Application Note 171

Applicable to the following products:	J4H-5V-USB J4H-HV-TRM J4H-HV-TRM-RTC-485

Introduction

The Juice4halt module is primarily designed for the Raspberry Pi. However, the board can also serve as a Micro-UPS for embedded systems or for other Single Board Computers working with a 5V supply voltage. The board can be easily adapted by using the Configuration Jumpers or by changing the board assembly. The Assembly Drawings showing the positions of all the parts mentioned in this document can be found at the end of this document. The parts are yellow highlighted.

Configuration Jumpers

There are many possibilities how to adapt the board to your application. The board contains several jumpers. The function change is done by removing/assembling a 0603-size jumper resistor on the determined position.

Note: n.a. means not assembled

Changing the Boot/Shutdown communication signal pin

The signal uses the Pin22 (GPIO25) as default. If this pin is occupied by another task, Pin16 (GPIO23) can be used instead. The configurations are summarized in the following table:

Pin22 (GPIO25)	default	R9=n.a.	R10=10R
Pin16 (GPIO23)	optional	R9=10R	R10=n.a.

It is also necessary to change the pin number in the script file executed in the Raspberry Pi.

Changing the Power failure signal pin

The signal uses the Pin15 (GPIO22) as default. If this pin is occupied by another task, Pin11 (GPIO17) can be used instead. The configurations are summarized in the following table:

Pin15 (GPIO22)	default	R7=n.a.	R8=10R
Pin11 (GPIO17)	optional	R7=10R	R8=n.a.

Changing the Power ON/OFF Button configuration
(applicable only to J4H-HV-TRM-RTC-485)

    a) <u>Configuration at first start</u>
          Initial state: all LEDs are dark

After attaching power to the Juice4halt module for the first time, the Raspberry Pi (SBC) will start booting automatically when the supercapacitor's voltage has reached 4.2V	default	R91=n.a.	R92=0R
The Raspberry Pi will not be powered-on automatically after reaching 4.2V, but will wait until the power Button is pushed. If the button will be pushed before reaching the 4.2V, the Raspberry Pi will be powered-on after reaching 4.2V at the supercapacitors.	optional	R91=0R	R92=n.a.

b) <u>Configuration at power failure followed by a shutdown</u>
   Initial state: the red LED is on

After a power failure followed by a shutdown the Raspberry Pi will be powered-on automatically when the power is recovered again. Even if the power is recovered during the shutdown, the shutdown will be completed, then the Raspberry Pi will be powered-off and on again.	default	R93=n.a.	R94=0R
The Raspberry Pi will not be powered-on automatically after a power recovery, but it will wait until the Power Button is pushed.	optional	R93=0R	R94=n.a.

Skipping the charge mode (Immediate start)

After attaching power to the Juice4halt module, the Raspberry Pi (SBC) will not start booting immediately. The Juice4halt module waits until the supercapacitors have enough charge (=reaching 4.2V) and then powers-on the Raspberry Pi. This is a protection feature that helps to avoid system crashes due to power failures occurring during the boot process.	default	R14=n.a.
Allow powering-on the Raspberry Pi immediately after attaching power to the input contacts. The Raspberry Pi will start booting even if the supercapacitors are not charged enough to cover a power failure during the booting phase. **Caution:** The immediate start is recommended only if the application can guarantee an uninterrupted power supply for the first moment, when the supercapacitors are being charged.	optional	R14=0R

Fast Charge / Slow Charge configuration

Fast Charge The charger draws constant 1.5A from the 5V power rail. Use this configuration when a short charge mode is required	default	R50=0R
Slow Charge The charger draws constant 0.5A from the 5V power rail. Use this configuration when the power supply can't source enough current for charging and for supplying the application at the same time	optional	R50=n.a.

RS-485 Echo (RX path always enabled)
(applicable only to J4H-HV-TRM-RTC-485)

Echo disabled The RX path is enabled only when the TX path is disabled	default	R64=n.a.
Echo enabled The RX path is always enabled. This means, when data are being transmitted (TX enabled), the data will be also received back. This feature can be used to control the proper function of the RS-485 bus or interface.	optional	R64=0R

RS-485 RX/TX direction control
(applicable only to J4H-HV-TRM-RTC-485)

automatic driver enabled by a low TX data bit driver disabled 25us after the end of a low TX data bit	default	R71=n.a.	IC3 assembled
controlled by signal GPIO24 (Pin18): High=TX enabled Low=RX enabled	optional	R71=0R	IC3=n.a.

Assembly change

Beside the configuration with jumpers it is also possible to modify the board assembly prior to fabrication in case of bulk purchasing (QTY>25(or 100, depending on the changed parts)). Please contact us for more information.

Changing the supercapacitor type

The default supercapacitors can be replaced by other types with more or less capacity. Depending on the capacity the backup time and the charge time will change. Both supercapacitors must be the same type.
The following conditions from the datasheet should be met:
Min. rated voltage > 2.7V
Max. ESR < 100mOhm
Max. current > 10A

It is important to keep the leads as short as possible.

Assembly positions	C11(SCAP1) C12(SCAP2)

RTC Battery Holder
(applicable only to J4H-HV-TRM-RTC-485)

The on-board RTC battery holder is for stationary applications only. When used in mobile applications we recommend leaving the on-board battery holder not assembled, and connecting an external battery holder by flexible wires soldered to the on-board battery holder contacts.

Assembly position	B1

Power ON/OFF Button
(applicable only to J4H-HV-TRM-RTC-485)

The Push-Button is one of the highest parts on the board. If your application does not require the Power ON/OFF function,the Push-Button can be left unassembled. There is also a possibility to choose another button type with a different button height.

Assembly position	SW1

Power input connector
(applicable only to J4H-HV-TRM and J4H-HV-TRM-RTC-485)

The default input connector is a 2.54mm pitch screw terminal block placed on the top side of the board. There is a possibility to replace this screw terminal by a DC Power Jack 0.70mm ID (0.028"), 2.35mm OD (0.093") placed on the bottom side of the board. The part number is PJ1-022-SMT-TR, Manufacturer CUI Inc.

Assembly positions	default	P4 for screw terminal
	optional	CON2 for DC Power Jack

Power input connector
(applicable only to J4H-5V-USB)

The default input connector is a Micro-USB connector placed on the bottom side of the board directly above the Micro-USB connector at the Raspberry Pi board. There is a possibility to replace or extend the Micro-USB connector by a 2.54mm pitch screw terminal block placed on the top side of the board at the position P4. Additionally a 1206-size zero-ohm resistor is required at the position R87 to bridge the 5V input Micro-USB to the screw terminal.

Assembly position (1206 Size)	R87=0 Ohm
Assembly position 2.54mm pitch	P4 for screw terminal

Indication LEDs

The 3 indication LEDs are placed on the bottom side of the board emitting light towards the edge. Alternatively the LEDs can be assembled on the top side of the board.

| Assembly positions	default	D23, D25, D27 fot bottom assembly
	optional	D22, D24, D26 for top assembly

Front-End DC/DC converter bridge
(applicable only to J4H-HV-TRM and J4H-HV-TRM-RTC-485)

The module contains a step down DC/DC converter, converting a high input voltage 7V..28V down to 5.1V for the 5V rail. This converter can be bridged by a 1206-Size Zero Ohm Resistor when a 5V input voltage is required.

Assembly position (1206 Size)	R87

Assembly Drawings
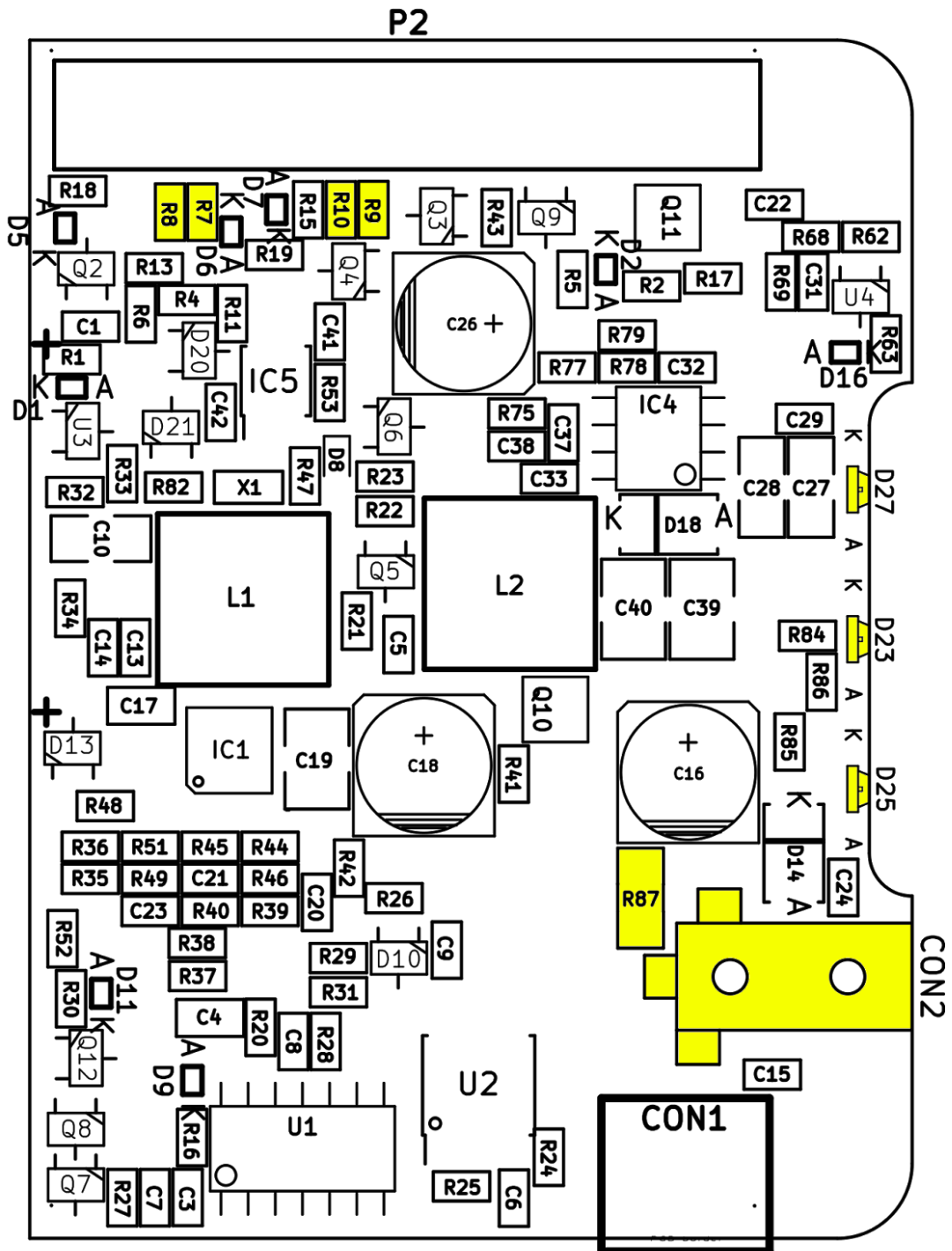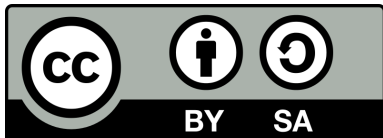
Top board side
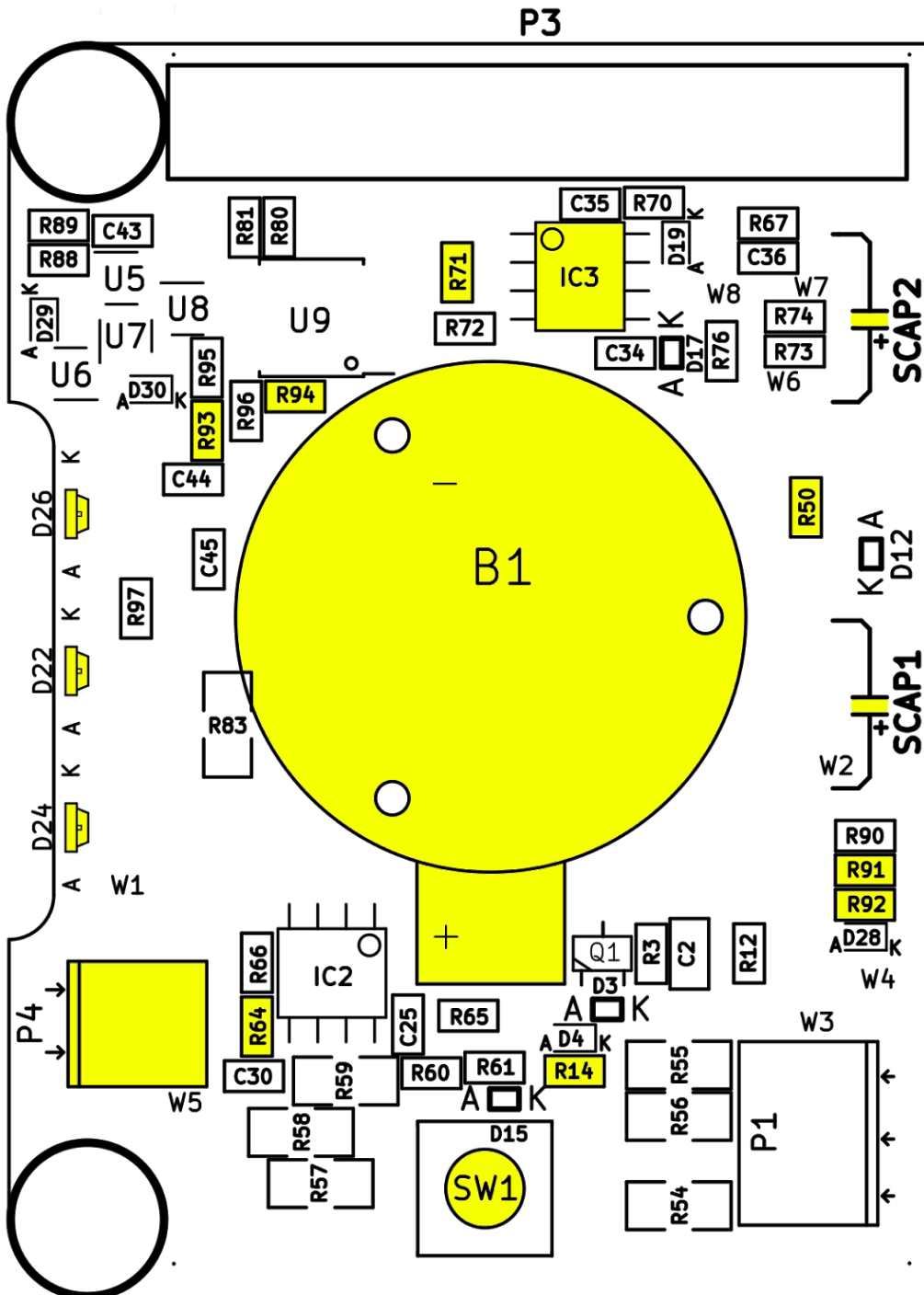
Bottom board side

Revisions and Changes

Document Revision

Rev	Date	Description
B	Oct 2017	Initial release

Juice4halt is a registered trademark