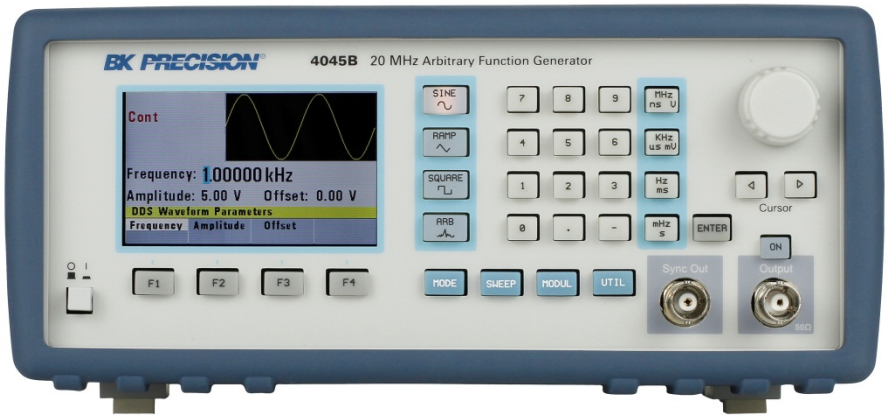
Model: 4014B, 4040B, 4045B

Function Generator

Software Help Document



Overview

The B&K Precision 4014B/4040B and 4045B provides a standard set of protocols that allows for remote control over PC. This software allows for basic controls and virtual front panel emulation to allow you to control most of the adjustable parameters of the instrument.

Note: The model 4045B includes the arbitrary waveform function, however this software does not support configuring for this output. To create arbitrary waveforms, please visit www.bkprecision.com and download the WaveX software.

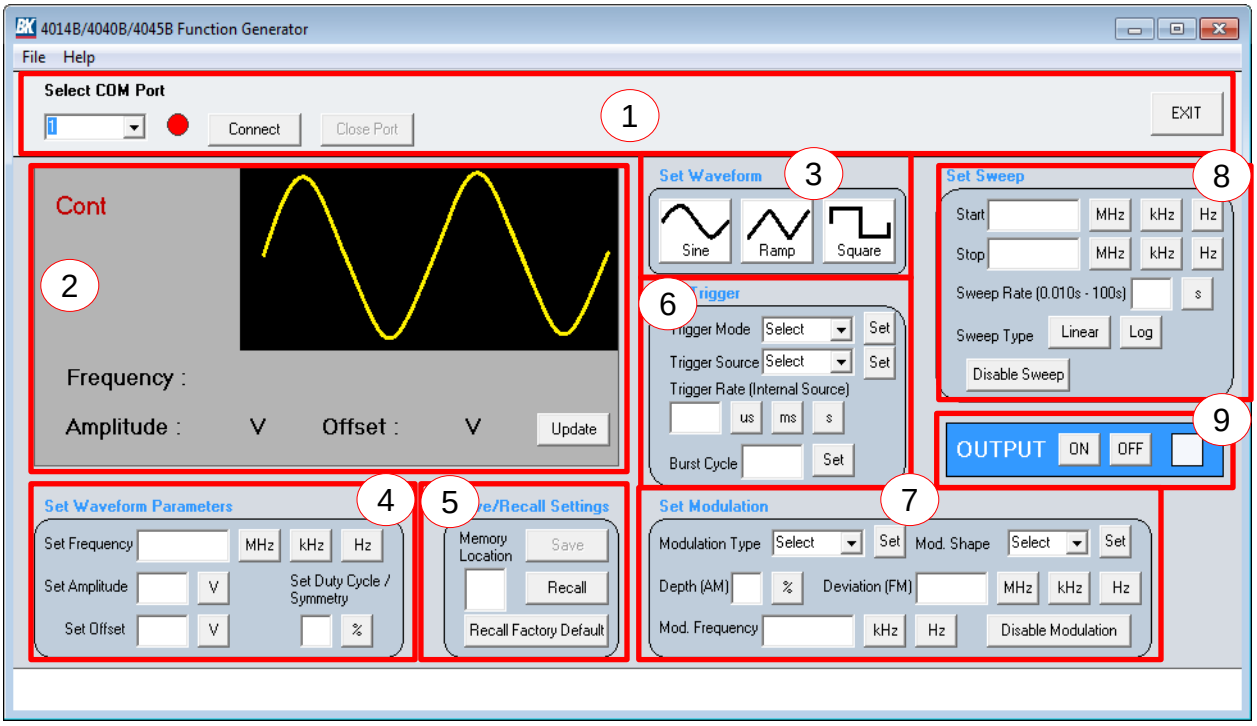
System Requirements

The below system requirements must be met to run this software:

- Windows XP/Vista/7 (32-bit or 64-bit)
- 512MB or higher
- USB Drivers installed (download from www.bkprecision.com)

Getting Started

Panel Controls



1	Initialize/Communication Control
2	Display Panel
3	Waveform Buttons
4	Waveform Parameter Control
5	Save/Recall Settings Control
6	Trigger Settings Control
7	Modulation Settings Control
8	Sweep Settings Control
9	Output Control

Enable Echoing

The instrument may be shipped with default setting for character echo disabled. In order to use the software, echoing must be enabled.

To enable echoing, follow the steps below:

1. Press “UTIL” and “F4” to select “Counter”.
2. Now, press “F4” three times to enter a system menu.
3. Press “F2” to select “Echo” and use the rotary knob to change Echo to “ON”.
4. Afterwards, press the “Sine” waveform button or any of the waveform buttons to exit the menu. Echo is not enabled.

Connecting with the Instrument

The first thing to do when using the software is to have it successfully connected to the instrument. You will use the controls shown below:

Initialize connection

When the software application is launched, it automatically detects the available serial COM ports registered with Windows.

From the drop-down menu, select the COM port number that is linked with the USB virtual COM port of the instrument.

When you initially connect to the USB port of the instrument, it will ask you to install the USB drivers. Follow the instructions in the user manual to properly install the USB drivers. When finished, go to “Device Manager” in Windows Properties to verify which COM port the instrument is assigned to. It should say ***BK Precision USB to Serial Converter (COM#)*** *where # is the COM port number that you will use to connect to the instrument.*

Click the “Connect” button and wait a few seconds. The round red light will turn green to indicate that it’s successfully connected to the instrument. During this time, the software will get information from the instrument to update most of the currently configured information, such as Waveform Shape, Frequency, Amplitude, Offset, Trigger Mode, Sweep, and Modulation. When finished, it will show the identification string at the bottom of the software indicating the model and the firmware version of the instrument.

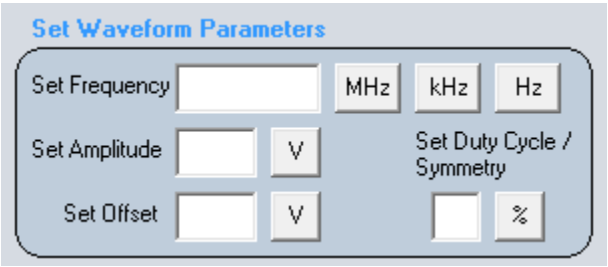
Close connection

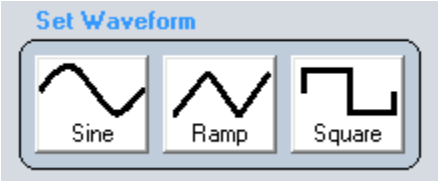
When you want to stop or disconnect communication to/from the instrument, click the “Close Port” button. The COM port will close and disable any communication to/from the instrument.

Configure Basic Waveform Output

There are 5 parameters that can be configured to setup a basic waveform for output: Frequency, Amplitude, DC Offset, Duty Cycle/Symmetry, Waveform Shape.

The controls to adjust these parameters are shown below:





Set Frequency

To set the frequency of the waveform, enter the numeric value in the input box next to **Set Frequency** . Afterwards, press either “MHz”, “kHz”, or “Hz” button to set the frequency and its corresponding unit.

For example, to set the waveform to 1.2345 kHz, type in “1.2345” in the input box and press “kHz”.

Note: The minimum and maximum frequency limits will apply. An error will occur if you enter a frequency outside the supported range. The limits will vary depending on the waveform shape selected.

Set Amplitude/DC Offset

To set the amplitude or DC offset of the waveform, enter the numeric value in the input box next to **Set Amplitude** or **Set Offset** . Afterwards, press “V” to set the amplitude or offset in volts. The acceptable range is: 0.010 V (10 mV) to 10 V.

Note: Amplitude and Offset have some constraints due to hardware limitations. In any instance, the amplitude and DC offset must satisfy the below formula, or it becomes an invalid setting:

$$\frac{Vpp}{2} + |Offset| \leq 5\ V$$

Set Duty Cycle/Symmetry

To set the duty cycle (square) or symmetry (triangle) of the waveform, enter the numeric value in the input box next to **Set Duty Cycle/Symmetry** . Afterwards, press the “%” button.

Square wave duty cycle can be adjusted from 20% to 80%, but frequency must be less than or equal to 2 MHz.

Triangle/ramp wave symmetry can be adjusted from 1% to 99%, but frequency must be less than or equal to 200 kHz.

Change Waveform Shape

To change the waveform shape, select the “Sine”, “Ramp”, or “Square” buttons. Once changed, the display panel will also change the illustration of the waveform.

Save/Recall Settings

The instruments can save or recall settings to and from within internal non-volatile storage memory. 4014B can store up to 9 user settings and 4040B and 4045B can store up to 19 user settings. One memory location is reserved for the default setting and cannot be changed.

To controls to save/recall settings are:

Save Settings

Configure the instrument to the settings you want to save. Then, enter a number between 1 – 9 (4014B) or 1 – 19 (4040B and 4045B) in the Memory location input box.

Then click the “Save” button and all the current instrument settings will be stored to the designated memory location.

Recall Settings

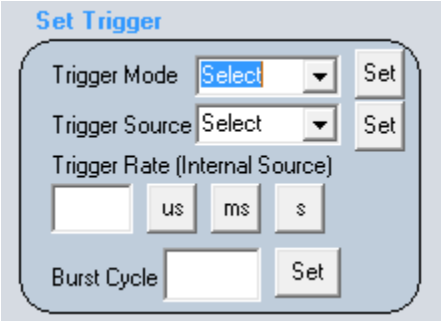
Enter a number between 1 – 9 (4014B) or 1 – 19 (4040B and 4045B) in the Memory location input box which contains the instrument settings you want to recall from a previous save.

Then click the “Recall” button and the instrument will be updated with those settings.

Restore to Factory Default

Click the “Recall Factory Default” button to set the instrument back to factory default settings.

Trigger Setup



To configure the trigger settings, the first configure the Trigger Mode.

Configure Trigger Mode

The instrument has four different triggering modes: Continuous, Triggered, Gate, Burst.

Continuous – The instrument will output the waveform continuously without the need to specify any trigger parameters. This is the default mode of the instrument, and it's also the mode used for sweep function and modulation.

Triggered – The instrument can provide a user configurable rate to internally trigger one cycle of the waveform per trigger. It can also be configured for external triggering where an external signal is used to trigger one cycle of the waveform.

Gated – The instrument can provide a user configurable rate to internally gate trigger the waveform. When gate is high the output will be a continuous waveform, and when low it will be off. External trigger can also be used for gated triggering.

Burst – Burst allows the instrument to trigger multiple cycles of the waveform within a given trigger rate internally, or from an external trigger signal.

Use the drop down menu to select the trigger mode, and then press the "Set" button next to it to set to that mode.

Note: Modulation or sweep functions will be disabled when trigger mode is set because these functions require operating in Continuous mode only.

Configure Trigger Source

The source of the trigger can come from internally of the instrument or from an external signal connected to the rear Trig In terminal.

To set for internal trigger, select **Internal** under the Trigger Source drop-down menu, then press the "Set" button next to it.

To set for external trigger, select **External** under the Trigger Source drop-down menu, then press the "Set" button next to it.

Configure Trigger Rate

This option is available and applicable for when Trigger Mode is configured to **Triggered, Gated, or Burst**. Also, trigger source must be set to **Internal**, as this parameter uses the internal trigger source.

To configure, enter a value in the input box and press either “us”, “ms”, or “s” to set the time unit.

The trigger rate range is 10 ms – 10 s. However, depending on the frequency of the waveform these limits may change. In some cases, if the settings conflict you will get a “Trig rate short” error on the screen of the instrument. This happens if frequency is set much higher than the trigger rate can support.

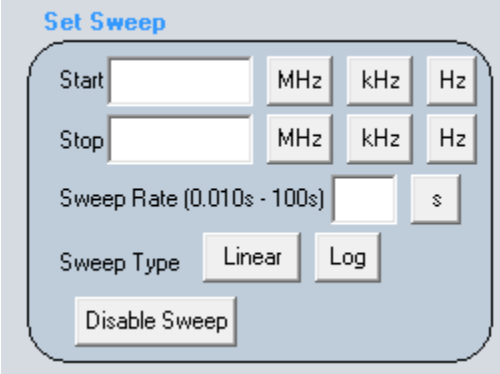
Configure Burst Cycle

This parameter is when Trigger mode is set to **Burst**. Users can specify the number of cycles to burst. Acceptable values are from 1 to 65535. However, this range can vary depending on the frequency of the signal and the rate of the burst.

Enter a value in the input box next to **Burst Cycle** and press the “Set” button next to it to configure the number of cycles.

Sweep Setup

Sweep function is available only for **Continuous** trigger mode. It does not support all other modes.



There are 4 parameters to configure for sweep function: Start Frequency, Stop Frequency, Sweep Rate, Sweep Type.

Configure Start and Stop Frequency

Use the input box next to start and stop to enter the start and stop frequency. Use the “MHz”, “kHz”, and “Hz” button next to the inputs to enter the corresponding frequency unit.

Note: To sweep in reverse direction, simply change the frequency values between start and stop frequency.

Configure Sweep Rate

The sweep rate is controlled by the instrument and can be set to any time between 10 ms to 100 s. On the software, this rate must be specified in seconds. For example, to set to 20 ms, type in 0.020 and then press “s”.

Configure Sweep Type

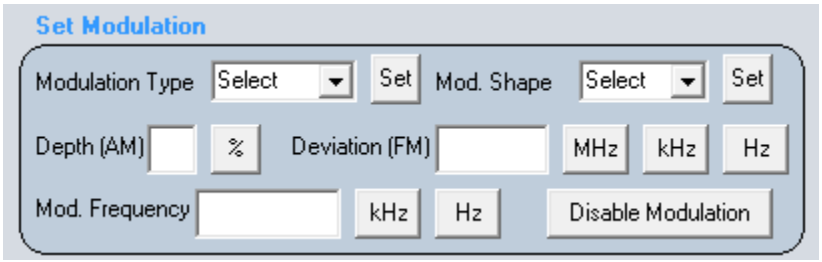
The instrument supports linear or logarithmic sweep. Click the “Linear” button for linear sweep, and “Log” button for log sweep.

The sweep will automatically turn on once either of these buttons are clicked.

To disable the sweep function at any time, press the “Disable Sweep” button.

Modulation Setup

Trigger mode is automatically set to **Continuous** when modulation type is configured. If sweep function was enabled prior, it will automatically be disabled before enabling modulation.



The above shows all the parameters that are adjustable for modulation function. The first parameter to configure is **Modulation Type**.

Configure Modulation Type

AM Internal, AM External, FM Internal, and **FM External** are all selectable modulation types. **Internal** refers to using Internal source, and **External** refers to using external source.

Once you select the type from the drop down menu, press the “Set” button next to it. The instrument will automatically enable modulation and output a modulated waveform if it’s set to **AM Internal** or **FM Internal**. If it’s configured for **AM External** or **FM External**, the modulated waveform will output when an external signal is connected into the Modulation In terminal in the rear panel of the instrument.

Configure Modulation Shape

The shape of the modulating signal can be selected between Sine, Square, and Triangle. For model 4014B, only Sine is available.

Use the drop down box to select one, and then press the “Set” button next to it to set the modulation shape.

Configure Depth AM

The depth percentage for AM modulation can be specified when the instrument is in **AM Internal**. Enter a value between 0 – 100 and press “%” to set the depth percentage.

Configure FM Deviation

FM deviation is for FM modulation and only if it’s set for **FM Internal**, as the deviation settings are generated internally. Enter a frequency value and use the “MHz”, “kHz”, or “Hz” buttons to set the deviation frequency.

Configure Modulating Frequency

The modulating frequency is for internal source only, so the modulation type must be set to **AM Internal** or **FM Internal** first.

Enter a value between 0.1 Hz – 20 kHz. Then, press the “kHz” or “Hz” button to set the modulating frequency.

Disable Modulation

To stop or disable modulation at any time, press the “Disable Modulation” button and the instrument will return to normal output.

Control Output State

The instrument has an output ON/OFF button to enable/disable the waveform output. To turn ON the output, press the “ON” button and the square indicator will turn green. To turn OFF the output, press the “OFF” button and the square indicator will no longer be green.

FAQ

Q: I pressed connect, but the wait icon keeps running and nothing is happening.

- This could be caused by several reasons, and you’ll have to force close the application before checking any of these:
  1. Connection is incorrect, or USB drivers are not installed correctly. Make sure you download and install the correct drivers from www.bkprecision.com
  2. The instrument is not recognizing the serial port after USB drivers are installed. You may need to reboot your system after the drivers are installed. Also, the driver requires Windows XP/Vista/7 OS.
  3. Echo is not enabled. Go to the “Enable Echoing” section to enable echoing. Afterwards, try connecting again.

Q: I’m trying to set burst while I sweep the frequency but it will not allow me.

- Burst sweep as well as modulation are not supported. Sweep and Modulation function will require the instrument to be in continuous mode for it to function properly.

Q: Why does it take so long to boot up or to change settings?

- Because there is a virtual display available in the software, delay time is included to process all the commands to query information from the device. Therefore, it takes a few seconds to update parameters and settings.