UPS Plco HV3.0B+ HAT Stack/Top-End

Intelligent Mobile Power Bank and Uninterruptible Power Supply with RTC, Peripherals and I2C control Interface

Especially Designed for the New Raspberry Pi® 3 Model B+

HAT Compliant

“Raspberry Pi” is a trademark of the Raspberry Pi® Foundation
The UPS PIco HV3.0B+ HAT Stack/Top-End 450 is an advanced Intelligent Mobile Power Bank and Uninterruptible Power Supply especially designed for the Raspberry Pi® 3 Model B+, that adds a wealth of innovative powering/backup functionality and development features to the innovative microcomputer! The UPS PIco HV3.0B+ HAT Stack/Top-End 450 will automatically shut-down your Raspberry Pi® if there is a power failure, supply mobile applications from battery source, and can be set to automatically monitor and reboot your Raspberry Pi® once power has been restored! It is equipped also with a Intelligent Externally Accessed (with Files Safe Shutdown) Slide Power Switch that allows to safety System Switch ON/OFF whenever you like, without worrying about files corruption as it is always properly shutdown the system before cable power will be disconnected. This new and very advanced feature, switches OFF also the Raspberry Pi® 3 Model B+ even if it is powered via their micro USB powering cable. This allows also to charge (optionally) the battery when Raspberry Pi® 3 Model B+ is OFF however still connected to the micro USB cable powering source.

The UPS PIco HV3.0B+ HAT Stack/Top-End 450 features a 5V 3A total current output on battery powering, designed for use on the latest Raspberry Pi® 3 Model B+!

The UPS PIco HV3.0B+ HAT Stack/Top-End 450 offers now 3 User Programmable Keys, 3 separate User programable LEDs with different colors, support for multiple and different chemistry of a high capacity batteries, bi-stable relay (Zero Power) configured as, as also 3 x A/D 12-bit converters with pre-adjustable readings to 5.2V. As also 10V, 20V and 30V conversion (when used with Terminal Blocks PCB or separate external resistors). Now, with number of embedded sensors (inbound current, outbound current, temperature, voltages), true 5V 1-wire interface, optional high voltage RS232 interface and many, many additional features!!

The UPS PIco HV3.0B+ HAT Stack/Top-End 450 is standard equipped with a 450mAh 15C LiPO battery (able to supply 6.5A) specially designed to enable safe shutdown during a power cut. Additionally, this can be easily upgraded to the extended 1500mAh, 4000mAh or 8000mAh, or 10400 mAh capacities, which enables prolonged use of a Raspberry Pi for up to 16 hours without a power supply connected!

The UPS PIco HV3.0B+ HAT Stack/Top-End 450 design support now batteries with different chemistry like: LiPO, Li-Ion as also LiFePO4. Especially the LiFePO4 batteries are addressed to applications where temperatures environment is more restricted as can be used for supplying from -10 degrees up to +60 degrees. In addition, the LiFePO4 have a unique extremely long life of charging/discharging that can achieve up to 2000 cycles or 10 years life time!!

Now, with new add-on board (PIco LP/LF Li-Ion 18650 Battery Holder) you can use all Li-Ion 18650 batteries from electronic cigarettes wide available on the local markets approaching total capacity of 7200 mAh, as also 18650 LiPO and LiFePO4.

The UPS PIco HV3.0B+ HAT Stack/Top-End 450 is powered, and the battery pack intelligently charged via the GPIO pins on the Raspberry Pi®, therefore no additional cabling or power supply is required. Due to that fact UPS PIco HV3.0B+ HAT Stack/Top-End 450 requires no external cable powering and fits within the footprint of the Raspberry Pi®, it is compatible with most cases, including Official Raspberry Pi case with closed lid (Top-End Version only)
Professional developers often need to protect their application. To support them UPS Pico HV3.0B+ HAT Stack/Top-End 450 offers the XTEA dual path encryption engine that protect the developed software with the secure code.

The new PCB is designed with 2 oz copper and 4 layers, especially for high current powering systems offering Multilayer Copper Thermal Pipes for increased System Thermal Response and better passive cooling!!

The UPS Pico HV3.0B+ HAT Stack/Top-End 450 can also be equipped with an optional Infra-Red Receiver which is routed directly to GPIO18.

The embedded Electromagnetic Programmable Sounder can be used as a simple buzzer but also as music player due to implemented sound generator and dedicated programmer interface.

The IoT developers will find useful the 3 independent ESD protected 12 bits buffered A/D converters as also number of internal sensors and sensor interfaces that can be used for system monitoring such as Battery Voltage, Raspberry Pi Voltage, Inbound/Outbound Current measure, System Temperature and true 5V 1-wire interface.

The integrated Hardware RTCC enables a new extremely usefully feature – the Events Triggered RTCC Based System Actions Scheduler. The Events Triggered RTCC Based System Actions Scheduler allows to timely start up, or shutdown the Raspberry Pi® on various internal or external events that include, data available on RS232, A/D, RTCC, and temperature, or just on requested Time Stamp.

Finally, the UPS Pico HV3.0B+ HAT Stack/Top-End 450 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. The FAN speed can be manually/automatically adjusted according to system temperature conditions linear from 0 % (FAN is OFF) up to 100% by increasing and decreasing rotation speed. Thus, guarantees the possible lowest level of noise and always extremely cool Raspberry Pi® 3 Model B+!

The UPS Pico HV3.0B+ HAT Stack/Top-End 450 can also be equipped with an optionally with:

- Infra-Red Receiver which is routed directly to GPIO18 via the PCB for remote IR operations.
- Additionally the Pico includes an 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.
- Bi-Stable (Latching), Zero Power Relay, configurable for a double DPDT 2A/30V
- Terminal Blocks PCB offering 12V RS232 interface, and all I/O interfaces Terminal Blocks capabilities
- Pico LP/LF Li-lon 18650 Battery Holder (single or double) that allows using all Li-lon 18650 batteries from electronic cigarettes wide available on the local markets, as also 18650 LiPO and 18650 LiFePO4 (known as 123 type).
The UPS Pico HV3.0B+ HAT Stack/Top-End 450 is designed to be 100% compliant with HAT standards for the Raspberry Pi® 3 Model B+ and includes two Gold Plated Pins, with install locations for the Raspberry Pi® 3 Model B+ that allows to have the Raspberry Pi® 3 Model B+ ON/OFF with continuous powering on the micro USB.
Features

The list of features of the UPS PiCo HV3.0B+ HAT Stack/Top-End 450 are as follows:

General

- **Designed Especially for the Raspberry Pi® 3 Model B+**
- **HAT Compliant** (HAT dimensions and HAT EEPROM)
- **Plug and Play** – Ultra Simple Semi-Automatic Installation via GitHub
- **Standard Interrupts driven interaction with Raspberry Pi® based on Daemons using GPIO27 (Pin13) & GPIO22 (Pin15), very responsive on massive files copying**
- **(Optional) GPIO free** (all GPIOs are available for user application) interaction with Raspberry Pi® is based on current consumptions and I²C activity
- **Simple status email broadcasting application based on Daemons** when Powering Status Changed
- **Enhanced System Monitoring and Programming API**
- **Labeled J8 Raspberry Pi® GPIO Pins** for Easy Plug & Play of experimental cables
- **Standard THT 40 Pin connector (not soldered)**
- **Remote bootloader** for Live Firmware Update on remote locations
- **Local bootloader** for Live Firmware Update

Powering Options

- **Intelligent Uninterruptible Power Supply** (UPS)
- **Mobile Battery Power Bank** (starts-up without cable power cycling)
- **File Safe Shutdown** and **Start-up** Functionality on a Single Button
- **Single slide ON/OFF switch for battery powered (mobile) and cable powered applications** running without power cycling (with **File Safe Shutdown functionality** when OFF)
- **Switches ON/OFF the Raspberry Pi® 3 Model B+** even if it is powered via their micro USB cable power!!
- Possibility to solder **external ON/OFF switch** (Ready Soldering PADs)
- **Integrated LiPO Battery** 450 mAh 15C (10-15 Minutes of Power Back-Up)
- **5V 2.6A Power Backup** (Peak Output 5V 3A)
- **No Additional External Power Input Required.** System is monitoring power status over 5V GPIOs, therefore is compatible with 99.99% of all existing cases
- **Additional programmable 5V power source with battery backup**, available for user applications also when Raspberry Pi is OFF (5V@750mA) protected with PPTC FUSE and reverse current flow diode, controlled by User and RTC Scheduler.
- User and RTC Scheduler controlled, 0.2A@3.3V protected output (sourced from independent and dedicated LDO)

Supported Batteries Types and Capacities

- **Support for LiPO, LiFePO4 and Li-Ion Chemistry Batteries** on the same PCB (with high current cable connection) with dedicated plastic base
- **Support for Li-Ion 18650 low cost batteries** (from Electronic Cigarettes) with dedicated mounting base PCB screwed on top
- Support for LiPO 18650 batteries with dedicated mounting base PCB screwed on top
- Support for LiFePO4 18650 batteries with dedicated mounting base PCB screwed on top
- Intelligent Automatic Battery Charger
- Available Standard Batteries Capacities are:
  - LiPO 1500 mAh
  - LiPO 4000 mAh
  - LiPO 8000 mAh
  - LiPO 10400 mAh
  - LiFePO4 3000 mAh
  - LiFePO4 4000 mAh
  - LiFePO4 8000 mAh
  - Li-Ion from 1200 mAh up to 7200 mAh
  - Any user selected 16850 battery capacity

**Embedded Peripherals and Interfaces**

- **3 User Programmable LEDs** for user own application with additional connectivity to external User LEDs
- **3 User Programmable Buttons** for their own application with additional cable connectivity to external User Buttons
- **System File Safe Shutdown/Start-up button** with additional cable connectivity to external button
- **Single slide ON/OFF switch for battery and cable powered applications** with additional cable connectivity to external User Switch (OFF is always combined with File Save Shutdown capability). Switches completely OFF the Raspberry Pi, while the battery can be charged
- (Optional) **Bi Stable Relay (Latching - Zero Power)** with two galvanic isolated independent contacts DPDT one 2A/30V and one 1A/30V
- Integrated **True 5V ESD protected 1-wire interface** (with voltage converter to 3.3V) connected directly to the GPIO4
- Integrated **ESD-Protected 3 x 12-bit A/D converters with voltage conversion embedded calculators and raw data option** (implemented in firmware extensive Lowpass and Olympic Score filtering):
  - 0V-5.2V
  - 0V-10V
  - 0V-20V
  - 0V-30V
- **Infra-Red Receiver** Sensor Interface (IR Not Included) directly connected to the GPIO18
- **Programmable Integrated PWM Sounder** (programmable by user API or Automatic), able to play music
- Integrated **Hardware Real Time Clock (RTC)** with Battery Back-Up
- **PWM fan control** with dedicated Temperature sensor touching the Raspberry Pi® PCB, based on Raspberry Pi or Embedded Temperature Sensor (Fan need to be ordered separately). Extremely useful for the new overclocked Raspberry Pi® 3 Model B+
- On Battery Powered **System Available Running Time** (calculated on battery capacity, Battery Level and System Current Consumption)
• (optional) **second RS232 port** (5V tolerant, or 12V via Terminals Block PCB)

**Embedded Sensors**

• **Outbound current** measure sensor when Battery powered
• **Inbound current** measure sensor when Cable powered
• **NTC based onboard** temperature sensor
• (Optional) TO92 Temperature sensor
• Battery Level Voltage
• Raspberry Pi GPIO 5V level

**User/Programmer Interface**

• **I2C PICo API Interface** for Control and Monitoring, with over 50 programming registers
• Support for 3 different users selectable I2C addresses sets:
  - **DEFAULT**: 0x68, 0x69, 0x6A, 0x6B, 0x6C, 0x6D, 0x6E, 0x6F
  - **NO_RTC**: 0x69, 0x6B
  - **ALTERNATE**: 0x58, 0x59, 0x5A, 0x5B, 0x5C, 0x5D, 0x5E, 0x5F

**System Schedulers**

• **Basic Time Scheduler**
• **Event Triggered RTC Based System Actions Scheduler** (ETR SAS)
  System can wakeup and sleep on external or internal events like:
  - temperature,
  - 3 x A/D levels,
  - voltage,
  - RS232 data;
• as also can trigger Actions like: Relay, Auxiliary Voltage ON/OFF, RS232 data with or without involvement of the Raspberry Pi®. Always based on internal Hardware RTC

**Case Compatibility**

• **No Additional External Power Input Required.** System is monitoring power status over 5V GPIOs, therefore is compatible with 99.9% of all existing cases
• **Fits Inside Most Existing Cases as no extra cabling is needed**
• **Fits inside to the Official Raspberry Pi Case with closed lid** (version Top-End only)
• **Switches ON/OFF the Raspberry Pi® 3 Model B+** even if it is powered via their micro USB cable power!!

**System Monitoring**

• **Status Monitoring** – Powering Mode, Inbound current, Outbound current, Powering Voltage, UPS Battery Voltage, Current and Temperature
• **Events Pi Log feature**
• **System LEDs** – UPS, BAT, CHG, INF, FAN (optionally selected can be mapped to User LEDs)
**System Healthy**, that informs user remotely if Raspberry Pi and UPS Pico HV3.0 are running properly and system is power protected (based on various internal system triggers)

**User Application Security**

- (optional) 2-way XTEA Based **Encryption Engine** for **User Intellectual Properties** protection

**System Protection**

- Direct **Raspberry Pi® Hardware Reset Button** via Spring Test Pin (pogo pin)
- **Programmable Watch-Dog Hardware** feature (Still Alive Timer)
- PPTC 2.6A fuse
- ZVD circuit on 5V GPIO connections
- **Microcontroller watch-dog**
- Over Temperature protection
- Over Current protection

**System Design**

- Designed and Analyzed with one of the most advanced CAD/CAM Tools - Mentor Graphics PADS
- Design Based on Microchip 16-bit 16MIPS micro controller
- Industrial Originated

**PCB Construction**

- **2 oz copper** PCB manufactured for proper high current supply
- 8mils track/8mils gap technology **4 layers PCB**
- PCB Surface Finishing - Immersion Gold
- **Multilayer Copper Thermal Pipes** for increased System Thermal Response and better passive cooling

**Designed and Manufactured in Europe**
<table>
<thead>
<tr>
<th>Features</th>
<th>UPS PIco HV3.0B+ HAT Models</th>
</tr>
</thead>
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<tr>
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<td>UPS PIco HV3.0B+ HAT Stack 450</td>
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<td></td>
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<tr>
<td><strong>Raspberry Pi® System Compatibility</strong></td>
<td></td>
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<tr>
<td><strong>Compatible Raspberry Pi Models</strong></td>
<td>Designed for Raspberry Pi® 3 Model B+</td>
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<tr>
<td><strong>Cases Compatibility</strong></td>
<td></td>
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<tr>
<td>Cases</td>
<td>Most of the cases</td>
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<tr>
<td></td>
<td>ModMyPi cases</td>
</tr>
<tr>
<td></td>
<td>PiModules PIco case</td>
</tr>
<tr>
<td><strong>Raspberry Pi® GPIO Usage (occupation)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Permanent use of I²C</strong></td>
<td>GND, 5V, SDA0, SC0</td>
</tr>
<tr>
<td><strong>User selectable addresses</strong></td>
<td>1: 68 69 6a 6b 6c 6d 6e 6f</td>
</tr>
<tr>
<td><strong>Selecteable use of Raspberry Pi®</strong></td>
<td>2: 58 59 5a 5b 5c 5d 5e 5f</td>
</tr>
<tr>
<td>RS232</td>
<td>Optional</td>
</tr>
<tr>
<td><strong>Selective use of Raspberry Pi® GPIO</strong></td>
<td>GPIO_GEN22 (pulse train generator)</td>
</tr>
<tr>
<td></td>
<td>GPIO_GEN27 (System Shutdown initiator)</td>
</tr>
<tr>
<td></td>
<td>Optional</td>
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<tr>
<td></td>
<td>Optional</td>
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<tr>
<td><strong>Interactions with Raspberry Pi®</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>GPIO_GEN22 (pulse train generator)</td>
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<tr>
<td></td>
<td>Optional</td>
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<tr>
<td><strong>Supported Batteries Types</strong></td>
<td></td>
</tr>
<tr>
<td>LIPO 3.7V with silicone high current cables</td>
<td>Standard - LIPO 450 mAh</td>
</tr>
<tr>
<td></td>
<td>Optional - LIPO 4000 mAh</td>
</tr>
<tr>
<td>LiFePO4 3.2V with silicone high current cables</td>
<td>Optional – LiFePO4 4000</td>
</tr>
<tr>
<td></td>
<td>Optional - LiFePO4 12000 mAh</td>
</tr>
<tr>
<td>Li-Ion 3.7V with silicone high current cables</td>
<td>Optional – Li-Ion 3200 mAh</td>
</tr>
</tbody>
</table>

**Additional Batteries Options**
<table>
<thead>
<tr>
<th>Battery Back</th>
<th>Pico Single LP/LE/Li-Ion 18650 Battery Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Held 18650 single batteries (all supported types) up to 3200 mAh, with extra reverse polarity protection</td>
</tr>
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<td></td>
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<table>
<thead>
<tr>
<th>Battery Life Charge/Discharge Cycles</th>
<th>LIPO</th>
<th>450 cycles</th>
<th>450 cycles</th>
<th>450 cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>LiFePO4</td>
<td>2000 cycles</td>
<td>2000 cycles</td>
<td>2000 cycles</td>
<td></td>
</tr>
<tr>
<td>Li-Ion</td>
<td>300 cycles</td>
<td>300 cycles</td>
<td>300 cycles</td>
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<table>
<thead>
<tr>
<th>Battery Charger</th>
<th>Standard - Continues fixed current 303 mAh</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Automatic Dynamic Power Tracing</td>
</tr>
<tr>
<td></td>
<td>(Voltage Proportional Charge Control –</td>
</tr>
<tr>
<td></td>
<td>especially designed for Solar Cells)</td>
</tr>
<tr>
<td></td>
<td>Charger with charging current 100 mA –</td>
</tr>
<tr>
<td></td>
<td>800 mA, triggered by voltage changes on</td>
</tr>
<tr>
<td></td>
<td>the 5V GPIO or External Power Source</td>
</tr>
<tr>
<td></td>
<td>Standard - Continues fixed current 303 mAh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Charging Modes</th>
<th>LIPO</th>
<th>Automatic Selected: Full Charging Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LiFePO4</td>
<td>Automatic Selected: Full Charging Cycle</td>
</tr>
<tr>
<td></td>
<td>Li-Ion</td>
<td>Automatic Selected: Full Charging Cycle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery Protection</th>
<th>450 mAh</th>
<th>On board cut-off protection system when thermal, overcharge or over discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Capacity Li-Ion, LiFePO4</td>
<td>On board cut-off protection system when thermal, overcharge or over discharge</td>
</tr>
<tr>
<td></td>
<td>On battery, PCM additional protection</td>
<td>On board cut-off protection system when thermal, overcharge or over discharge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery Electrical Isolation System</th>
<th>Battery is Electrically Isolated (however cable connected) until system start up for the first time and receive 5V from GPIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional</td>
<td>Slide ON/OFF switch (external or internal), OFF always with File Save shutdown functionality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery Back-Up</th>
<th>System Battery Backup</th>
<th>Standard – 5V 2.6A current continuous supply to Raspberry Pi via GPIO Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Auxiliary 5V and 3V3 Battery Backed Supply on Pico I/O Pins</td>
<td>Standard – 5V 750 mA current and 3V3 continuous supplies on Pico I/O Pin battery backed, with possibility to continuous supply auxiliary devices with Raspberry Pi disconnected. Total system current should not exceed 3A.</td>
</tr>
<tr>
<td></td>
<td>Battery Back-up Type</td>
<td>UPS Standby Type, with switch over time of 250 μs, during switching time the protected system (Raspberry Pi*)</td>
</tr>
<tr>
<td></td>
<td>Standard – 5V 2.6A current continuous supply to Raspberry Pi via GPIO Pins</td>
<td>Standard – 5V 750 mA current and 3V3 continuous supplies on Pico I/O Pin battery backed, with possibility to continuous supply auxiliary devices with Raspberry Pi disconnected. Total system current should not exceed 3A.</td>
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</tr>
</tbody>
</table>
### Powering Monitoring Point

With added hardware, it is powered by auxiliary online power source for maximum 10mS, therefore no power gap on GPIO during switching time.

### UPS Activation Powering Triggers

GPIO 5V pins <=4.65V Proprietary Algorithm of Falling Power Peak Analysis

### Cable Reactivation

After 3s of continuously cable powering (without spikes)

### Intelligent Mobile Power Bank

**Direct Battery Powering with Internal/External ON/OFF Slide Switch**

ON/OFF Slide Switch with File Safe Shutdown functionality when switching to OFF (keep battery powering ON until system shutdown)

### Cable Powering Sources

<table>
<thead>
<tr>
<th>Power Source</th>
<th>2.6 A</th>
<th>2.6 A</th>
<th>2.6 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raspberry Pi® GPIO 5V Pins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Power Source 7-28 VDC</td>
<td>3A max (adjusted according dynamic power tracking algorithm - Voltage Proportional Charge Control – especially designed for Solar Cells)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HAT Compliant

<table>
<thead>
<tr>
<th>HAT EEPROM</th>
<th>Exists</th>
<th>Exists</th>
<th>Exists</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAT Dimensions</td>
<td>Compliant</td>
<td>Compliant</td>
<td>Compliant</td>
</tr>
</tbody>
</table>

### Additional Features - Peripherals

#### Pico I/O Interface

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent from Raspberry Pi® 3.3 V supply @200 mA</td>
</tr>
<tr>
<td>With battery Back-up (Raspberry Pi® can be OFF when this power</td>
</tr>
<tr>
<td>Auxiliary 3.3 V source is available)</td>
</tr>
<tr>
<td>ESD Protected True 5V 1-wire interface</td>
</tr>
<tr>
<td>Independent from Raspberry Pi® 5.0 V supply @750 mA</td>
</tr>
<tr>
<td>With battery Back-up (Raspberry Pi® can be OFF when this power</td>
</tr>
<tr>
<td>Auxiliary 5 V source is available)</td>
</tr>
<tr>
<td>12 Bit A/D converters ESD protected, pre-scaled to 5V, 10V, 20V and 30V</td>
</tr>
<tr>
<td>(on TB PCB) with Sampling rate 100K SPS, buffered</td>
</tr>
<tr>
<td>3V3/5V0 RS232 Port that can be programmed as:</td>
</tr>
<tr>
<td>primary Raspberry Pi® Port</td>
</tr>
<tr>
<td>Secondary (independent from the existing on Raspberry Pi®)</td>
</tr>
<tr>
<td>Optical Isolated Interface (readable as digital or analog)</td>
</tr>
<tr>
<td>Primary 3 Pin Bi-stable (Zero Power) Relay Interface</td>
</tr>
<tr>
<td>Rating (resistive)</td>
</tr>
<tr>
<td>Maximum Switching Current/Voltage on Terminal Block</td>
</tr>
<tr>
<td>Current/Voltage on 16 Pin Header</td>
</tr>
<tr>
<td>3V3/5V0 RS232 Port that can be programmed as:</td>
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<td>primary Raspberry Pi® Port</td>
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<td>Maximum Switching Current/Voltage on Terminal Block</td>
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<tr>
<td>Current/Voltage on 16 Pin Header</td>
</tr>
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</table>
## Pico Terminals Block Extension PCB (Supplied separately)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Pico Terminals Block Extension PCB</th>
<th>Pico Plus Terminal Block Standard Interface</th>
<th>Pico Plus Terminal Block Standard Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V RS232 converter attached to primary or secondary Serial Port Terminal Block on each Pico I/O Interface listed above</td>
<td>Yes (Optional with TB PCB)</td>
<td>Yes (Optional with TB PCB)</td>
<td>Yes (Optional with TB PCB)</td>
</tr>
<tr>
<td>DC in 7 – 28 V with Power Tracking</td>
<td>None</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Secondary 3 Pin Bi-stable (Zero Power) Relay Interface</td>
<td>Optional if Relay Installed</td>
<td>Yes</td>
<td>Optional if Relay Installed</td>
</tr>
</tbody>
</table>

## Hardware User Interface

<table>
<thead>
<tr>
<th>Feature</th>
<th>Pico Terminals Block Extension PCB</th>
<th>Pico Plus Terminal Block Standard Interface</th>
<th>Pico Plus Terminal Block Standard Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>System LEDs Indicators</td>
<td>UPS, BAT, CHG, INF, FAN Blue, Green, Red With capability to connected external LEDs</td>
<td>UPS, BAT, CHG, INF, FAN Blue, Green, Red With capability to connected external LEDs</td>
<td>UPS, BAT, CHG, INF, FAN Blue, Green, Red With capability to connected external LEDs</td>
</tr>
<tr>
<td>User programmable Keys</td>
<td>RPIR, UPSR, FSSD AKEY, BKEY, CKEY</td>
<td>RPIR, UPSR, FSSD AKEY, BKEY, CKEY</td>
<td>RPIR, UPSR, FSSD AKEY, BKEY, CKEY</td>
</tr>
<tr>
<td>External Connectivity to Pico Keys</td>
<td>With capability to connected external KEYS</td>
<td>With capability to connected external KEYS</td>
<td>With capability to connected external KEYS</td>
</tr>
<tr>
<td>Audio Interface</td>
<td>Electromagnetic Transducer, with programmable sound duration and frequency, able to play music</td>
<td>Electromagnetic Transducer, with programmable sound duration and frequency, able to play music</td>
<td>Electromagnetic Transducer, with programmable sound duration and frequency, able to play music</td>
</tr>
</tbody>
</table>

## Other Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Pico Terminals Block Extension PCB</th>
<th>Pico Plus Terminal Block Standard Interface</th>
<th>Pico Plus Terminal Block Standard Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Backed Hardware Real Time Clock and Calendar</td>
<td>Yes Only when UPS (power cycling is used)</td>
<td>Yes Only when UPS (power cycling is used)</td>
<td>Yes Only when UPS (power cycling is used)</td>
</tr>
<tr>
<td>Bi-Stable (Zero Power) Relay</td>
<td>Yes (optional)</td>
<td>Yes</td>
<td>Yes (optional)</td>
</tr>
<tr>
<td>Passive Cooling System</td>
<td>Based on multiple copper layers thermal pipes for heating dissipation</td>
<td>Based on multiple copper layers thermal pipes for heating dissipation</td>
<td>Based on multiple copper layers thermal pipes for heating dissipation</td>
</tr>
<tr>
<td>Automatic Active Cooling System (FAN)</td>
<td>Yes (optional if FAN installed) based on temperature of the Raspberry Pi® PCB read by separate external Sensor</td>
<td>Yes (optional if FAN installed) based on temperature of the Raspberry Pi® PCB read by separate external Sensor</td>
<td>Yes (optional if FAN installed) based on temperature of the Raspberry Pi® PCB read by separate external Sensor</td>
</tr>
<tr>
<td>Automatic File Safe Shutdown Functionality</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Raspberry Pi® Reset via POGO Pin</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic Restart on Power Return</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Events Triggered RTCC Based System</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Actions Scheduler</td>
<td>Yes (both ways) Extended on more Events</td>
<td>Yes (both ways)</td>
<td>Yes (both ways)</td>
</tr>
<tr>
<td>Real Time Battery Capacity Measure</td>
<td>Yes (based on System current consumption)</td>
<td>Yes (based on System current consumption)</td>
<td>Yes (based on System current consumption)</td>
</tr>
<tr>
<td>Secondary Serial Port (based on software driver)</td>
<td>Yes (future firmware option)</td>
<td>Yes (future firmware option)</td>
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</tr>
<tr>
<td>IR interface</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Optimized design for a very low noise A/D operation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Optimized Ultra Low Power design for a long time Battery System Operation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Feature</td>
<td>PX32</td>
<td>PX72</td>
<td>PX74</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>XTEA Encryption</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Extended Raspberry Pi® Watch-Dog (Still Alive)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>I2C Pico Programmer Interface</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RS232 @command Interface on Primary and Secondary Serial Port</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bootloader for Live Firmware Update</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PCB Manufacturing</td>
<td>4 Layers, 2 OZ Copper, 8mils/8mils Immersion Gold Plated, PB Free alloy assembly</td>
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