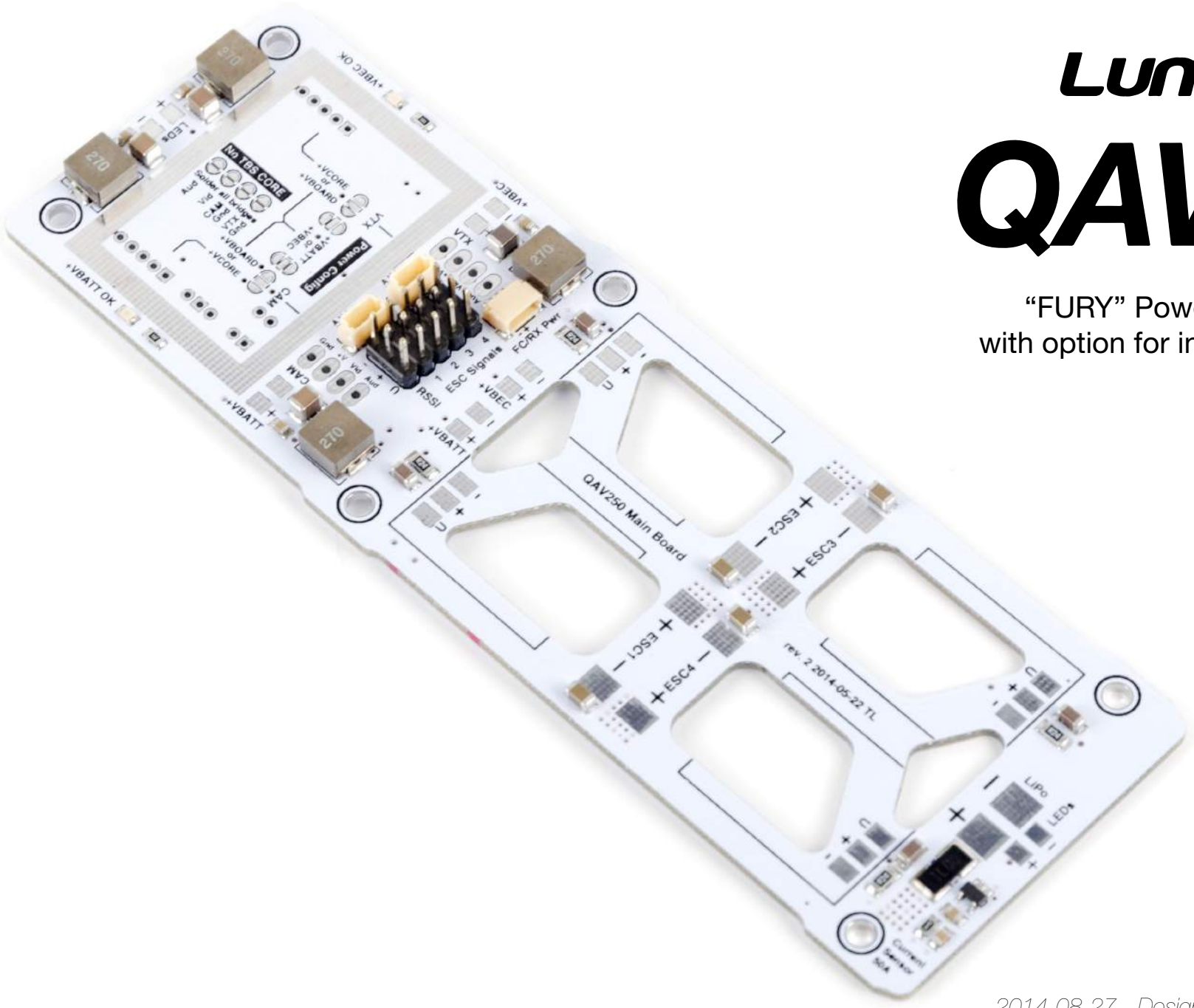


Lumenier

QAV250

"FURY" Power Distribution Board
with option for integrated TBS CORE

User Manual

2014-08-27 - Designed and developed by ivc.no

About the “FURY” Board

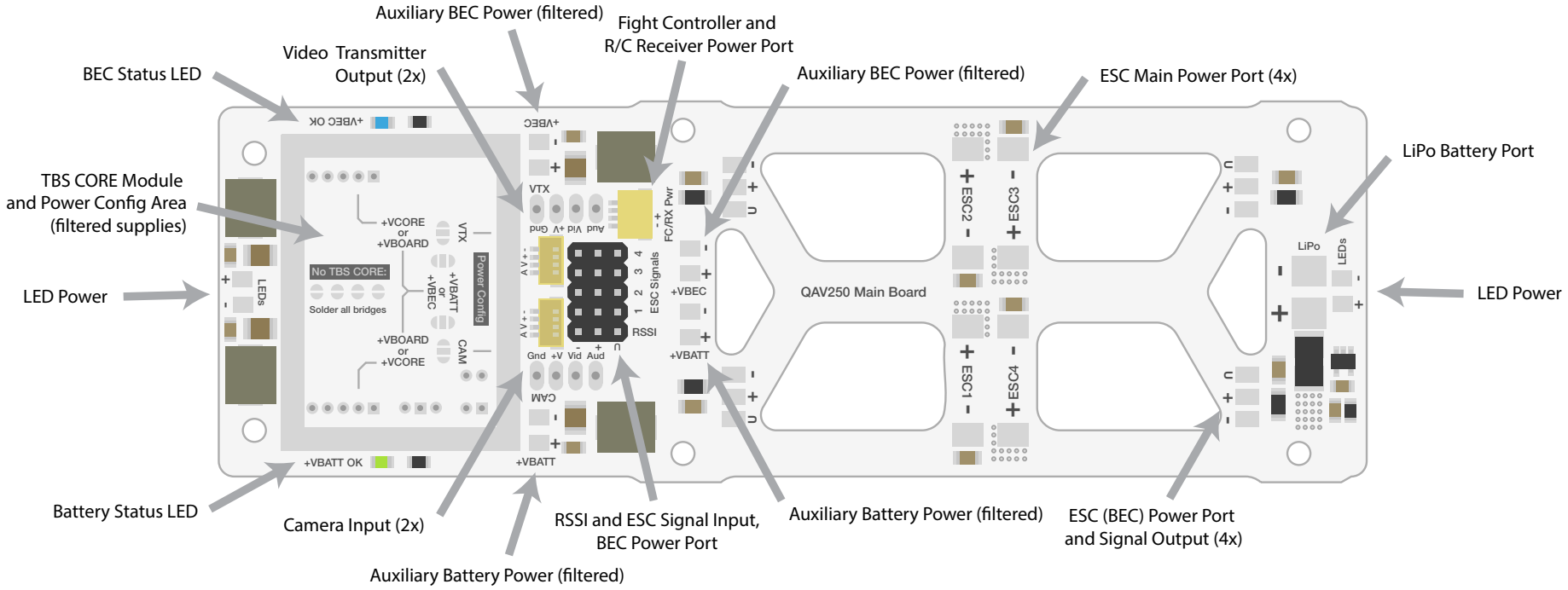
This board is designed specially for the QAV250 mini-H quadrotor platform by Lumenier - both G10 and CF models. It is designed to reduce wiring and make setup easy by integrating the power, control, video signal distribution all in a centralized and clean way.

The ESCs can be entirely connected to the board, both main power and control signals, to remove excess wire slack. The video and audio signal is routed via handy sockets or solder pads to ease the setup and maintainance of the video gear.

All necessary cables are included for the most commonly used equipment, making installation plug and play. Some soldering is required to install the power lead, ESCs and TBS CORE module.

The available space in front section of the board is intended for installation of an optional TBS CORE, directly on the board. This module separates the FPV power supply from the main R/C system - which tend to generate electrical noise. It filters out the noise, removing video lines and stabilizes the video feed. Lastly, it carries a very handy OSD (On-Screen Display) which is overlayed on the video downlink and displays vital flight stats, i.e. current consumption, battery voltage, flight timer and received R/C signal strength.

The additonal mounting holes in front enhances the rigidity of the frame and protects the front of the board from flexing too much.



Select Power Configuration

The power configuration area dictates which voltage source is supplied to the camera and video transmitter. After configuring the jumpers, the final path routes the correct power source through to the end-devices. The selection is split in **two primary sections** with *two sub-sections*, as listed below.

TBS CORE - Configure +VCORE for CAM and/or VTX
- *Configure TBS CORE 12V or 5V to CAM via solder bridge*
- *Configure TBS CORE 12V or 5V to VTX via solder bridge*

Board (No TBS CORE) - Configure +VBOARD for CAM & VTX
- *Configure +VBATT (e.g. 3S, 12V) or +VBEC to CAM*
- *Configure +VBATT (e.g. 3S, 12V) or +VBEC to VTX*

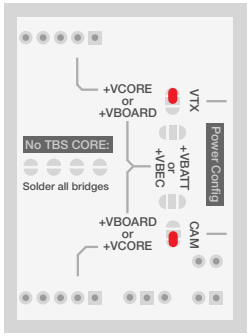
Or a mix of both, i.e. +VBOARD for VTX and +VCORE for CAM.

Important: when connecting a powerful VTX (>500mW RF power) which has on-board voltage regulation (e.g. ImmersionRC gear), connect it directly to +VBATT pads, not via TBS CORE. Otherwise the TBS CORE could run into overload and shutdown because of poor power effiencies.

Examples of common configurations:

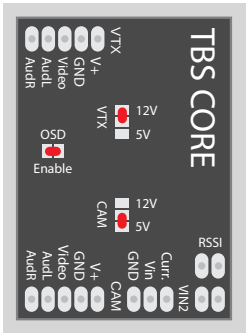
With TBS CORE

CAM and VTX voltage source via TBS CORE



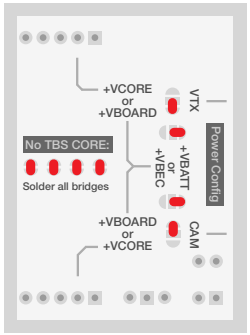
Then

CAM 5V and VTX 12V, OSD enabled



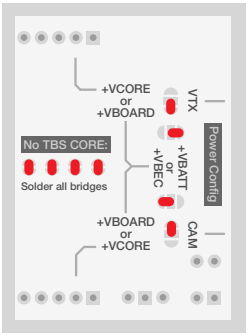
Board - Without (no) TBS CORE

CAM and VTX capable of 3S battery voltage (12V)



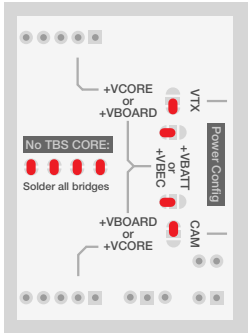
OR

CAM 5V from BEC and VTX 3S battery voltage (12V)



OR

CAM and VTX 5V from BEC



Install TBS CORE (optional)

The TBS CORE is installed on three rows (5+2+12 pins) of 2mm pitch pin headers (included). Break-off the correct strip length and remove the unused pins. Use tape to hold the pin headers in place while applying solder to the bottom side of the board. Also solder the two “Power Config” pads to use +VCORE, see previouse page.

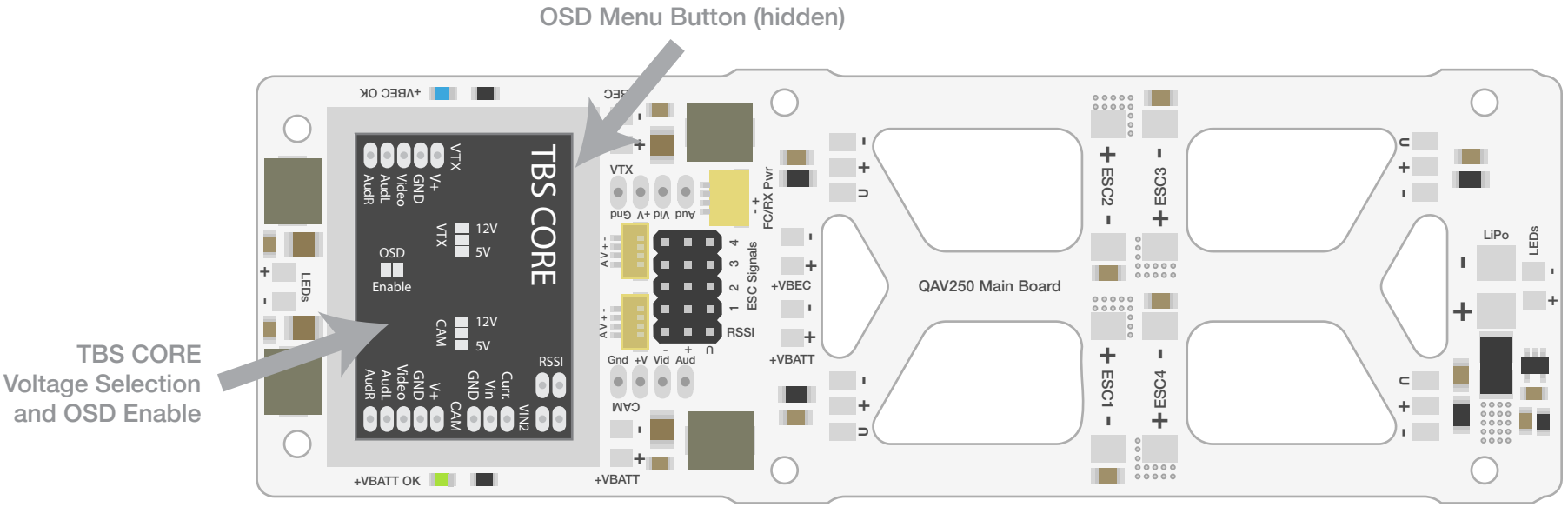
Once the pin headers are in place, place the TBS CORE module onto the headers and apply ample amount of solder to the top of the solder pads. Let the solder flow down and onto the pins to make a proper solder connection.

Next, solder a bridge over the correct voltage jumper for your specific camera and video transmitter - look at the specifications. Only two of the three pads should be soldered, e.g. if you have a 12V camera only apply solder over the middle and the right “12V” pad.

Add a dab of solder on the “OSD Enable” pads to turn on the video overlay feature.

RF Shield (optional)

If you have the RF shield available and plan to fly UHF or long range, position the shield over the designated area with the small button hole facing the “+VBEC” and “VTX” side of the board. Apply a small dot of solder to the middle of the four sides. Leaving only a small dot makes it easier to remove later on if needed.



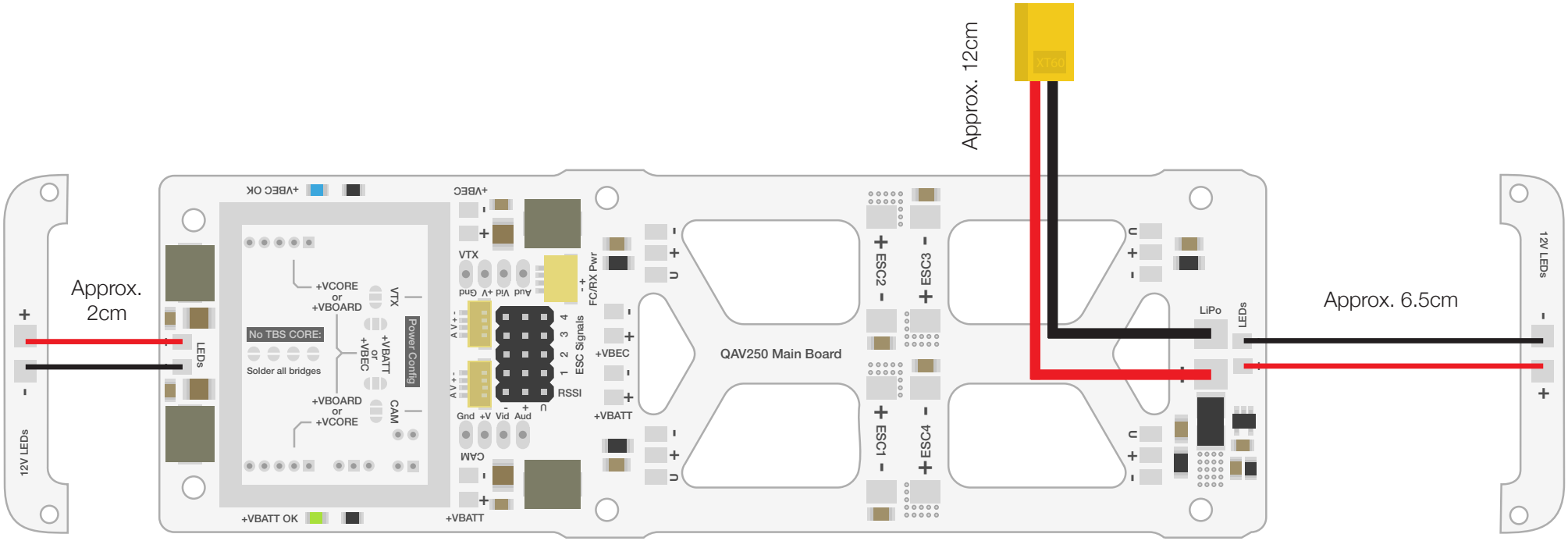
Solder Power Lead and LED Boards

Cut the battery lead to length (approx. 12cm should give sufficient slack) and strip the ends. Add a suitable connector (XT60, Deans) to one end, add a short piece of heat shrink tubing to protect the exposed connector solder joints.

Next, pre-tin the other ends and battery pads on the rear of the board. Solder the red lead to the pad labeled “+” and the black lead to the “-” pad.

Now, solder short leads to the LED boards (provided in the QAV250 kit). The front lead is a bit shorter than the rear lead. Solder the ends to the pads labeled “LEDs” on the board.

These pads provide unregulated battery voltage. The LEDs will work fine with 3S and 4S battery power.



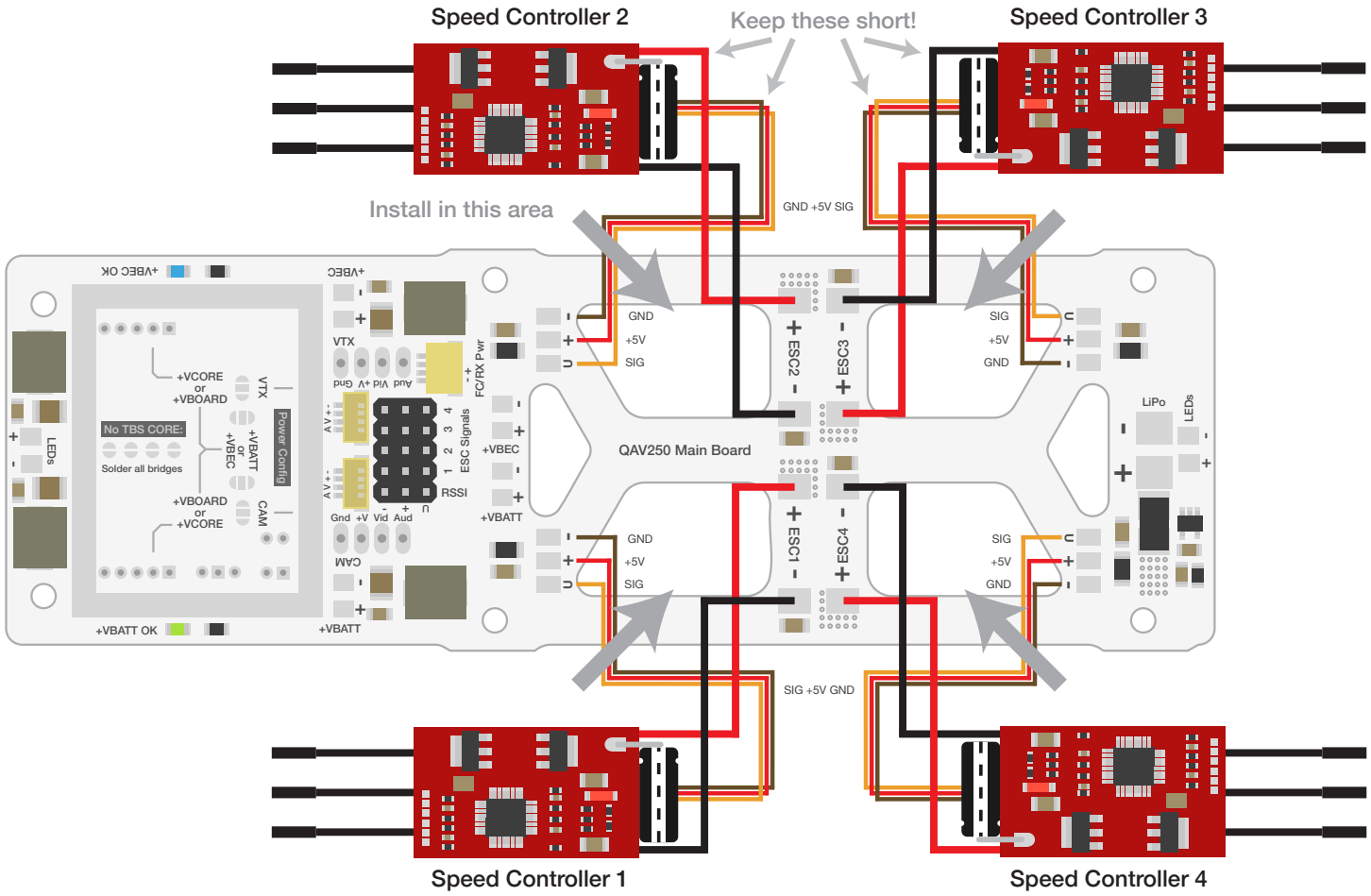
Install Speed Controllers

The board is designed to fit small 3S to 4S, 10 to 18A speed controllers, size approx. L29 mm x W18 mm x H10 mm. The ESCs will be place over the cut-outs in the board to provide additonal air flow and cooling. The original heat shrink tubing should remain on the ECSs.

The orientation of the ESC (front facing, rear facing) does not matter, only that the red (”+”) and black (”-”) leads match the board labels, and that the control signal is connected to the “U” pad.

Both supply leads and control leads on the ESC will be soldered to the board, making the final assembly very modular. Start by positioning the ESC over the pads and cut the leads to length - the supply leads will be fairly short. Strip and solder the control leads to the three pads, followed by the main power pads.

Note: calibration of the ESCs can still be done individually, but now via the main pin header in the center of the board.



Connect Flight Controller and R/C Receiver

The board is designed to minimize wires. The “minimalistic setup” utilized PPM from the R/C receiver and connects the ESCs via the “RcvrPort” on the OpenPilot Flight Controller. While the “classic setup” shows a more traditional setup, makes it possible to connect other flight controllers and receivers.

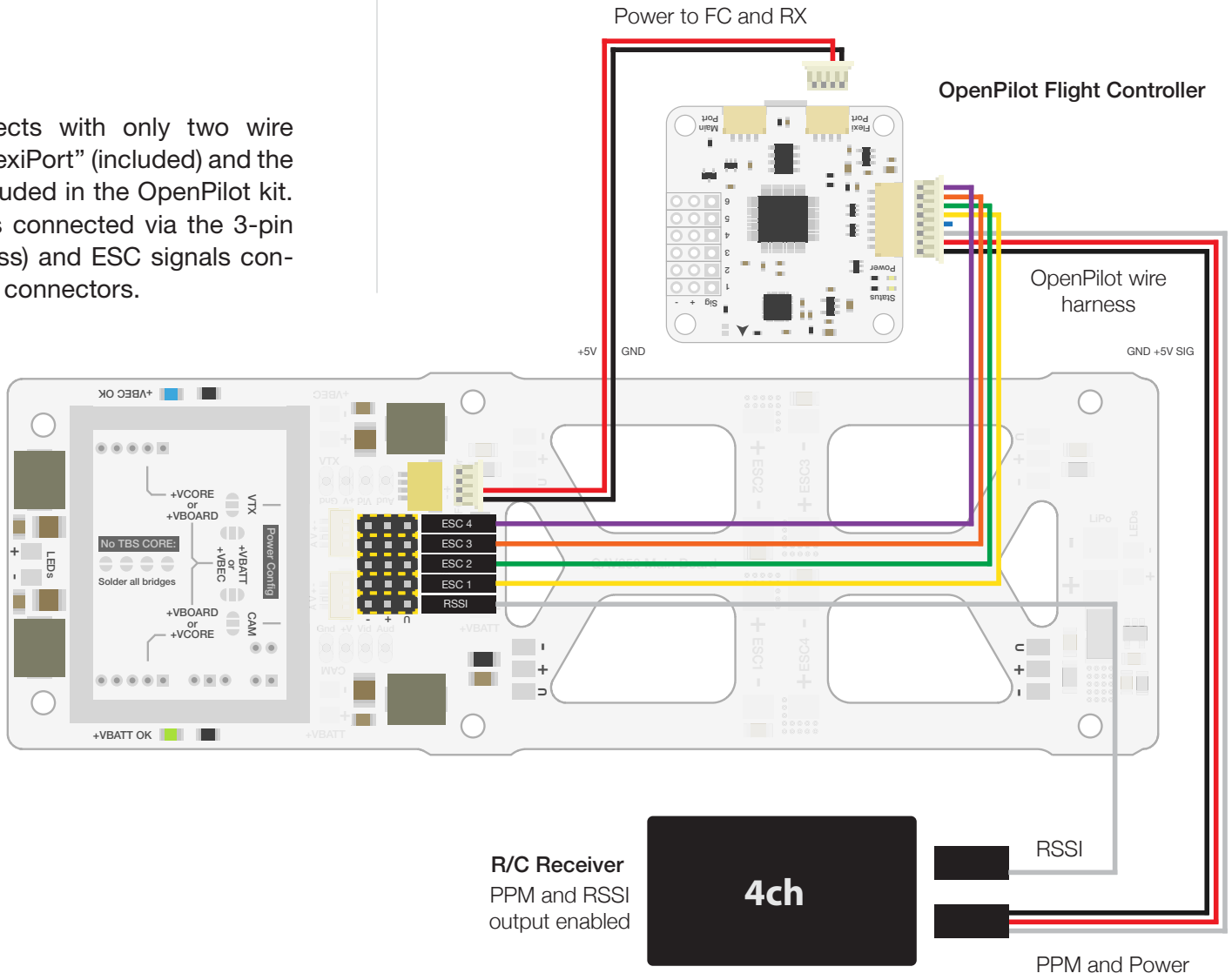
Minimalistic setup (recommended)

The OpenPilot and R/C receiver connects with only two wire harnesses. The first is for power via the “FlexiPort” (included) and the other is a 8-pin wire harness which is included in the OpenPilot kit. Power and PPM from the R/C receiver is connected via the 3-pin servo connector (on the 8-pin wire harness) and ESC signals connect individually with the single wire servo connectors.

Note: The FlexiPort on the OpenPilot FC is by default configured to be an input and it is good practice to configure the FlexiPort to be “PPM+Output” before connecting your receiver. How to perform this changed is detailed later in the manual under “Configure OpenPilot Flight Controller”.

Power cable (4-pin JST-SH to JST-SH) compatibility:

- OpenPilot CC3D (all editions)
- OpenPilot CC3D Atom
- OpenPilot REVO (all editions)

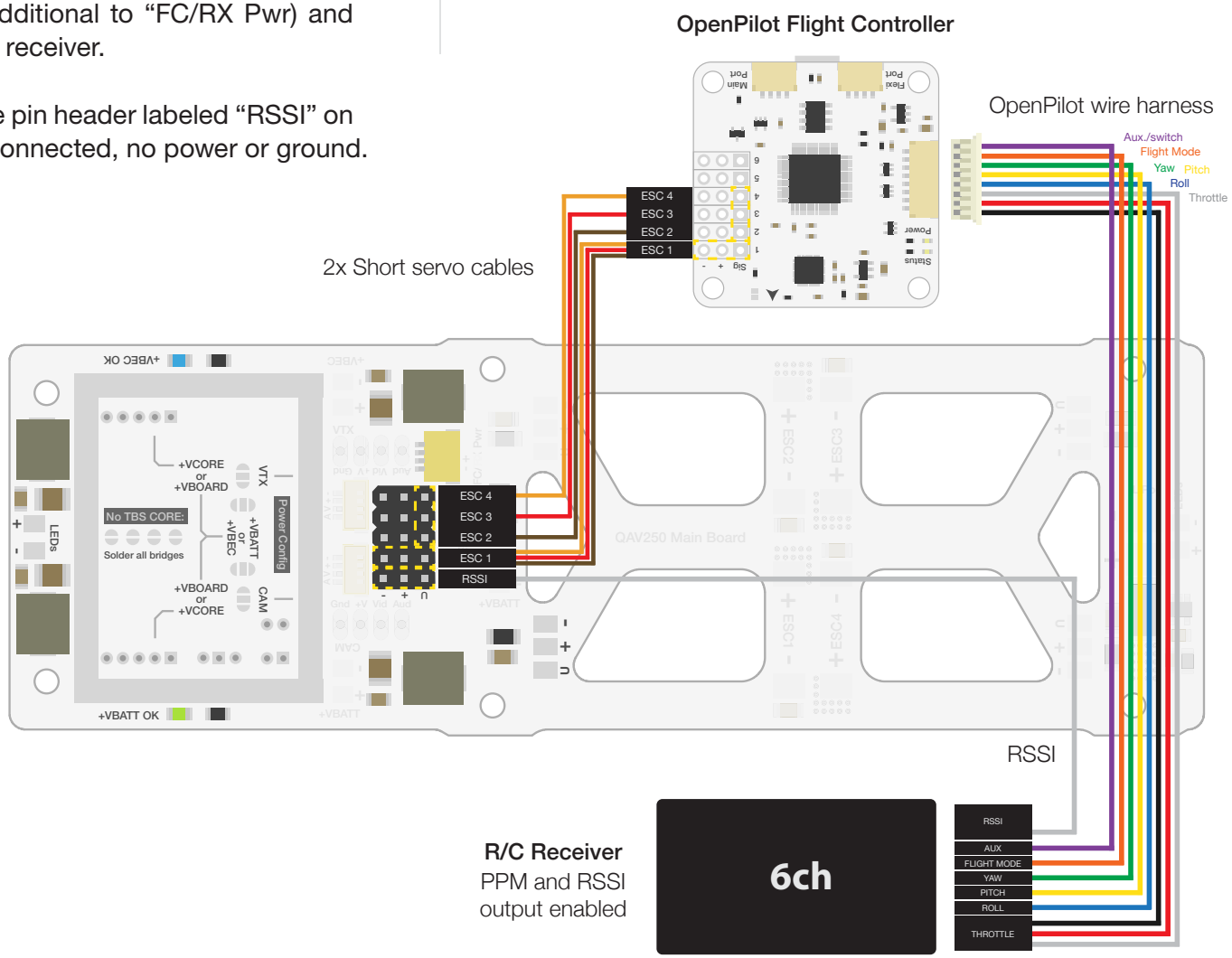


Connect Flight Controller and R/C Receiver (cont.)

Classic setup

Setting up any other flight controller (or the OpenPilot) and traditional PWM control signals (non-PPM) from the R/C receiver, can be done using regular servo cables and kit cables. The ESC signal headers provide filtered +5V BEC power (in additional to “FC/RX Pwr) and ground to the flight controller and R/C receiver.

Connect the RSSI signal (if used) to the pin header labeled “RSSI” on the board. Only the signal should be connected, no power or ground.



Connect Camera and Video Transmitter

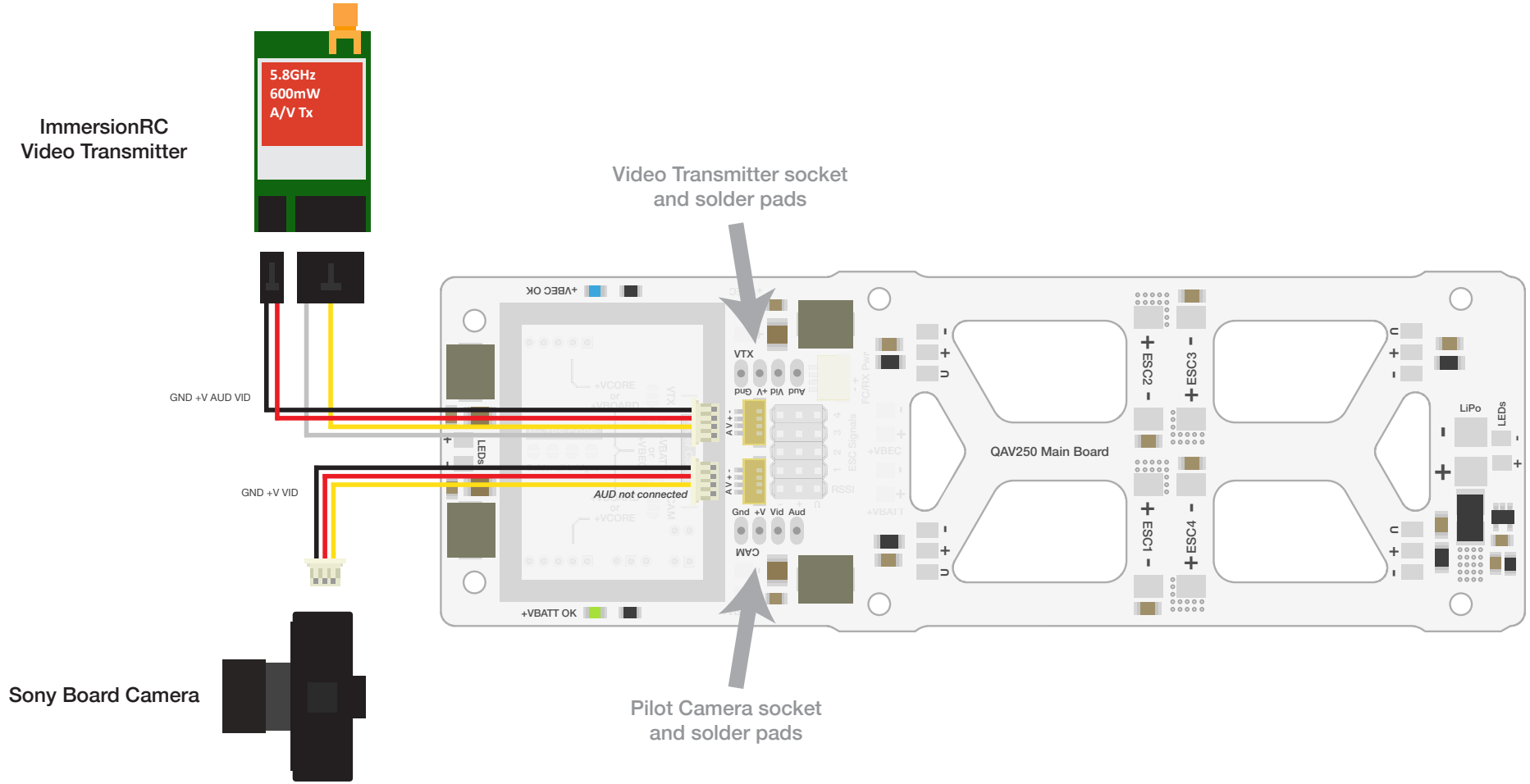
Minimalistic setup

To make the FPV setup easy, the board comes with a set of specially made cables. This makes it easy to connect the most popular Sony board cameras and ImmersionRC video transmitters - just plug and play! The JST-SH sockets are labeled “CAM” and “VTX”. The friction between the header connector and socket is strong and willl stay in place flight.

Wire harness compatibility:

- **Camera cable:**
  Lumenier CU-690 Ultra
  FPV PZ0420 Camera
  Lumenier CS-800 Super
  FPV CMQ1993X Camera

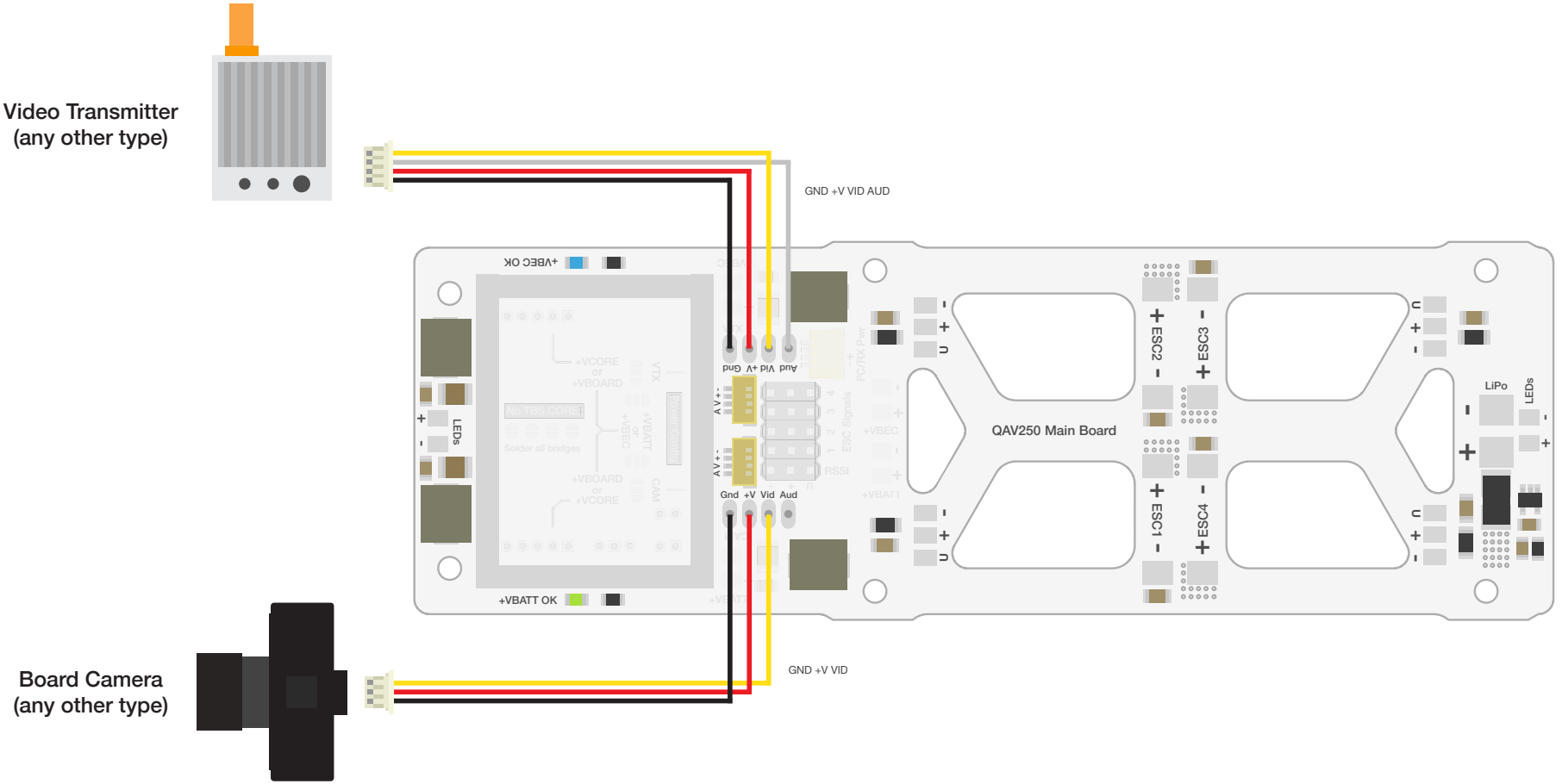
- **Video transmitter cable:**
  ImmersionRC 5.8 GHz 600mW Video Transmitter
  ImmersionRC 5.8 GHz 250mW Video Transmitter



Connect Camera and Video Transmitter (cont.)

Classic setup

To connect all other cameras and video transmitters, splice the included cables or solder bare wires directly to the 2.54mm solder pads. The pads are labeled “Aud” for audio (mono), “Vid” for video, “V+” for power and “Gnd” for ground.



Setup TBS CORE OSD

The TBS CORE can be configured to calibrate the RSSI range and current sensor type. With the FPV system powered on, enter the CORE OSD by holding down the small button on the right side of the TBS CORE board. If you have the RF shield installed, there is a small hole to reach the button.

A short press on the button will scroll through the menu options, while a long press will enter/accept the change.

Current Sensor 50A

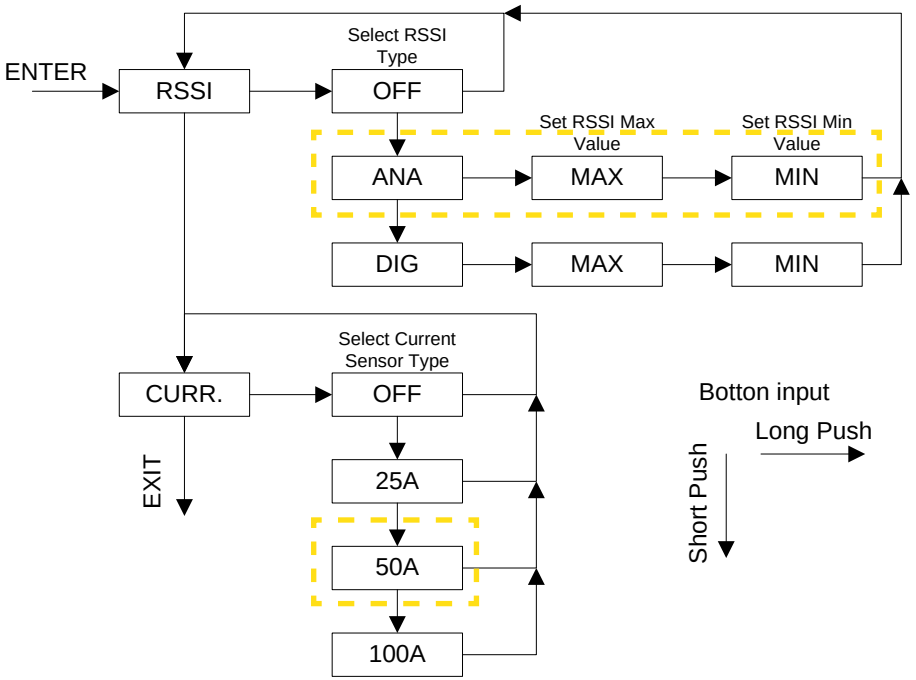
Enter the OSD and scroll through until the “CURR.” setting appears. Next, scroll through to the “50A” current sensor value appears. A long press confirms the setting.

- Current sensor amperage: **50A**

Calibrate RSSI

After connecting the R/C receiver and hooking-up the RSSI output to the RSSI on the board, enter the CORE OSD menu. Next, go to the “RSSI” menu option, enter and select the “ANA” option. Power on the R/C transmitter and continue by selecting “Max.”, then turn off the R/C transmitter and select “Min.” This sets the 100% and 0% end-point value which corresponding received R/C RF power levels.

- RSSI type: **ANA**
- Calibrate minimum and maximum signal strength range



TBS CORE menu system overview. *Source: TBS CORE Manual*

Status LED Lights

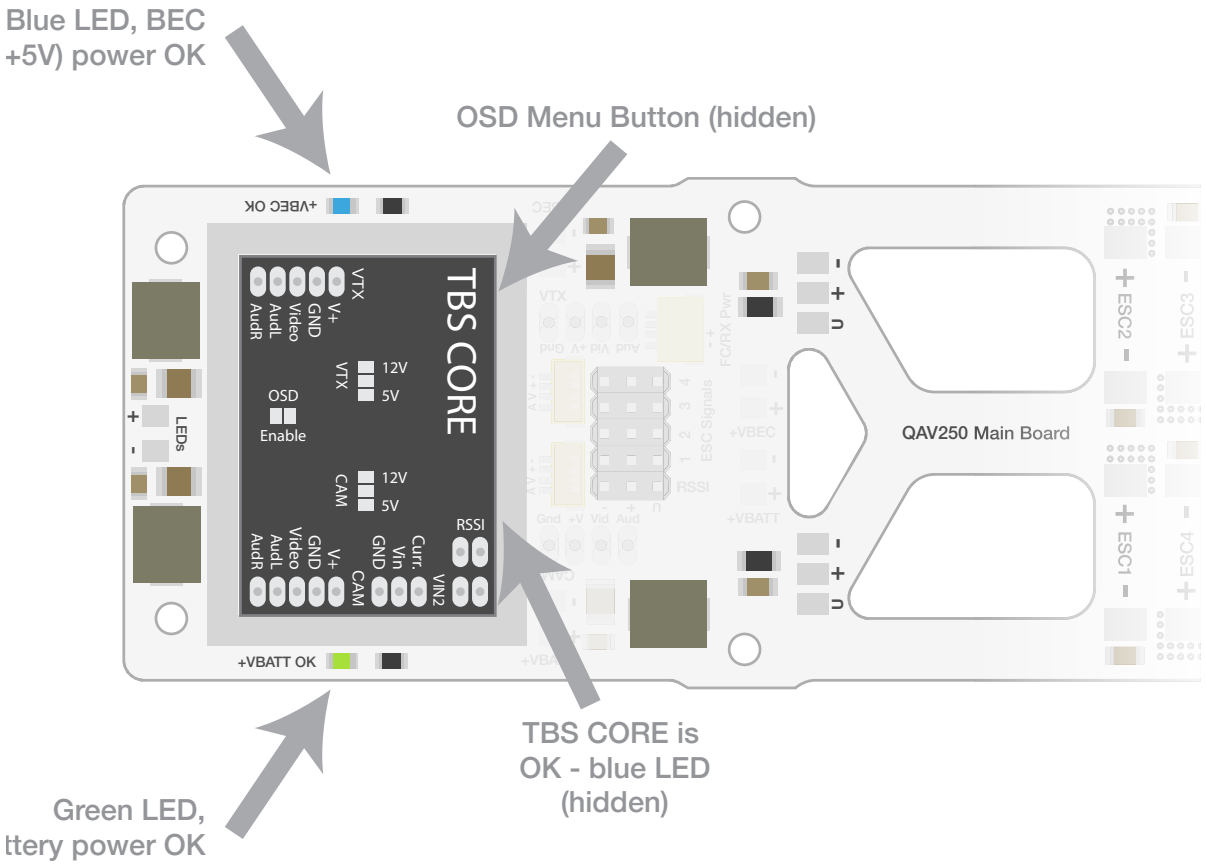
The board has two LED lights to indicate that the necessary power sources are available and ready. Battery power (+VBATT) lights up green while BEC power (+VBEC) lights up green.

In addition, the TBS CORE has an on-board blue LED to indicate proper operation.

Status light indicators:

Board:
- **Blue LED** - +5V power from the ESC BEC is OK
- **Green LED** - Power from the battery is OK

TBS CORE:
- **Blue LED** - Unit is operating normally

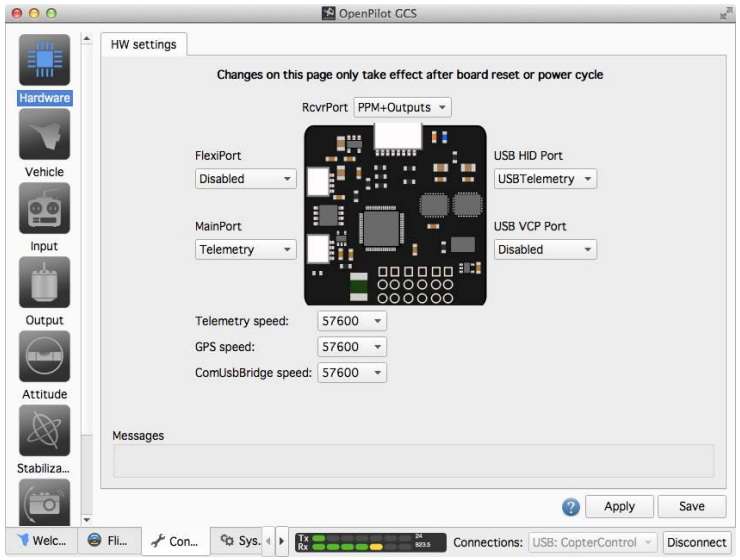


Configure OpenPilot Flight Controller

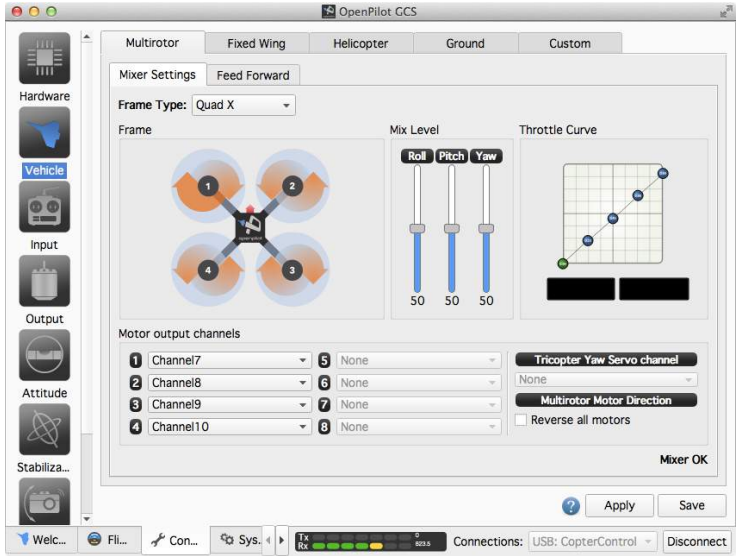
To use the OpenPilot “RcvrPort” as both an PPM input and ESC output requires some re-configuration of the controller board. To use the classic setup, follow the official OpenPilot guide (it will not be shown here). This section is based on OpenPilot GCS 14.01.

Minimalistic setup

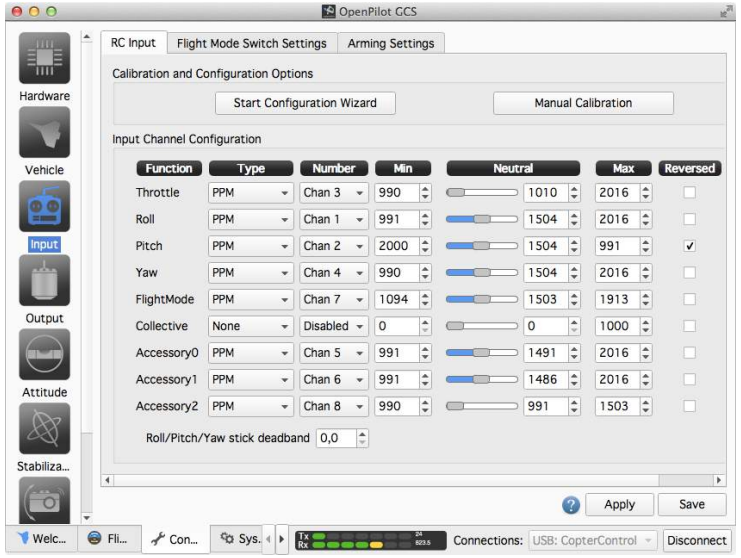
Start by opening the “Hardware” tab and setting the “RcvrPort” to “PPM+Outputs”, this makes the red/white/black cable PPM input and the others outputs to the ESCs.



Next, go to the “Vehicle” tab and change “Motor output channels” to 1 -> Channel7, 2 -> Channel8, 3 -> Channel9 and 4 -> Channel10, as shown in the next image. This maps the logic motors to physical output pins.

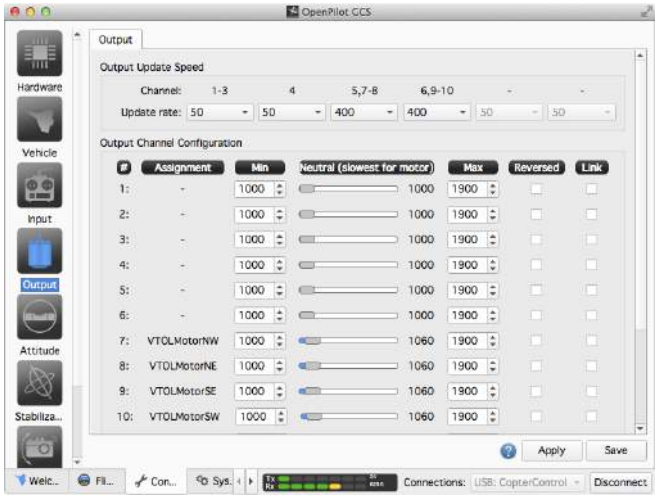


Map the PPM stream to R/C input functions. This differs from the image below depending on how your R/C radio is arranging and streaming the channels to the receiver. Use the “Start Configuration Wizard” to make this easy.

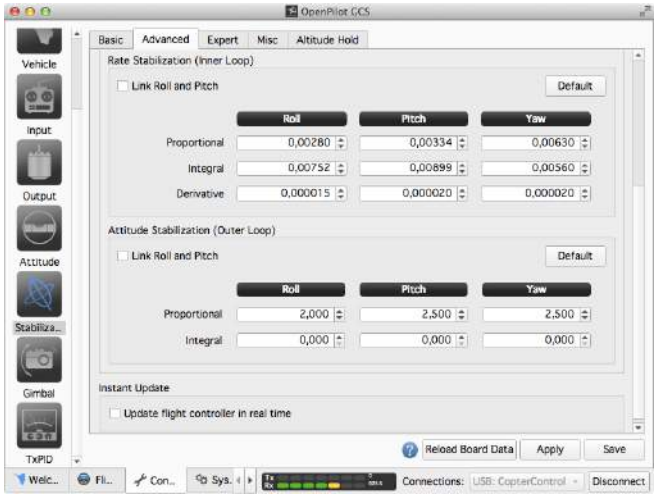


Configure OpenPilot Flight Controller (cont.)

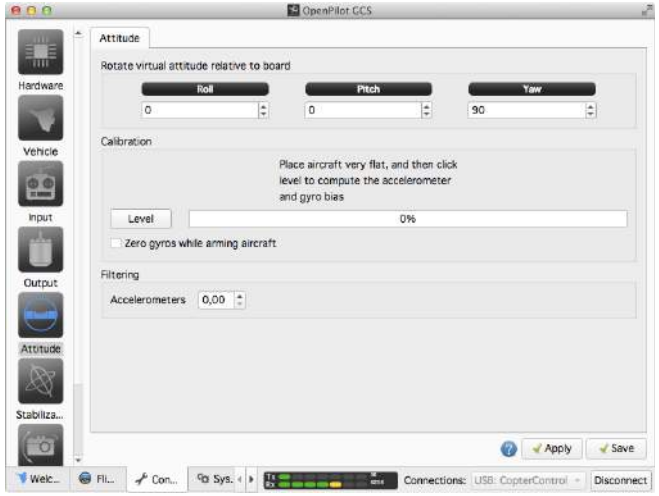
Next, open the “Output” tab and change the “Output update speed” to 400 Hz for ch. “5,7-8” and “6,9-10”. Set the minimum (idle) level for the motors to around 1060 µS. **Important: with propellers off!**



Now, tweak the stabilization values to suit the new weight and center of gravity. Only slightly or no changes should be necessary.



Lastly, change the logic orientation of the board if the arrow does not pointing in the forward direction. It is handy to have the USB connector face out of the right side of the platform for easy access. This moves the “RcvrPort” point to the rear and making the connection of the cable very tidy.



The following table shows what the correct value should be for the “Yaw” option.

Top of board is facing:	Arrow is pointing:	Roll	Pitch	Yaw
Up	Forward	0	0	0
Up	Right	0	0	- 90
Up	Backward	0	0	+180
Up	Left	0	0	+90

Mounting Board

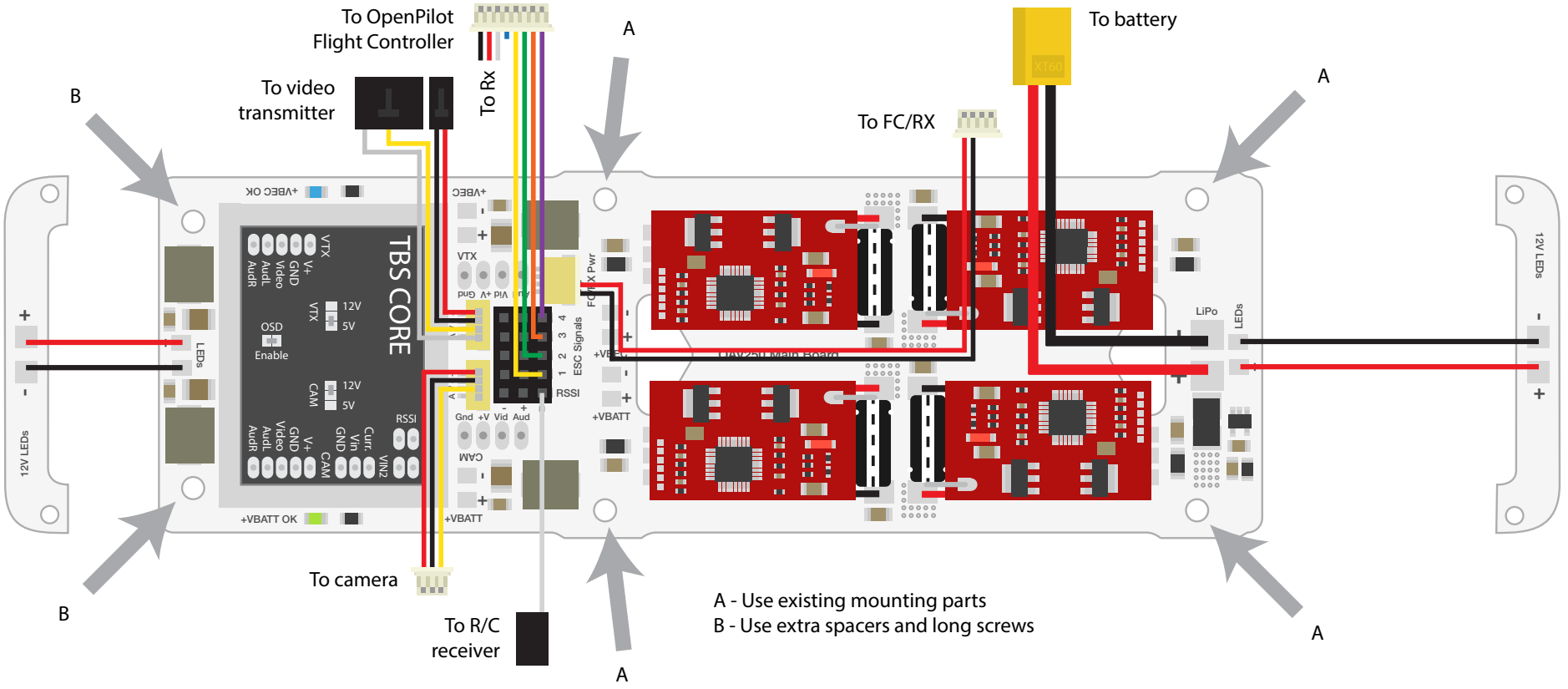
Begin by positioning the “FC/RX Pwr” cable and OpenPilot wire harness (if used) between the ESCs, feeding it to the rear end. Position the board to the bottom of the QAV250 platform, feed the battery power lead, “FC/RX Pwr” cable and OpenPilot wire through the rear cut-outs in the platform and align the hollow spacers over the holes.

The two front screw holes on the board require an additional pair of hollow spacers and long screws (included).

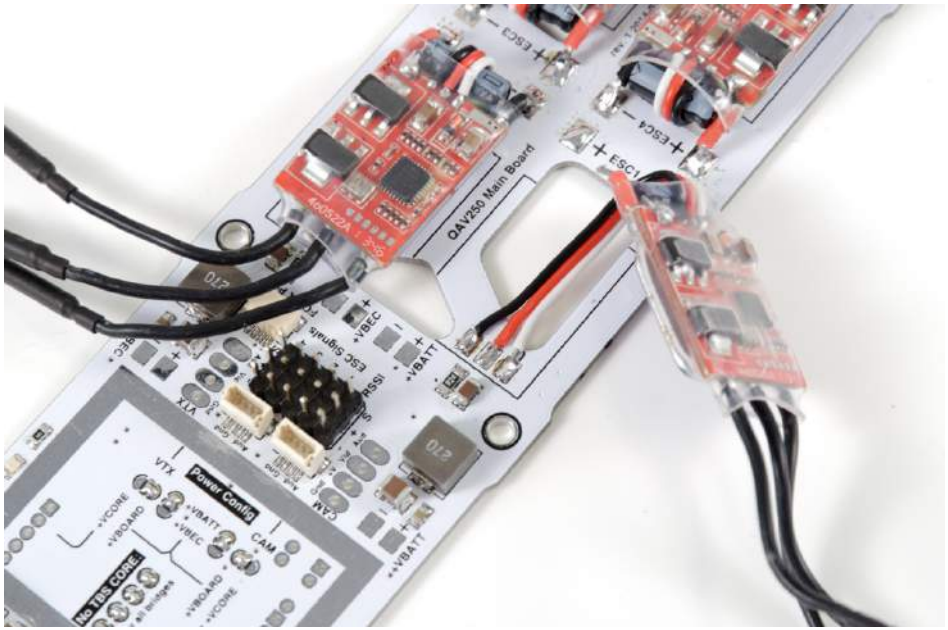
Screw the bolts in place. Connect the camera and video transmitter cables to their respective devices and plug in the other end to the sockets on the board (if used). Plug in the ESC signal cables on the pin header.

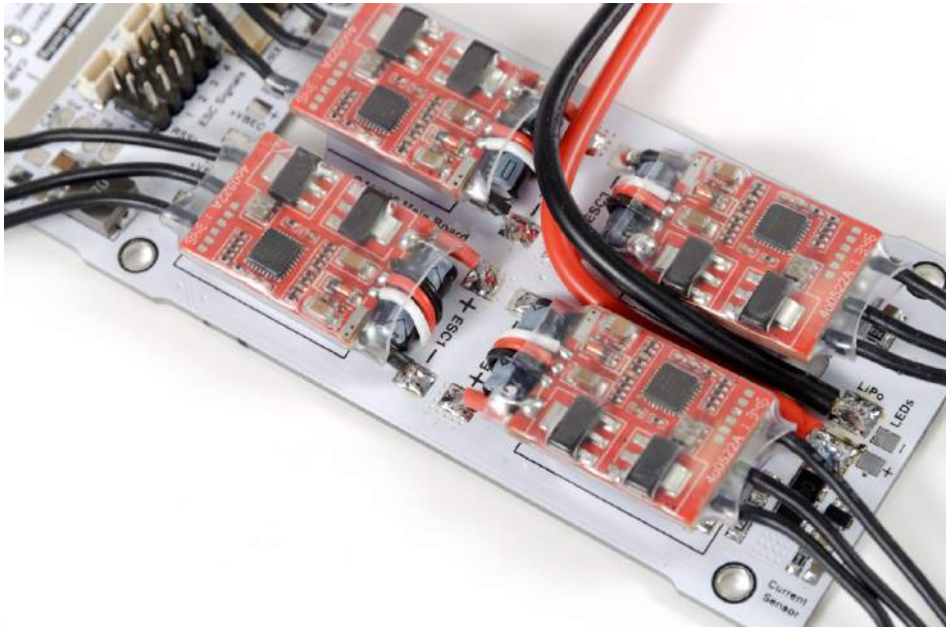
Mount the LED boards to the frame as normal using taper screws.

Finished! (hopefully)



Setup Complete





Note: this shows a prototype board, but it is essentially the same as production