UPiS - Uninterruptible Power intelligent Supply

Introduction
The UPiS is an Advanced Powering add-on Module for the RaspberryPi® that adds a wealth of additional features to the powering functionality. It is equipped with a LiPO battery (1150 or 2600 mAh) and features a buck/boost switching power converter. There is no need for any additional cabling or power supply, as the UPiS is powered by the same power supply of your original RaspberryPi®; you just insert the UPiS on the top of the P1 connector of your RaspberryPi®. The UPiS has an embedded measurement system that continuously checks the powering voltage and current consumption, and when the cable power is absent or insufficient, it automatically switches to the battery source. Then, it keeps checking the input voltage on all power sources, and when cable power is available again, it switches to it automatically, turning the battery source off. The UPiS uses exactly the same micro USB Power Supply that you are using to supply your RaspberryPi®, however it also has an extended external voltage input1 for other non-standard powering sources.

Applications
The UPiS as an add-on Module is addressed to all users that need a power back-up and/or sensing features for applications running on the RaspberryPi®. All applications running on the RaspberryPi® can take advantage of the uninterruptible power supply feature of the UPiS (ranging from RaspberryPi®-based fan-less servers to solar-powered applications), but in

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1 The extended external voltage input is available only in the advanced version of the UPiS

Intelligent Modules for the Raspberry Pi
addition, the UPiS provides a wealth of sensors and features, all cumulated in a single all-in-one unit, that can enable writing many innovative applications.

**Features**

The features of the UPiS Module can be categorized as follows:

- Powering functionalities
- I/O and control functionalities
- RTC functionalities
- Interfaces functionalities
- Software Protection functionalities
- Environment supervising functionalities

In detail, the list of UPiS features is below:

1. Supervised and Protected Powering from all cable sources
   a. RaspberryPi ® micro USB (5 VDC) – available from firmware release V1.20
   b. Additional micro USB (5V DC)
   c. Extended External Powering Input (7V DC – 18V DC) [Advanced version only]
2. Battery Power Backup on each cable powering source (including original RaspberryPi® micro USB – optional after firmware activation) – the UPS feature
3. Onboard Rechargeable LiPO Battery (1150/2600 mAh) – battery working time is from 2 to 5 hours, depending on the version, system load and configuration
4. Onboard enhanced multiple level protection system for the LiPO battery:
   a. Cut-off jumper
   b. PTC fuse
   c. Onboard Thermometer
   d. Over-charge and Over-discharge protection
   e. Over-voltage and Under-voltage protection
5. Onboard Intelligent Automatic LiPO Battery Charger (Charges the battery automatically only if the supply voltage is present and can provide enough current to both feed the RaspberryPi® and charge the battery)
6. RaspberryPi® Hardware ON/OFF Switch
7. Embedded Emulated RTC (Real Time Clock – DS1307) accessible via RaspberryPi® I2C and/or RS232 provided from the System
8. Onboard Analog Thermometer (accessible via RaspberryPi® RS232)
9. Onboard True USB interface (can be used as RS232 – USB Bridge)
10. Programmable Time, RaspberryPi® File Safe Shutdown Button
11. Full monitoring of all UPiS Powering Parameters via RaspberryPi® RS232 port:
   a. Current Consumption
   b. Voltage on each Power source
   c. System Temperature

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2 Requires that the RaspberryPi® be powered from the second micro USB placed on the UPiS board or from Extended External Powering Input
d. Battery Level

e. Powering source

12. RTC based programmed Startup/Shutdown
13. Onboard UPiS Reset Button (resets UPiS and RaspberryPi® but not RTC by cutting the powering of the RaspberryPi® for a very short time)
14. Onboard NO RELAY controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN0)
15. Onboard ESD Protected 1-wire interface, controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN3) with separate 3.3V supply pull-up resistor.
16. Onboard ESD Protected I/O pin, controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN3)
17. Onboard True 12 V RS232 interface to the external world (with level converter)
18. Protected (Resettable fuse 140 mA) 5 VDC output for user applications, with battery backup feature
19. Non-protected 3.3 VDC output for user applications (usually used for 1-wire application), separate and independent from the RaspberryPi® 3.3 supply.
20. Extended Tiny Encryption Algorithm (XTEA) cryptographic Customer Software Protection System (with custom defined protection keys)
21. Scripting language
22. LED-based Status Information System
RaspberryPi® P1 Connector

Uninterruptible Power intelligent Supply

Intelligent Modules for the Raspberry Pi
NEW Product for the B+/A+

UPS PiCO

Uninterruptible Power Supply
with Integrated Battery, Peripherals and I^2C control Interface

for use with

Raspberry Pi® B+, A+, B, and A

HAT Compliant

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Designed and Manufactured by PiModules and ModMyPi

www.pimodules.com  www.modmypi.com
System Overview

Introduction
The **UPS Pico** is an advanced uninterruptible power supply for the Raspberry Pi® that adds a wealth of innovative power back-up functionality and development features to the innovative microcomputer!

The standard **UPS Pico** is equipped with a 300mAh LiPO battery specially designed to enable safe shutdown during a power cut. Additionally, this can be easily upgraded to the extended 3000mAh version, which enables prolonged use of a Raspberry Pi for **up to 8 hours** without a power supply connected!

The **UPS Pico** features an embedded measurement system that continuously checks the powering voltage of the Raspberry Pi®. When the cable power on the Raspberry Pi® is absent, insufficient, or the device detects a power failure, the **UPS Pico** automatically switches to the unit’s battery source. The module then continues to check the voltage on the Pi and switches automatically back to the regular cable supply when power is once again available.

The **UPS Pico** is powered and the battery pack intelligently charged via the GPIO pins on the Raspberry Pi®, so no additional cabling or power supply is required.

The **UPS Pico** is designed to be 100% compliant with [HAT standards](#) for the Raspberry Pi® B+ and A+, and is mechanically compatible with the original Raspberry Pi® models A and B when an extension header is used. In addition to this, because the **UPS Pico** requires no external powering and fits within the footprint of the Raspberry Pi®, it is compatible with most cases.

The **UPS Pico** can also be equipped with an optional [Infra-Red Receiver](#) which is routed directly to GPIO18 via the PCB. This opens the door for remote operation of the Raspberry Pi® and **UPS Pico**!

Finally, the **UPS Pico** features an implemented Automatic Temperature Control [PWM FAN controller](#), and can be equipped with a micro fan kit, which enables the use of the Raspberry Pi® in extreme conditions including very high temperature environments.
Applications

**UPS Pico** is equipped with plenty of features which make it an extremely useful tool for Raspberry Pi® project development. It not only provides powering continuity, but also offers extra user programmable LEDs, Sensors, buttons and I/O’s. The unit also features a dedicated **10-bit analogue to digital converter** with two channels making it the perfect board for remote and unmanned sensor deployment. These extra features result in the **UPS Pico** being a superior all-in-one device perfect for many innovative projects, and embedded applications.

Features

The list of features of the **UPS Pico** is as follows:

- Raspberry Pi B+ HAT Compliant
- Plug and Play
- Smart Uninterruptible Power Supply (UPS)
- Integrated LiPO Battery (8-10 Minutes of Power Back-Up)
- Intelligent Automatic Charger
- No Additional External Power Required
- Additional 3000 mAh Battery for 8 Hours Run-Time (Not Included)
- 5V 2A Power Backup (Peak Output 5V 3A)
- Integrated Software Simulated **Real Time Clock (RTC)** with Battery Back-Up
- **File Safe Shutdown** Functionality
- Raspberry Pi B+ **Activity Pin**
- PWM FAN control (Fan Not Included)
- 2 User Defined LEDs
- 2 User Defined Buttons
- **Integrated Buzzer** for UPS and User Applications
- **Status Monitoring** - Powering Voltage, UPS Battery Voltage and Temperature
- **I2C PiCo Interface** for Control and Monitoring
- RS232 Raspberry Pi Interface for Control and Monitoring
- **XTEA Based** Cryptography User Software Protection
- 2 Level **Watch-dog Functionality** with **FSSD and Hardware Reset**
- Raspberry Pi B+ **Hardware Reset Button via Spring Test Pin** (Not Included)
- Jumper for Raspberry Pi B+ Pin Functionality Selection
- **Stackable Header** for Add-On Boards
- **Boot Loader** for Live Firmware Update
- Compatible with **Intelligent IR Remote Power ON/OFF (PowerMyPi)**
- Integrated ESD-Protected 2 Channel A/D 10 Bit Converters 0-5.2V
- Integrated ESD-Protected 1-Wire Interface
- **Labeled J8 Raspberry Pi B+ GPIO Pins** for Easy Plug & Play
- **Infra Red Receiver** Sensor Interface (IR Not Included)
- Upgradable with PiCo Add-on Boards
- Fits Inside Most Existing Cases
Hardware Upgrades – the Plco Add-on Boards

The UPS Plco is equipped with plenty of features that make it an extremely useful tool for Raspberry Pi® based project development. However, it can’t do everything! In order to cover a broader range of user requirements, we are developing a wide range of add-on boards that can be hosted on the top of UPS Plco. These Plco Add-on Boards will be designed to extend the functionality of the product, whilst being simple to integrate by plugging directly on top! However, in order to keep compatibility with HAT standard, each Plco Add-on Boards data will be stored in the UPS Plco HAT EEPROM. The following upgrade boards are in development and will be available soon:

- **EPR Plco Board**
  
The Extended Powering Plco Board, will be designed to accept external powering voltage from 6 - 32V DC, and enable the use of solar panels. The device will also be equipped with various sensors, an RS232 converter, a USB interface, a bi-stable Relay and many more useful I/O’s. The EPR will of course retain the powering functionality of the UPS Plco.

- **MCOM Plco Board**
  
  A Multi-Communication Plco Board, offering a multiple communication channels including 4 x RS232, RS485, etc.

- **RBT Plco Board**
  
  A RoBoT Plco Board, offering a toolset for the ROBOT projects development.

- **SNS Plco Board**
  
  A SeNsorS Plco Board, offering a toolset for various sensors projects development.
Photo Gallery