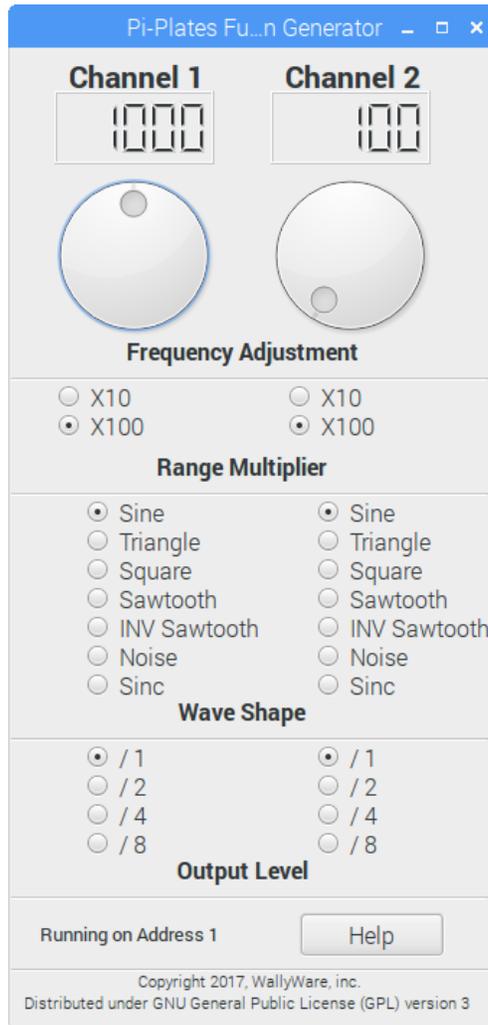




DAQC2plate Function Generator Manual



Revision 1.0

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Introduction

While not as popular as a voltmeter or an oscilloscope, most analog and audio engineers have a function generator on their workbench. Using this, it is possible to determine the response of a circuit (typically an amplifier) to different kinds and levels of inputs.

Historically, the first product of the Hewlett Packard company was the HP 200C audio oscillator. It was designed around vacuum tubes and used the resistive properties of a small light bulb to stabilize the output:



Figure 1

The function generator application described in this manual is a basic two channel instrument that will allow a beginner to learn and a more experienced user to generate basic signals quickly.

Before You Get Started

The following applies to all of the DAQC2plate applications:

1. You might be tempted to run the Oscilloscope App and the Function Generator App at the same time. However, due to how the Raspberry Pi handles certain hardware resources, this could cause contention issues which would result in both apps misbehaving. Even if you try this with two different DAQC2plates on a single RPi, you could still have problems. So, do not run more than one application at a time and follow this rule: One stack = One app.
2. When launched, an application will run on the first addressed DAQC2plate on the stack. For example, if you have two DAQC2s stacked together at addresses 0 and 5, the application will run on the board at address 0.
3. Do not expect these applications to have the same performance of \$1000 instruments from Fluke and Tektronix. They are for the most part, capable of operating in the audio band of 10 to 20Khz.
4. All knobs can be rotated with a mouse pointer for coarse adjustments. For fine adjustments, the left and right arrows on your keyboard can be used.

Specifications

The function generator application for the DAQC2plate has the following specifications:

Waveform Types	Sine, square, triangle, saw tooth, inverse saw tooth, noise, sinc
Minimum Frequency	10Hz
Maximum Frequency	10,000Hz
Frequency Accuracy	+/- 1% typical
Output Levels	4.096 volts p-p, 2.048 volts p-p, 1.024 volts p-p, 0.512 volts p-p
Amplitude Error	+/- 1.5%
Resolution	12 bits
Channels	2

NOTE:

1. The Function Generator mode of the DAQC2plate uses lookup tables to provide most of the output waveforms. The values from these tables are retrieved and passed to digital to analog converters at a rate of 200,000 samples per second. To smooth out the jagged edges that this method can produce, each channel has a 20 Khz low pass filter. While this filter will not distort sine waves, you will see degradation on signals with high frequency content like the Sawtooth and the Sinc starting at frequencies as low as 5Khz.
2. The output of the Function generator swings from zero volts to the peak voltage selected by the Output Level buttons for each channel. See the section AC Coupling for a simple circuit to produce an AC waveform.

Function Generator Operation

Layout

The various regions of the oscilloscope display are highlighted below. Note that there are three primary functional areas:

1. The Frequency Adjustment and Range Multiplier
2. Waveshape selection
3. Output Level Select

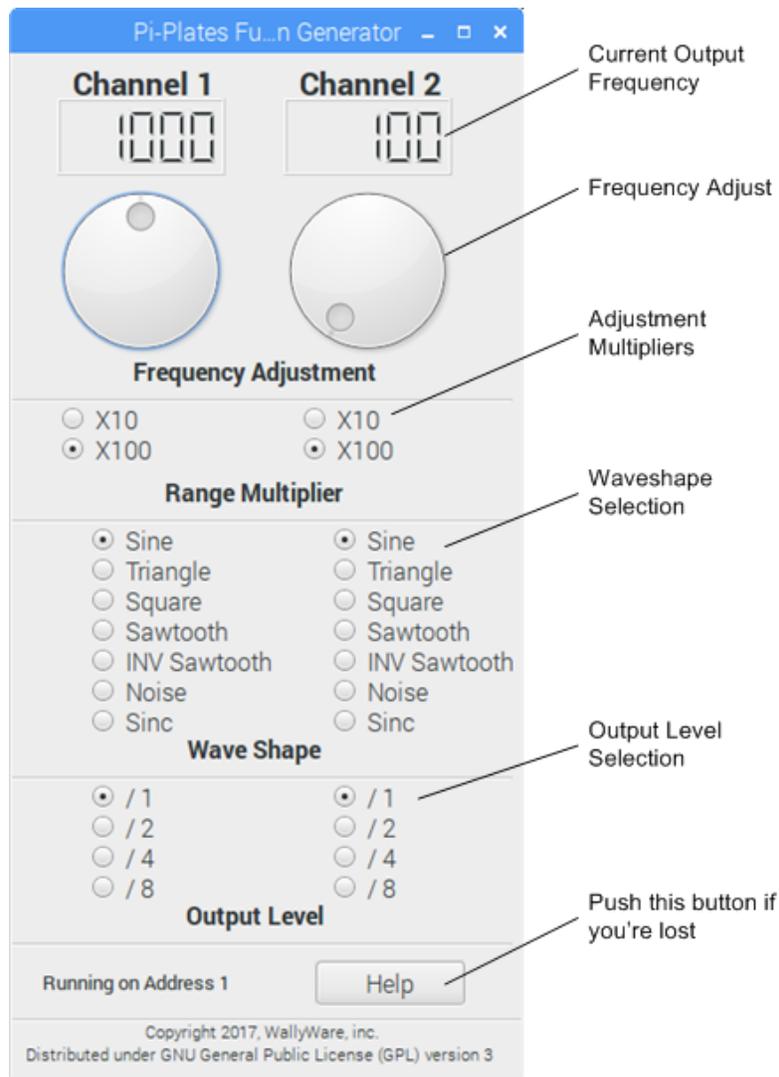
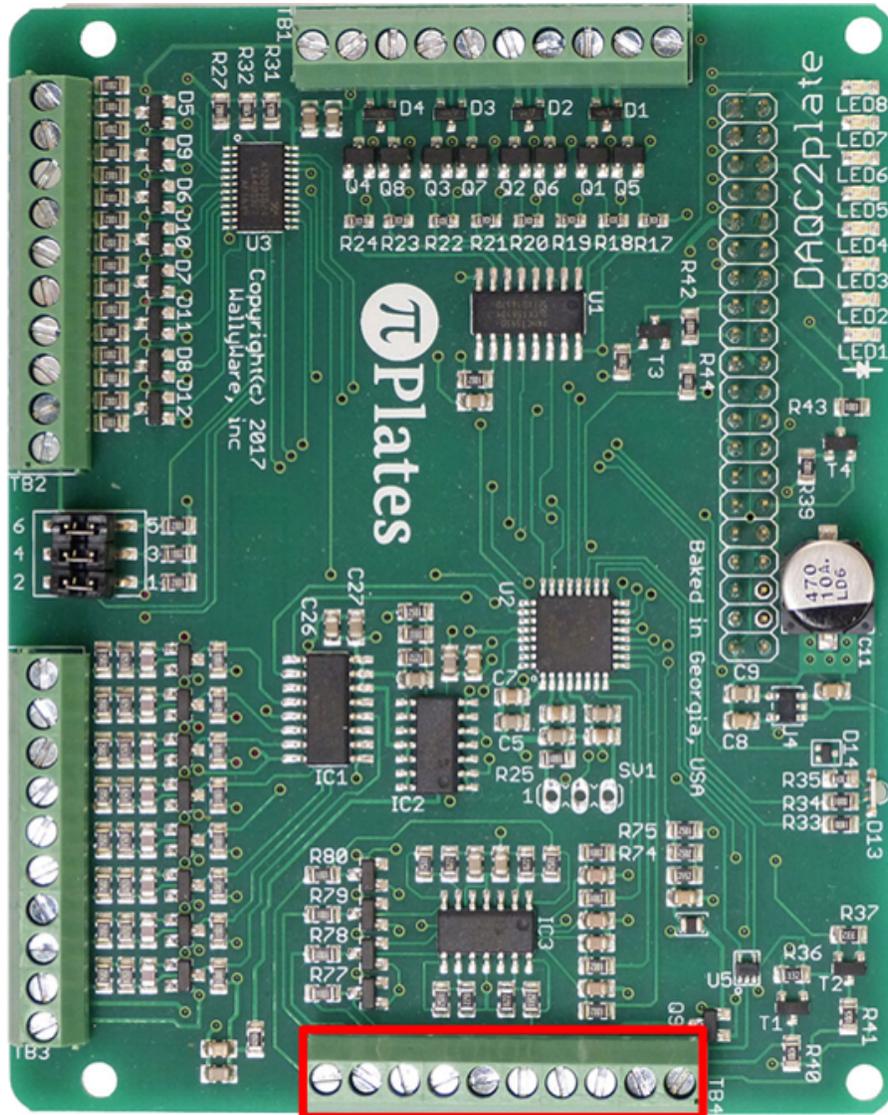


Figure 1

Connections

Refer to the figure below on where to connect to the function generator output signals on the DAQC2plate. Channel 1 is Extended Function Block pin 1 and Channel 2 is on pin 2. Connect one of the grounds from pin 5 or pin 6 to the ground signal on your circuit.



Extended Functions Block

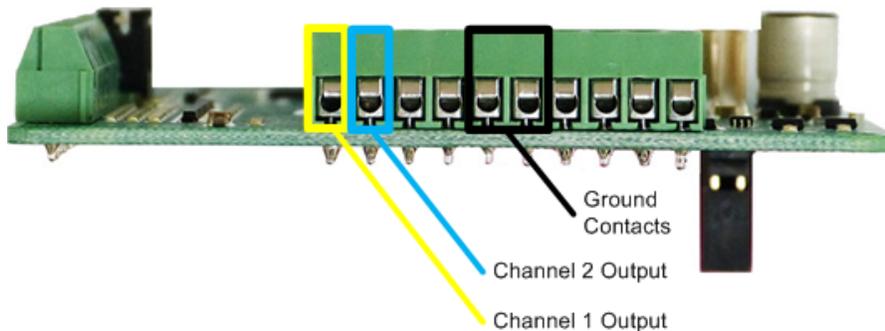


Figure 2

Frequency Adjustment

There are two controls that adjust the output frequency: the first is the big dial under the display that provides an exponential adjustment over two orders of magnitude. For example, with the settings shown, the Channel 1 dial will set the frequency to 100 Hz when completely counterclockwise, 1,000 Hz at the midpoint, and 10,000Hz when completely clockwise.

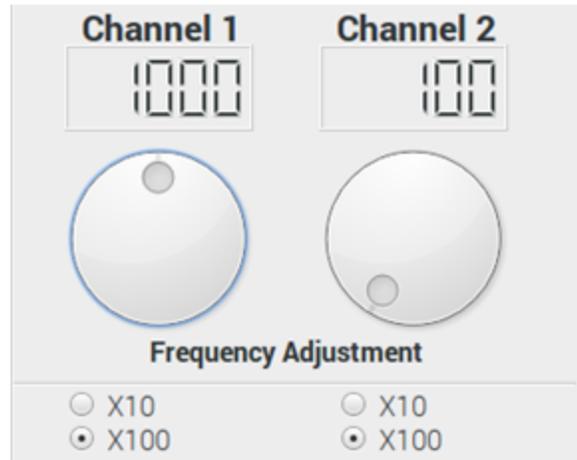


Figure 3

Clicking on the X10 button below the dial will reduce those values by a factor of 10.

Waveshape Selection

Each channel of the The Function Generator can output a unique waveshape using the buttons shown below:



Figure 4

For reference, these waveforms look like:

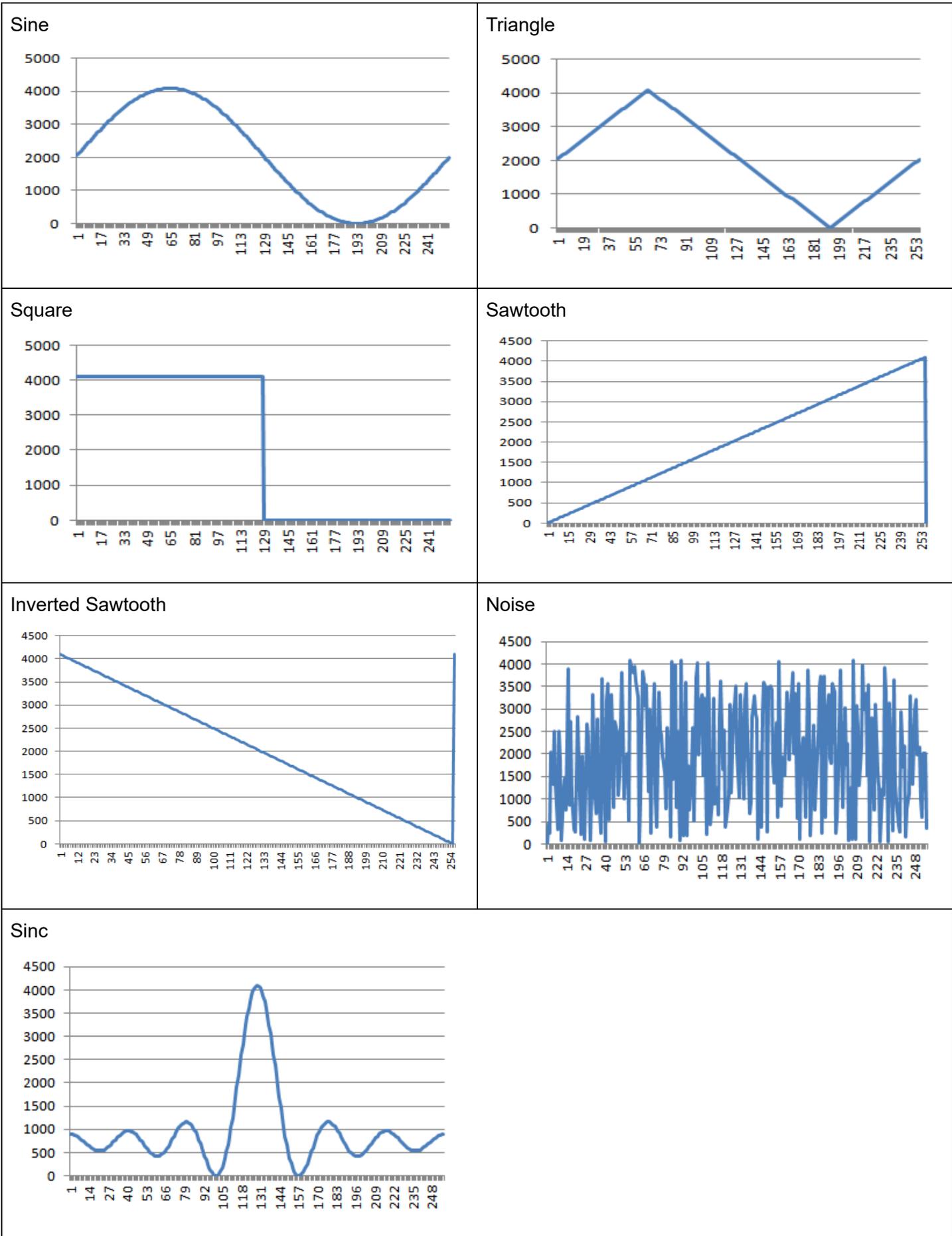


Figure 5

Output Level

Each channel of the DAQC2plate Function Generator has a very basic amplitude control. The Output Level is simply a set of buttons that set the peak to peak value of the output waveform.

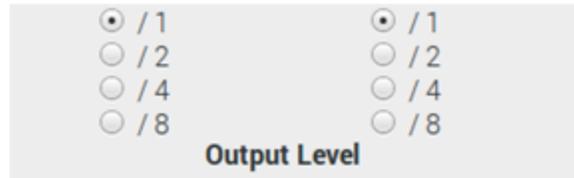


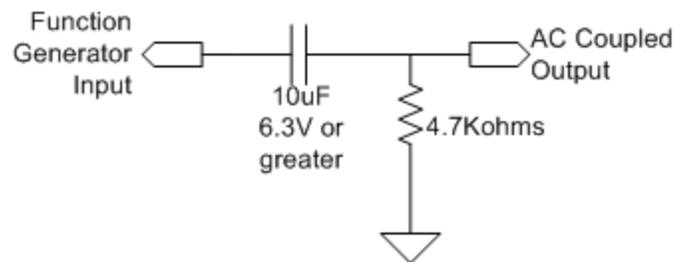
Figure 6

The waveform output range associated with each of the above settings is:

Setting	Range
/1	Zero to 4.095 volts
/2	Zero to 2.048 volts
/4	Zero to 1.024 volts
/8	Zero to 0.512 volts

AC Coupling

As mentioned previously, the output amplitude of the Function Generator ranges from zero volts to the peak values listed above. If you want AC signals, then use the following circuit:



The 10uF capacitor can be ceramic or an electrolytic. But if you use the latter, place the positive lead on the Function Generator output.

Revision History

Revision	Description
1.0	Initial Release