User Manual

PocketFrog

Compact Test Equipment
for a new generation

Voltmeter
Power Supply
Counter/Timer

Models: BFPA1 & BFPB4

Read this entire manual

Standard Measurement

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This warranty is your only remedy. No other warranties, such as fitness for a particular purpose, are expressed or implied.

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To obtain service during the warranty period, contact support@standardmeasurement.us to obtain return authorization information, then, send the product with the RMA number on the outside of the package and a description of the problem.

Document Revisions

Revision 1.0, 12/20/2022 Initial release

Table of Contents

1 Preface

Conventions Used in This Manual

The following style conventions are used in this document:

`Bold mono font:` text the user types, example:
`Voltage * 2`

Shaded: Buttons and check boxes on the host application.

1.1 Explanation of Safety Warnings

⚠ DANGER!
Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury

⚠ WARNING!
Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

1.2 Documentation and Information

Internet
The latest version of the documentation is available on our website:
http://standardmeasurement.us/guides/

Documentation Feedback
Comments on the Standard Measurement product documentation can be submitted on the support website. Comments can also be sent to support@standardmeasurement.us

We appreciate your comments.

2 Safety and Warnings

⚠Warning: To prevent possible electrical shock, fire, or personal injury, read all safety information before you use the PocketFrog.

- Carefully read all instructions.
- ⚠ **WARNING!**: PocketFrog is NOT waterproof. Any exposure to any fluid may be dangerous and will void warranty. Clean with dry cloth.
- Use this Product only as specified.
- ⚠ **DANGER!:** PocketFrog is NOT electrically isolated from the host computer. Do not connect to external power.
- Must not be used with other devices plugged into the mains.
- ⚠ **DANGER!:** Not for voltages greater than 40 volts DC.
- Limit operation to the specified measurement category, voltage, or amperage ratings.
- Do not use the PocketFrog around explosive gas, vapor, or in damp or wet environments.
- ⚠ **DANGER!:** Do not use on AC voltages.
- Do not use in any way that exceeds Measurement Category I (CAT I). The transient withstand capability is 40 VDC.
- Measure a known voltage first to make sure that the PocketFrog operates correctly.
- ⚠ **WARNING!**: Do not use the PocketFrog if it is damaged.
- Only use the power adapter that was shipped with the PocketFrog.
- Comply with local and national safety codes.
- Use personal protective equipment (approved eye protection) to prevent shock and arc blast injury where hazardous live conductors are exposed.
- Do not use or store the PocketFrog in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.
- There are NO user serviceable parts inside.

2.1 Safe Disposal

Do not throw in trash

Go to
www.standardmeasurement.us and
contact us for current disposal instructions.

POCKETFROG

GUIDES

3 Description of PocketFrog

3.1 Distinctive Characteristics

PocketFrog is a compact power supply, voltmeter, and universal counter in a pocket sized package. The power supply is adjustable from 1 volt to 20.0 volts at up to 2 amps. For low power applications it operates using power from your host computer. For up to 40 watts of output power, an external power adapter must be used. The Voltmeter can measure any DC voltage from 0 to 40 volts DC. The voltage reading can be offset. Minimum and maximum voltages are recorded. The universal Counter/Timer can measure frequency, period, pulse width, duty cycle, and edge totals. The counter/timer input threshold is adjustable.

⚠ **WARNING!**: **The PocketFrog is not to be used in a manner inconsistent with this manual.**

3.2 Package Contents for AC adapter version 2909-BFPA3

a. PocketFrog USB Instrument
b. Voltmeter probes
c. Alligator clip Cables
d. USB cable, Type A to Type A
e. USB cable Type C to Type A
f. USB Thumb Drive
g. External AC Power Adapter
h. User Manual

External AC Power Adapter

3.3 Package Contents for USB Power Delivery version 2909-BFPB4

a. PocketFrog USB Instrument
b. Voltmeter probes
c. Alligator clip Cables
d. USB cable, Type A to Type A
e. USB cable Type C to Type A
f. USB Thumb Drive
g. USB Power Adapter (user must provide USB power & cable)
h. User Manual

USB “Power Delivery” Power Adapter

For the PocketFrog USB Power Delivery model to deliver up to 40 watts of power, the user MUST provide:

1. A USB Type-C to Type-C cable with a 3 amp or greater rating.
2. A USB Power Delivery source capable of at least 59 watts of power at 20 volts.

Example USB Power Delivery Sources:

Anker Nano II 65 watt 100VAC for home and office use. There are many similar products. It is important to make sure yours can deliver at least 59 watts.

Urvns 120 watt car charger for use while traveling. There are many similar products. It is important to make sure yours can deliver at least 59 watts.

Baseus Power Bank, 65 watt, for use in the field. Products like this are available in many capacities. It is important to make sure yours can deliver at least 59 watts.

4 Installation and Setup

4.1 How to Install the PocketFrog

Step 1: Select the USB extension cable appropriate for your computer. There are two short USB extension cables, one with a USB Type-A connector and the other a USB Type-C connector.

Step 2: Plug the selected cable into your PocketFrog.

Step 3: Plug the cable and PocketFrog into your computer.

⚠ **WARNING!**: Plugging your PocketFrog directly into your computer, without the extension cable, can risk damage to your PC and your PocketFrog due to stress from plugging and unplugging banana plugs.

Step 4: Insert USB stick into an available USB Port. It contains installers, videos, and tools. You may also go to our web site and download installers.

4.2 Installing the application:

By included USB Stick
Plug the USB stick into your computer. Open the folder for your operating system. Launch the installer.

By website
http://www.standardmeasurement.us/guides and install the latest version of the PocketFrog application on your computer.

Launch the application. If you have trouble please see troubleshooting at back of manual or email support@standardmeasurement.us

5 Operation and Use

5.1 Setting up the PocketFrog

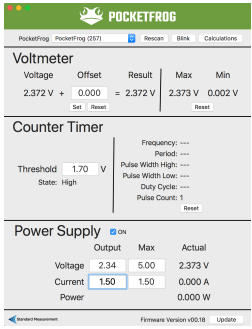
If your PocketFrog must supply over 10W of output power, you must use one of the external power adapters for proper operation. If you must use a long USB cable or USB Hub, you must use one of the external power adapters for proper operation. Depending on the model you purchased, you have an external AC power adapter or a USB Type-C Power Delivery adapter.

External power Jack on side of PocketFrog

5.1.1 Using the PocketFrog in GUI

1. Double click the PocketFrog icon to open the desktop application.

You will see the usage agreement window, only use the PocketFrog in a safe manner. If you agree you will see the window for controlling the PocketFrog.



If you only have one PocketFrog connected to your computer, the PocketFrog application will try to connect to it. Verify by looking at the top pull down labeled ‘PocketFrog’

with your serial number appended. If you don't see it, click the Rescan button.

2. Select your device from the pulldown if not already connected.

3. After selecting your PocketFrog you can click the Blink button and the LED on the PocketFrog will blink rapidly between green, yellow, and red. If you can't get a connection, see the Trouble Shooting section.

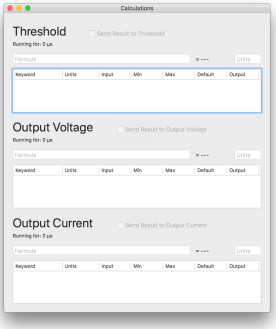
4. After connected to your PocketFrog, your voltmeter and counter/timer are operational. To turn the power supply on you need to check the power supply's ON checkbox.

⚠ **WARNING!** The status LED will blink red if the voltmeter input exceeds 30 volts.

5. The power supply has safety limits for both the power supply voltage and the power supply current in the right edit fields with a heading of Max. Adjust these fields first for your application.

6. Now you can adjust the settings under the Output heading.

7. If you need to make the power supply controlled by a calculation, click the Calculations button in the upper right hand corner. This will open the Calculations window.



8. Calculations may be entered in the field labeled Formula. See section 6 for more on calculations.

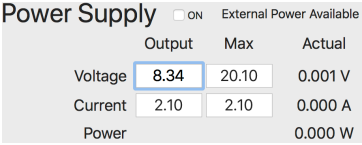
5.1.2 Adjusting your PocketFrog Measurement Settings

The window is divided into five main sections.

To Adjust Settings:

1. Use the scroll wheel of a mouse while the cursor is placed over the setting.
2. Use 2 finger scroll on a track pad while the cursor is placed over the setting.
3. Type in the desired value into the setting field.
4. Drag and drop a value in from another application. (beta on Linux)
5. Copy and paste.

5.1.3 Setting up your PocketFrog as a Power Supply



The power supply can regulate either voltage or current:

Setting voltage output:

1. Uncheck the power supply ON checkbox for safety.
2. Set the output Voltage to desired voltage between 1.00 and 20.0V.
3. Set the current limit to a value greater than your circuits maximum load, but no higher than a safe level.
4. Check the power supply ON checkbox to power your circuit.
5. The actual voltage and current draw are displayed.

Setting current output:

1. Uncheck the power supply ON checkbox for safety.

2. Set the output current to desired current between 0.60A and 2.00A.
3. Set the voltage limit to a value a little lower than your circuits maximum voltage input, but no higher than a safe level.
4. Check the power supply ON checkbox to power your circuit.
5. The actual voltage and current draw are displayed.

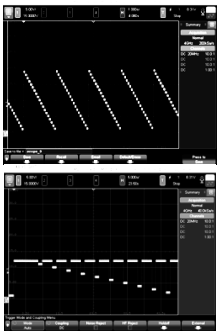
5.2 Status Indicator on PocketFrog

Continuous red	=	Internal Failure
Fast blinking red	=	High Voltage Warning
Slow blinking red	=	External Pwr Fault
Solid green	=	Connected to host
Blinking green	=	Ready to connect to host
Red-Ye-Gr blink	=	Blink clicked after connecting

6 Calculation Window

6.1 Overview

Below are examples of waveforms that can be generated. Your calculation updates the PocketFrog output about ten (10) times a second depending on the performance of your host computer.

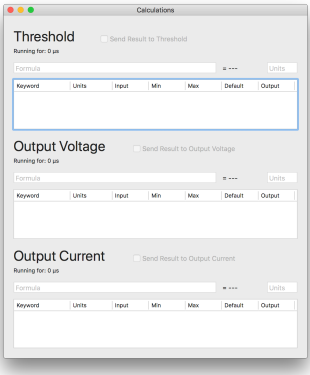


When using calculations, it is recommended to set the current limit to its maximum due to the rapid step changes in voltage when running calculations to the power supply voltage.

As you enter keywords for measurements, those measurements appear in the list below your formula. You can add limits to your measurements so your calculations don't go out of control. See below for included Math Functions and Operators, and Example formulas

Programmable mode:

1. In the upper right corner of the main window is the Calculations button which when clicked will open the calculation window.



2. The PocketFrog power supply voltage can be controlled by calculations in the center section of this window.
3. Both the power supply ON checkbox in the main window, and the calculation Send Result to… checkbox must be checked for the calculation to control the power supply voltage.

5.2 Defining calculations:

To create your own calculation, you need to write an equation that describes your power supply voltage or current in terms of a calculation. This calculation could be very simple, for example you want the voltage to be 15% above 9 volts. Your calculation will be:

```
9 * 1.15
```

Your voltage will be set to 10.35 volts. You may desire a periodic waveform, in this example, ripple on a voltage. This would use a variable based on time such as:

`srunning` seconds running

or

`usrunning` microseconds running

The running timer starts when both the power supply is ON *and* the Send Result to… checkbox is checked. So, if you want your ripple to be a sine wave riding on top of your output voltage of 5 volts, you could write:

```
5 + sin( srunning )
```

This would be a very slow ripple as a sine wave has a period of 2π radians, or about 6.3 seconds. To make a 2Hz ripple, use:

```
5 + sin( srunning * 4 * pi )
```

A calculation can also allow you to control the output voltage from another measurement. Let's start with a very simple example, let's measure a voltage from a resistor divider or signal generator that can't supply much current, and supply that same voltage with up to 2 amps. Connect the voltmeter input to your signal. That equation would simply be:

```
voltage
```

The output will simply be the voltmeters measurement. Notice after you entered voltage that the table below the calculation populated with a row. This row allows you to set limits on your calculation variables.

If you wanted the power supply to double the voltage measured on the voltmeter, the calculation will be:

```
voltage * 2
```

Other measurements can be used, like pulse width high. Converting a 0.9 to 2.1 millisecond pulse width to a voltage from 1 to 6 volts is done with:

```
((pulsewidthhigh-900)/1500)*6.25+1
```

The table below automatically populated with pulsewidthhigh allowing you to add limits and a default if the signal goes away.

Calculation may also be used for unit conversion or transfer functions from measurements. Simply leave the Send Result to… checkbox unchecked. The calculations worksheet shows an example of converting a thermistor resistor divider to degrees C.

6.3 Built-in Functions and Operators

Arithmetic

+	Addition
-	Subtraction
*	Multiplication
/	Divide
\	Integer Divide
mod	Remainder of a division
( )	Parenthesis
-	Unary minus (may need parenthesis)

Math

Abs(x)	Absolute Value

Ceiling(x)	Ceiling function
Floor(x)	Similar to INT()
Max(a, b, c...)	Maximum of *n* parameters
Min(a, b, c...)	Minimum of *n* parameters
Rnd()	Random number from 0 to 1
Round(x)	
Sign(x)	Returns -1, 0, or +1
Sqrt(x)	Square root

Logrithms

Log(x)	log base e
Exp(x)	*e* to the x
Pow(x, y)	x to the y power

Trigonomitry

Sin(rad)	
Cos(rad)	
Tan(rad)	
Asin(sin)	Returns radians
Acos(cos)	Returns radians
Atan(tan)	Returns radians

Comparisons

If(test, result true, result false) Comparisons

Measurement variables

dutycycle	From universal counter (%)
frequency	From universal counter (Hz)
period	From universal counter (µs)
pulsewidthhigh	From universal counter (µs)
pulsewidthlow	From universal counter (µs)
pulsecount	From universal counter (cnt)
pwrcurrent	From power supply (Amps)
pwrvoltage	From power supply (Amps)
voltage	From voltmeter (Volts)
voltmax	From voltmeter (Volts)
voltmin	From voltmeter (Volts)
usrunning	Microseconds from timer
srunning	Seconds from timer

Constants

e	2.7182818285
Pi	3.1415926536

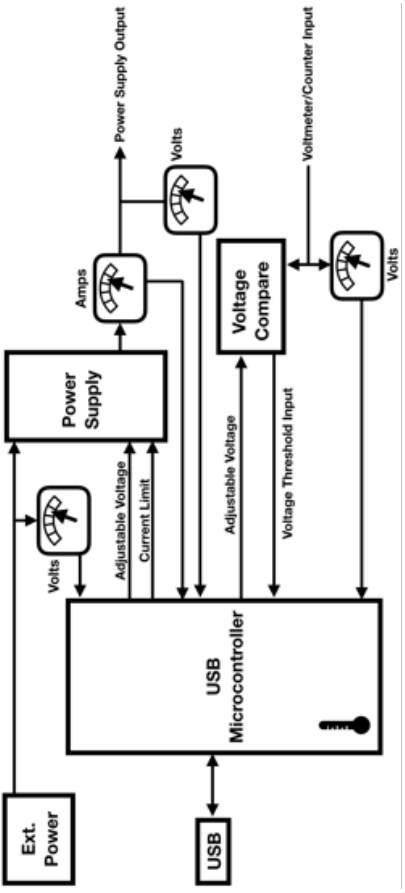
6.4 Calculation Workbook

The calculation workbook can be opened with either Microsoft Excel or Libre Office. At the time of this writing, it includes parameterized formulas for these waveforms, more will be added over time:

- Sine wave
- Tangent wave
- Square wave, 50% duty cycle
- Square wave by pulse widths
- Triangle wave
- Sawtooth wave – ramp rising edge
- Sawtooth wave – ramp falling edge
- Full wave rectified sine wave
- Power supply, filtered output
- Test pulse, firmware stress test. Can generate pulses like ISO16750-2
- Power dropout pulse, firmware stress test. Can generate pulses like ISO16750-2
- Battery discharge. Can generate pulses similar to ISO16750-2 section 4.5
- Automotive cold crank. Can generate pulses similar to ISO16750-2 section 4.6.3
- Load Step Response
- Pulse Width to Power Supply Voltage
- Thermistor Readings in °C. (Thermistor from power supply output to voltmeter, Fixed resistor from voltmeter to ground)

7 PocketFrog Block diagram

The PocketFrog is controlled by an internal microcontroller for connecting your computer to the internal instruments. The microcontroller also monitors internal temperature, and all voltage and current measurements. The power supply is a step-down/step-up switching converter that the microcontroller controls.



8 Maintenance

⚠ **WARNING!:** Never use liquids of any kind to clean the PocketFrog. The PocketFrog is NOT water proof and will be damaged by liquids.

8.1 PocketFrog maintenance by user

Clean the PocketFrog only with a dry cloth.

Unplug from computer when not in use.

Periodically check all cables and probes for wear or exposed conductors. Never use a damaged cable or probe, replace immediately.

Keep all USB and Banana connections free from dirt, dust, or moisture.

9 Troubleshooting and Repair

9.1 Identify and Solve Problems

9.1.1 Troubleshooting by user

⚠ **WARNING:** The product has no user serviceable parts inside.

Error	Cause	Solution
PocketFrog is plugged in to the computer but the Host application program isn't recognizing it.	Damaged cable or other program running on host has the PocketFrog port.	Replace cable and quit other programs they may have connected to the PocketFrog port.
PocketFrog voltmeter is reading lower voltage than you expect.	Internal thermal protection fuse has triggered.	Quit PocketFrog host application and unplug PocketFrog for 5 minutes to allow protection to reset.
PocketFrog status LED is red when I plug it in.	PocketFrog has failed its internal self-test.	PocketFrog must be returned to factory.
Waveforms from calculations are distorted.	Host computer is not issuing commands with the required timing.	Other applications must be quit to allow enough compute power to the PocketFrog.
Application does not launch on Linux	Application file not enabled to execute.	Right click on file, →Properties → Permissions, enable execute.
Application does not launch	Operating system too old.	Update your operating system.
PocketFrog Disconnects unexpectedly	USB cable can't deliver required power	Use your external power source (A.C. or USB Power Delivery)

9.1.2 Finding log files for error reporting or support

If you need technical help, you should turn on logging so you can share a log of your issue with our support staff. To turn on logging:

MacOS: Go to PocketFrog menu

Linux and Windows: Go to Edit menu and click on Preferences, then check the logging option.

See the table below that shows you where to find your log files for the different operating systems. In the File menu is a Log function to aid in finding and emailing log files.

You must then repeat the steps that caused the error(s). Send these log files with your support request so that our support staff has the information to help you.

Location of Log files:

Windows
```
%AppData%\Standard
Measurement\PocketFrog\Logs
```

Mac
```
~/Library/Application
Support/Standard
Measurement/PocketFrog/Logs
```

Linux
```
~/Standard
Measurement/PocketFrog/Logs
```

10 Specifications

Parameter	Range	Resolution
Programmable power supply output voltage	1.00 to 20.0 volts	0.01 volt
Programmable power supply output current limit	0.60 to 2.10 amps	0.05 amp
Set universal counter input voltage threshold	0.25 to 35 volts	0.01 volt
Power supply output over voltage protect	1.00 to 20.0 volts	0.01 volt
Power Supply output voltage monitoring. (measured at power supply output terminals)	0.00 to 22.00 volts	0.001 volt
Power Supply maximum current limit	0.6 to 2.10 amps	0.05 amp
Voltmeter input voltage	0.00 to 40.00 volts	0.001 volt
Frequency measurement (3 volt peak to peak square wave, threshold set at 1.5V)	0.1 Hz to 200kHz	1 Hz
Pulse width high measurement (3 volt peak to peak square wave, threshold set at 1.5V)	10 microseconds to 5s (50kHz Maximum)	1 µs
Duty cycle measurement (3 volt peak to peak square wave, threshold set at 1.5V)	1% to 99% for frequencies below 50 kHz. Period affects accuracy.	1%
Pulse counting (3 volt peak to peak square wave, threshold set at midpoint)	0 to 2,147,483,646 edges	1 edge
Pulse width low measurement	10 µs to 5s	1.0 µs