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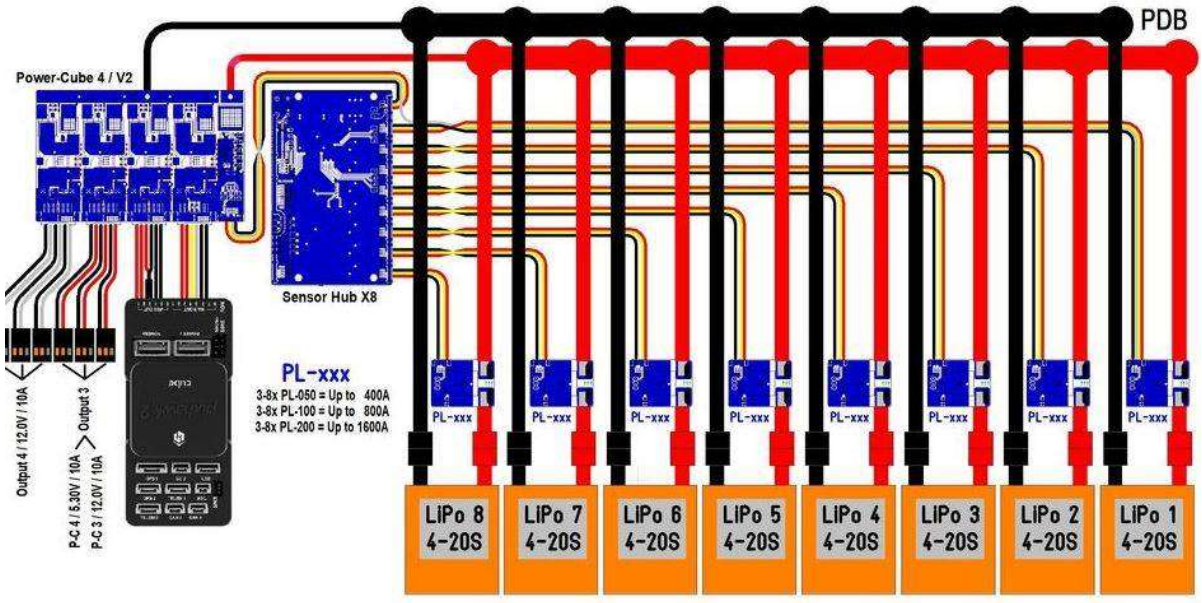
PL – Series Sensor Hub X8

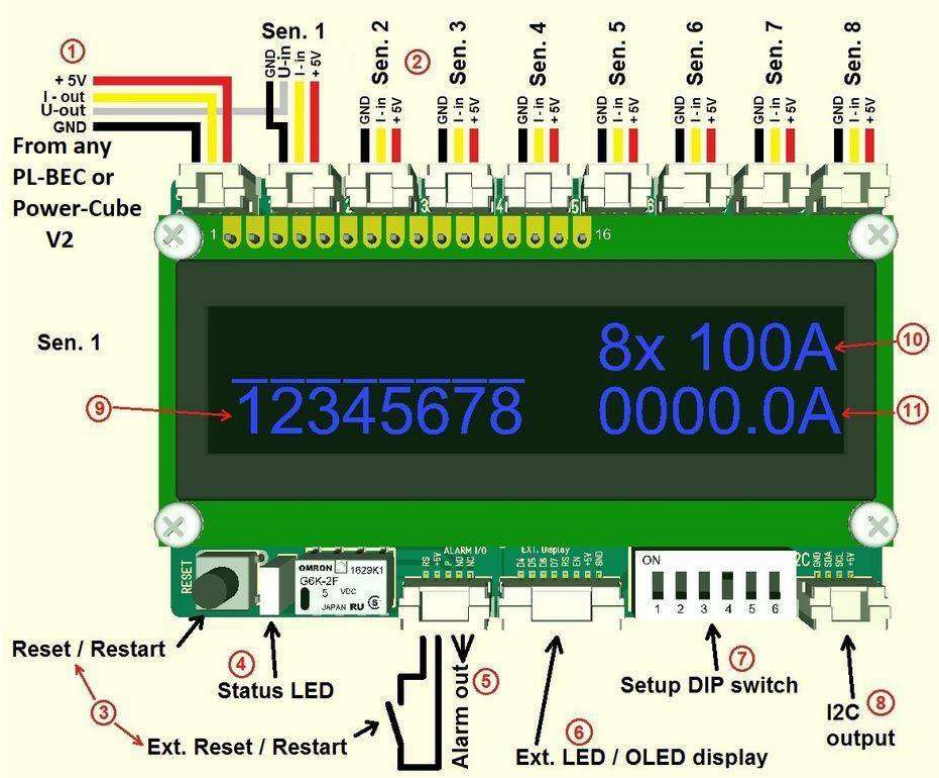
Installation:

The Sensor Hub X8 can be either installed via double side tape, or screwed down to the main frame, by removing the 4 bottom M3 screws and drilling holes into the frame. Then reinstall the screws trough the frame. -> The original screws will be too short, so please replace them with longer ones according to your frame thickness.

Wiring Schematic:

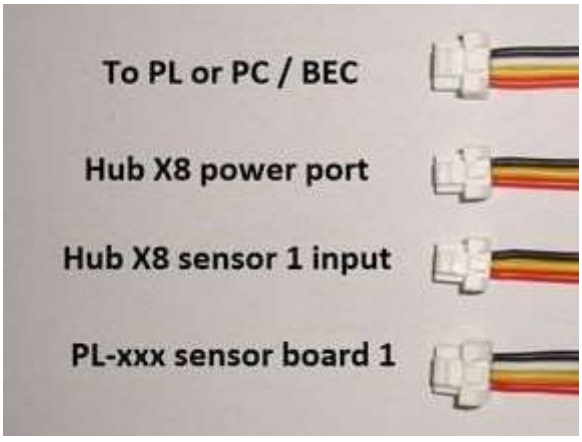


Connection to external equipment:



01: Connection To BEC:

The Hub X8 is compatible to any PL or PC / BEC.
Please connect the special cable here with 2x 4p and 2x 4p. connectors

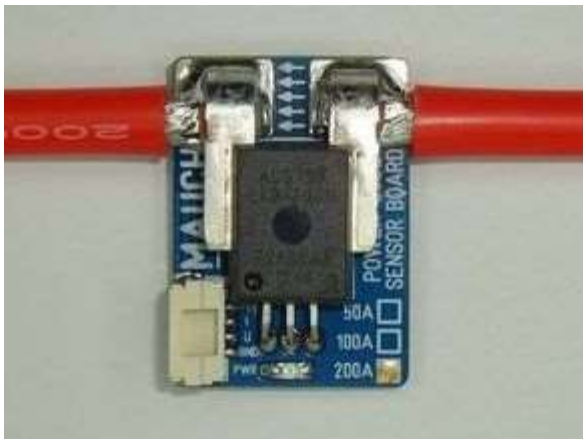


1st 4p -> To PL or PC / BEC
1st 3p -> Hub X8 power port
2nd 3p -> Hub X8 sensor 1 input
2nd 4p -> PL-xxx sensor board 1

The supply voltage is 4.95-5.05V and the max. current should not exceed 0.5A.

The current draw of the Hub X8 (with active OLED) is 50mA, plus 8x 15mA (current sensors) = 170mA (0.17A)
So even if we connect 2pcs X8 with 16 current sensors, plus a Hub X2 (15mA), we're still below the 0.5A.
(2 x 0.17A) + 0.015A = 0.335A

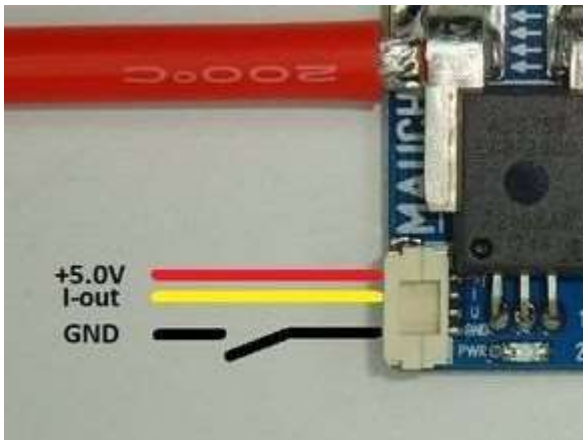
02: Sensor Connectors:



Please connect here any of PL-xxx sensors. However, all sensors must be of the same current rating!
If you use less than 8 sensors, then it doesn't matter where you connect the sensors. However, sensor 1 must be always connected, via the 4p cable for voltage measurement.
For more details, please check Pos. (9).

The 7 cables to connect the PL-xxx sensor boards (4p <-> 3p), come together with the Hub X8 (L=200mm)

Only PL-xxx sensors can be used. The Hub X8 is not compatible with HS-xxx-xx sensors!



If all 8 possible sensors are installed, but you want to fly your UAV with only 4 LiPo's, then you can deactivate the unused current sensors, by either disconnecting them from the Hub X8, or installing a switch into the GND wire of the sensor board.

Do not install the switch into the + 5V or I-out cable!
Do not install the switch into the cable of sensor 1!

If the sensor is disconnected, or the GND wire is switched off, then the Hub X8 will deactivate the sensor input during boot up or restart.

03. Reset / Restart:

In case of any alarm (over current or under current), then you can perform an reset, by either re-powering the Hub X8, or press the reset switch for a short time.
If you press the reset switch longer than 2 seconds, then the Hub X8 will restart. This is helpful if you deactivate installed sensors after switching on the system.
It is possible to install an external reset / restart switch (not included), the necessary 5p cable with connector is included.

2x red for external switch + 3x white for alarm relays output.

4: Status LED:

RED = During startup / Any alarm is active and the alarm relays is ON / If the Reset - Restart switch is pressed.
GREEN = After booting up and all connected sensors are initialized / No active alarm

05: Alarm Out:

Pin 3 = P -> The middle contact of the relays.
Pin 4 = NO (normal open)
Pin 5 = NC (normal closed)

Any power LED or buzzer can be connected here, but the max. current should not exceed 1A.
The necessary 5p cable with connector is included. -> 2x red for external switch + 3x white for alarm relays output.

06: External LCD / OLED display:

If the Hub X8 is installed in a place where the display is no more visible, then you can connect here a standard 2x16 LCD display (4-bit data bus), but please do not use any LCD displays with back LED light, as these lights can draw easily more than 200mA and the supplied power from the Power-Cube might be not enough.
You also can install an 2x16 / OLED display. The current draw of these displays is minimal (30mA). Therefore, Internal and External display can be active.
REM: External OLED displays with CFK cover and reset switch might be available soon.

Please check Pos. (7), for how to activate / deactivate the internal and external display.

07: Setup DIP switch:

S1	S2	
OFF	OFF	Internal and external display OFF
OFF	ON	Internal display ON and External display OFF
ON	OFF	Internal display OFF and External display ON
ON	ON	Internal and external display ON

S3	S4	S5	S6	
ON	OFF	OFF	OFF	PL - 050 Sensors
ON	ON	OFF	OFF	PL - 100 Sensors
ON	ON	ON	OFF	PL - 200 Sensors
ON	ON	ON	ON	PL - 400 Sensors (PL-400 Sensors / release Q2-2024)

08: I2C connector:

Only for maintenance use to read out the log files.
This connector can not be used for flight controllers who only support I2C mower modules. For example, Pixhawk 6x or equivalent.

9. Sensor status indicator:

The numbers 1 to 8 are for the current sensors and the symbol above indicates the status.
_ = No sensor connected or sensor deactivated -> See Pos. (2)
▌ = Sensor connected and current is within average.
L = The current of this sensor is at least 25% lower than the average current of the other sensors -> Alarm relay active
H = The current of this sensor is at least 25% higher than the average current of the other sensors -> Alarm relay active

10. Sensor indicator:

Here it is displayed how many current sensors are connected/active and the current range of the individual sensor.

11. Current display:

The display will show the summarized current of all sensors, based on the standard Amp/Volt settings -> See Pos. (12)

12. Current output and setup MissionPlanner:

The output voltage from the Sensor Hub X8 is always optimized to be 0.0-3.3V from 0A to full current on all sensors. Doesn't matter how many sensors are connected/active. This ensures, that we always use the full range of the FC analog input, to get the most accurate current readings as well as capacity consumption calculation.

For example: 4 x 100A Sensors = 0.0V @ 0A and 3.3V @ 400A -> Amp/Volt value = 120
5 x 200A Sensors = 0.0V @ 0A and 3.3V @ 1000A -> Amp/Volt value = 300
8 x 200A Sensors = 0.0V @ 0A and 3.3V @ 1600A -> Amp/Volt value = 480

Please follow the procedure here to setup the correct Amp/Volt value:
http://ardupilot.org/copter/docs/common-mauch-power-modules.html

Standard values for Amp/Volt:

	1x	2x	3x	4x	5x	6x	7x	8x
PL-050	20	40	60	80	100	120	140	160
PL-100	30	60	90	120	150	180	210	240
PL-200	60	120	180	240	300	360	420	480
PL-400	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a