

Pi-UpTimeUPS – UPS and power mobility for Raspberry Pi

[Overview](#)[Features](#)[Applications](#)[Datasheet](#)[Downloads](#)[FAQ](#)[Recommended Peripherals](#)[Supported Models](#)[Image Gallery](#)[ebay](#)[Amazon](#)[tindie](#)

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Pi-UpTimeUPS provides power mobility to the Raspberry Pi. Note - batteries or the Raspberry Pi shown are not included.

Pi-UpTimeUPS. Power mobility and UPS for a Raspberry Pi.



I. Pi-UpTimeUPS Overview

Pi-UpTimeUPS is an Uninterrupted Power Supply (UPS) for a Raspberry Pi. Pi-UpTimeUPS fits snugly on top of a Raspberry Pi making the Raspberry Pi mobile by providing a power source for an extended period of time.

Pi-UpTimeUPS provides the following capabilities:

- 1) Battery backup power and UPS.** Pi-UpTimeUPS provides continuous operations for up to ten (10) hours (depending on battery type used). On tests done, we have measured around twelve (12) hours using two 18650-3000 mAh fully charged batteries (as measured on a Pi-3 model B board, with Wi-Fi and Bluetooth on.) The run time will vary depending on the model of the Raspberry Pi used and the peripherals connected to the Raspberry Pi. Batteries take approximately 5 hours to charge. The larger the battery size the longer the UPS run time.
- 2) Provides steady power to the Raspberry Pi.** Pi-UpTimeUPS protects the Raspberry Pi from brown-outs as well as power failures preventing unwanted downtime. Pi-UpTimeUPS accepts power input from an external power source and charges its batteries at the same time it provides clean uninterrupted power to Raspberry Pi. A new power source is not needed. The same power source to a Raspberry Pi can be used with the Pi-UpTimeUPS board. Make sure the power source is connected to the Pi-UpTimeUPS board and not the Pi power port. This enables Pi-UpTimeUPS to charge the battery and Power the Pi at the same time.
- 3) Automatic recharge.** Pi-UpTimeUPS recharges the battery when the power comes back on after a power failure.
- 4) Auto shutdown.** The battery charge level is monitored by hardware. This status is indicated on GPIO 26, pin 37. Sample code is provided to monitor the status of the GPIO and shutdown the Pi properly when the battery level is low. The software is downloaded [here](#).

5) Power Reset switch. Pi-UpTimeUPS allows a restart of the Raspberry Pi after a software shutdown or whenever needed. With Pi-UpTimeUPS, there is no need to plug or unplug the external power source to reset the Pi. A Power-Reset switch on Pi-UpTimeUPS resets the Pi after a shutdown. A red LED turns on to signal the Pi power reset. There is also an additional connection for an external reset switch. Should you plan to use an external switch or encase the Pi (with Pi-UpTimeUPS) in an enclosure, you can use this connection point to connect an external reset switch. The external switch has to be normally off, with momentary on toggle.

6) Battery Protection. The battery is protected in several ways:

1. A temperature sensor monitors the temperature and suspends charging operation if the temperature rises to unsafe levels.
2. An onboard chip protects the batteries from over charging or over discharging - both of which could damage the batteries.
3. The battery charging circuitry manages the charge level so that the batteries remain charged.
4. The charge power level is maintained so that the Raspberry Pi and its peripherals get the priority in operation over battery charging. Thus, if the Raspberry Pi demands more power, the battery provides it and resumes charging after the demand for the additional power is fulfilled.
5. A fuse protects the 3.3V power supply to protect against short circuits.

The protections not only protects the battery from damage, it also extends the useful life of the battery.

7) Software. Python code provided for download for Pi-UpTimeUPS includes sample code for using the analog ports. Instructions are also provided for setting up the RTC. The software can be downloaded from the web as well.

8) UPS power sources: 3.3V and 5V UPS power is provided. Note the 3.3V power is not tapped from the Raspberry Pi. It is regenerated from the UPS and the batteries. A maximum of 800 mA of power can be drawn from the 3.3V power source.

[Back to the Top](#)

ADDITIONAL FEATURES

1. **Industry Standard Batteries.** Pi-UpTimeUPS uses standard 18650 Lithium Ion rechargeable batteries instead of custom batteries. 18650 batteries are commonly available. Batteries are not included with Pi-UpTimeUPS.
2. **Mounting holes and standoffs** provide mechanical stability of the Raspberry Pi and Pi-UpTimeUPS assembly. This ensures the batteries or the board does not fall off. Recommend using 15mm standoff. Also recommend Pi-UpTimeUPS is the top board on a Raspberry Pi stack. If a board needs to be stacked on top of a Pi-UpTimeUPS, use 23mm headers or longer headers. An 2x20 pin header extension will be needed for proper connection.
3. **Fuse and Power Protection.** A temperature sensitive and current sensitive fuse protects exposed 3.3V connection.
4. **Temperature monitoring.** The battery charging chip monitors the battery temperature and shuts the charging off if the batteries get too hot or if the ambient temperature rises above 50 degrees C.

After cooling charging is resumed. The temperature monitoring protects the batteries and system from heating up and causing damage.

5. **Auto shutoff** – Battery level is monitored in hardware. Download software code to shutdown the Pi when battery level runs low. (provide URL to download)The Python code will shut down the system when the battery level runs low. When the battery level runs below 2.7 V the system shuts down, protecting the battery. If needed, the python code can be run as a cron job to monitor the battery health and shutdown system when batteries run low.
6. **Works with all current models of the Raspberry Pi using a 40 pin header.** This includes Raspberry Pi-3, Pi-2 and other. Older models with a 26 pin header will not work with this board. Other clone boards such as Pi Orange, Asus Tinker etc. all work with the Pi-UpTimeUPS. The Python code will have to be modified for the Operating system used with the clone boards.
7. **On-board LED's shows the status of Pi-UpTimeUPS.** A red LED indicates a power reset and glows when the Power Reset switch is pressed. See our FAQ for more information on other LED's. A battery low LED (orange color) shows the battery condition low. If the battery is low, the Raspberry Pi may not reboot till the battery reaches a stable level.
8. **Compatible** – compatible with other boards and follows the Raspberry Pi HAT format for mounting holes, headers etc. This includes clones as well.

[Back to the Top](#)

Typical Pi-UpTimeUPS

UPS. Pi-UpTimeUPS provides protection against brown outs as well as power failure. When the power fails there is no interruptions to the normal operations of the Raspberry Pi. Depending on the batteries used, the run time could be as much as 16 hours (for some of the older models or Pi) to as little as 12 hours (e.g. a Pi-3 with WiFi and Bluetooth operational.) The run time will depend on the battery capacity (mAh) and the peripherals connected to the Pi. Run time will be longer if larger capacity batteries are used. Battery charge time is approximately 5 hours. Recommend using a solar panel 10W or more to provide sufficient power to charge the batteries as well as power the Pi during sunlight hours.

Data Logging and remote Data Loggers. Pi-UpTimeUPS enhances capabilities of the Raspberry Pi for data logging applications and for remote data loggers. If power source is not available readily, the batteries can be recharged in the day using a 5V solar panel or other renewable energy sources (e.g. wind turbines.)

Mobility. Pi-UpTimeUPS is a compact, rechargeable power source making the Pi mobile. Many applications such as digital cameras, game controllers, portable oscilloscopes, mobile phones, drone monitoring, and more are made possible using Pi-UpTimeUPS.

Security and Surveillance. Pi-UpTimeUPS ensures that the security and surveillance applications you create have the necessary power. Pi-UpTimeUPS works well with the Raspberry Pi Camera – providing necessary power to the camera as well as the Raspberry Pi for continued security and surveillance – even when the power fails.

Robotics. Pi-UpTimeUPS provide a compact, stackable power source making it ideal for robotics. The total capacity of 6000 mAh (two batteries, each rated for 3000 mAh) can run a robot for a long time.

Drones. The Li-Ion 18650 batteries provide one of the best power densities in the industry today. For drones, power source and weight is of concern. Pi-UpTimeUPS offers the best power density, harnessed securely to a Raspberry Pi in the industry today.

IoT devices. IoT devices uses sensors. Some of the sensors are digital. Some of them analog. With Pi-UpTimeUPS and the Pi-16ADC board, both analog and digital sensors can be connected. The data is read over an I²C bus. Sample code for the ADC shows how the information can be gathered several times a second. Building an IoT prototype or IoT device is made fast and easy.

Power Mobility. The UPS function for the Pi-UpTimeUPS makes the Raspberry Pi mobile. The Pi is no longer dependent on the power outlet. No need to shutdown and reboot the Pi every time you want to take it with you to school or to work or to your friend's house or anywhere else. If a power outlet is available, use it and enjoy extended run time. If a power outlet is not available, simply connect a 5V solar panel and extend the time away from the power outlet.

What else can you use Pi-UpTimeUPS for? Raspberry Pi has created an amazing ecosystem. It is refreshing to see many different applications users are creating; how students use the Raspberry Pi to enhance programming skills, and how the Raspberry Pi is used for a variety of low cost computing needs. We believe that using Pi-UpTimeUPS, many Raspberry Pi applications will be created more quickly and easily.

[Back to the Top](#)

Recommended Peripherals:

The following peripherals are recommended.

Pi-Z-UpTime: UPS for a Pi using one Li-Ion 14500 battery, ideal for Pi **Zero**. UPS 5V via header or USB Power out. A micro-USB to micro-USB cable is provided for Pi Zeros which do not have the header installed.

Pi-UpTimeUPS: UPS for Pi-2 or Pi-3 using one/two 18650 batteries. Provides UPS 3.3V and 5V. Includes reset switch and provision for external reset switch. **Pi-BB:** Bread board with 300 connect points. Use this board to add other breakout boards with the Pi.

Pi-BB-RPS: Dual DC RPS-power breadboard, including 7-24V and USB power. 5V and 3.3V generated on board. Dual power provides Redundant Power Supply (RPS). Combine RPS with UPS power by connecting the Power out port on the Pi-BB-RPS to the power in port on Pi-UpTimeUPS. Also use the bread board for connecting other breakout ports. Use available 7V to 24V power to power the whole system. Use the over 240 connection points with breakout boards such as a Real-Time-Clock for off-grid uses.

Pi-BB: Bread board with 300 connect points. Power Pi and electronics. 5V and 3.3V Power bus is provided. Use the over 300 connection points with breakout boards such as a Real-Time-Clock for off-grid uses.

Pi-16ADC for 16 bit, 16 channel Analog to digital converter board for attaching analog sensors or monitoring other capabilities on the Raspberry Pi.

Pi-EzConnect: Secure GPIO connections for Pi-2 and Pi-3.

PiZ-EzConnect: Secure GPIO connections for Pi **Zero**. Can also be used with Pi-2 and Pi-3. Small compact Pi Zero format.

PiZ-EzConnect KIT: Build your own connector for Pi **Zero** or Pi-2, Pi-3 using PiZ-EzConnect board. Soldering required.

[Back to the Top](#)

II. Using Pi-UpTimeUPS and other boards (HATs / shields)

Pi-UpTimeUPS uses the header pins of the Raspberry Pi to provide power to the Pi. As long as the other boards follow the Raspberry Pi Foundation standards for connections, Pi-UpTimeUPS will work with these boards.

III. Pi Models Supported



By default, we ship the larger, 40 pin connectors which works with the Raspberry Pi+ (models A+, B+, Pi-2 and Pi-3, and other vendors adhering to the HAT standard). Pi-Zero is also supported, as long as a 40 pin header is soldered onto the Pi-Zero. The mounting holes for the standoff for Pi-zero are such that only two standoffs can be connected. Note that the Pi-UpTimeUPS board will extend beyond the dimensions of the Pi-Zero board.

Older models of the Raspberry Pi with a 26 pin header are not supported

[Back to the Top](#)