B&K PRECISION®

Model: 4014B, 4040B

DDS Function Generator

USER MANUAL
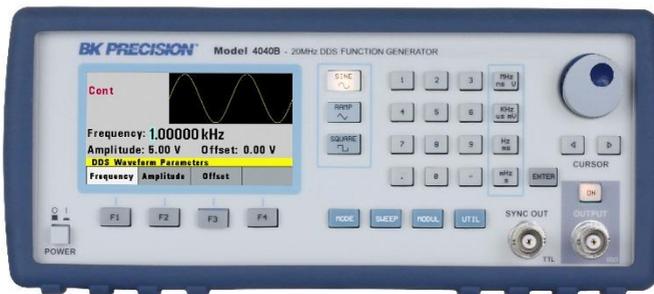
Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and repair of this instrument. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument.

If this device is damaged or something is missing, contact the place of purchase immediately.

This manual contains information and warnings that must be followed to ensure safe operation as well as maintain the meter in a safe condition.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. This instrument is grounded through the ground conductor of the supplied, three-conductor ac power cable. The power cable must be plugged into an approved three-conductor electrical outlet. Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable must meet IEC safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified maintenance

personnel. Disconnect the power cord before removing the instrument covers and replacing components. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

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

DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications to this instrument. Return the instrument to B&K Precision for service and repair to ensure that safety features are maintained.

WARNINGS AND CAUTIONS

WARNING and **CAUTION** statements, such as the following examples, denote a hazard and appear throughout this manual. Follow all instructions contained in these statements.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of part or all of the product.

WARNING: *Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.*

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WARNING: **To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.**

CAUTION: **Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.**

CAUTION: **This product uses components which can be damaged by electro-static discharge (ESD). To avoid damage, be sure to follow proper procedures for handling, storing and transporting parts and subassemblies which contain ESD-sensitive components.**

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

⚠	Refer to the user manual for warning information to avoid hazard or personal injury and prevent damage to instrument.
	Chassis (earth ground) symbol.
	On (Power). This is the In position of the power switch when instrument is ON.
	Off (Power). This is the Out position of the power switch when instrument is OFF.
I	On (Supply). This is the AC mains connect/disconnect switch at the back of the instrument.
○	Off (Supply). This is the AC mains connect/disconnect switch at the back of the instrument.

CE Declaration of Conformity

The function generators meet the requirements of 2006/95/EC Low Voltage Directive and 2004/108/EC Electromagnet Compatibility Directive with the following standards.

Low Voltage Directive
- EN61010-1:2010
  Safety requirements for electrical equipment for measurement, control, and laboratory use-Part 1

EMC Directive
- EN61326-1:2006
- EN61000-3-2 (2006+A2:2009)
- EN61000-3-3 (2008)
- EN61000-4-2 (2009)/-3 (2006+A2:2010)/-4 (2004+A1:2010)/-5 (2006)/-6 (2009)/-11 (2004)

1   Introduction

1.1 Introduction

This manual contains information required to operate the B&K Precision model 4014B and 4040B DDS Function Generators. This section covers the instrument's general description, specifications and characteristics.

1.2 Description

The 4014B and 4040B are versatile high performance function generators. Implemented using a DDS (direct digital synthesis) architecture, these instruments generate stable and precise sine, square, and triangle waveforms. Both models also provide linear and logarithmic sweep for users needing sweep capability. An auxiliary TTL output at the generator's frequency is available to synchronize external devices. The instrument can also be remotely operated via the USB interface and is SCPI compatible.

1.3 Specifications

Model	4014B	4040B
Frequency Characteristics		
Sine	0.01 Hz – 12 MHz	0.01 Hz – 20 MHz
Square	0.01 Hz – 12 MHz	0.01 Hz – 20 MHz
Triangle	0.01 Hz – 1 MHz	0.01 Hz – 2 MHz
Accuracy	0.01% + 0.006 Hz	

Resolution	*6 digits or 10 mHz
Output Characteristics	
Amplitude Range	10 mV$_{p-p}$ to 10 V$_{p-p}$ (into 50 Ω) 20 mV$_{p-p}$ to 20 V$_{p-p}$ (open circuit)
Resolution	3 digits (1000 counts)
Amplitude Accuracy	± 2 % ± 20 mV of programmed output from 1.01 V – 10 V
Flatness	± 0.5 dB to 1 MHz ± 1 dB to 12 MHz	± 0.5 dB to 1 MHz ± 1 dB to 20 MHz
Offset Range	- 4.99 V to 4.99 V (into 50 Ω)
Offset Resolution	10 mV, 3 digits
Offset Accuracy	± 2 % ± 10 mV (into 50 Ω)
Output Impedance	50 Ω ± 2 %
Output Protection	Protected against short circuit or accidental voltage practically available in electronic laboratories, applied to the main output connector
Waveform Characteristics	
**Harmonic Distortion	0 – 1 MHz, < -60 dBc 1 MHz – 5 MHz, < -50 dBc 5 MHz – 12 MHz , < -45 dBc	0 – 1 MHz, < -60 dBc 1 MHz – 5 MHz, < -50 dBc 5 MHz – 12 MHz , < -45 dBc 12 MHz – 20 MHz, < -50 dBc
Square Rise/Fall Time	< 20 ns (10% to 90% at full amplitude into 50 Ω)
Variable Duty Cycle	Square: 20% to 80 %, up to 2 MHz Triangle: 1 % to 99 % in 1% steps, up to 200 kHz
Symmetry Accuracy at 50%	± 1 %
Operating Modes	
Continuous	Output continuous at programmed parameters
Triggered	Output quiescent until triggered by an internal or external trigger, at which time one waveform

		cycle is generated to programmed parameters. Frequency of waveform cycle is limited to 1 MHz.	
Gate	-		Same as triggered mode, except waveform is executed for the duration of the gate signal. The last cycle started is completed.
Burst		-	2 – 65535 cycles
Trigger Source	Trigger source may be internal, external, or manual. Internal trigger rate 0.1 Hz – 1 MHz (1µs – 10 s)		
Modulation Characteristics			
Amplitude Modulation			
Internal	0.1 Hz – 20 kHz sine only		0.1 Hz – 20 kHz sine, square, or triangle waveform
External	5 V_{p-p} for 100% modulation, 10 kΩ input impedance		
Frequency Modulation			
Internal	0.1 Hz – 20 kHz sine only		0.1 Hz – 20 kHz sine, square, or triangle waveform
External	5 V_{p-p} for 100% modulation, 10 kΩ input impedance		
Sweep Characteristics			
Sweep Shape	Linear or Logarithmic, up or down		
Sweep Time	10 ms to 100 s		
Input and Output			
Trigger IN	TTL compatible Maximum rate 1 MHz Minimum width > 50 ns Input impedance 1 kΩ		
Sync OUT	TTL pulse at programmed frequency 50 Ω source impedance		
Modulation IN	5 V_{p-p} for 100% modulation 10 kΩ input impedance		

	DC to > 20 kHz minimum bandwidth	
Counter Characteristics		
Range	50 Hz to 25 MHz	
Resolution	Auto ranging, up to 8 digits	
Accuracy	± 0.02 % ± 2 digits	
Sensitivity	100 mV$_{rms}$ typical	
General		
Memory Storage	Store up to 10 instrument settings	Store up to 20 instrument settings
Power Requirements	100 V – 240 V AC ± 10% (90 V – 264 VAC)	
Max. Power Consumption	< 25 VA	< 30 VA
Operating Temperature	0 °C – 50 °C	
Storage Temperature	-10 °C – 70 °C	
Humidity	95% RH, 0 °C – 30 °C	
Dimensions	213 mm x 88 mm x 210 mm (WxHxD)	
Weight	Approx. 2.5 kg	
Safety Standards	EN55011 for radiated and conducted emissions EN55082 EN61010	

*For square wave, resolution is up to 4 digits when frequency is > 20 kHz.
**For sine wave at 5 V$_{p-p}$ into 50 Ω.

Note: All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 23 °C ± 5 °C. Specifications are subject to change without notice.

To ensure the most current version of this manual, please download the latest version here:
http://www.bkprecision.com/search/4040B

For current up-to-date product information, please visit
www.bkprecision.com

2   Installation

2.1 Introduction

This section contains installation information, power requirements, initial inspection and signal connections for the 4014B and 4040B signal generators.

2.2 Package 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 generator is shipped with the following contents:

- **4014B or 4040B DDS function generator**
- **AC Power Cord**
- **USB (type A to B) interface cable**
- **Certificate of Calibration**

Verify that all items above are included in the shipping container. If anything is missing, please contact B&K Precision.

2.4 Instrument Mounting

The 4014B and 4040B Function Generators are intended for bench use. The instrument includes a front feet tilt mechanism for optimum panel viewing angle. The instrument does not require special cooling when operated within conventional temperature limits. It may be installed in a closed rack or test station if proper air flow can assure removing about 15 W of power dissipation.

2.5 Power Requirements

The function generators can be operated from any source of 90V to 264V AC, frequency from 48Hz to 66Hz. The maximum power consumption is 25 VA(4014B)/30VA(4040B). Use a slow blow fuse of 1A, UL/CSA approved as indicated on the rear panel of the instrument.

   The instrument power fuse is located in the AC input plug. To access the fuse, first disconnect the power cord and then remove the fuse box.

2.6 Fuse Replacement

There is a 1A, 250V rated slow blow fuse at the AC input. Should the fuse ever get blown, follow the steps below to replace:

1. Locate the fuse box next to the AC input connector in the rear panel.
2. With a small flat blade screwdriver, insert into the fuse box slit to pull and slide out the fuse box as indicated below.
3. Check and replace fuse if necessary.

Fuse box

Fuse box slit

Check/Remove Fuse
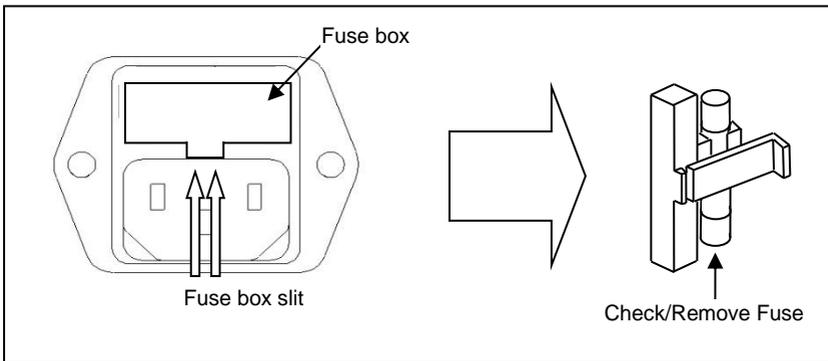
2.7 Grounding Requirements

For the safety of operating personnel, the instrument must be grounded. The central pin on the AC plug grounds the instrument when properly connected to the ground wire and plugged into proper receptacle.

WARNING

TO AVOID PERSONAL INJURY DUE TO SHOCK, THE THIRD WIRE EARTH GROUND MUST BE CONTINUOUS TO THE POWER OUTLET. BEFORE CONNECTION TO THE POWER OUTLET, EXAMINE ALL CABLES AND CONNECTIONS BETWEEN THE UNIT AND THE FACILITY POWER FOR A CONTINUOUS EARTH GROUND PATH.
THE POWER CABLE MUST MEET IEC SAFETY STANDARDS.

2.8 Signal Connections

Use RG58U 50Ω or equivalent coaxial cables for all input and output signals to and from the instrument.

3 Operating Instructions

3.1 General Description

This section describes the displays, controls and connectors of the function generator.
All controls for the instrument local operation are located on the front panel
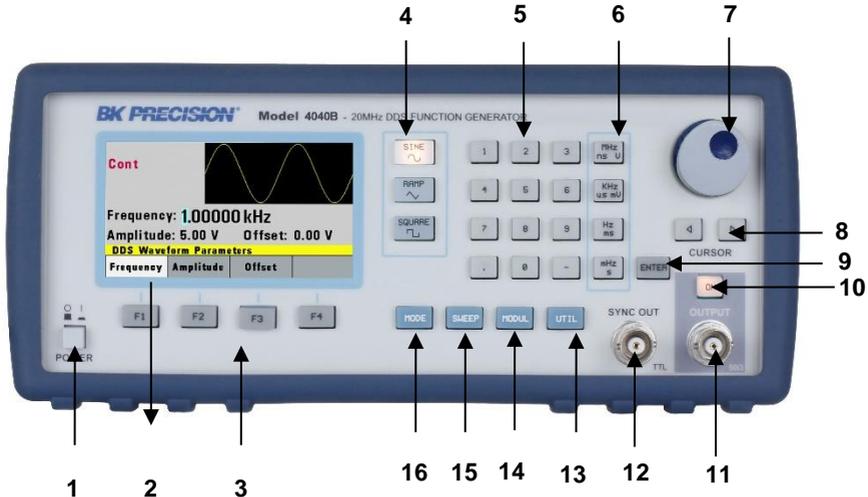
1	**Power Button**	Power ON/OFF unit
2	**LCD Display**	Displays all instrument data and settings
3	**Function Keys**	F1 – F4 function keys to select menu options

4	**Waveform Buttons**	Select Sine, Ramp/Triangle, Square waveform shape
5	**Numeric Keypad**	Enter numeric values for parameters
6	**Units Keys**	Select unit of frequency, time, or voltage
7	**Rotary Knob**	Increment/decrement numerical values or menu selections
8	**Cursor Keys**	Move cursor (when visible) left or right
9	**Enter Key**	Confirm parameter entries
10	**Output ON/OFF**	Enable/Disable Output
11	**Output BNC**	Main output
12	**SYNC OUT BNC**	Sync output
13	**UTIL Button**	Utility menu
14	**MODUL Button**	Selects Modulation menu
15	**SWEEP Button**	Selects Sweep function menu
16	**MODE Button**	Selects Trigger mode menu

3.2 Display Window

The function generator has a color LCD display that can display up to 400 x 240 dots. When powering on the unit, sine waveform is selected and current settings will appear in the display. The bottom of the display shows a menu (selectable with function keys) that corresponds to the function, parameter,

or mode display selected.

3.3 Front Panel Controls

The front-panel controls select, display, and change parameter, function, and mode settings.
Use the numerical keypad, rotary input knob and the cursor movement keys to enter data into the waveform generator.

To change a setting:
 1. Press the key that leads to the item to change.
 2. Move cursor using cursor keys to the appropriate position in the numeric field (if applicable).
 3. Use the rotary input or the numerical keyboard to change the value of the displayed item. Changes take effect immediately.

3.4 Connectors

The function generator has two BNC connectors on the front panel where you can connect coaxial cables. These coaxial cables serve as carrier lines for output signals delivered from the function generator.

Output Connector
Use this connector to transfer the main output signal from the function generator.

Trig In Connector
Use this connector to apply an external trigger or gate signal, depending on the waveform generator setting, to the generator. When the built-in frequency counter is enabled, this connector becomes an input for the counter.

Sync Out Connector
Use this connector to output a positive TTL sync pulse generated at each waveform cycle.

Modulation In Connector
5V p-p signal for 100% modulation, 10Kohms input impedance with DC - >20 KHz bandwidth.

3.5 Output Connections

The waveform generator output circuits operate as a 50 Ω voltage source working into a 50 Ω load. At higher frequencies, non terminated or improperly terminated output causes aberrations on the output waveform. In addition, loads less than 50 Ω reduce the waveform amplitude, while loads more than 50 Ω 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:
1. Use good quality 50 Ω coaxial cable and connectors.
2. Make all connections tight and as short as possible.
3. Use good quality attenuators if it is necessary to reduce waveform amplitudes applied to sensitive circuits.
4. Use termination or impedance-matching devices to avoid reflections.
5. 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.

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.

3.6 MENU Keys

These keys select the main menus for displaying or changing a parameter, function, or mode.

3.6.1   WAVEFORM Keys

These keys select the waveform output and display the waveform parameter menu (frequency, amplitude and offset).
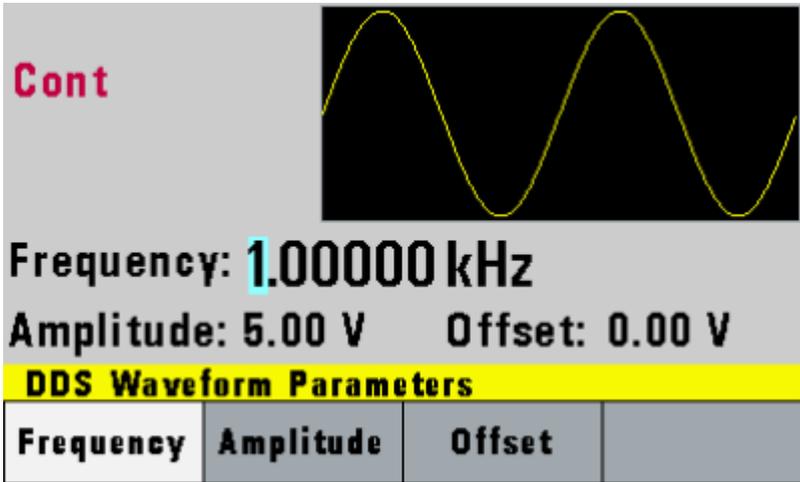
Sine Menu

F1: Frequency – Selects and displays the frequency. Change the frequency setting using the cursor keys, rotary knob, or numerical keys.

F2: Amplitude – Selects and displays the amplitude. Change the amplitude setting using the cursor keys, rotary knob, or numerical keys.

F3: Offset – Selects and displays the offset parameter. Change the offset by using the cursor keys, rotary knob, or numerical keys. If a certain setting cannot be produced, the waveform generator will display a "**Setting Conflict**" message.

Amplitude and offset settings interact and are bound by hardware restrictions. To obtain the desired waveform, the amplitude and offset must satisfy the following formula:

25

$(Vp-p)/2 + |offset| <= 5$ volts

F4: Symmetry – When the Square or Triangle waveforms are selected, the SYMMETRY (duty cycle) parameter is available. Change the symmetry (Triangle) or duty cycle (Square) by using the cursor keys, rotary knob, or numerical keys. If a certain setting cannot be produced, the waveform generator will display a warning message.
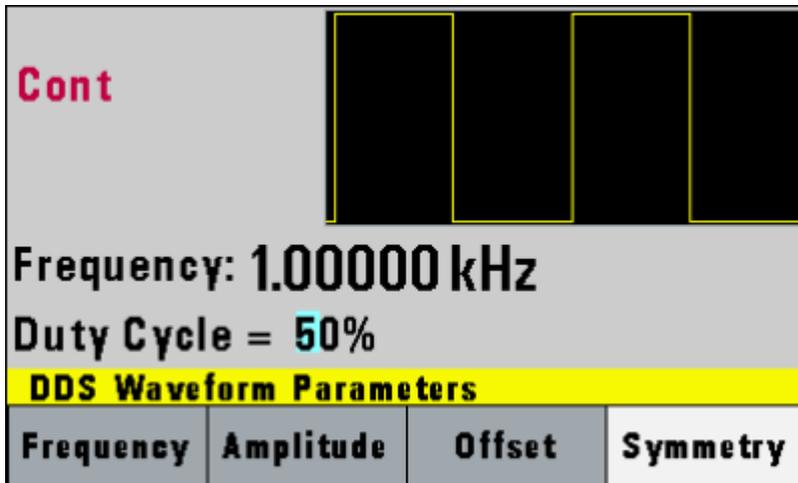
Square Menu

3.6.2   MODE Key

Selects the output mode: CONT (Continuous), TRIG (Triggered), GATE (Gated), and BRST (Burst).

To select the output mode, press MODE, then press the function key that corresponds to the desired Mode menu option, as shown:
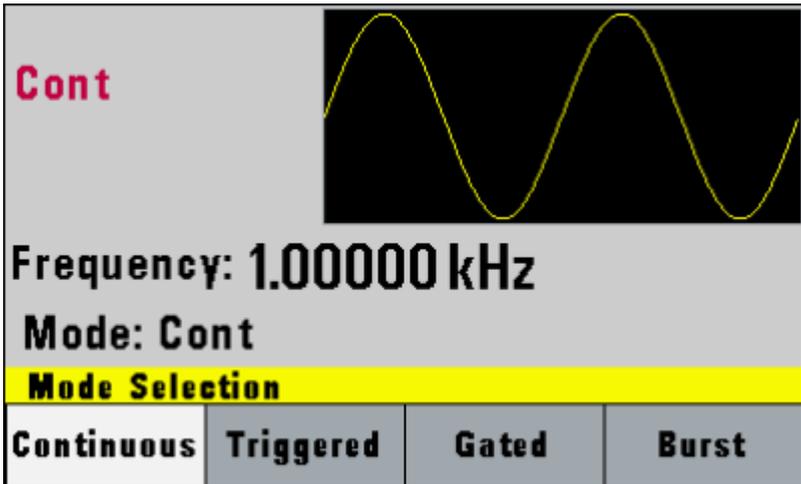
Mode Menu

F1: Continuous – Selects continuous output.

F2: Triggered – Triggers one output cycle of the selected waveform for each trigger event.

F3: Gated – Triggers output cycles as long as the trigger source asserts the gate signal.

F4: Burst – Triggers 'N' number of output cycles for each trigger event, where N ranges from 2 to 65,535.

Note: Gate and Burst modes are not available on 4014B.

After selecting the TRIGGERED, GATED, or BURST menu, the trigger source menu is available:
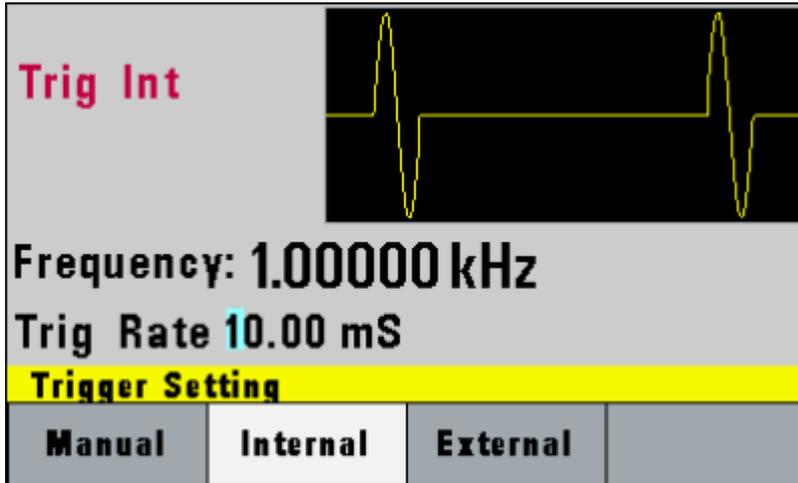
Trigger Menu

F1: Manual – Selects manual as the trigger source. To trigger the waveform generator,
press this MANUAL trigger button again.

F2: Internal – Selects the internal trigger generator as the trigger source. Change the
internal trigger rate displayed with the rotary input knob.

F3: External – Selects the external trigger signal as the trigger source. The trigger source
is supplied through the TRIG IN connector.

In BURST MODE, the **F4** key displays **N-Burst**, representing the number of burst cycles to output with

each trigger. The **N** value can be changed from 2 to 65,535.

Burst Int

Frequency: 1.00000 kHz

Burst Internal N= 2

Trigger Setting

| **Manual** | **Internal** | **External** | **N-Burst** |

Burst Menu

3.6.3 UTILITY Key

Burst Int
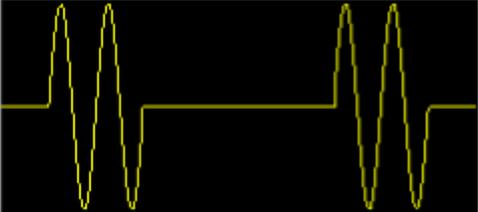
Frequency: 1.00000 kHz

Recall 0 Defaults

Utilities Menu

| **Recall** | **Store** | **Out-On Def** | **COUNTER** |

F1: Recall – Recalls a previously stored front-panel setup from the selected buffer. Change the buffer number by using the rotary input knob. Valid storage buffer numbers are from:
4014B: 1 to 9
4040B: 1 to 19
Buffer 0 is the factory default setup.

F2: Store – Stores the current front-panel setup to the specified storage buffer. Change the buffer number by using the data keys or the rotary input knob. Valid storage buffer numbers range from:
4014B: 1 to 9
4040B: 1 to 19

F3: Out-On Def – Selects the OUTPUT state on power-up. Select **ON** to enable or **OFF** to disable the output on power-up.

F4: COUNTER – Enables the built-in frequency counter. The frequency of the signal connected to the **TRIG IN** connector will be displayed. The counter is auto ranging with up to 8 digits of resolution.

Counter: 0 Hz

off

Counter Screen

Press **F1** - **Off** to turn off the counter.

3.6.4 SWEEP Key

Selects the Sweep Mode and allows entering of sweep parameters: Sweep Start, Sweep Stop, and Sweep Rate. To select the sweep mode, press SWEEP, then press the function key that corresponds to the desired Sweep menu option, as shown:

Cont

Frequency: Lin Sweep

Amplitude: 5.00 V   **Offset:** 0.00 V

Sweep Selection

| Off | Linear | Logarithmic | Set |
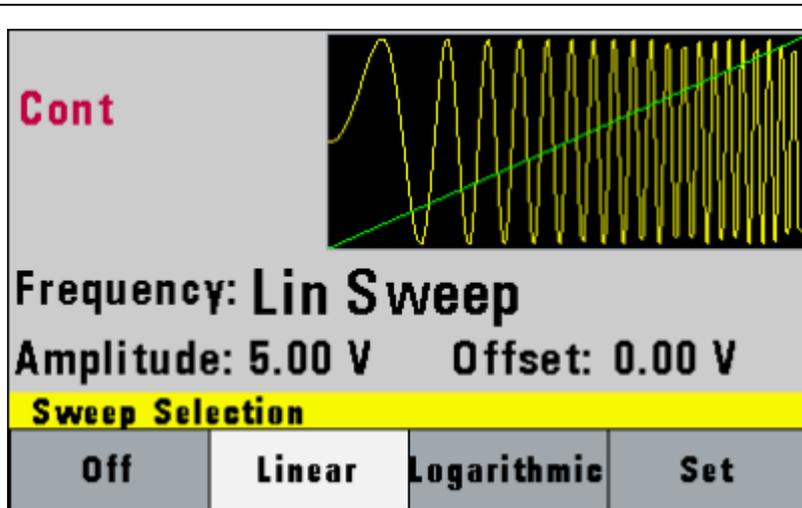
Sweep Menu

F1: Off – Disables the sweep function.

F2: Linear – Selects the Linear sweep shape.

F3: Logarithmic – Selects the Logarithmic sweep shape.

F4: Set – Defines the Sweep Start and Stop frequencies.
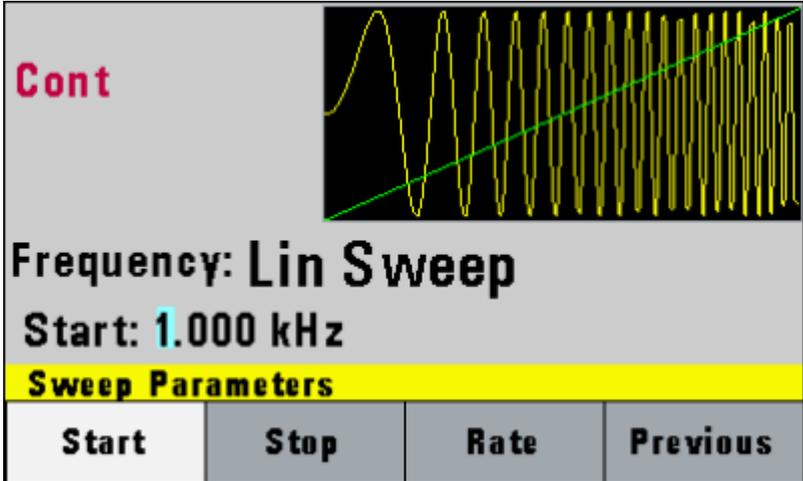
Set Sweep Menu

3.6.5 MODULATION Key

Selects the AM or FM Modulation mode. To select the output mode, press MODUL key, then press the function key that corresponds to the desired menu option, as shown:
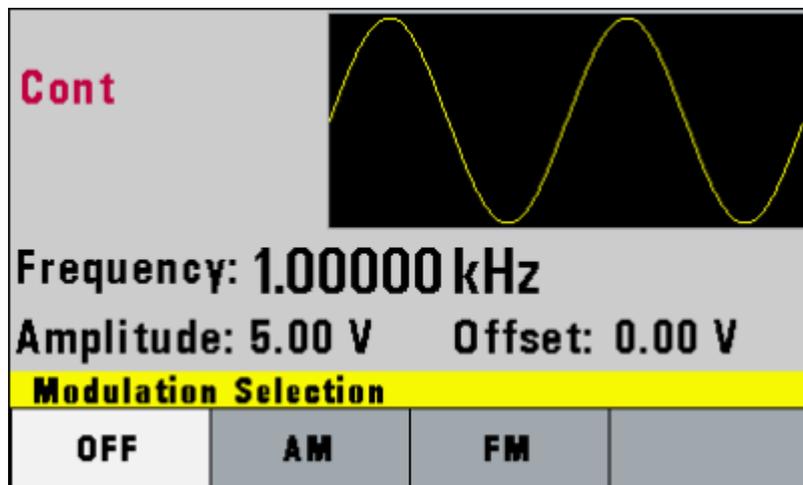
Modulation Menu

Press **F2** to select **AM** menu:
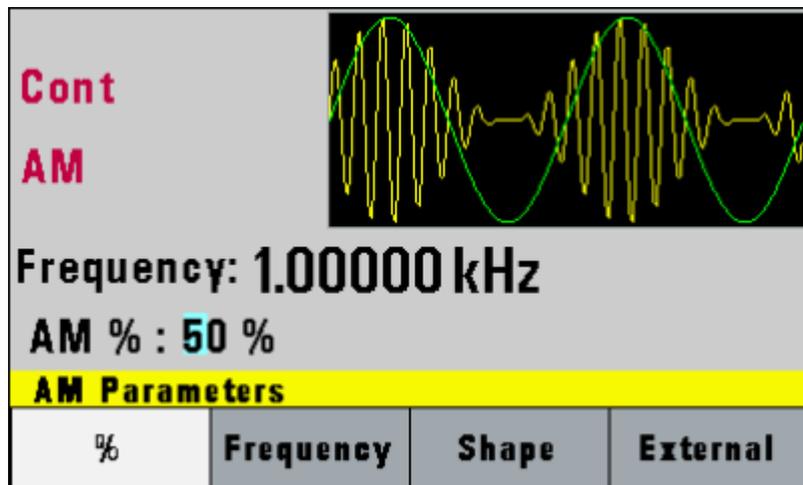
AM Menu

F1: % - Defines the modulation depth (from 0 to 100%)

F2: Frequency - Selects the modulation frequency, from 0.1 Hz to 20.00 kHz.

F3: Shape - Selects the modulating waveform between Sine, Square, or Triangle. For model 4014B, only Sine is available.

F4: External - Selects and enables the external modulation by an external signal applied to the Modulation In connector in the rear panel.

Press **F3** to select **FM** menu:
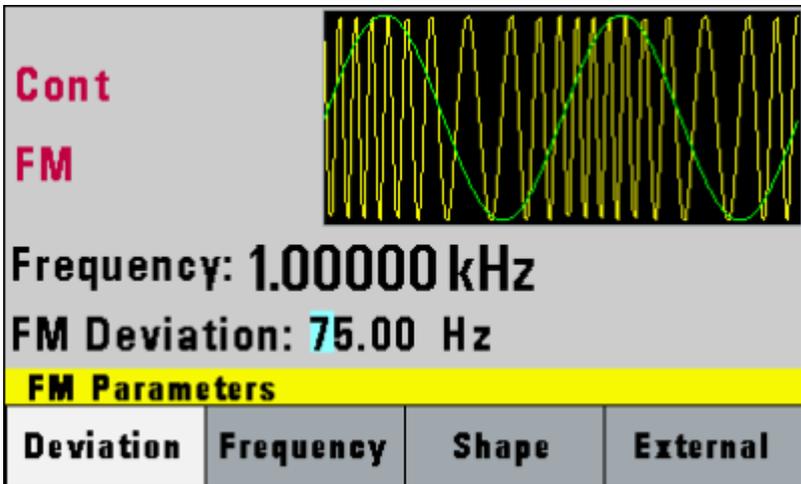
FM Menu

F1: Deviation - Defines the FM deviation frequency.

F2: Frequency - Selects the modulation frequency, from 0.1 Hz to 20.00 kHz.

F3: Shape - Selects the shape of the modulating waveform between Sine, Triangle, or Square. For model 4014B, only Sine is available.

F4: External - Selects and enables the external modulation by an external signal applied to the Modulation In connector in the rear panel.

3.7 ON Key

Use this key to control the main output signal. When the output is active, the **ON** key will be lit. By default, this will be ON (enabled) from a power-up. This can be changed by changing the **Out-On Def** settings from the **UTILITY** menu.

3.8 Cursor Keys

Use these keys to move the cursor (when visible) either left or right. They are used in conjunction with the rotary input knob to set the step size of the rotary input knob.

3.9 Rotary Input Knob

Use this knob to increase and decrease numeric values. The cursor indicates the low-order position of the displayed value which changes when you rotate the knob (for straight numeric entries only). For other types of data, the whole value changes when you rotate the knob.

3.10 Power-On Settings

At power-on, the waveform generator performs a diagnostic self-test procedure to check itself for errors. If an error is found, 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 Error Indication section.
When the waveform generator finishes the diagnostic self-test routine, it enters the local state (LOGS) and assumes power-on default settings. Table 1 lists the factory default settings or selected after RECALL 0.

Table 1 – Power-on Default Settings

Key Function	Value	Description
Function	Sine	Output Waveform
Frequency	1.0000 kHz	Waveform Frequency
Amplitude	5.00 V	Peak-to-peak output amplitude
Offset	0.00 V	Zero DC offset
Output	OFF	Output disabled
Sweep	OFF	Sweep function disabled
Modulation	OFF	Modulation function disabled
N-BURST	2	Wave per burst for burst mode
Trig Source	Continuous	Continuous trigger
Trig Rate	10 ms	Internal trigger rate

3.11 Memory

The waveform generator uses non-volatile flash memory for storing the front panel settings.
4014B: Up to 10 front panel settings can be stored (includes storage location 0 for factory default settings).
4040B: Up to 20 front panel settings can be stored (includes storage location 0 for factory default settings).

3.12 Displaying Errors

The waveform generator displays error messages when front-panel settings are either invalid or may produce unexpected results.

Table 2 – Error Messages

Message Text	Description
Out of range	The set value is out of the instrument's limits.
Setting conflict	Settings conflict with another parameter setting or value.
Empty location	Attempt to recall settings from an empty storage location.
Trig rate short	Internal trigger rate is too short to output waveform or burst.
Save RAM	New firmware installed.

3.13 Quick Start

This section explains how to generate various waveforms and modify the output waveform.

* Generating a waveform output
* Modifying waveform output
* Storing and recalling a waveform generator setup

3.13.1   Selecting a Standard Waveform

You can select several standard waveforms as: sine, triangle, square. Creating a standard waveform requires selecting the waveform type, parameters and their settings that define the waveform.

Generating a standard waveform requires the following:

* Selecting the waveform
* Setting the output frequency
* Setting the output amplitude and offset

3.13.2   Setting the Output

To set the output channel, press the Output **ON** key. The key will lit indicating the output is enabled.

3.13.3   Using Voltage Offset

Through the offset parameter you can add a positive or negative DC level to the output waveform.

To set voltage offset:
1. Select a waveform to display its menu.
2. Press F3:Offset to display the offset setting.
3. Use the rotary input knob or the numerical keys to set the voltage offset.

To turn the voltage offset OFF, repeat the steps above, but set the offset voltage level to 0.

3.13.4   Storing and Recalling a Waveform Generator Setup

You can store front-panel setups inside the internal non-volatile flash memory. When you recall a stored setup, the front-panel settings change to match the settings in the stored setup.

Storing Setups

To store the front-panel setup:

1. Press UTILITY to display the menu.
2. Press F2:Store to select the Store mode.
3. Use the rotary input knob to select a buffer number. Valid buffer numbers range from 1 to 9 (4014B) or 1 to 19 (4040B).

Buffer 0 is a read-only buffer that contains the default setup/power-on settings from Table 1.

The function generator will overwrite and store settings into a buffer that had settings previously stored inside without a warning.

Recalling Setups

To recall stored front-panel setup:

1. Press UTILITY to display the menu.
2. Press F1:Recall to select the Recall mode.
3. Use the rotary input knob to select a buffer number. Valid buffers numbers range from 0 to 9 (4014B) or 0 to 19 (4040B). Buffer 0 is a read-only buffer that contains the default power-on setup.

4 Programming

4.1 Overview

This section provides detailed information on programming the generator via the USB (virtual COM) interface.

4.1.1 Connecting to USB (Virtual COM) Interface

Currently, the USB (virtual COM) interface supports Windows® XP/7 operating systems.

To connect to a PC for remote communication, please follow the steps below:

For Windows 7:
1. The USB driver is included in the CD that comes with the instrument. You can also go to www.bkprecision.com and browse this product's page to find and download the USB driver.
2. Connect the included USB Type A to Type B cable to the generator and the computer, then power on the instrument.
3. On most operating systems, it will attempt to automatically install, showing the following screen:

Driver Software Installation

Installing device driver software

AT91USBSerial   Searching Windows Update...

Obtaining device driver software from Windows Update might take a while.
Skip obtaining driver software from Windows Update
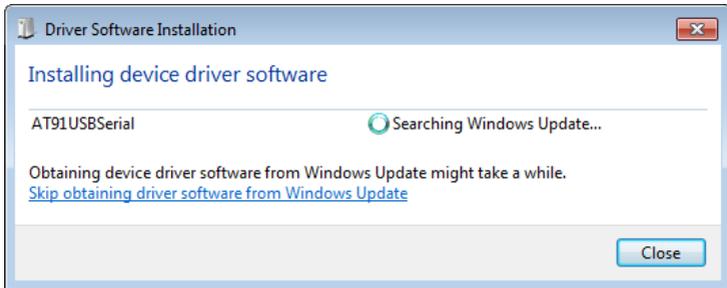
Close

4. Click the "Close" button to stop the automatic search of the driver from Windows Update.
5. Now, go to **Device Manager** on the computer (Open up the "start" button, and right-click "Computer" and select "Properties". Click "Device Manager" link on the top left of the side menu)
6. There will be an item listed under "Other devices" labeled "AT91USBSerial". Right-click the item and select "Update Driver Software…"
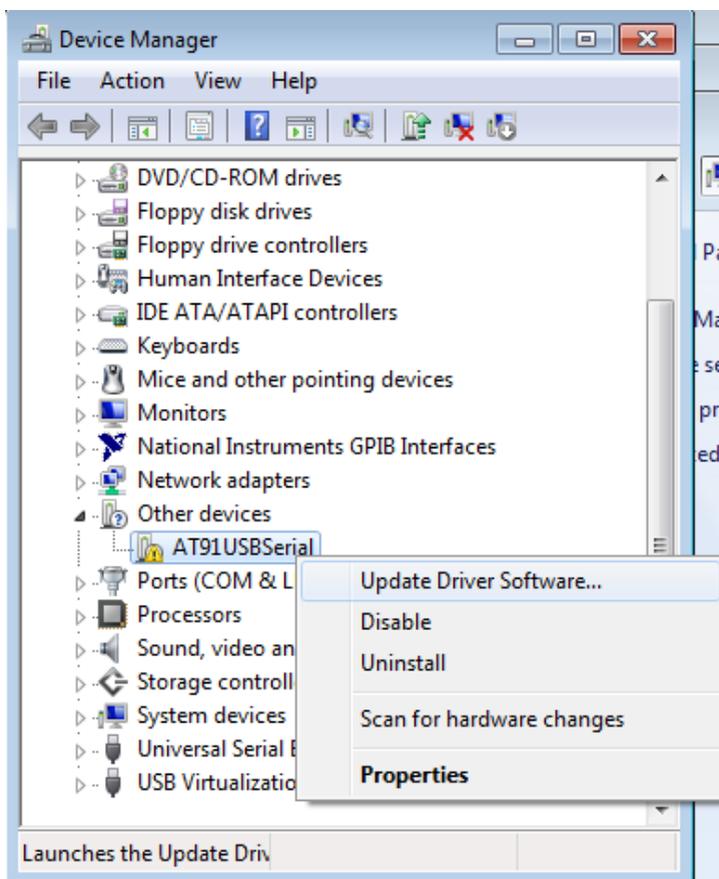
7. In the following window, select "Browse my computer for driver software", and following this, select "Let me pick from a list of device drivers on my computer".
8. Now there will be a window listing Common hardware types. Click the "Next" button and select on the following screen "Have Disk…"
9. From the "Install From Disk" window, click "Browse…" and locate and double-click the USB driver file

downloaded from the website labeled "atm6124_cdc.inf".

10. Now click "OK". It will show in the window under Model "AT91 USB to Serial Converter". Click "Next" and you will get the following note:
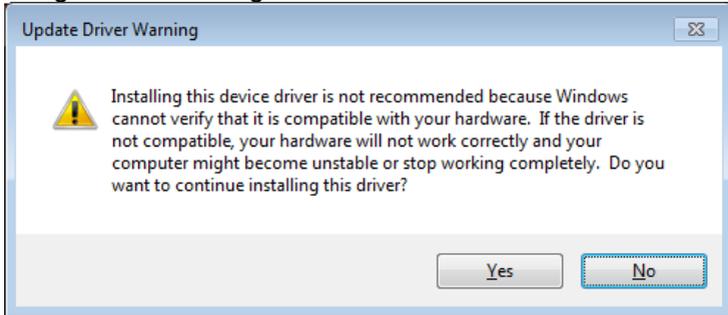
11. Go ahead and click "Yes". When you get the following prompt, select "Install this driver software anyway".
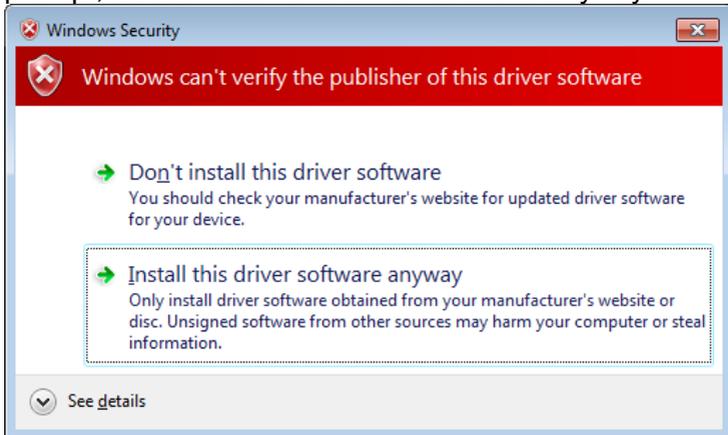
12. The driver will now install. Once finished, under "Device Manager", you should see under "Ports (COM & LPT)" an item labeled "BK Precision USB to Serial Converter (COM#)". The "COM#" is the com port that can be used to access the virtual COM port for remote communication.

For Windows XP:
1. The USB driver is included in the CD that comes with the instrument. You can also go to www.bkprecision.com and browse this product's page to find and download the USB driver.
2. Connect the included USB Type A to Type B cable to the generator and the computer, then power on the instrument.
3. The following screen will appear.

4. Select "No, not this time" and click "Next".
5. In the following screen, select "Install from a list or specific location (Advanced)" and click "Next".
6. In the next screen, select "Don't search. I will choose the driver to install." and click "Next" again.
7. In the following screen, click "Have Disk…"
8. From the "Install From Disk" window, click "Browse…" and locate and double-click the USB driver file

downloaded from the website labeled
"atm6124_cdc.inf". Select it and click "OK".

9. The following screen will appear.

Found New Hardware Wizard

Select the device driver you want to install for this hardware.

Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

☑ Show compatible hardware

Model
BK Precision USB to Serial Converter

⚠ **This driver is not digitally signed!**
Tell me why driver signing is important

[Have Disk...]

[< Back] [Next >] [Cancel]

10. Click "Next", and a prompt will appear:

Hardware Installation

⚠ The software you are installing for this hardware:

BK Precision USB to Serial Converter

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

Continue Anyway   STOP Installation

11. Click on "Continue Anyway" and the driver will now install.
12. The driver will now install. Once finished, under "Device Manager" (This can be opened by: Right-click "My Computer"->Select "Properties"->Select "Hardware" tab->Click "Device Manager"), you should see under "Ports (COM & LPT)" an item labeled "BK Precision USB to Serial Converter (COM#)". The "COM#" is the com port that can be used to access the virtual COM port for remote communication.

4.1.2   USB (Virtual COM) Settings

The USB (virtual COM) interface settings for the communication port are as follows:

BAUDRATE: 115200
PARITY: NONE
DATA BITS: 8
STOP BIT: 1
FLOW CONTROL: NONE

4.2   Device States

The device may be in one of the two possible states described below.

4.2.1   Local State (LOCS)

In the LOCS state, the device may be operated from the front panel.

4.2.2   Remote State (REMS)

In the REMS state, the device may be operated from the USB interface. Actuating any front panel key will cause the device state to revert to the LOCS.

4.3   Message Exchange Protocol

The device decodes messages using the Message Exchange Protocol similar to the one defined in IEEE 488.2. The following functions implemented in the MEP must be considered:

4.3.1   The Input Buffer

The device has a 128-byte long cyclic input buffer. Decoding of remote messages is begun as soon as the input buffer is not empty, that is, as soon as the controller has sent at least one byte to the device. Should the input buffer be filled up by the controller faster than the device can remove the bytes and decode them, the bus handshake (CTS/RTS) is used to pause data transfer until room has been made for more bytes in the buffer. This prevents the controller from overrunning the device with data.

4.3.2   The Output Queue

The device has a 100-byte long output queue in which it stores response messages for the controller to read. If at the time a response message is formatted the queue contains previously formatted response messages, such that there is not enough places in the queue for the new message, the device will hold off putting the message in the queue until there is place for it.

4.3.3 Response Messages

The device sends a Response Message in response to a valid query. All queries return a single Response Message Unit.

4.4 Instrument Identification

The *IDN? common query is used to read the instrument's identification string. The string returned is as follows:

BK, MODEL 4040B,0,V0.1

The "V0.1" reflects the firmware version number and will change accordingly.

4.5 Instrument Reset

The *RST common command effects an instrument reset to the factory default power up state.

4.6 Command Syntax

4.6.1 General Command Structure

A Program Message is defined as a string containing one Program Message Units, which is an instrument command

or query. The Program Message is terminated by the Program Message Terminator.

The Program Message Terminator consists of optional white space characters, followed by the Linefeed (LF) character (0x0A).

The Program Message Unit can be divided into three sections as follows:

a) Program Header

The Program Header represents the operation to be performed, and consists of ASCII character mnemonics.
Two types of Program Headers are used in the MODEL 4040B: Instrument-control headers and Common Command and Query headers. Common Command and Query Program Headers consist of a single mnemonic prefixed by an asterisk ('*').

The mnemonics consist of upper - or lower-case alpha characters.

Example: The command to set the frequency to 1KHZ may be written in the following ways:

FREQ 1KHZ
FREQ 1000HZ
FREQ 1000
FREQ 1E3
freq 1khz
freq 1000hz

freq 1000
freq 1e3

b) Program Header Separator

The Program Header Separator is used to separate the program header from the program data. It consists of one or more white space characters, denoted as <ws>. Typically, it is a space.

c) Program Data

The Program Data represent the values of the parameters being set, for example, the '1KHZ' in the above examples. Different forms of program data are accepted, depending on the command. The Program Data types used in the instrument are:

i) Character program data

This form of data is comprised of a mnemonic made up of lower - or upper-case alpha characters. As with Program Header mnemonics, some Character Data mnemonics have short and long forms. Only the short or the long form may be used.

ii) Boolean data

Boolean data indicate that the parameter can take one of two states, ON or OFF. The parameter may be character type

ON or OFF

or numeric. A numeric value is rounded to an integer. A non-zero result is interpreted as 1 (ON), and a zero result as 0 (OFF).
Queries return the values 0 or 1.

iii) NRf

This is a decimal numeric data type, where
NR1 indicates an integer number,
NR2 indicates a fixed point real number, and
NR3 indicates a floating point real number.

iv) Numeric value program data

This data type defines numeric values, as well as special cases of Character Data. Numeric values may be specified in any of Integer, Fixed Point or Floating Point format. All parameters which have associated units accept a suffix, which may be specified using upper or lower-case characters. When the suffix is not specified, the numeric value is accepted in the default units, which are Hertz for frequency, Seconds for time, and Volts for voltage. To set the frequency to 1KHz we can send one of the following commands:

FREQ 1000
FREQ 1E3

The special forms of character data accepted as numbers are

MAXimum: sets the parameter to its maximum value.

MINimum: sets the parameter to its minimum value.

For example, to set the frequency to its maximum value we can send the command

FREQ MAX

Some Program Message Units either require, or can accept, more than one data element. Program data elements are separated from each other by the Program Data Separator. It is defined as optional white space characters followed by a comma (','), which in turn is followed by optional white space characters.

There are two types of Program Message Units: Command Message Units and Query Message Units. A Query differs from a Command in that the Program Header is terminated with a question mark ('?'). For example, the frequency might be queried with the following query:

FREQ?

Some Query Message Units accept data, giving the device more specific information about what is being queried. In many cases the Query Message Unit may optionally be supplied with the MIN or MAX mnemonics as data. This

tells the device to return the minimum or maximum value to which the parameter may currently be set. For example,

FREQ? MAX

will return the maximum value to which the frequency may currently be set.

Not all Program Message units have query forms (for example, SAV), and some Program Message Units might have only the query form (for example IDN?).

The instrument puts the response to the query into the output queue, from where it may be read by the controller.

NOTE: All commands should be terminated with a <CR> carriage return or <LF> line feed character. Any response string from a query command has both <CR> and <LF> characters appended. For example, an amplitude query command will return 1.23<CR><LF>.

4.7   Status Reporting

The instrument is capable of reporting status events and errors to the controller.

4.7.1   The Error Queue

The error queue is used to store codes of errors detected in the device. It is implemented as a cyclic buffer of

length 10. The error queue is read with the following query:

ERR?

The first error in the queue is returned, and the queue is advanced.

4.7.2 Error Codes

The negative error codes are defined by SCPI. Positive codes are specific to the instrument.

The error message is returned in the form

<error number>,"<error description>"

A table of error numbers and their descriptions is presented here.

No error reported

0 - No error

Command Errors

A command error is in the range -199 to -100, and indicates that a syntax error was detected. This includes the case of an unrecognized header.

-100   Command Error

_____

-101	Invalid character	
-102	Syntax error	
-103	Invalid separator	
-104	Data type error	
-108	Parameter not allowed	
	More parameters than allowed were received	
-109	Missing parameter	
	Fewer parameters than necessary were received	
-110	Command header error	
-111	Header separator error	
-112	Program mnemonic too long	
	The mnemonic must contain no more than 12 characters.	
-113	Undefined header	
-120	Numeric data error	
-121	Invalid character in number	
-123	Exponent too large	
-124	Too many digits	
-128	Numeric data not allowed	
	A different data type was expected	
-131	Invalid suffix	
-134	Suffix too long	
-138	Suffix not allowed	
-140	Character data error.	
-141	Invalid character data.	
	Incorrect character data were received.	
-144	Character data too long	
	Character data may contain no more than 12 characters.	

-148	Character data not allowed
-158	String data not allowed
-161	Invalid block data
	An error was found in the block data
-168	Block data not allowed
-178	Expression data not allowed

Execution Errors

An execution error indicates that the device could not execute a syntactically correct command, either since the data were out of the instrument's range, or due to a device condition.

-200	Execution error
	An attempt was made to RECALL the contents of an uninitialized stored setting buffer.
-211	Trigger ignored.
	The *TRG common command was ignored due to the device not being in the correct state to execute the trigger.
-220	Parameter error.
	A parameter is in the correct range, but conflicts with other parameters.
-221	Settings conflict.
	The parameter is out of range due to the current instrument state.
-222	Data out of range.

-223   Too much data.
            The arbitrary waveform memory limit
has been exceeded.
-224   Illegal parameter value.
            The parameter value must be
selected from a finite list of possibilities.

Device-Specific Errors

An error specific to the device occurred.

-315   Configuration memory lost.
            Device memory has been lost.
-330   Self-test failed.
-350   Queue overflow.
Error codes have been lost due to more than 10 errors
being reported without being read.

Query Errors

A query error indicates that the output queue control
has detected a problem. This could occur if either an
attempt was made to read data from the instrument if none
was available, or when data were lost. Data could be lost
when a query causes data to be formatted for the
controller to be read, and the controller sends more
commands without reading the data.

-410   Query INTERRUPTED.

Data were sent before the entire response of a previous query was read.

-420   Query UNTERMINATED.

An attempt was made to read a response before the complete program message meant to generate that response was sent.

Warnings

The execution of some commands might cause an undesirable instrument state. The commands are executed,   but a warning is issued.

500   Trigger rate short
510   Output overload

"Trigger rate short" means that the period of the waveform is larger than the value of the internal trigger rate. Thus not every trigger will generate a cycle (or burst) of the waveform.

4.8   COMMON COMMANDS

4.8.1   System Data Commands

*IDN? - Identification query

The identification query enables unique identification of the device over the GPIB. This query should always be the last in a program message. It returns a string with four fields:

_____

Manufacturer name
Model name
Serial number (0 if not relevant)
Version number

Command
Type: Common Query
Syntax: *IDN?
Response: BK, MODEL 4040B,0,V1.1

4.8.2 Internal Operation Commands

*RST - Reset command

The Reset command performs a device reset. It causes the device to return to the factory default power up state.

Type: Common Command
Syntax: *RST

4.8.3 Device Trigger Commands

a) *TRG - Trigger command

This command is analogous to the IEEE 488.1 Group Execute Trigger interface message, and has the same effect. It is used to trigger the device to output a wave, and is accepted only when the trigger mode is set to Trigger, Gate or Burst, and the trigger source is set to BUS.

Type: Common Command
Syntax: *TRG

4.8.4 Stored Settings Commands

*RCL - Recall instrument state

This command is used to restore the state of the device to that stored in the specified memory location.

Arguments
Type   <NRf>
Range   0 to 9 (4014B) / 0 to 19 (4040B). Non integer values are rounded before execution

Type: Common Command
Syntax: *RCL<ws><NRf>
Example: *RCL 0 (Recall default state)
             *RCL 9

*SAV - Save instrument state

This command is used to store the current instrument state in the specified memory location.

Arguments
Type: <NRf>

Range:	0 to 9 (4014B) / 0 to 19 (4040B). Non integer values are rounded before execution
Type:	Common Command
Syntax:	*SAV<ws><NRf>
Example:	*SAV 2

Stored setting location 0 stores the factory defaults, and is a read-only location.

4.9   INSTRUMENT CONTROL COMMANDS

Instrument control commands are grouped into logical subsystems according to the SCPI instrument model. The commands are comprised of mnemonics indicating the subsystem to which the command belongs, and the hierarchy within that subsystem. When the command is to be referred to the Root node, it should be prefixed with a colon (:). Mnemonics appearing in square brackets [...] are optional. The '|' character is used to denote a choice of specifications. The '<ws>' is used to denote a white space character.

Note: When controlling the instrument remotely, do not interrupt the instrument with front panel interactions. Although the instrument will be automatically changed back to LOCS (local) mode, subsequent remote commands may cause errors during communication, in which will require a need of

restarting the instrument before continuing again with remote operations.

4.9.1   Default Subsystem

The Source Subsystem controls the frequency, voltage, amplitude modulation and clock source. The command structure is as follows:

```
FUNCtion        SINusoid|SQUare|TRIangle|
FREQuency       <numeric value>
AMPLitude       <numeric value>
OFFSet          <numeric value>
DCYCle          <numeric value>
OUTPUT          ON/OFF

MODULation      OFF/AM/FM/INT/EXT
DEPTh        <numeric value>
MODFRequency  <numeric value>
MODSHape  SIN/TRI/ SQU
DEViation       <numeric value>

SWEep       ON/OFF/LIN/LOG
SWRAte      <numeric value>
SWSTArt       <numeric value>
SWSTOp        <numeric value>

MODE        CONT/ TRIG / GATE /  BRST
TRIG        INT  /  EXT
TRAte         <numeric value>
BURSt         <numeric value>
```

FREQuency <frequency>

The frequency command controls the frequency of the output waveform.

Arguments
Type: Numeric.
Units: MHz, KHz, Hz (default)
Range: For SIN and SQU – 0.1 Hz to Max.
frequency (see specifications),
              For TRI – 0.1 Hz to 1 MHz,
Rounding: The value is rounded to 5 digits or 100 mHz.
Command Type:Setting or Query
Setting
Syntax: FREQuency<ws><frequency>[units]
              FREQuency<ws>MINimum|MAXimum
Examples: FREQ 5KHZ
              FREQ 5E3
              FREQ MAXIMUM
              FREQ MIN
Query
Syntax: FREQuency?[<ws>MAXimum|MINimum]
Examples: FREQ?
              FREQ? MAX
Response: NR3

Considerations:

1) The MIN and MAX arguments refer to currently settable minimum or maximum.
2) FIXed is alias for CW.

AMPLitude <p-p amplitude>

The amplitude command is used to set the peak-to-peak amplitude of the output waveform. Note that the amplitude and the offset are limited by the relation:

$$\text{Peak Amplitude} + |\text{Offset}| <= 5V$$

Arguments
Type: Numeric
Units: V, mV, VPP, mVPP
Range: 10mV to 10V
Rounding: 1mV for 10mV to 999mV. 10mV for 1V to 10V.
Command Type: Setting or Query
Setting
Syntax: AMPLitude<ws><amplitude>[units]
                AMPLitude<ws>MINimum|MAXimum
Examples: AMPL 2.5
                AMPL 2.5V
                AMPL MAX
Query
Syntax: AMPLitude? <ws>MINimum|MAXimum]
Examples: AMPL?
                AMPL? MAX
Response: NR2
Considerations:

1) The MAXimum amplitude is dependent on the offset.
2) The MAX and MIN arguments should not be used in a program message containing an OFFSet command, since these values are evaluated during parsing, based on the current value of the offset.

OFFSet <offset>

The offset command is used to set the DC offset of the output waveform. Note that the amplitude and the offset are limited by the relation:

$$\text{Peak Amplitude} + |\text{Offset}| \leq 5V$$

Arguments
Type: Numeric
Units: V, mV
Range: 10mV to 5V
Rounding: To 10mV
Command Type: Setting or Query
Setting
Syntax: OFFSet<ws><offset>[units]
                 OFFSet<ws>MINimum|MAXimum
Examples: OFFS 2.5
                 OFFS 2.5V
                 OFFS MAX
Query
Syntax: OFFSet?[<ws>MINimum|MAXimum]
Examples: OFFS?
                 OFFS? MAX

Response: NR2
Considerations:

1) The MAXimum offset is dependent on the amplitude.
2) The MAX and MIN arguments should not be used in a
program message containing an AMPLitude command,
since these values are evaluated during parsing, based on
the current value of the amplitude.

FUNCtion

The function command is used to set the type of waveform
to be generated by the instrument.

Command Type: Setting or Query
Setting Syntax: FUNCtion<ws><SIN|SQU|TRI>
Examples: FUNC SIN
                 FUNC TRI
Query Syntax: FUNCtion?
Examples: FUNC?
Response: SIN|TRI|SQU

DCYCle <duty cycle value>

This command is used to set the duty-cycle of the square
wave or the symmetry of triangular wave. The value is
given in percent .

Arguments Type: Numeric
Units: None (percent implied)

Range: 1 to 99
Rounding: To integer
Command Type: Setting or Query
Syntax: DCYCle <ws><duty cycle value>
                DCYCle <ws>MINimum|MAXimum
Query Syntax: DCYCle?[<ws>MINimum|MAXimum]
Response: NR3

OUT <state>

This command controls whether the output is ON or OFF.

Arguments
Type: Boolean
Command Type: Setting or Query
Setting
Syntax: OUT<ws>ON|1|OFF|0
Examples: OUT ON
                OUT 1
Query
Syntax: OUT?
Response: 0|1

MODULation

This command activates or deactivates modulation:
Command Type: Setting or Query
Setting
Syntax: MODULation OFF|AM|FM|INT|EXT
Examples: MODULation FM

```
            MODULation OFF
            MODULation EXT
Query
Syntax:       MODULation?
Response:   OFF        |
            AM INT    |
            AM EXT   |
            FM INT    |
            FM EXT
```

DEPTh

This command sets the AM modulation depth in %

```
Arguments
Type:             Numeric
Units:            none (implied %)
Range:            0 to 100
Rounding:         To integer
Command Type:  Setting or Query
Setting
Syntax:           DEPTh<ws><percent depth>
                  DEPTh<ws>MINimum|MAXimum
Examples:         DEPTh  50
Query
Syntax:           DEPTh?[<ws>MINimum|MAXimum]
Response:         NR3
```

MODFRequency

This command sets the AM and FM modulating waveform frequency

Arguments
Type: Numeric.
Units: MHz, KHz, Hz (default)
Range: Fmax = 20 KHz
                  Fmin = 0.01 Hz
Command Type: Setting or Query
Setting
Syntax: MODFR<ws><frequency>[units]
                  MODFR<ws>MINimum|MAXimum
Examples: MODFR 5KHZ
                  MODFR 5E3
                  MODFR MAXIMUM
                  MODFR MIN
Query
Syntax: MODFR?[<ws>MAXimum|MINimum]
Examples: MODFR?
                  MODFR? MAX
Response: NR3

MODSHape

This command selects the modulating waveform shape

Arguments
Type: Character
Options: SINusoid, TRIangle, SQUare
Command Type: Setting or Query
Setting

Syntax:	MODSHape<ws><SIN|TRI|SQU>
Examples:	MODSHape SIN
	MODSHape TRI
Query	
Syntax:	MODSHape?
Response:	SIN|TRI|SQU

DEViation

This command sets the FM modulation deviation

Arguments
Type:	Numeric.
Units:	MHz, KHz, Hz (default)
Range:	
	Fmax = carrier frequency
	Fmin = 0.01 Hz
Command Type:	Setting or Query
Setting	
Syntax:	DEViation<ws><frequency>[units]
	DEViation<ws>MINimum|MAXimum
Examples:	DEV 5KHZ
	DEV 5E3
	DEV MAXIMUM
	DEV MIN
Query	
Syntax:	DEViation?[<ws>MAXimum|MINimum]
Examples:	DEV?
	DEV? MAX
Response:	NR3

SWEep

This command activates or deactivates sweep:

Arguments
Type: Boolean
Command Type: Setting or Query
Setting
Syntax: SWE<ws>ON|OFF|LIN|LOG
Examples: SWE ON
              SWE LIN
Query
Syntax: SWE?
Response: OFF|LIN ON|LIN OFF|LOG ON|LOG OFF
Note: Sweep will automatically be active if set to Linear or Logarithmic.

SWRAte

This command sets the time for one complete sweep:

Arguments
Type: Numeric
Units: S, mS, uS, nS
Range: 10mS to 100S
Command Type: Setting or Query
Setting
Syntax: SWRAte<ws><time>[units]
              SWRAte<ws>MINimum|MAXimum

Examples: SWRAte 50MS
Query
Syntax: SWRAte?[<ws>MINimum|MAXimum]
Response: NR3

SWSTArt

This command sets the start frequency of the sweep:

Arguments
Type: Numeric.
Units: MHz, KHz, Hz (default)
Range: Dependent on the frequency range of the
current function.
Command Type:Setting or Query
Setting
Syntax: SWSTArt<ws><frequency>[units]
                 SWSTArt<ws>MINimum|MAXimum
Examples: SWSTArt 5KHZ
                 SWSTArt 5E3
                 SWSTArt MAXIMUM
                 SWSTArt MIN
Query
Syntax: SWSTArt?[<ws>MAXimum|MINimum]
Examples: SWSTArt ?
                 SWSTArt ? MAX
Response: NR3

SWSTOp

This command sets the stop frequency of the sweep:

Arguments
Type: Numeric.
Units: MHz, KHz, Hz (default)
Range: Dependent on the frequency range of the current function.
Command Type: Setting or Query
Setting
Syntax: SWSTOp<ws><frequency>[units]
                 SWSTOp<ws>MINimum|MAXimum
Examples: SWSTOp 5KHZ
                 SWSTOp 5E3
                 SWSTOp MAXIMUM
                 SWSTOp MIN
Query
Syntax: SWSTOp?[<ws>MAXimum|MINimum]
Examples: SWSTOp ?
                 SWSTOp ? MAX
Response: NR3

MODE <trigger mode>

This command is used to set the trigger mode.

Arguments

Type: Character
Options: CONTinuous
                 TRIGger
                 GATE
                 BURSt

Command Type: Setting or Query
Setting
Syntax: MODE<ws><CONT|TRIG|GATE|BURS>
Examples: MODE CONT
               MODE BURS
Query
Syntax: MODE?
Response: CONT|TRIG|GATE|BURS

TRIGger <trigger source>

This command is used to select the trigger source, for use in the Trigger, Gate and Burst trigger modes.

Arguments

Type: Character
Command Type: Setting or Query
Setting
Syntax: TRIGger<ws><INT|EXT>
Examples: TRIG EXT
               TRIG INT
Query
Syntax: TRIGger?
Response: INT|EXT

BURSt <burst count>

This command is used to set the number of cycles to be output in the BURST mode. It is not a standard SCPI command.

Arguments

Type:	Numeric
Range:	1 to 65535
Rounding:	To integer value
Command Type:	Setting or Query
Setting	
Syntax:	BURSt<ws><value>
Examples:	BURS 100
	BURS MAXIMUM
Query	
Syntax:	BURSt?[<ws>MAXimum|MINimum]
Response:	NR1
Examples:	BURST?
	BURS? MAX

TRAte <trigger rate>

Sets the rate of the internal trigger.

Arguments

Type:	Numeric
Units:	S, mS, uS, nS
Range:	1 uS to 10S

Rounding: to 4 digits
Command Type: Setting or Query
Setting
Syntax: TRAte<ws><value>[units]
                 TRAte<ws>MINimum|MAXimum
Examples: TRAte 10E-6
                 TRAte MIN
Query
Syntax: TRAte?[<ws>MINimum|MAXimum]
Response: NR3
Examples: TRAte?
                 TRAte? MIN

ERRor?

This query returns the first entry in the error queue, and removes that entry from the queue.

Command Type: Query only
Query
Syntax: ERRor?
Response: <Error number>, "<error description>"

SERVICE INFORMATION

Warranty Service: Please go the support and service section on our website www.bkprecision.com to obtain a 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 the support and service section on our website www.bkprecision.com to obtain a 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 pre-paid 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.

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

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

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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