

# Pi-UpTimeUPS – UPS and power mobility for Raspberry Pi

## Key Features

- Provides UPS functionality for Raspberry Pi.
- UPS 5V out (via micro USB) & UPS 3.3V @ 700mA available.
- Uses one or two 18650 batteries. Includes battery management.
- Reset switch for rebooting the Pi. An external reset switch can be connected.
- Python code shuts down the Raspberry Pi when battery is low.
- Uses GPIO 26 to monitor low battery Voltage.
- Hard shutdown when battery runs dangerously low, protecting the battery.
- LEDs can be turned off to save power.
- GPIO can be disconnected if it conflicts with a pre-existing GPIO.

A Raspberry Pi is tethered to the wall power outlet. It needs the power via the micro-USB cable to operate. When the Raspberry Pi needs to be moved from one location to another, it needs to be shut down and rebooted. If the power fails, the Raspberry Pi shuts down without a proper shutdown sequence, sometimes with catastrophic after effects. Pi-UpTimeUPS provides clean, stable, reliable uninterruptable (UPS) power to the Raspberry Pi. Pi-UpTimeUPS provides power mobility for the Raspberry Pi.



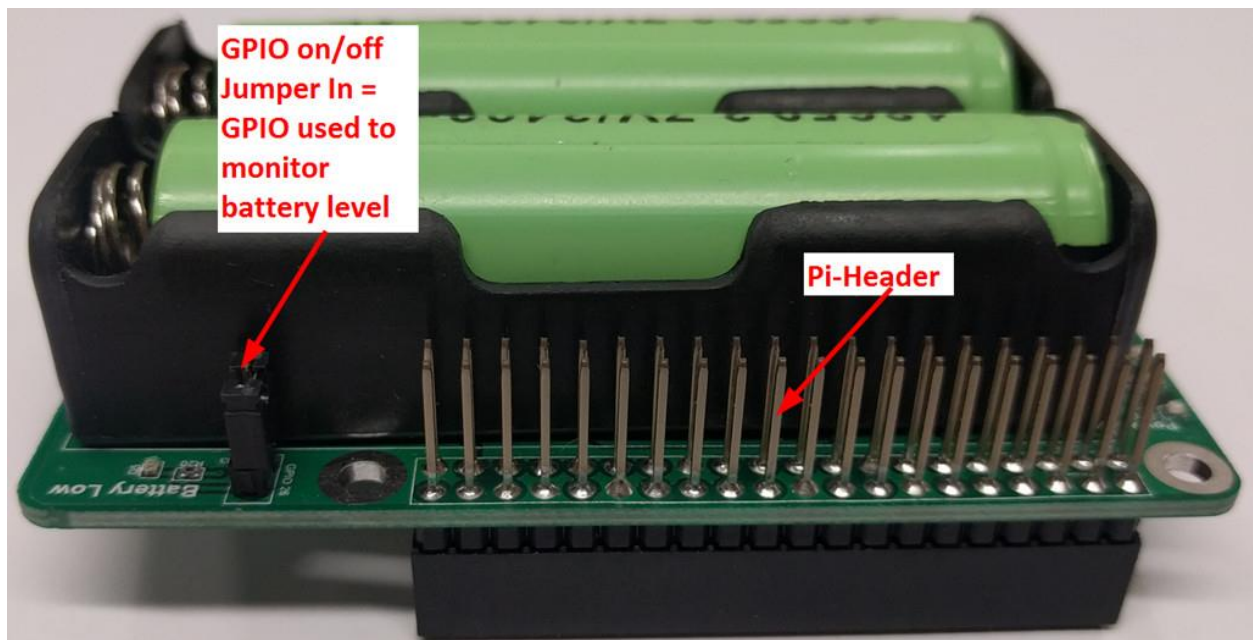
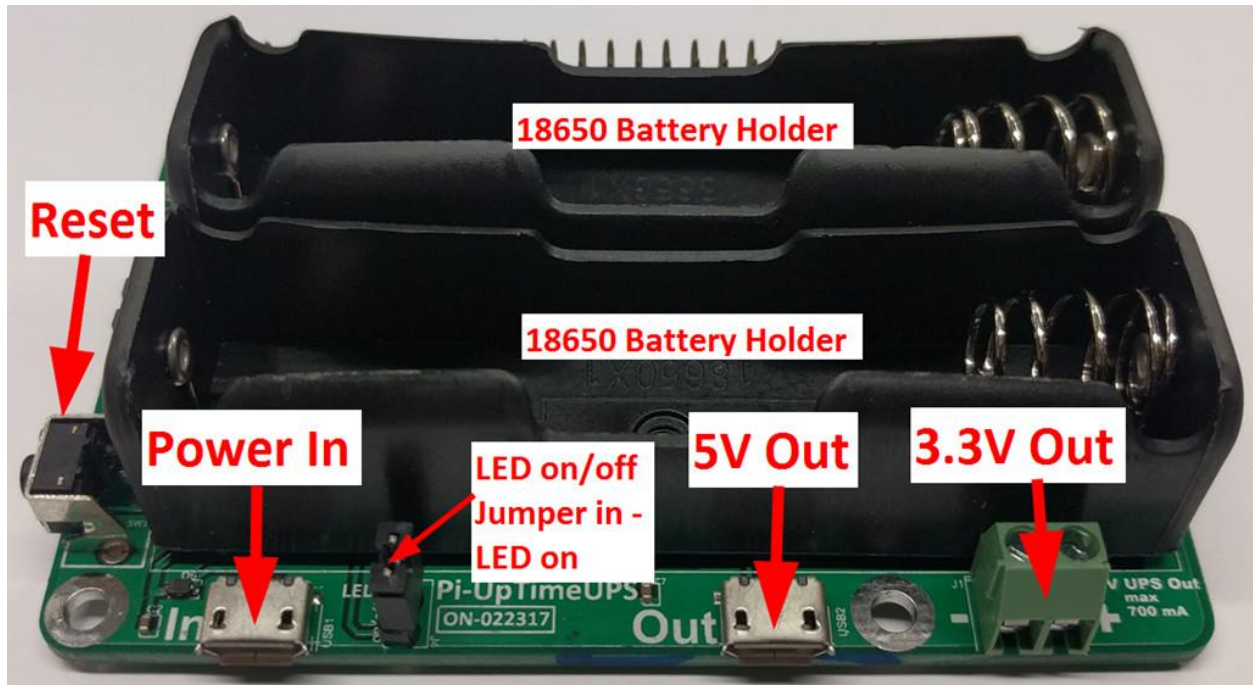
Install one or two 18650 batteries<sup>1</sup> in the Pi-UpTimeUPS battery holder and the Raspberry Pi continues to operate when power fails or when the power plug is disconnected. The batteries are charged when power is available. When power fails, the necessary power is generated from the batteries by Pi-UpTimeUPS to power the Raspberry Pi, the peripherals attached to it and provide UPS power to Power Out ports. The micro-USB port provides 5V. The 3.3V (max 0.7A) is generated on the Pi-UpTimeUPS and does not tax the 3.3V Raspberry Pi power capabilities. Pi-UpTimeUPS automatically charges the battery when power is restored. Power demands placed by the peripherals attached to the Raspberry Pi are also addressed by Pi-UpTimeUPS. Pi-UpTimeUPS protects the Raspberry Pi from brown-outs and other power related issues.

Battery level is monitored via GPIO 26. Sample software provided uses GPIO 26 and ensures a proper shutdown when the batteries run low. An onboard sensor measures the battery level and performs a hard shutdown when the battery level is low. By removing the shunt on the GPIO jumper, the GPIO is not used. This can be useful when GPIO 26 is in use for other purpose. In these situations, it is recommended to jump the GPIO to another available GPIO.

A power reset switch on Pi-UpTimeUPS makes it easy to reboot the Raspberry Pi after a software shutdown. After a software shutdown, a Raspberry Pi requires a user to plug/unplug the micro USB power to restart the Raspberry Pi. With Pi-UpTimeUPS, a momentary press of the power reset switch restarts the Raspberry Pi.

The LED jumper shunt removed turns off the LEDs minimizing the power lost.

<sup>1</sup> 18650 batteries are not included with Pi-UpTimeUPS. Inserting batteries incorrectly can cause irreversible damage to the hardware.



Not shown in the picture – connection point for external Reset switch.

Reset switch is used to power On/Off Pi after software shutdown. 3.3V Out is generated locally by Pi-UpTimeUPS and not drawn from pin 1 of the Pi. Maximum 700 mA.

# Specifications

## General Information

**Model Number:** Pi-UpTimeUPS

## Raspberry Pi Models supported

Any Raspberry Pi with a 40-pin header is supported. For example, Pi 2, Pi 3, Pi Zero, Pi Zero W etc. Older Raspberry Pi models with a 26-pin header are not supported.

## Power

**Input Power:** 5V via micro USB connector on PiZ-UpTime. Batteries are not charged if the micro USB connector is not connected to Power connector on Pi-UpTimeUPS.

**Power Adapter:** Not included.

**Maximum Current:** 1.6 Amps total. This is used by 5V (Pi, USB etc.) and 3.3V power.

**Maximum 3.3V UPS current:** 700 mA. 3.3V is generated by Pi-UpTimeUPS.

**Ripple:** Less than 25mV p-p.

**Operating Frequency:** 18.5kHz.

**Battery Low Trigger:** 3V

**Battery Low hard-shutdown:** 2.8V

## Output

**5V UPS Power:** Power provided to the Raspberry Pi via the 40-pin header, pin 2. 5V UPS power can be accessed via micro-USB out connector.

**3.3V UPS Power:** 3.3V UPS Power is generated and available via the connector on the board. 3.3V Power from the Pi is not used.

## Batteries

**Batteries:** Two unprotected<sup>2</sup> 18650 Lithium-ion batteries. **Batteries are not included.**

**Battery capacity:** Recommend 2000 mAh to 3500 mAh capacity battery.

**LEDs:** Battery charge status & other information is shown by LED's on the board. Reset LED is lit when reset.

**Battery monitoring:** Via Pin37, GPIO 26. GPIO low to high when Battery is 3.0V or less. Hard shutdown when battery is 2.8V or less. Monitoring available via sample python code.

**Battery polarity:** Both batteries are inserted with positive polarity on the same side. **Reversing battery polarity can cause irreversible damage to Pi-UpTimeUPS board.**

**Battery holder:** Self-extinguishing Thermoplastic Polyester, black color.

**Safety:** Onboard circuitry prevent over charging, deep discharging. Temperature monitor checks temperature and shuts down charging if it becomes too hot.

**Battery Charging:** Uses CCCV charging method.

**Depleted Batteries:** Uses low current charging to bring charge level up and then CCCV charging.

## Spacers

M2.5x23mm spacers recommended.

## Reset Switch

**Reset Switch:** Reboots the Raspberry Pi after a shutdown.

**External Switch:** Connection points on the board for external normally-off, momentary-on reset switch.

## Dimensions

**Board dimensions:** 83mm x 70mm x 35mm (3.3" x 2.2" x 1.4").

**Weight:** About 50g (1.7 oz.) without batteries. Note each battery adds approximately 50 grams of weight.

**Header:** Female pins on bottom. Male pins on the top. Pin thickness appx. 0.6mm. Female pin height appx 11 mm. Male pin height appx 10.25 mm.

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<sup>2</sup> Protected cells will not fit in the battery holder.

## Warranty

90-day limited warranty.

## Other Information

### Recommended peripherals:

**Pi-EzConnect:** for GPIO connections

**Pi-16ADC:** 16 channel, 16-bit Analog to Digital Converter (ADC)

**Spacers:** M2.5, 15 mm spacer kit

**PiZ-UpTime:** UPS board for Pi Zero and Pi Zero W.  
Can be used with Pi-2 or Pi-3 as well. Run time on a battery is substantially less.

**Pi-BB:** Half size bread board (BB) with USB power.  
Powers Pi and electronics on BB. 3.3V from Pi.  
Power bus for 3.3V and 5V.

**Stacking header extender** to attach other HATs on top of Pi-UpTimeUPS.

**RoHS Compliance:** Electronic components, board etc. are RoHS compliant.

**Operating Temperature:** 0°C to +50°C with batteries.  
0°C to +85°C without batteries.

**Operating Humidity:** 10% to 80% non-condensing.

**Code download:** [www.alchemypower.com](http://www.alchemypower.com)

**Product Video:** <https://youtu.be/FMIRmrrCF-I>

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