse/Fine to determine how zoom y is affected.

Pan X

To pan horizontally:

1. Press the WAVE button then use the soft key to select **ARB › Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

5. Press the **Pan X** softkey.

    –   Use the rotary knob to pan in (clockwise) and out (clockwise).

Pan Y

To pan in vertically:

1. Press the WAVE button then use the soft key to select **ARB › Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

5. Press the **Pan Y** softkey.

    –   Use the rotary knob to pan in (clockwise) and out (clockwise).

Reset

To reset all the navigation settings:

1. Press the WAVE button then use the soft key to select **ARB › Settings**.

2. Press the **Marker** softkey to enter the **Marker Menu**.

3. Press the **Full Screen** softkey to enter the **Full Screen Menu**.

4. Press the **Navigator** softkey.

5. Press the **Reset** softkey.

10.10 Edit

Enter data for creating arbitrary waveforms. You can enter data one point at a time, as a value at an address, draw a line from one point (a value at an address) to another point, create a predefined waveform, or combine these to create complex waveforms. The valid data values range is -32767 to 32767. The valid waveform memory addresses range from 1 to maximum memory length of instrument.

The data value governs the output amplitude of that point of the waveform, scaled to the instrument output amplitude. Therefore, a value of 32767 corresponds to positive peak amplitude, 0 corresponds to the waveform offset, and -32767 corresponds to the negative peak amplitude.

To enter the **Waveform Editing mode**:

Press the WAVE button then use the soft key to select **ARB > Edit**.
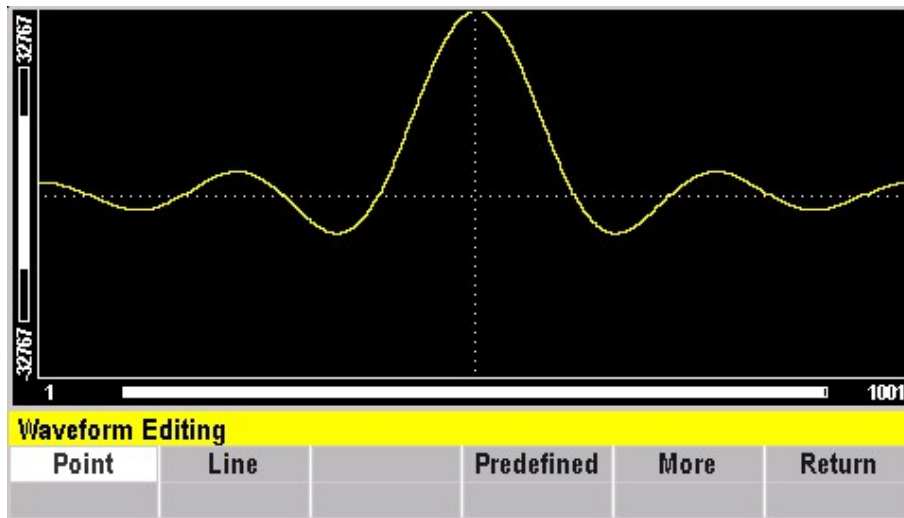
Figure 10.5 ARB Editing Menu

- **Point**
- **Line**
- **Predefined**
- **More**

10.10.1 Point

The **Point Menu** allows point by point waveform editing.

To enter the **Point Menu**:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.
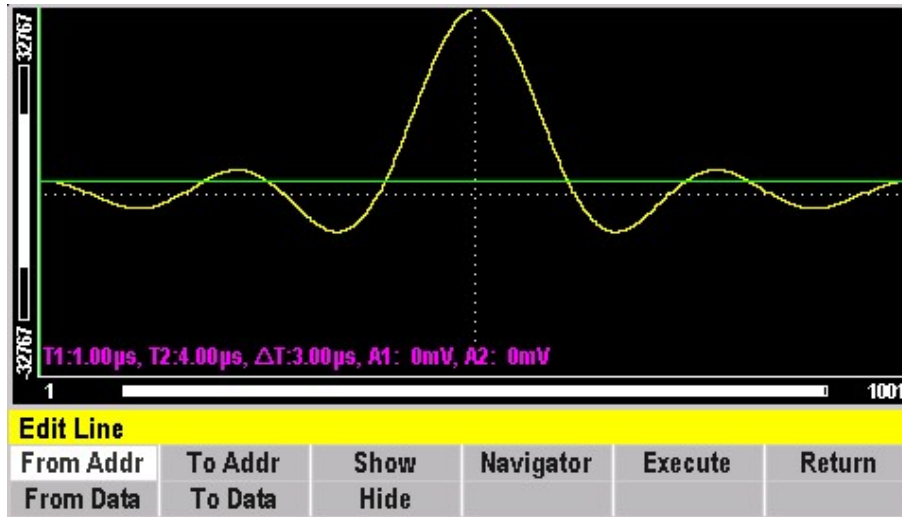
2. Press the **Point** softkey.
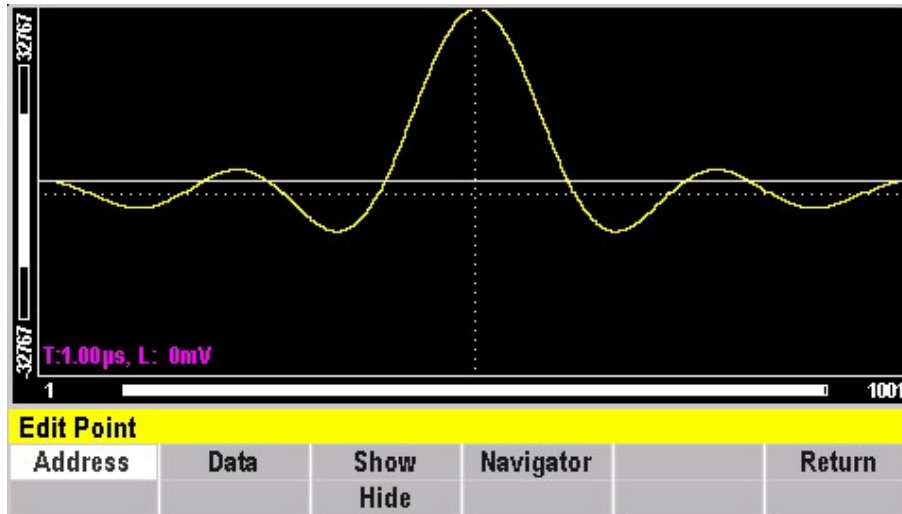
Figure 10.6   Point Menu

- **Point Addr**   • **Data**   • **Point Show/Hide**   • **Navigation**

Point Address

To select the current address in the arbitrary waveform memory:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.

2. Press the **Point** softkey to enter the **Point Menu**.

3. Press the **Addr** softkey to set the address of the marker.

    –   Use the numeric keypad to input the parameter value directly.

    –   Or use the rotary knob to change its value.

Show/Hide

To toggle the address and data of the selected point:

1. Press the `WAVE` button then use the soft key to select **ARB** > **Edit**.

2. Press the **Point** softkey to enter the **Point Menu**.

3. Press the **Show/Hide** softkey to hide or show the point's information.

   – Use the rotary knob to change the transparency of the box displaying the address and data.

Data

To select the data point value at the current address:

1. Press the `WAVE` button then use the soft key to select **ARB** > **Edit**.

2. Press the **Point** softkey to enter the **Point Menu**.

3. Press the **Data** softkey to set the address of the marker.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

You can change the point value from -32767 to 32767.

10.10.1 Line

The **Line Menu** allows a line drawing from one point (a value at an address and the data) to another point.

To enter the **Edit Line Menu**:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.
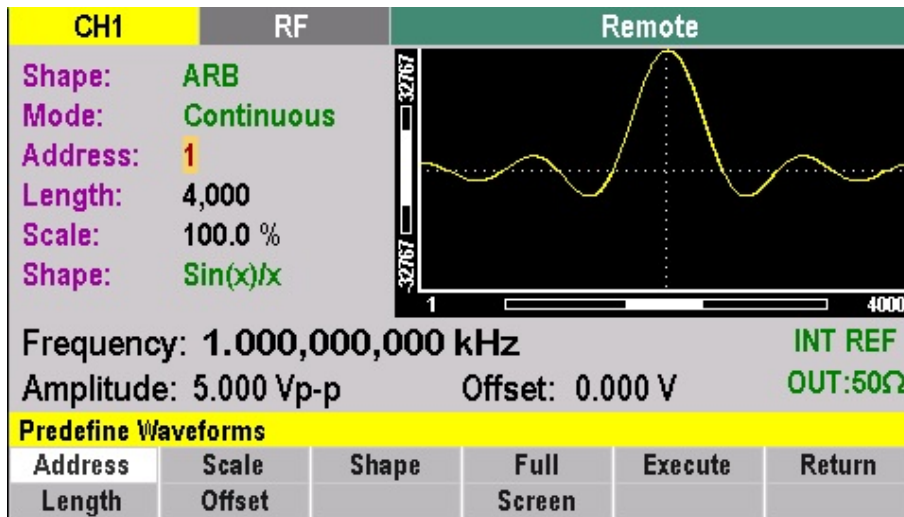
2. Press the **Line** softkey.

Figure 10.7   Line Menu

- **From Addr/**
  From Data

- **To Addr/**
  To Data

- **Show/**
  Hide

- **Navigation**

- **Execute**

From Addr/From Data

To select the line's starting point address and data:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.

2. Press the **Line** softkey to enter the **Edit Line Menu**.

3. Press the **From Addr/From Data** softkey to toggle between the address and data function. (The selected function will be highlighted in white)

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

To Addr/To Data

To select the line's starting point address and data:

1. Press the `WAVE` button then use the soft key to select **ARB > Edit**.

2. Press the **Line** softkey to enter the **Edit Line Menu**.

3. Press the **To Addr/To Data** softkey to toggle between the address and data function. (The selected function will be highlighted in white)

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

Show/Hide

To toggle between show and hide press the **Show/Hide** softkey:

1. Press the `WAVE` button then use the soft key to select **ARB > Edit**.

2. Press the **Line** softkey to enter the **Edit Line Menu**.

3. Press the **Show/Hide** softkey to hide or show the box displaying the two line points information.

   – Use the rotary knob to change the transparency of the box displaying the address and data.

Execute

To execute the line created:

1. Press the `WAVE` button then use the soft key to select **ARB > Edit**.

2. Press the **Line** softkey to enter the **Edit Line Menu**.

3. Press the **Execute** softkey to apply the line created.

10.10.1 Predefined

Select a predefined waveform and edit some of its parameters.
To enter the **Edit Predefined Menu**:

1. Press the **WAVE** button then use the soft key to select **ARB > Edit**.

2. Press the **Predefined** softkey.

Figure 10.8 ARB Edit Predefined

- **Address** • **Length** • **Scale** • **Predefined Offset** • **Show/Hide** • **Predefined Shape**

Address

To selects the starting address of the predefined waveform:

1. Press the **WAVE** button then use the soft key to select **ARB > Edit**.

2. Press the **Predefined** softkey.

3. Press the **Address/Length** softkey to toggle between the **Address** and **Length** function.

   – The chosen function will be highlighted in white.

   – If **Length** is chosen press the softkey once more to change to the **Address** function.

4. Input desired starting address.

    –   Use the numeric keypad to input the parameter value directly.

    –   Or use the rotary knob to change its value.

Note:

Changing the starting address will affect the scale and the offset of the predefined waveform.

Length

To selects the length (number of points for a full wave) of the predefined waveform:

1. Press the `WAVE` button then use the soft key to select **ARB › Edit**.
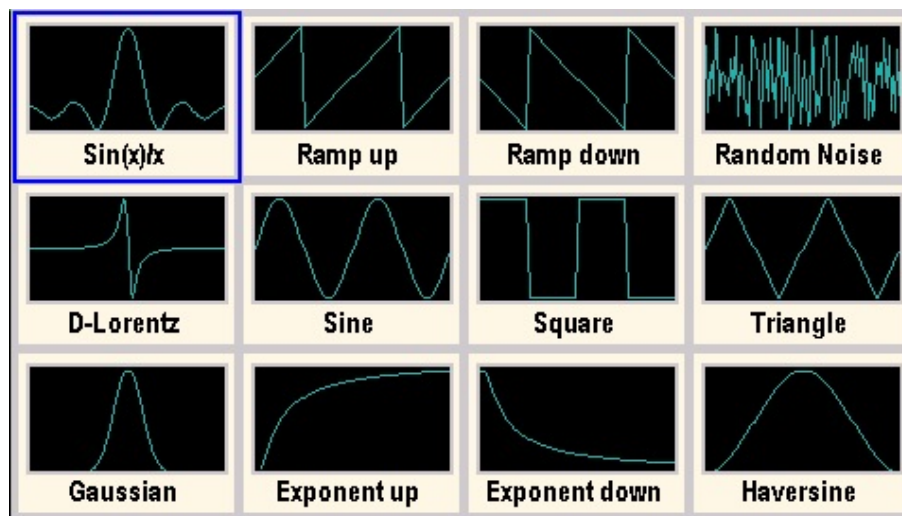
2. Press the **Predefined** softkey.

3. Press the **Address/Length** softkey to toggle between the **Address** and **Length** function.

    –   The chosen function will be highlighted in white.

    –   If **Address** chosen press the softkey once more to change to the **Length** function.

4. Input desired length.

    –   Use the numeric keypad to input the parameter value directly.

    –   Or use the rotary knob to change its value.

Note:

The length value must be a number that is divisible by 4 or by 2. If not, a message stating "Must divide by 4" or "Must divide by 2" will appear. Different waveforms have different limitations on the length. Refer to the **table** below.

Wave	Minimum	Divisible by
Sine	16	4
Triangle	16	4
Square	2	2
Noise	16	4

Table 10.2   Waveform Length Examples

Scale

Selects the scale of the waveform. If the scale is too high, a message will display "Scale too high."

100% scale spans the waveform scale from -32767 to 32767. Scale factors are limited by the point data value of the starting point. This limitation is automatically calculated and applied.
To select the scale:

1. Press the WAVE button then use the soft key to select **ARB** > **Edit**.

2. Press the **Predefined** softkey.

3. Press the **Scale/Offset** softkey to toggle between the **Scale** and the **Offset** function.

   – The chosen function will be highlighted in white.

   – If **Offset** is chosen press the softkey once more to change to the **Scale** function.

4. Input desired Scale.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

Predefined Offset

To select the point data value for the start point of the predefined wave:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.

2. Press the **Predefined** softkey.

3. Press the **Scale/Offset** softkey to toggle between the **Scale** and the **Offset** function.

   – The chosen function will be highlighted in white.

   – If **Scale** is chosen press the softkey once more to change to the **Offset** function.

4. Input desired Offset.

   – Use the numeric keypad to input the parameter value directly.

   – Or use the rotary knob to change its value.

Predefined Shape

To open the **Predefined Shape Menu**:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.

2. Press the **Predefined** softkey.

3. Press the **Shape** softkey.

Figure 10.9   ARB Shape Menu

To select a predefined waveform:

1. Use the rotary knob to highlight the chosen waveform with a blue outline.

2. Press the **Select** softkey to select the desired waveform.

3. Press the **Execute** softkey to perform the predefined wave insertion on the wave memory.

If Random Noise wave is selected, a submenu is displayed:
Execute New Noise allows the generation of a noise wave.
Execute Add Noise insert noise to an existing waveform with a ratio selected by the Scale value.

10.10.1 More

To open the **More Menu**:

1. Press the WAVE button then use the soft key to select **ARB > Edit**.

2. Press the **More** softkey.
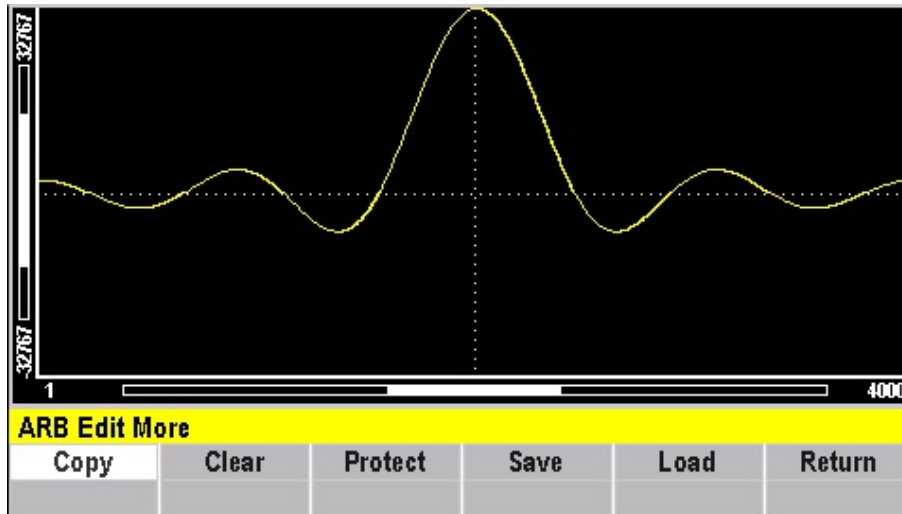
Figure 10.10   ARB More Menu

• **Copy**   •   **Clear**   •   **Protect**   •   **Save**   •   **Load**

Copy

The copy function copies an area of waveform memory to another area of waveform memory. Press the **WAVE** button then use the soft key to select **ARB > Edit > More > Copy**.
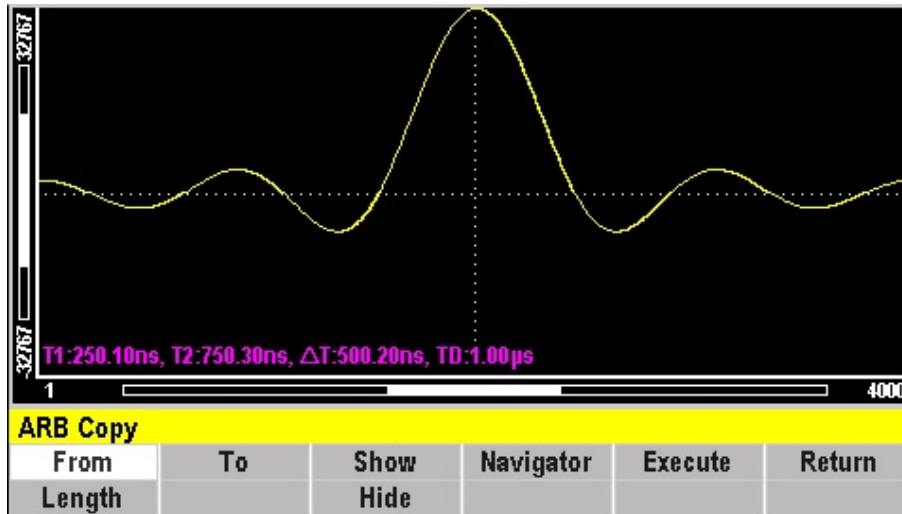
Figure 10.11   ARB Copy Menu

From

Selects the address of the starting point to copy. Press the **WAVE** button then use the soft key to select **ARB > Edit > More > From**.

Copy Length

Use the numeric keypad or rotary knob to selects the length (number of points) of the waveform to copy.

Copy To

Use the numeric keypad or rotary knob to selects the destination address where the first point is copied.

Copy Show/Hide

Toggle to show or hide the toolbar displaying the **Start**, **Length**, and **Dest** information. If **Show** is chosen use the rotary knob to control the transparency of the toolbox.

Navigation

See the **Navigation** section.

Execute

Select to copy the section of the waveform selected using the commands in the **Copy Menu**.

Clear

The clear function clears (sets the data values to zero) either a section of or all of waveform memory. Press the WAVE button then use the soft key to select **ARB** > **Edit** > **More** > **Clear**.
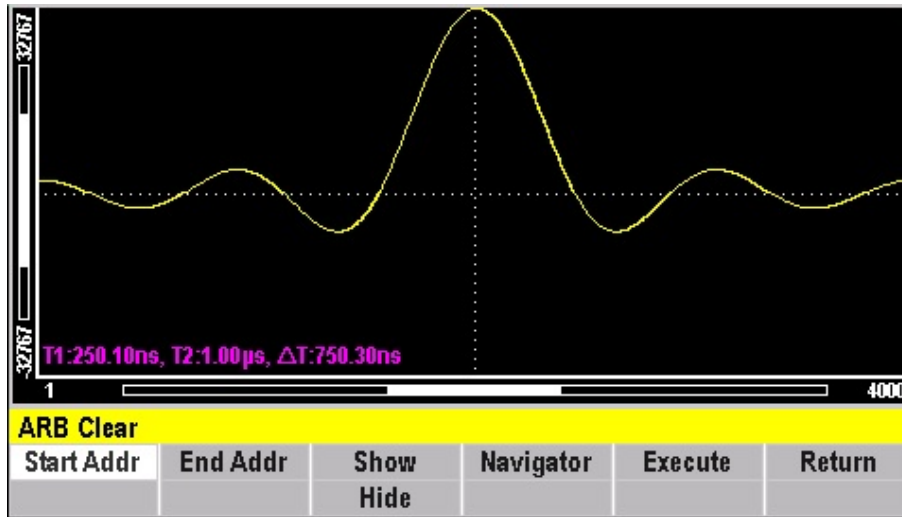
Figure 10.12   ARB Clear Menu

Clear Start Addr

Select the address of the first point in the section to be cleared.

Clear End Addr

Select the address of the last point in the section to be cleared.

Clear Show/Hide

Toggle to show or hide the toolbar displaying the **Start** and **Stop** information.

If **Show** is chosen use the rotary knob to control the transparency of the toolbox.

Navigation

See the **Navigation** section.

Execute

Select to clear the section of the waveform selected using the commands in the **Clear Menu**.

> **Note:**
>
> To clear all of the waveform memory set **Start Addr** to Min and **End Addr** to Max.

Protection

The protection function protects (makes read-only) a section of waveform memory.

Press the WAVE button then use the soft key to select **ARB** > **Edit** > **More** > **Clear**.
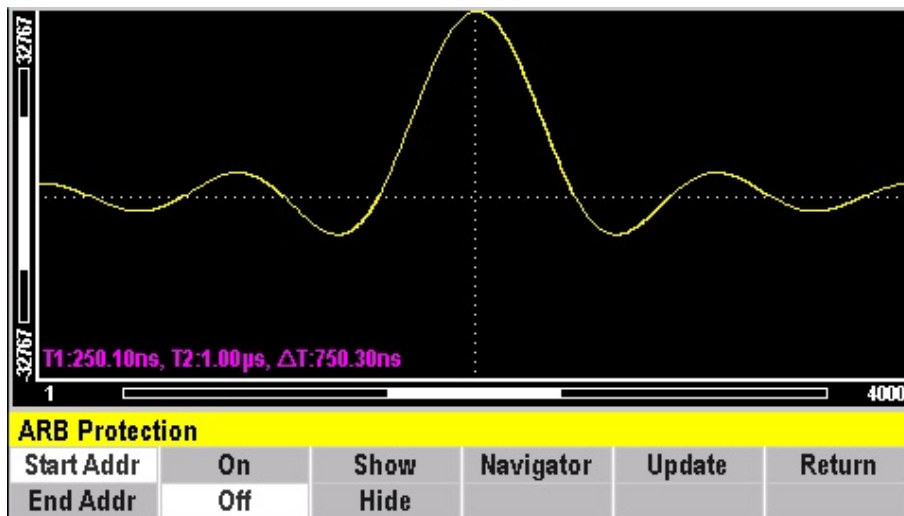
Figure 10.13   ARB Protection Menu

Protection Start Addr

Select the address of the first point in the section to be set to read-only.

Protection End Addr

Select the address of the last point in the section to be set to read-only.

Protection On/Off

Toggle to enable/disable the protection function. Select the unprotect mode to resets memory protection. If the memory protection is reset the whole waveform memory can be written into.

Protection Show/Hide

Toggle to show or hide the toolbar displaying the **Start Addr**, **Stop Addr**, and **Protect** information. If **Show** is chosen use the rotary knob to control the transparency of the toolbox.

Navigation

See the **Navigation** section.

Update

Select to perform the memory protect function (set the selected section to read-only).

Save

Save the waveform edits to either a flash drive or to the internal memory. If the edits are not saved selecting another waveform with the WAVE menu will be displayed the following warning.
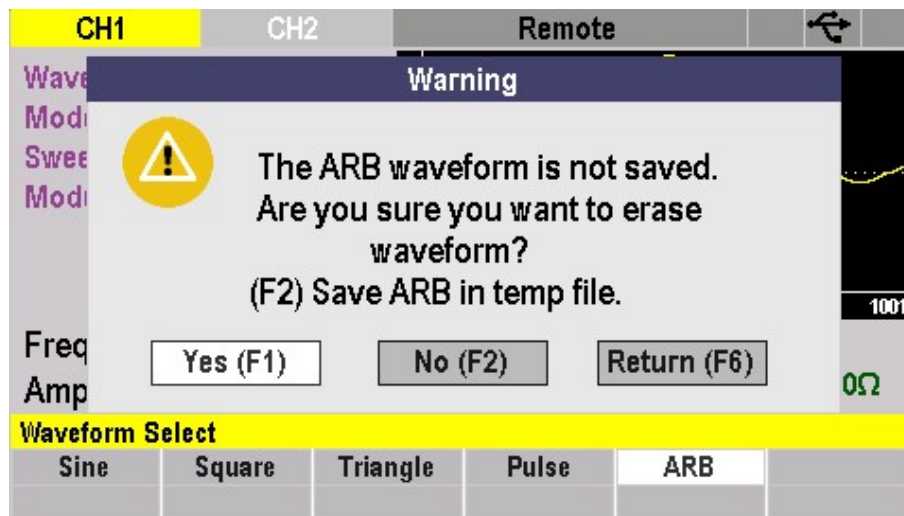
Figure 10.14   ARB Save Warning

The softkey furthest to the left is the **F1** key, and the softkey furthest to the right is the **F6** key.

Load

Load a waveform's edits from either a flash drive or from the internal memory.

MODE Key

Press the **MODE** button to select the output mode.
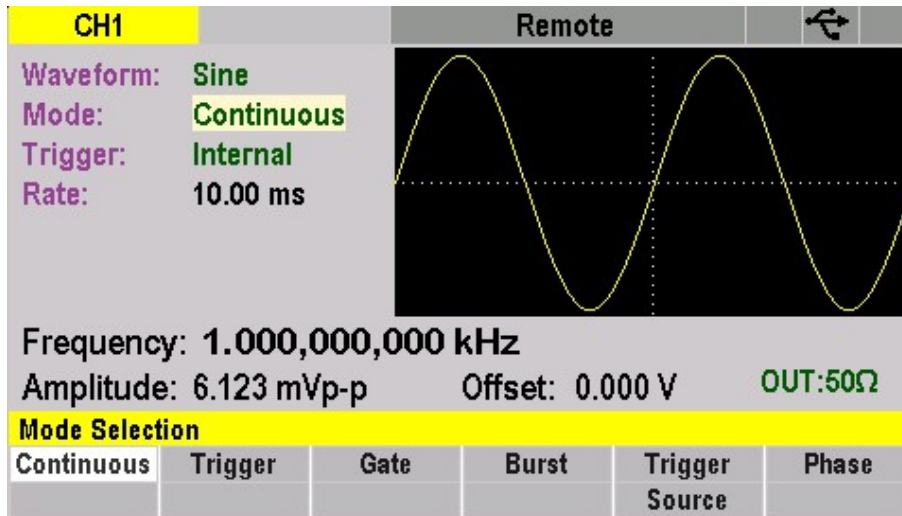
Figure 11.1   Output Modes Menu

Parameter	Description
Continuous	The waveforms output is continuous.
Trigger	Trigger the waveform using the selected **Trigger Source**.
Gate	The waveform output is controlled according to the gate signal level.
Burst	The waveform is output in a specified number of cycles.
Trigger Source	Set the trigger source to either Manual, Internal, or External.
Phase	Save the set parameters of the waveform as a template.

Table 11.1   Output Modes

11.1 Continuous

Press the **MODE** button then use the soft keys to select **Continuous**.

The waveform will continuously be outputted.

11.2 Trigger

In Trigger Mode, the waveform output can be controlled by three different sources. Find more information on these trigger sources the section **Trigger Source**. Press the **MODE** button then use the soft keys to select **Trigger**.

11.3 Gate

Press the **MODE** button then use the soft keys to select **Gate**.

In gated mode, the generator controls the waveform output according to the gate signal level. The menu refers to high as **POS** and low as **NEG**.

When the gated signal is "high", the generator outputs a continuous waveform. When the gated signal is "low", the generator first completes the output of the current period and then stops.

External NEG:
When the gated signal is "high", the generator first completes the output of the current period and then stops. When the gated signal is "low", the generator outputs a continuous waveform

11.4 Burst

The Burst function can generate versatile waveforms. Burst times can last a specific number of waveform cycles. Press the **MODE** button then use the soft keys to select **Burst**.

Triggers a set number cycles for each trigger event. The number of cycles (**N-Count**) can be set from 2 to 999999.

11.5 Trigger Source

Triggers can be controlled in three ways: **Manual**, **Internal Rate**, and **External**.

Manual

Press the [MODE] button then use the soft keys to select **Trigger Source > Manual**.

A burst will be generated from the corresponding channel when the Trigger softkey is pressed when manual trigger is selected.

Internal Rate

Press the [MODE] button then use the soft keys to select **Trigger Source > Internal**.

The generator outputs continuous burst waveform when internal trigger is selected.
Change the internal trigger rate displayed with the rotary input knob or numeric keypad.

External

Press the [MODE] button then use the soft keys to select **Trigger Source > External**.

The generator accepts the trigger signal through the TRIG IN connector at the rear panel when external trigger is selected.

A burst will be generated according to the signal level.

When External Trigger source is selected, an additional menu button **POS / NEG** becomes available to select the level of the external trigger signal. **POS** specifiges a high level for a burts and **NEG**. specifies a low level for a burst.

Sweep Key

In **Sweep Mode**, the generator steps from the start frequency to the stop frequency in the sweep time specified by the user. The waveforms that support sweep include sine, square, and triangle.

To select the **Sweep Mode**: Press the SWEEP button.
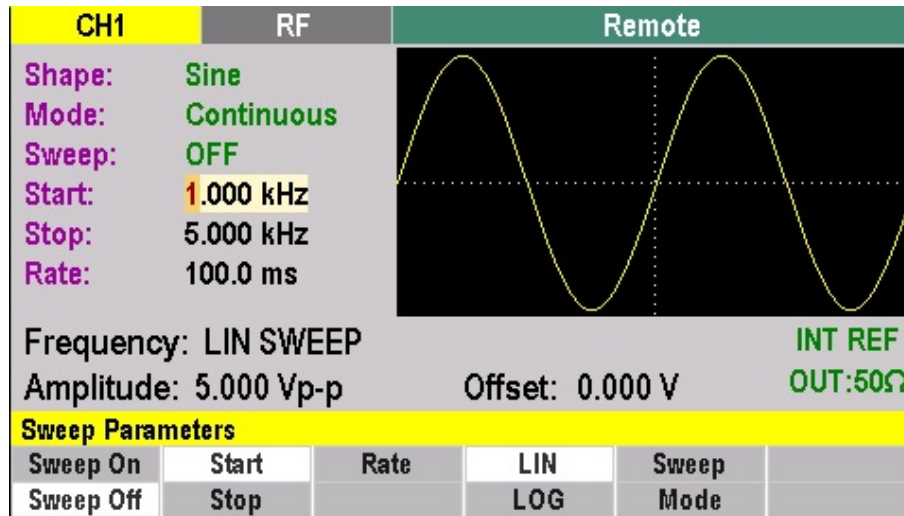
Figure 12.1   Sweep Mode Menu

Parameter	Description	
Sweep On/Off	Toggle to enable/disable sweep mode.	
Start/Stop	Toggle to set the start/stop frequencies.	
Rate	Set the sweep rate.	
LIN/LOG	Set the sweep rate.	
Sweep Mode	Select the sweep mode.	
	Continuous	Set sweep mode to continuous. (default mode)
	Trigger	Set sweep mode to trigger.
	Gate	Set sweep mode to gate.
	Burst	Set sweep mode to burst.
	Trigger Source	Set the trigger source.

Table 12.1   Sweep Parameters

12.1 Sweep On/Off

Press the SWEEP button then use the soft key **Sweep On/Sweep Off** to toggle the sweep function on and off. Sweep is not available for **Pulse** or **ARB** waveforms.

12.2 Start/Stop

1. Press the SWEEP button then use the soft key **Sweep Start/Stop** to toggle between **Start** and **Stop**.

   – The selected parameter will be highlighted in white.

2. Input the desired Start/Stop frequencies.

   – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

12.3 Rate

To set the sweep rate:

1. Press the SWEEP button then use the soft keys to select **Rate**.

2. Input the desired rate.

   – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter's unit.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

12.4 LIN/LOG

To select linear or logarithmic sweep:

Press the SWEEP button then use the soft key **LIN/LOG** to toggle between **LIN** and **LOG**.

– The selected parameter will be highlighted in white.

12.5 Sweep Mode

By default, turning ON the sweep function will automatically set to a continuous sweep.

Once **Sweep** is enabled follow the steps in **Mode Key** to select a sweep mode.

Modul Key

The 4078C/4079C can generate AM, FM, FSK, PWM, PM, and BPSK modulated waveforms. Modulating parameters vary with the types of the modulation.

Press the [MODUL] button to enterh the **Modulation Menu**.
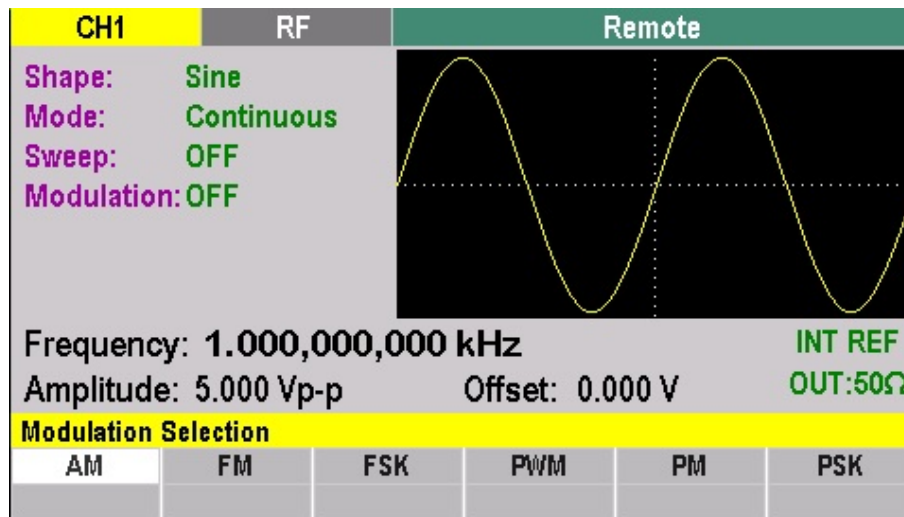
Figure 13.1   Modulation Menu

Setting	Description
AM	The amplitude of the carrier is varied by the instantaneous voltage of the modulating waveform.
FM	The frequency of the carrier is varied by the instantaneous voltage of the modulating waveform
FSK	The frequency is shifted between two preset values.
PWM	The pulse width of the carrier is varied according to the modulating singnal.
PM	The phase of the carrier is varied by the instantaneous voltage of the modulating waveform.
BPSK	The phase of the carrier is varied by the instantaneous logic leavel of the baseband signal.

Table 13.1   Sweep Parameters

The avaliable modulation mode will vary depending on the waveform chosen.

	SINE	SQUARE	TRIANGLE	PULSE	ARBITRATY
AM	YES	YES	YES	YES	YES
FM	YES	YES	YES	NO	NO
FSK	YES	YES	YES	NO	NO
PWM	NO	YES	NO	NO	NO
PM	YES	YES	YES	NO	NO
BPSK	YES	YES	YES	NO	NO

Table 13.2   Modulation Combinations

13.1 AM

The modulated waveform consists of two parts: the carrier and the modulating waveform.
In AM, the amplitude of the carrier varies with the instantaneous voltage of the modulating waveform.

Press the MODUL button then use the soft keys to select **AM**.
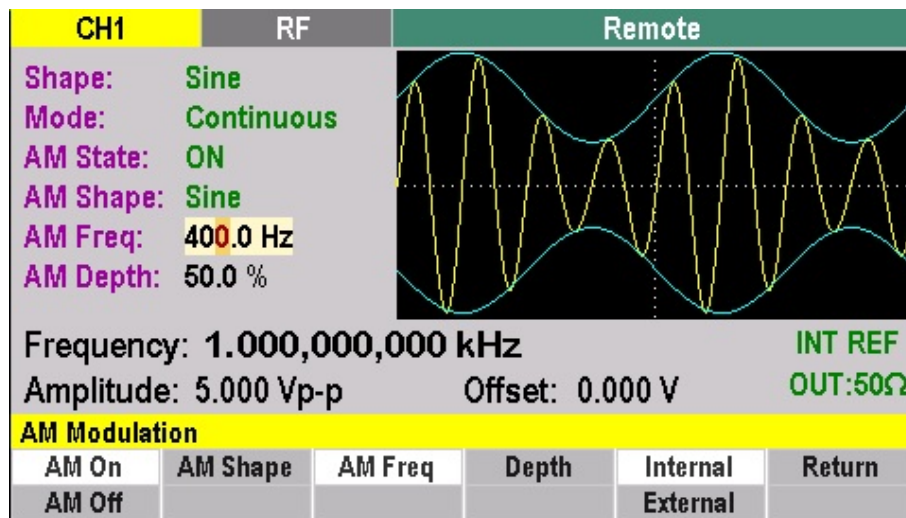
Figure 13.2   AM Menu

AM On/Off

Press the MODUL button then use the soft key **AM On/ AM Off** to toggle the AM waveform on and off.

AM Shape

To select the shape of the modulated wave:

Press the [MODUL] button then use the soft keys to select **AM Shape**.

− Use the corresponding softkey to select the desired shape. (**Sine**, **Square**, and **Triangle**)

AM Frequency

Set the internal modulation frequency, from 0.01 Hz to 20.00 KHz.

1. Press the [MODUL] button then use the soft keys to select **AM Shape**.

2. Enter the desired modulation frequency.

   − Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   − Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Depth

Modulation depth is expressed as a percentage. It indicates the amplitude variation degree. AM modulation depth varies from 1% to 100%.

1. Press the [MODUL] button then use the soft keys to select **AM Shape**.

2. Enter the desired modulation frequency.

   − Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   − Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Internal/External

When internal AM modulation source is selected, press the **Shape** softkey to select Sine, Square, and Triangle as modulating waveform.

When external AM modulation source is selected, the generator accepts external modulating signal from the **Modulation In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the `MODUL` button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

    –   The selected modulation source will be highlighted in white.

13.2 FM

The modulated waveform consists of two parts: the carrier and the modulating waveform.
In FM, the amplitude of the carrier varies with the instantaneous voltage of the modulating waveform.

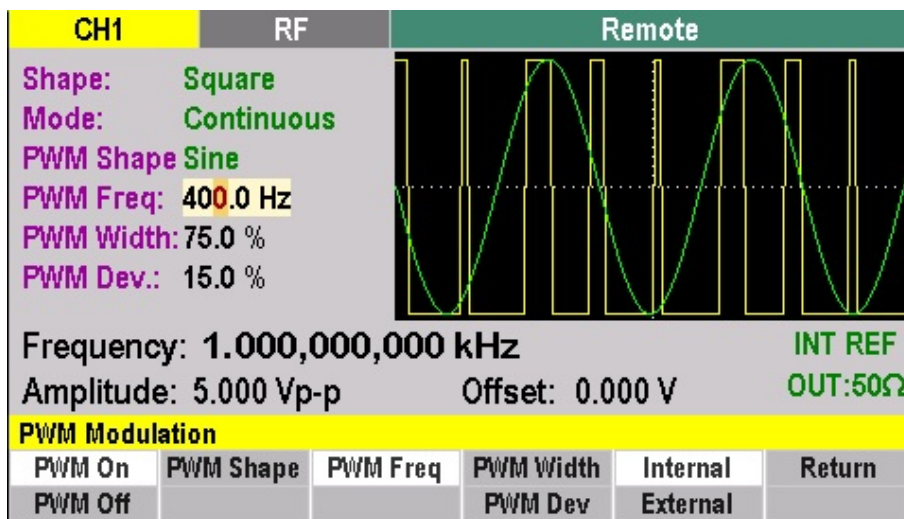Press the `MODUL` button then use the soft keys to select **FM**.
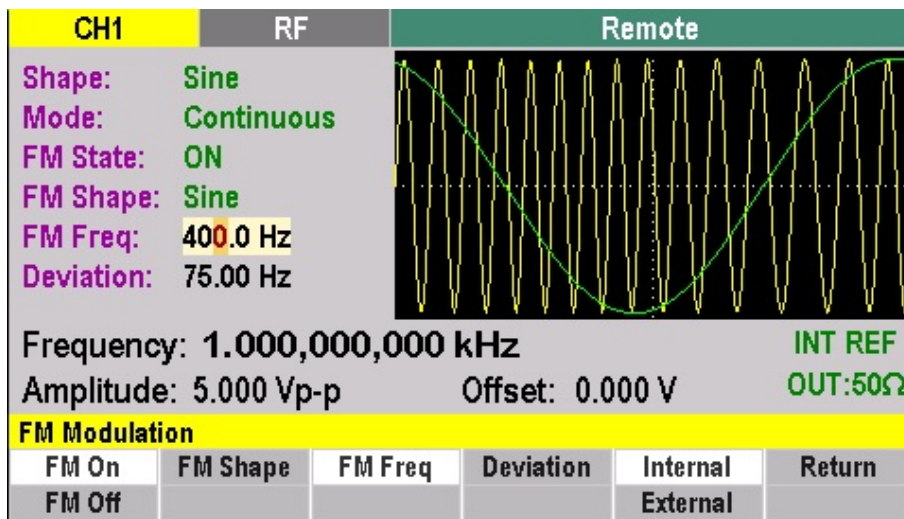
Figure 13.3   FM Menu

FM On/Off

Press the [MODUL] button then use the soft key **FM On/ FM Off** to toggle the FM waveform on and off.

FM Shape

To select the shape of the modulated wave:

Press the [MODUL] button then use the soft keys to select **FM Shape**.

– Use the corresponding softkey to select the desired shape. (**Sine**, **Square**, and **Triangle**)

FM Frequency

Set the internal modulation frequency, from 0.01 Hz to 20.00 KHz.

1. Press the [MODUL] button then use the soft keys to select **FM Shape**.

2. Enter the desired modulation frequency.

   – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Deviation

Modulation depth is expressed as a percentage. It indicates the amplitude variation degree. FM modulation depth varies from 1% to 100%.

1. Press the [MODUL] button then use the soft keys to select **FM Shape**.

2. Enter the desired modulation frequency.

   – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Note:

The maximum deviation is half the maximum frequency.

Internal/External

When internal FM modulation source is selected, press the **Shape** softkey to select Sine, Square, and Triangle as modulating waveform.

When external FM modulation source is selected, the generator accepts external modulating signal from the **Modulation In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the **MODUL** button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

    – The selected modulation source will be highlighted in white.

13.3 FSK

FSK is Frequency Shift Keying, the output frequency of which switches between two preset frequencies (carrier frequency and the hop frequency or sometimes known as mark frequency (1) and space frequency (0)).

Press the **MODUL** button then use the soft keys to select **FSK**.
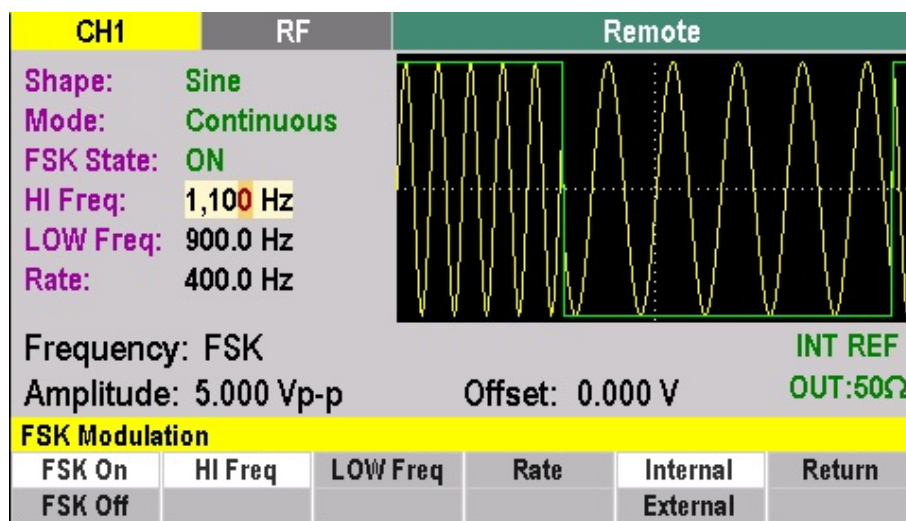
Figure 13.4 FSK Menu

13.3.1 FSK On/Off

Press the **MODUL** button then use the soft key **FSK On/ FSK Off** to toggle the FSK waveform on and off.

13.3.2 HI Freq

To set the high frequency of the FSK. :

Press the **MODUL** button then use the soft keys to select **Hi Freq**.

– Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

– Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

13.3.3 LOW Freq

To set the low frequency of the FSK:

Press the **MODUL** button then use the soft keys to select **LOW Freq**.

– Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

– Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

13.3.4 Rate

Set the rate of the alternation between the low and high frequencies:

Press the **MODUL** button then use the soft keys to select **Rate**.

– Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

– Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

13.3.5 Internal/External

When internal FSK modulation source is selected, press the Shape softkey to select Sine, Square, and Triangle as modulating waveform.

When external FSK modulation source is selected, the generator accepts external modulating signal from the **Modulation In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the [MODUL] button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

   – The selected modulation source will be highlighted in white.

13.4 PWM

PWM is Pulse Width Modulation, the carrier is a pulse waveform used to control the average voltage by turning the switch between the supply and the load on and off.

Press the [MODUL] button then use the soft keys to select **PWM**.

Figure 13.5   PWM Menu

13.4.1 PWM On/Off

Press the **MODUL** button then use the soft key **PWM On/PWM Off** to toggle the PWM waveform on and off.

PWM Shape

To select the shape of the modulated wave:

Press the **MODUL** button then use the soft keys to select **PWM Shape**.

– Use the corresponding softkey to select the desired shape. (**Sine**, **Square**, and **Triangle**)

PWM Frequency

Set the internal modulation frequency, from 0.01 Hz to 20.00 KHz.

1. Press the **MODUL** button then use the soft keys to select **PWM Shape**.

2. Enter the desired modulation frequency.

    – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

    – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

PWM Width/PWM Dev

To set the modulation width and deviation, 0 -100%:

1. Press the **MODUL** button then use the soft keys to select **PWM Width/PWM Dev** to toggle between **PWM Width** and **PWM Dev**.

2. The selected parameter will be highlighted in white.

3. Enter the desired width/deviation.

    – Use the numeric keyboard to input value directly.

    – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

    – The width + deviation is limited to 100%.

Internal/External

When internal PWM modulation source is selected, press the **Shape** softkey to select Sine, Square, and Triangle as modulating waveform.

When external FM modulation source is selected, the generator accepts external modulating signal from the **Modulation In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the **MODUL** button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

   – The selected modulation source will be highlighted in white.

13.5 PM

PM is Phase Modulation, the modulated waveform consists of two parts: the carrier and the modulating waveform. In PM, the phase of the carrier varies with the instantaneous voltage level of the modulating waveform.

Press the **MODUL** button then use the soft keys to select **PM**.
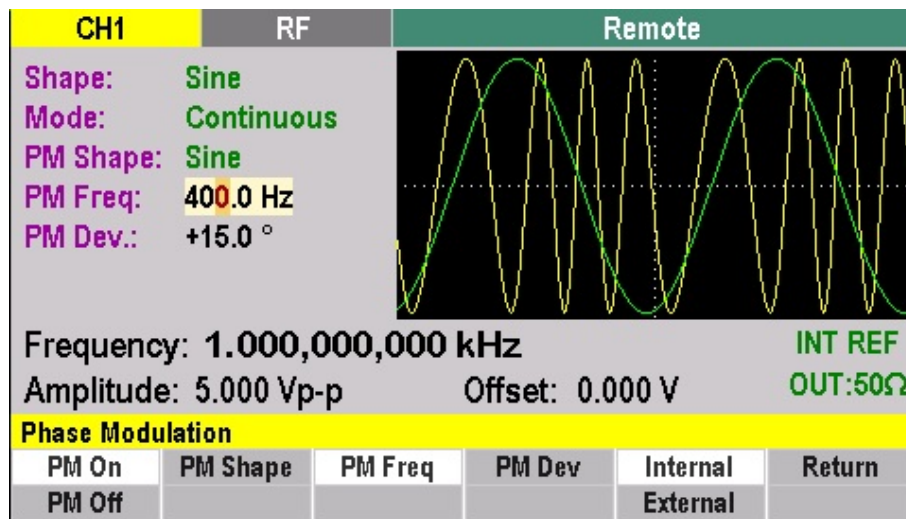
Figure 13.6   PM Menu

13.5.1 PM On/Off

Press the MODUL button then use the soft key **PM On/PM Off** to toggle the PM waveform on and off.

PM Shape

To select the shape of the modulated wave:

Press the MODUL button then use the soft keys to select **PM Shape**.

– Use the corresponding softkey to select the desired shape. (**Sine**, **Square**, and **Triangle**)

PM Frequency

Set the internal modulation frequency, from 0.01 Hz to 20.00 kHz.

1. Press the MODUL button then use the soft keys to select **PM Shape**.

2. Enter the desired modulation frequency.

   – Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

PM Dev

To set the PM deviation, 0 to 360º:

1. Press the MODUL button then use the soft keys to select **PM Dev**.

2. Enter the desired deviation.

   – Use the numeric keyboard to input value directly.

   – Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Internal/External

When internal PM modulation source is selected, press the **Shape** softkey to select Sine, Square, and Triangle as modulating waveform.

When external PM modulation source is selected, the generator accepts external modulating signal from the **Modulation In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the **MODUL** button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

    –   The selected modulation source will be highlighted in white.

13.6 BPSK

BPSK is Binary Phase Shift Keying, the modulated waveform consists of two parts: the carrier and the modulating waveform.

Hi. Phase/Lo. Phase

Press the **MODUL** button then use the soft key **Hi. Phase/Lo. Phase** to toggle between **Hi. Phase** and **Lo. Phase**.

1. The selected parameter will be highlighted in white.

2. Enter the desired Hi. Phase/Lo. Phase 0 to 360º.

    –   Use the numeric keyboard to input value directly.

    –   Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

13.6.1 Rate

Set the rate of the alternation between the low and high frequencies:

Press the **MODUL** button then use the soft keys to select **Rate**.

–   Use the numeric keyboard to input value directly, then press the corresponding softkey to select the parameter unit.

– Or use the arrow keys to select the digit to edit, and then use the knob to change its value.

Internal/External

When external BPSK modulation source is selected, the generator accepts external trigger signal from the **Trig In** connector at the rear panel. At this time, the amplitude of the modulated waveform is controlled by the signal level applied to the connector.

1. Press the button then use the soft keys **Internal/External** to toggle between Internal and **External**.

2. Select the desired modulation source.

   – The selected modulation source will be highlighted in white.

Setups Key

The waveform generator can store the current front-panel settings, called a setup, into one of 50 storage locations.

When you recall a setup, the waveform generator restores the front-panel settings to those that were stored in the selected storage location.

All waveform data except for the waveform memory data is stored in the setup.
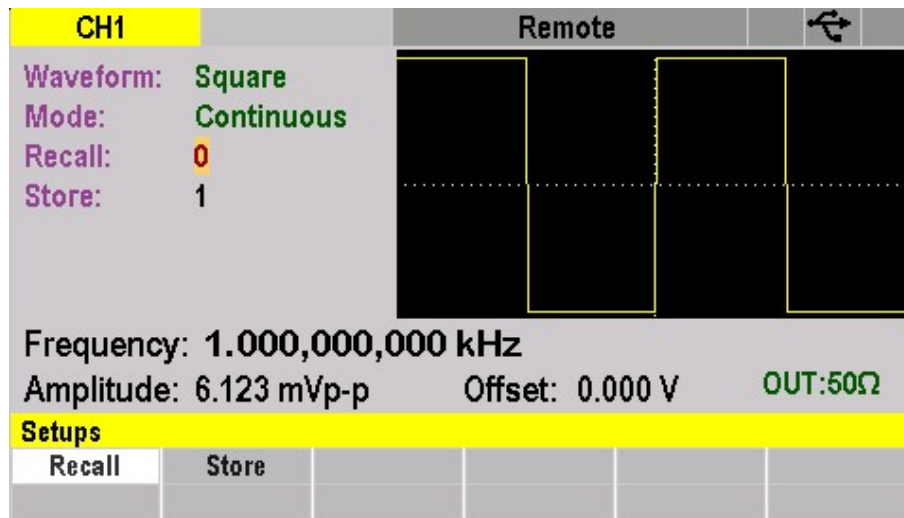
Figure 14.1   Setups Key Menu

14.1 Recall

Press the SETUPS button then use the soft keys to select **Recall**.

Recalls a previously stored front-panel setup from the selected storage location. Change the storage location number by using the rotary input knob. Valid storage location numbers are from 0 to 49. Location 0 is a read-only buffer that contains the power-on settings listed in the **Default** section.

14.2 Store

Press the `SETUPS` button then use the soft keys to select **Store**.

Stores the current front-panel setup to the specified storage location. Change the storage location number by using the numeric keypad or the rotary input knob. Valid storage location numbers range from 1 to 49.
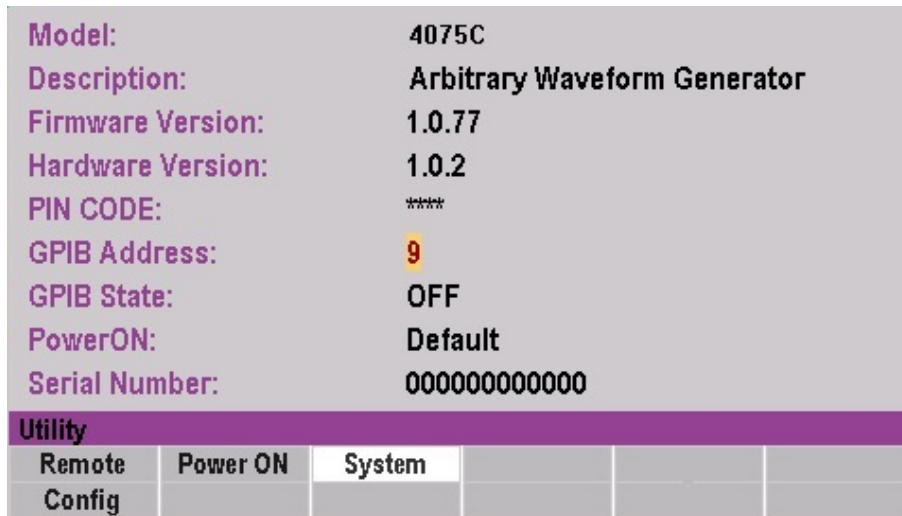
Note:

Storing a waveform generator setup does not store
waveform memory data. To store waveforms memory data:

Press the `WAVE` button then use the soft keys to select **ARB > Edit > More > Load**.

Utility Key

Press the [Utility] button followed by **F1** to enter the Remote Config menu.
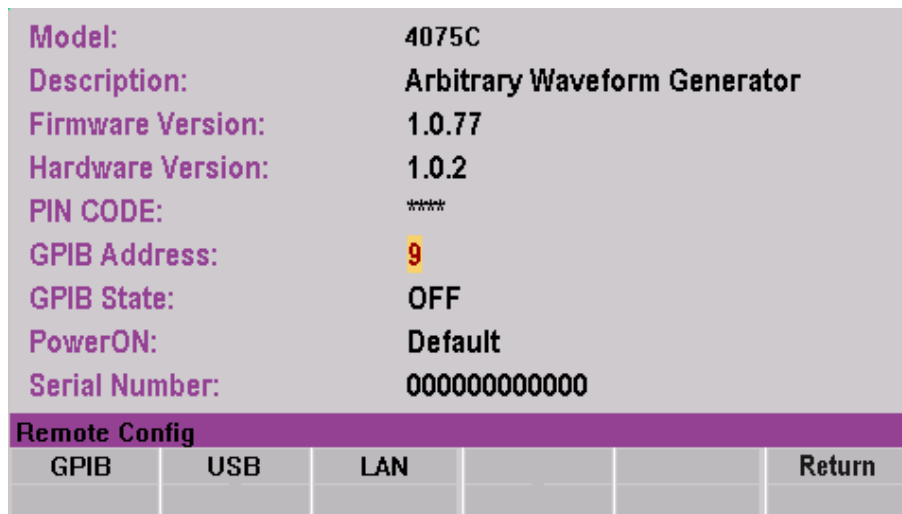
Figure 15.1   Utility Menu

15.1 Remote Configuration

The 4078C/4079C support remote communication on three interfaces: USB, LAN, and GPIB (optional).

Select and configure the following interfaces:

- **USB**

- **LAN**

- **GPIB**

15.1.1 USB Settings

Press the [Utility] button then use the soft key to select **Remote Config › USB**.

The USB remote port is located in the rear-panel. See **1.4**

The 4078C/4079C are USBTMC compliant.

Figure 15.2   USB Details

The VISA Resource string provides the following information:

USB0::‹Vendor ID›::‹Product ID›::‹Serial Number›:INSTR

Example   From figure **15.2** :
    ‹Vendor ID› = 0x3121
    ‹Product ID› = 4078C: 0X1102 (max. 30MHz),4079C: 0X1103 (max, 50MHz)

    ‹Serial Number› = 123456789

	Note:

To communicate with the unit, you must install the USB driver. For Windows® 7, 8, and 10 users, this may install automatically when the instrument is connected.

For other users, visit **bkprecision.com.** to download the driver.

Users who have LabVIEW™ or NI-VISA installed will automatically have this driver in their system. In this case, driver download is not required.

15.1.2 LAN

Press the [Utility] button then use the soft key to select **Remote Config > LAN**.

On the instrument screen in the upper right corner a LAN status indicates whether the LAN connection is good.

To configure the **LAN Settings**:

The following settings are available in **LAN Settings**:

- **IP Address**

- **Gateway IP**

- **Mask**

- **DNS**

- **DHCP On/ DHCP Off**

- **Hostname**

- **Default**

- **LAN Reset**

Figure 15.3   LAN Settings

IP Address

The **IP Address** is a unique string of numbers separated by periods. To enter an IP address:

Press the Utility button then use the soft key to select **Remote Config › LAN › IP**.

Use the numeric keypad to enter an IP address. Then the ◄ ► keys are used to separate each number in the string. After inputting each number press Enter to set the address.

Gateway IP

The gateway address is by default the IP address of the network device that connects the instrument. If **IP Mode** is set to DHCP **Gateway IP** does not have to be set.
To set **Gateway IP** :

Press the Utility button then use the soft key to select **Remote Config › LAN › Gateway**.

Use the numeric keypad to enter an IP address. Then ◄ ► keys are used to separate each number in the string. After inputting each number press Enter to set the address.

Mask

Subnet Mask divides the IP address into network address and host address.
To set **Subnet Mask**:
Press the Utility button then use the soft key to select **Remote Config › LAN › Mask**.

Use the numeric keypad to enter the subnet mask. Then ◄ ► keys are used to separate each number in the string. After inputting each number press Enter to set the address.

DNS

Domain Name Service (DNS) is the system that automatically translates Internet addresses to the numeric machine addresses. The DNS address is the IP address of the system that performs this service.

If **IP Mode** is set to DHCP DNS will automatically be set.
To set the **Primary DNS** :

Press the [Utility] button then use the soft key to select **Remote Config** > **LAN** > **DNS**.

Use the numeric keypad to enter an IP address. Then ◄ ► keys are used to separate each number in the string. After inputting each number press [Enter] to set the address.

DHCP On/ DHCP Off

Select **Dynamic Host Configuration Protocol** (**DHCP On**) or **DHCP Off** to set how the LAN settings will be configured.

Press the [Utility] button then use the soft key to select **Remote Config** > **LAN** > **DHCP On/ DHCP Off**.

The easiest way to configure the LAN settings is to set the IP Mode to **DHCP On**. **DHCP On** will automatically assign an IP address to the instrument.

The settings can manually be configured by selecting **DHCP Off**.

Hostname

Each instrument comes with a fixed hostname. The fixed hostname has the following format:
DNS hostname: BK-4078C-XXXXX (XXXXX indicates the last 5 numbers of Serial Number)

mDNS hostname: BK-4078C-XXXXX.local

DNS hostname: BK-4079C-XXXXX (XXXXX indicates the last 5 numbers of Serial Number)

mDNS hostname: BK-4079C-XXXXX.local

Figure **15.3** shows the example:

<div align="center">

4078CWG

</div>

Restore Default

Restore Default will set all LAN settings to their factory defaults.

To restore factory defaults:

Press the [Utility] button then use the soft key to select **Remote Config > LAN > Default**.

Before restoring LAN settings to default the following warning will display.
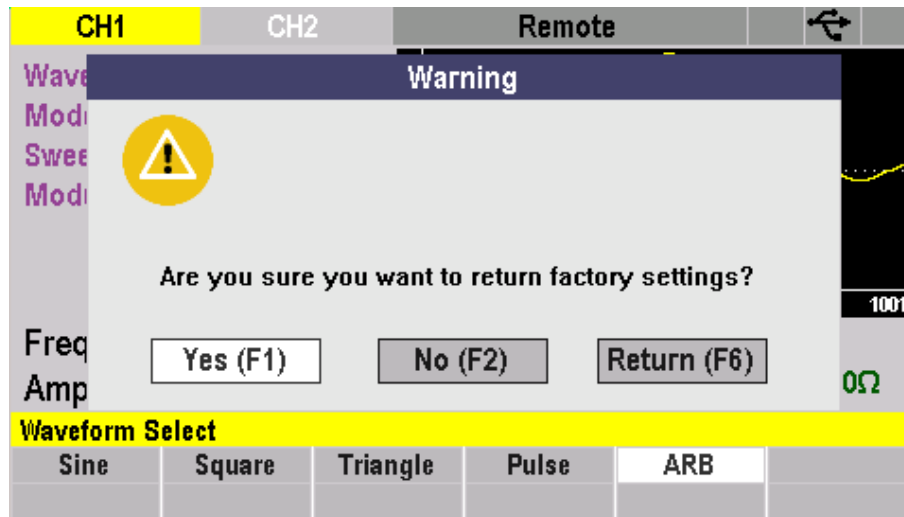

Figure 15.4   Restore Factory Defaults

Select **Yes (F1)** to set to factory default.

LAN Reset

LAN Reset resets all LAN settings and webpage passwords.

To reset LAN :

Press the [Utility] button then use the soft key to select **Remote Config** > **LAN** > **Reset** .

Before resetting a warning will display informing both LAN settings and webpages passwords will be reset.
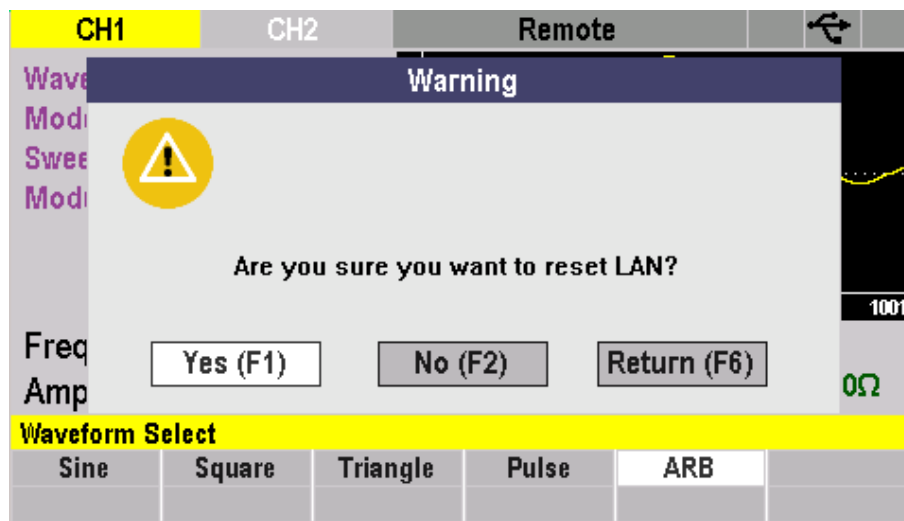

Figure 15.5   Reset

Select **Yes** to finalize the reset.

15.1.1 GPIB

The GPIB address can be set to any value from 1 to 31 using the rotary knob or keypad.
The value is kept in nonvolatile memory and used at power-on. The factory default address is 9.
Setting the address to 31 puts the device in the off-bus state (it will not respond to messages on the GPIB bus).
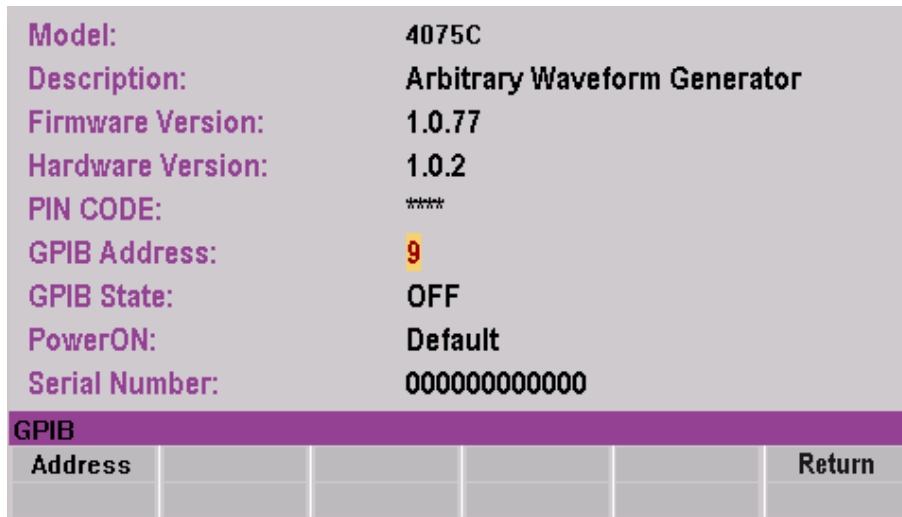

Figure 15.6   GPIB

To configure the **GPIB Settings**: Press the [Utility] button then use the soft key to select **Remote Config** ⟩ **GPIB**.
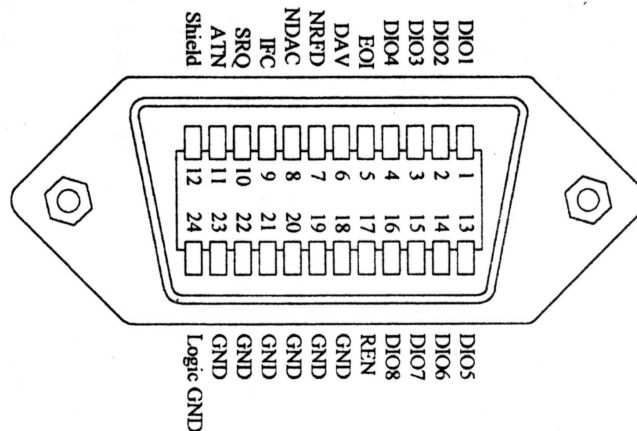

Figure 15.7   Standard GPIB Connector

Note:

GPIB is an optional add-on and will only be available if GPIB is installed in the unit.

The rear panel GPIB connector connects to a standard IEEE-488 bus cable connector. The GPIB line screens are not isolated from chassis and signal ground.

15.2 Power On

Press the [Utility] button then use the soft key to select **Power On**.
Selects the power-on default setting.

- **Default**

- **Location**

- **Last Settings**
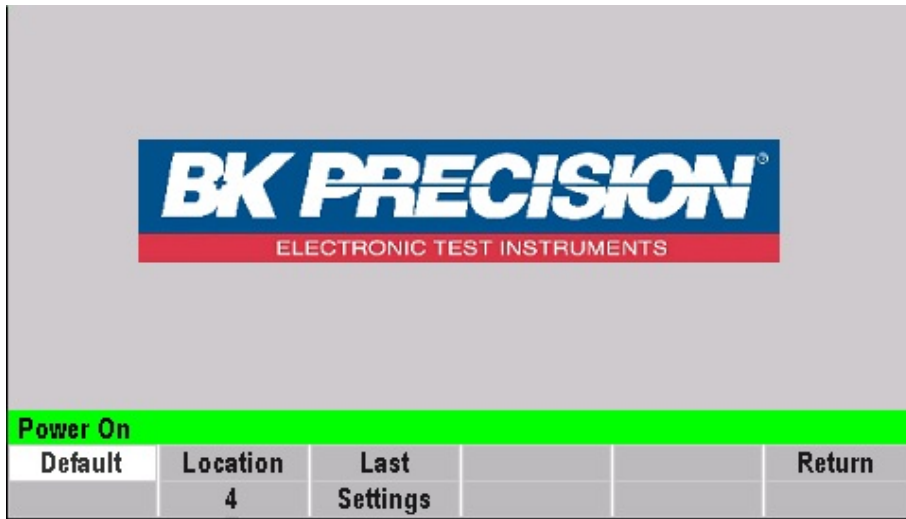
Default

Select **Default** to have the waveform generator power on with the factory default settings.

Press the [Utility] button then use the soft key to select **Power On › Default**.

Waveform Shape	Sine
Frequency	1 KHz
Amplitude	5.00 Vpp
Offset	0.00 Vdc
Phase	0.0 °
Output Impedance	50 Ω

**Table 15.1**   Default Values

Location

Select **Location** to have the waveform generator power on with the stored settings in one of the 50 locations.

Press the [Utility] button then use the soft key to select **Power On › Location**.

–   Use the numeric keypad or the rotary knob to assign an address (1 to 49).

Last Settings

Select **Last Settings** to have the waveform generator power on with the last set settings.

Press the [Utility] button then use the soft key to select **Power On ⟩ Last Settings**.

15.3 System

To enter the System Menu:

Press the [Utility] button then use the soft key to select **System**.

Note:

To enter the sub-menus in the **System Menu** a pass code is needed. The default passcode is **1111**.
The default password can be change in the **Pin Code Change**. If the set code is forgotten contact B&K
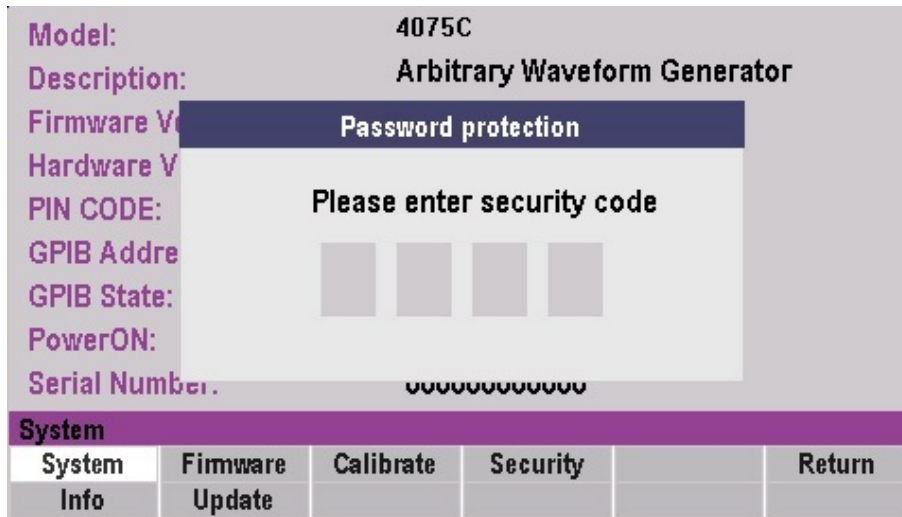Precision customer support.

Figure 15.8   Pass Code

- **System Info**

- **Firmware Update**

- **Calibrate**

- **Security**

Model:	4075C
Description:	Arbitrary Waveform Generator
Firmware Version:	1.0.77
Hardware Version:	1.0.2
PIN CODE:	****
GPIB Address:	9
GPIB State:	OFF
PowerON:	Default
Serial Number:	000000000000

| System | | | | | |
| System Info | Firmware Update | Calibrate | Security | | Return |

15.3.1 System Info

To view the system information:

Press the [Utility] button then use the soft key to select **System**.

The default selection on the System Menu is System Info.
The following information can be viewed here:

⟨Model⟩
⟨Firmware Version⟩
⟨Hardware Version⟩
⟨Pin Code⟩
⟨Power On Location⟩
⟨Serial Number⟩

Refer to image System Menu.

15.3.2 Firmware Update

A **Firmware Update** is available by using a flash drive on the front panel USB connector.

Press the [Utility] button then use the soft key to select **System > Firmware Update**.

– Use the keypad to enter the passcode.

The following screen will appear press any button to proceed.
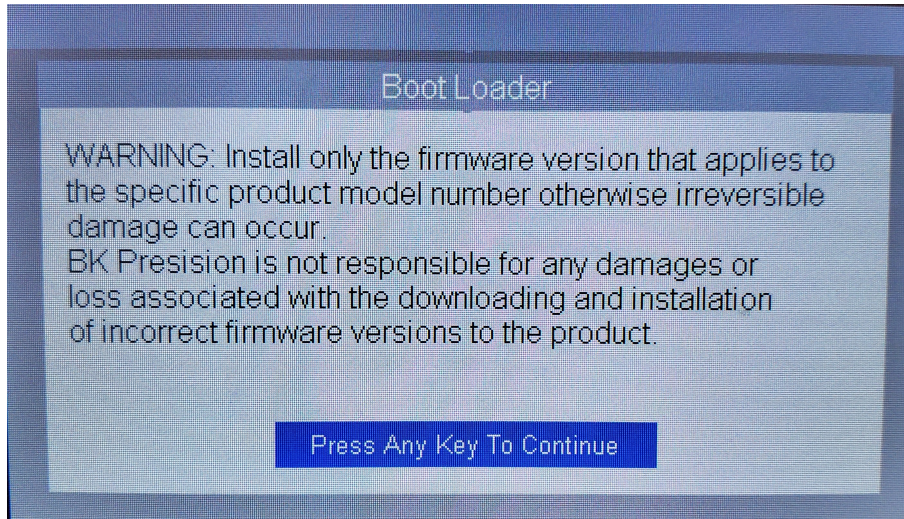
To choose the firmware file press **F1**, or press **F6** to exit the **Firmware Update Menu**.
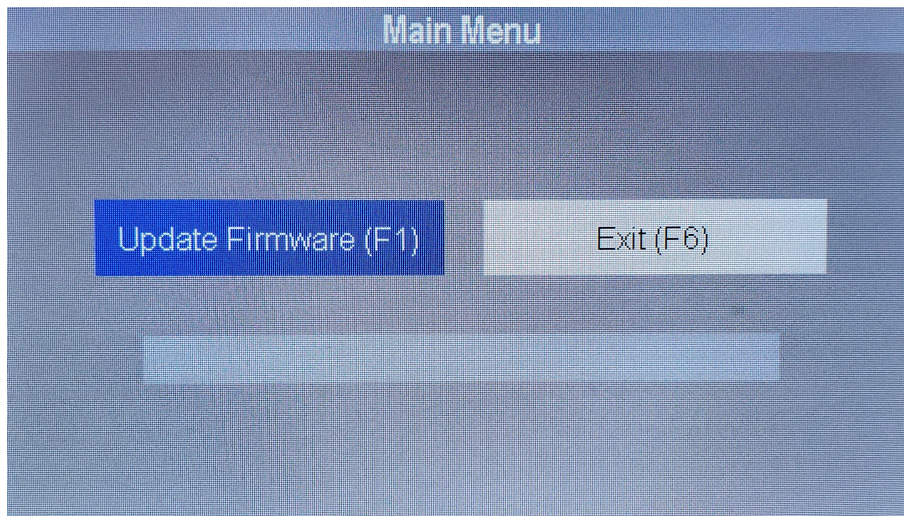
15.3.3 Calibration

The Calibrate menu is intend for use by technical personnel equipped with the required instruments and accessories for unit calibration. Please contact factory for detailed calibration procedures. To enter calibration mode.

Press the [Utility] button then use the soft key to select **System** ⟩ **Calibrate**.

See chapter Calibration Adjustment Procedure to adjust the calibration.

Security

To enter the **Security Menu**:

Press the [Utility] button then use the soft key to select **Security**.

– Use the numeric keypad to enter a four digit passcode. See section **System**.

Pin Code Change

Changes the security code.

Press the [Utility] button then use the softkey to select **Security** ⟩ **Change Code**.

– Use the numeric keypad to enter a four digit passcode **1111**.

Serial Number

Changes the serial number of the unit.

Press the [Utility] button then use the soft key to select **Security** ⟩ **Serial Number**.

– Use the rotary knob to navigate the keyboard displayed on the screen.
   Press the softkey **F1** to select the key highlighted in white one the keyboard.

NISPOM

A **NISPOM** clear function is available that clears all instrument settings, waveform memories and LAN parameters, clear and format the flash memory and file system.

Press the [Utility] button then use the soft key to select **Security** ⟩ **NISPOM**.

– A **Warning** screen will appear to verify that all user settings will be erased.

– Press the softkey **F1** to proceed and erase all settings.

–   Press the softkey **F2** to cancel.

–   Press the softkey **F6** to return to the Security Menu.

System Reset

Select to reset the settings in the **Security Menu** to default.

Press the Utility button then use the soft key to select **Security › System Reset**.

Specification	4079C	4078C
Frequency Characteristics		
Sine	1 uHz – 50 MHz	1 uHz – 30 MHz
Square	1 uHz – 50 MHz	1 uHz – 30 MHz
Ramp	1 uHz - 1 MHz	1 uHz - 1 MHz
Accuracy	2 ppm	2 ppm
Resolution	1uHz	1uHz
Arbitrary Characteristics		
Waveform Length	16 M points / channel	16 M points / channel
Vertical resolution	16 bits	16 bits
Sampling Rate	1uHz-250 MHz, 1uHz resolution	1uHz-250 MHz, 1uHz resolution
Rise and Fall time	6 ns min	6 ns min
Jitter	<40 ps rms	<40 ps rms
Non-volatile Memory	1 GB file system, up to 30 full ~~16M~~ 4M points waves	1 GB file system, up to 30 full ~~16M~~ 4M points waves
Output Characteristics		
Amplitude Range	1 mV-10Vpp into 50 ohm, 2mV-20Vpp into open circuit	1 mV-10Vpp into 50 ohm, 2mV-20Vpp into open circuit
Amplitude resolution	4 digits	4 digits
Amplitude Accuracy	± 1% of setting ± 1mVpp at 1 Khz	± 1% of setting ± 1mVpp at 1 Khz
Amplitude Flatness	± 0.15 dB to 5MHz (ref 1KHz/50 ohm), ±0.3dB to 20 MHz, ±0.4dB to 30MHz, ±1dB to 50MHz	± 0.15 dB to 5MHz (ref 1KHz/50 ohm), ±0.3dB to 20 MHz, ±0.4dB to 30MHz, ±1dB to 50MHz
Offset Range	+/- 5V / 50 ohm	+/- 5V / 50 ohm
Offset Resolution	4 digits	4 digits
Offset Accuracy	±1% of offset setting ± 0.25% of Amplitude setting ±2 mV	±1% of offset setting ± 0.25% of Amplitude setting ±2 mV
Output Impedance	50 ohms	50 ohms
Output Protection	protected for over voltage and overcurrent applied to the output	protected for over voltage and overcurrent applied to the output
Waveform Characteristics		
Sine		
Harmonic Distortions	<-70 dBc to 20KHz, <-50dBc to 10MHz, <-40dBc to 20MHz, <-35dBc to 50MHz	<-70 dBc to 20KHz, <-50dBc to 10MHz, <-40dBc to 20MHz, <-35dBc to 50MHz
THD	<0.04%, 20 Hz-20KHz	<0.04%, 20 Hz-20KHz
Spurious and Non-harmonic	<-70dBc to 1 MHz, increasing +20dB/decade above 1MHz	<-70dBc to 1 MHz, increasing +20dB/decade above 1MHz
Phase noise	-120 dBc/Hz at 10KHz offset	-120 dBc/Hz at 10KHz offset
Square		
Square Rise/Fall	< 5 ns at full amplitude (10Vp-p)	< 5 ns at full amplitude (10Vp-p)
Overshoot	<2%	<2%
Square Duty Cycle	0.01% - 99.99%	0.01% - 99.99%
Square Jitter	<40 ps rms	<40 ps rms
Ramp and Triangle		
Ramp Symmetry	0%-100.0%, 0.1% resolution	0%-100.0%, 0.1% resolution
Ramp Nonlinearity	< 0.05% from 5%-95% of signal amplitude	< 0.05% from 5%-95% of signal amplitude
Pulse		
Width	10 ns min	10 ns min
Rise/Fall	6 ns min, variable	6 ns min, variable
PRBS		
Bit rate	1 mbps to 50 Mbps, 1 mbps resolution	1 mbps to 50 Mbps, 1 mbps resolution
Sequence length	2^n-1	2^n-1
Trigger Modes		

Modes	Continuous, Trigger, Gated, Burst	Continuous, Trigger, Gated, Burst
Source	Internal, External	Internal, External
Internal Rate	1 us – 1000 s	1 us – 1000 s
Burst N	1-100,000,000	1-100,000,000
Phase Start-Stop	0º – 360º, 0.1% resolution	0º – 360º, 0.1% resolution
Modulation Characteristics		
Modes	AM, FM, PM, FSK, BPSK, PWM	AM, FM, PM, FSK, BPSK, PWM
AM depth	0%-100%	0%-100%
FM Deviation	1uHz to 30 MHz	1uHz to 30 MHz
PM Deviation	0 -360 º, 0.1º resolution	0 -360 º, 0.1º resolution
BPSK	0 – 360º , 0.1º resolution	0 – 360º , 0.1º resolution
BPSK Rate	0.001Hz to 1MHz	0.001Hz to 1MHz
FSK Rate	0.001Hz to 1MHz	0.001Hz to 1MHz
PWM Deviation	0%-100%, 0.01% resolution	0%-100%, 0.01% resolution
Internal Modulation	0.01Hz – 50 KHz	0.01Hz – 50 KHz
External Modultion	1 mHz - 100 KHz	1 mHz - 100 KHz
Internal Modulation Waveform	sine, square, ramp, arb	sine, square, ramp, arb
Source	Internal, External	Internal, External
Sweep Characteristics		
Shape	Linear, Log, List	Linear, Log, List
Time	10 ms – 500 s	10 ms – 500 s
Mode	internal, external, continuous or burst	internal, external, continuous or burst
Dual channel characteristics		
Operating	Independent, coupled parameters, combined, equal, differential	Independent, coupled parameters, combined, equal, differential
Coupling	Frequency, Amplitude, Offset	Frequency, Amplitude, Offset
Inputs and Outputs		
Modulation Input	Separate for each channel	Separate for each channel
Trigger Input	Separate for each channel	Separate for each channel
Sync Output	Separate for each channel	Separate for each channel
10 MHz Ref IN/Out	Separate IN and OUT connectors	Separate IN and OUT connectors
General Characteristics		
Display	LCD 4.3'	LCD 4.3'
RTC	Year, Month, Day, Time	Year, Month, Day, Time
USB	USB TMC	USB TMC
LXI	Compliant	Compliant
GPIB	Optional	Optional
USB Host	Yes, File system	Yes, File system
NISPOM	Included	Included

Service Information

Warranty Service: Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging with proof of purchase to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device.

Non-Warranty Service: Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device. Customers not on an open account must include payment in the form of a money order or credit card. For the most current repair charges please refer to the service and support section on our website.

Return all merchandise to B&K Precision Corp. with prepaid shipping. The flat-rate repair charge for Non-Warranty Service does not include return shipping. Return shipping to locations in North America is included for Warranty Service. For overnight shipments and non-North American shipping fees please contact B&K Precision Corp.

Include with the returned instrument your complete return shipping address, contact name, phone number and description of problem.

<div align="center">

B&K Precision Corp.
22820 Savi Ranch Parkway
Yorba Linda, CA 92887
bkprecision.com
714-921-9095

</div>

LIMITED THREE-YEAR WARRANTY

B&K Precision Corp. warrants to the original purchaser that its products and the component parts thereof, will be free from defects in workmanship and materials for a period of **three years** from date of purchase. B&K Precision Corp. will, without charge, repair or replace, at its option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form of a sales receipt.

To help us better serve you, please complete the warranty registration for your new instrument via our website www.bkprecision.com

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. The warranty is void if the serial number is altered, defaced or removed.

B&K Precision Corp. shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitations of incidental or consequential damages. So the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

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Version: June 27, 2023