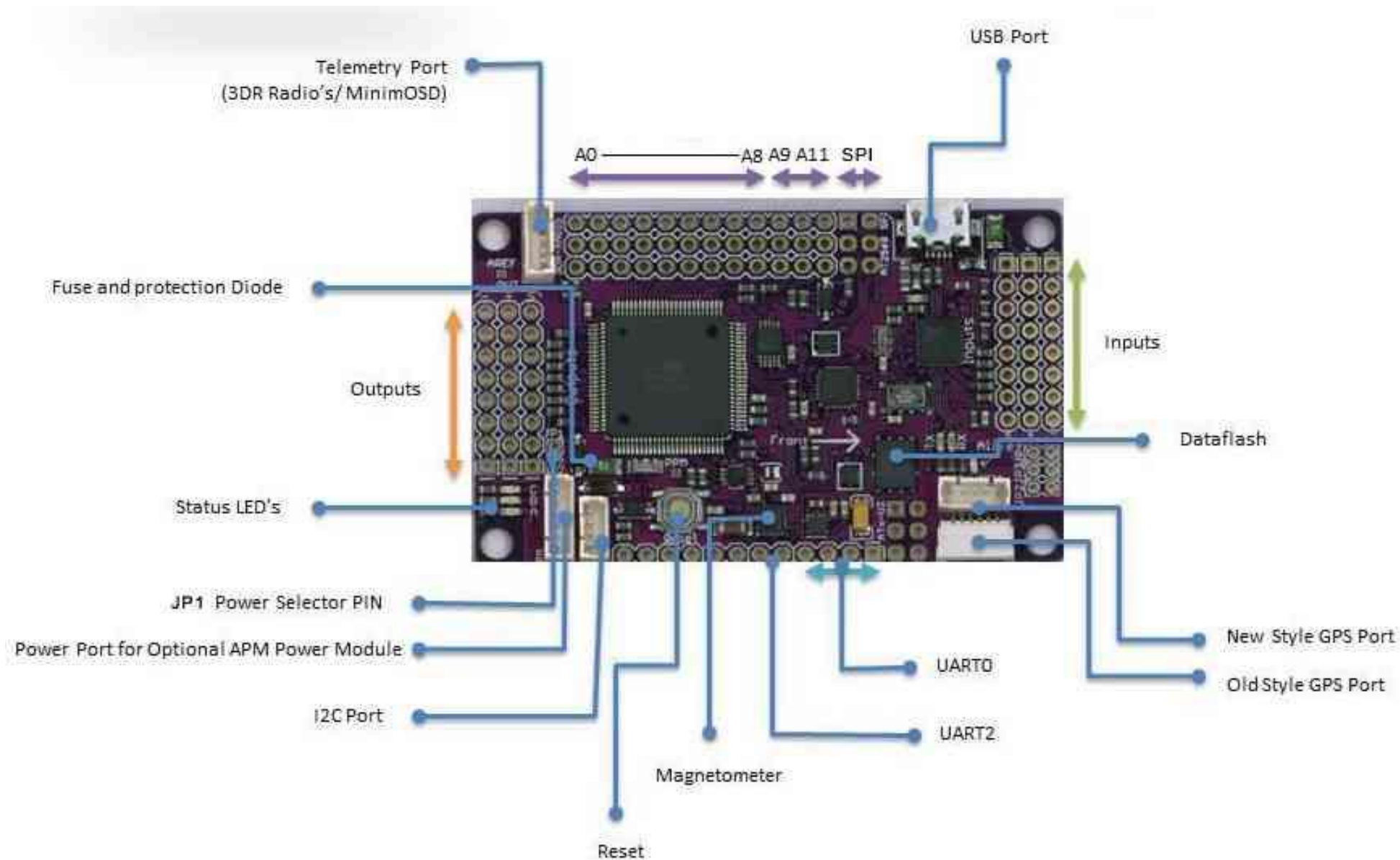


Quadcopter Wiring

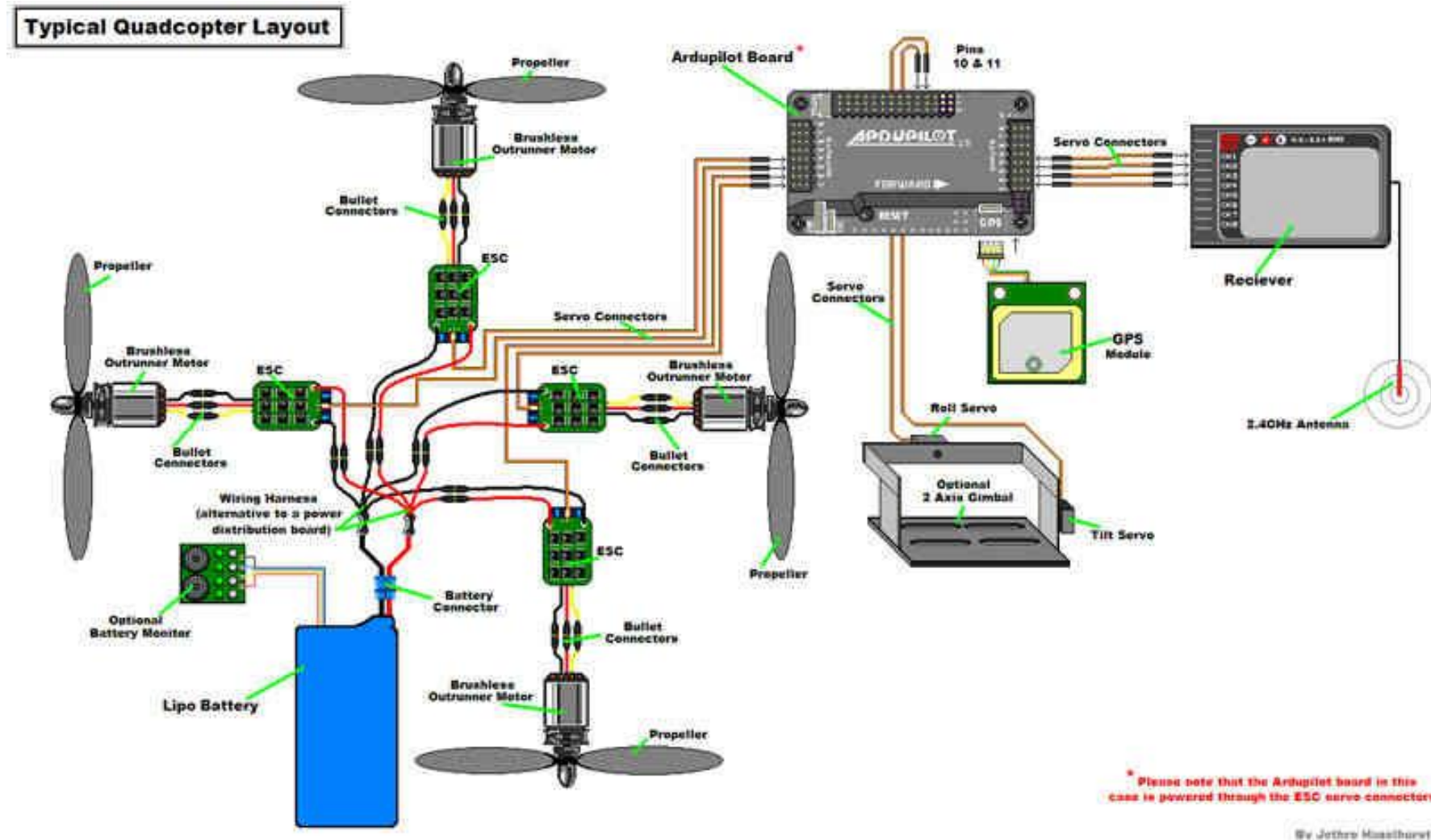
Mahmoud Gamal Eldin Mohamed Elewa
UDC Quadcopter Control Team

Wednesday, October 16th 2018





APM Wiring Diagram



Powering the flight controller

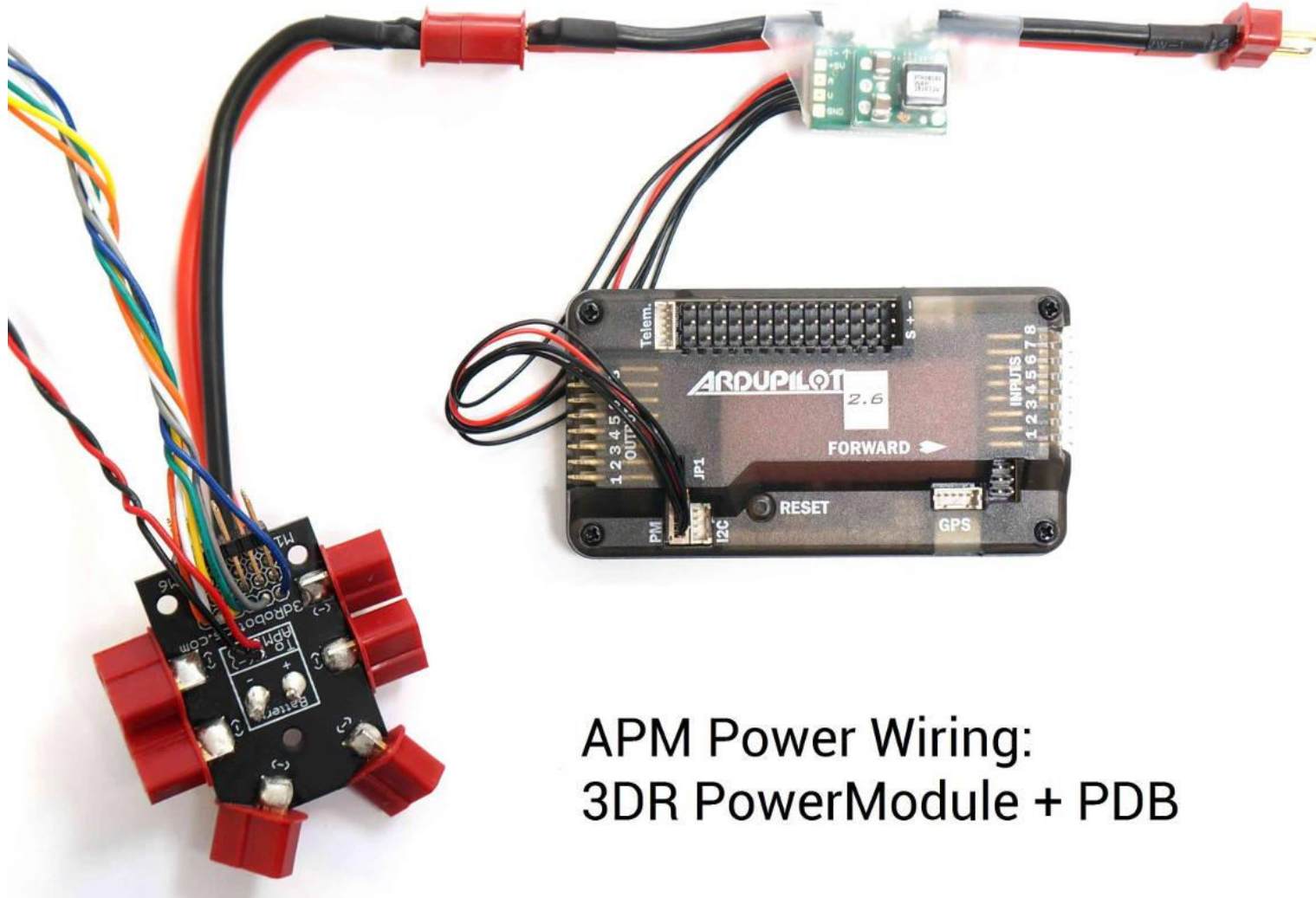
- To wire a power module, connect the **red**-and-**black** two wire cable on the power module to the **PDB red and black two-wire**.
- Connect the power module to the APM PM port using a 6-position cable.
- Connect the PDB multi-wire cable to APM Output Signal pins with the M1 wire connecting to the signal pin labeled 1, M6 and signal pin 6, etc...

➡ From battery

To ESC or PDB ➡

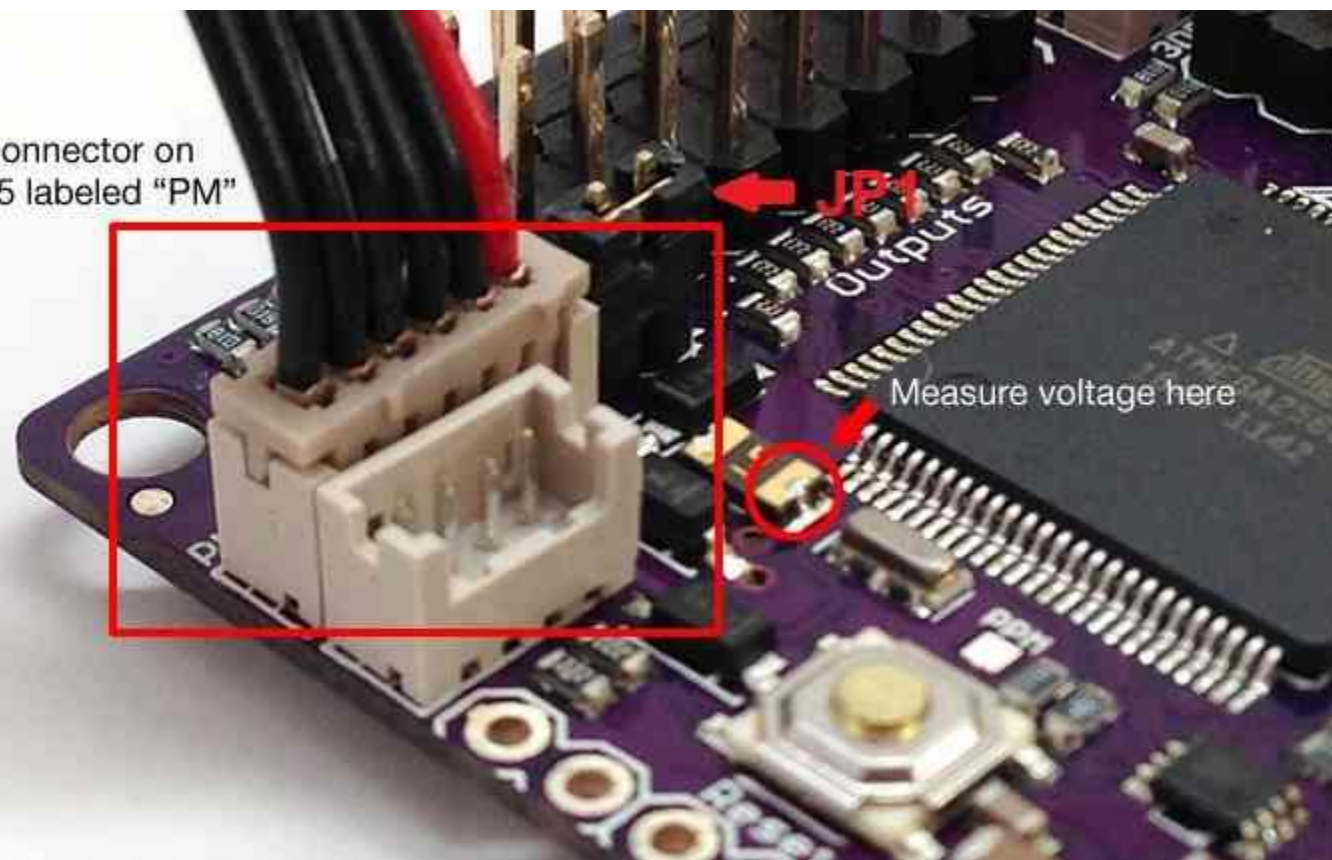


6-pos connector provides +5.3V,
current and voltage measurements



APM Power Wiring:
3DR PowerModule + PDB

6-pos connector on
APM 2.5 labeled "PM"



JP1

Measure voltage here

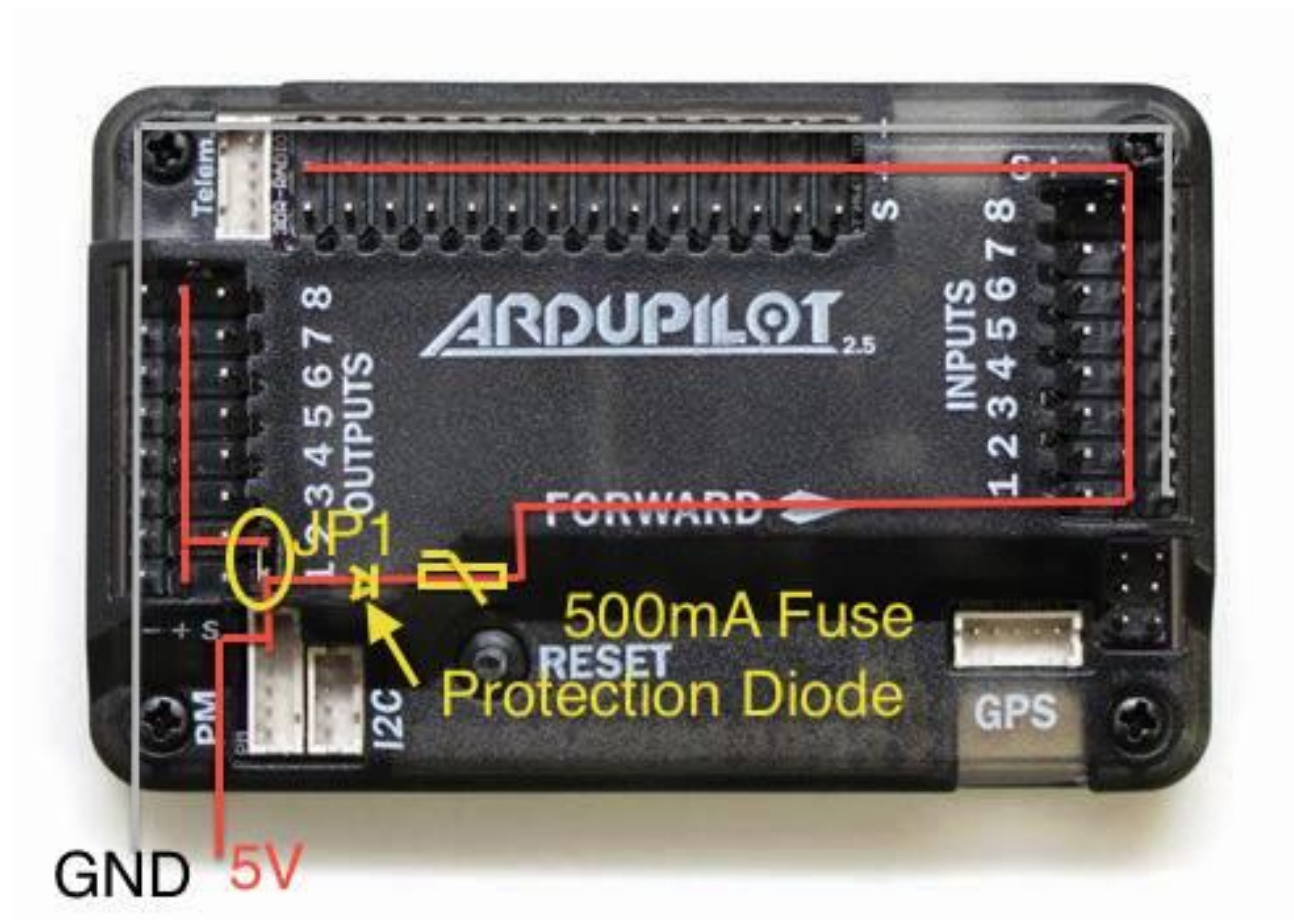
Warning

- Most Power Module's maximum input voltage is 18V. This is the maximum allowed by the on-board regulator. (4 cell LiPo max).
- The Power Module provides enough power for the flight controller, receiver, lower power peripherals like a low power lidar and telemetry radio but it does not have sufficient power for servos or high current devices like FPV transmitters and the RFD900 telemetry radios.

APM 2.x Power Module Notes:

- You should normally remove the APM's JP1 jumper when using the Power Module so that only your APM board and your receiver are powered from the Power Module's on-board regulator and not from your ESCs.
 - Removing the jumper allows you to use the APM's servo output rail to distribute power from your ESC's BEC or separate UBEC to any servos or external equipment.
 - If you are using servos, plug an ESC BEC or stand alone UBEC power wire and ground wire into two of the power and ground pins on the APM's servo output rail to provide a common power and ground bus for servo power.
- You can leave the jumper present if you are using ESCs that have no BECs or if all the ESC BECs power wires are cut and you are not powering any servos from the servo out rail.
- You can also individually power each servo from each individual ESC-BEC.
 - Simply run the power and ground from each ESC-BEC individually and directly to each servo (very handy for multi-copters).

- Under no circumstances should you ever attempt to draw servo power from the analog input connector.



Powering Modes

☐ **Power Module and no servos**

- If you have a power module and you are not using servos.
- Ensure JP1 is not installed.
- Provide the necessary power via the power module connected to the APM's power module connector.
- When connecting your ESCs to the OUTPUT connector clip the BEC power leads on each ESC's 3 wire connector.
 - Or connect only the ESC's signal wires to the OUTPUT connector.

❑ No Power Module and no servos and power provided by BEC from ESC

- If you do not have a power module and you are not using servos.
- Ensure JP1 is installed and provide the necessary power via the BEC from one of your ESC's.
- Connect one ESC's BEC power and ground wires to one pair of the APM OUTPUT connectors power and ground pins.
- Clip the BEC power leads on the remaining 3 wire connectors.
- Ensure that the ESC's signal wires are connected to the appropriate APM OUTPUT connector signal pins.
- You must ensure that your ESC's BEC has a sufficient power capability (at least 2 amps).
 - Most 20 amp or higher ESCs have 2 amp BECs.

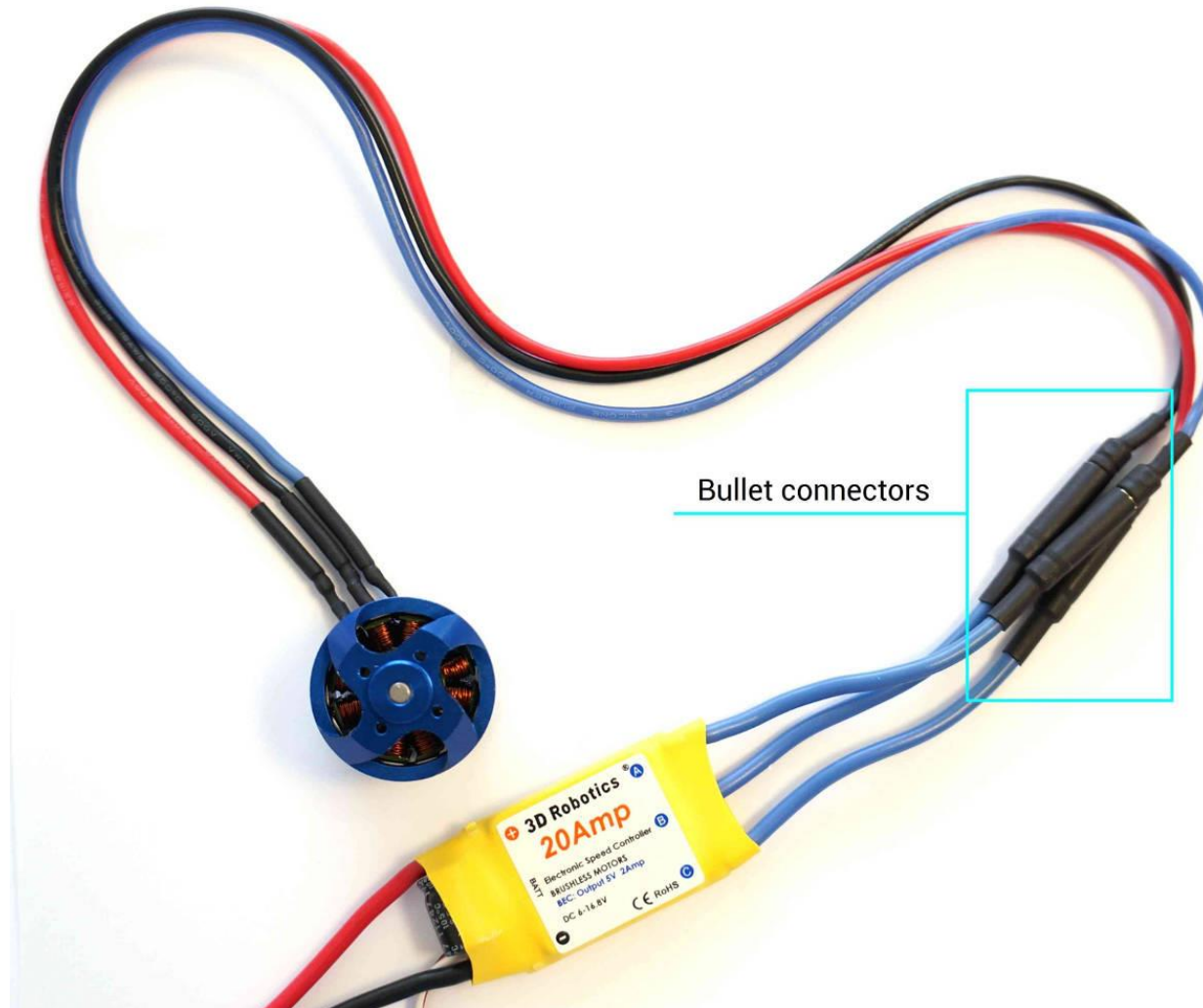
More Powering modes

- <http://ardupilot.org/copter/docs/common-powering-the-apm2.html>

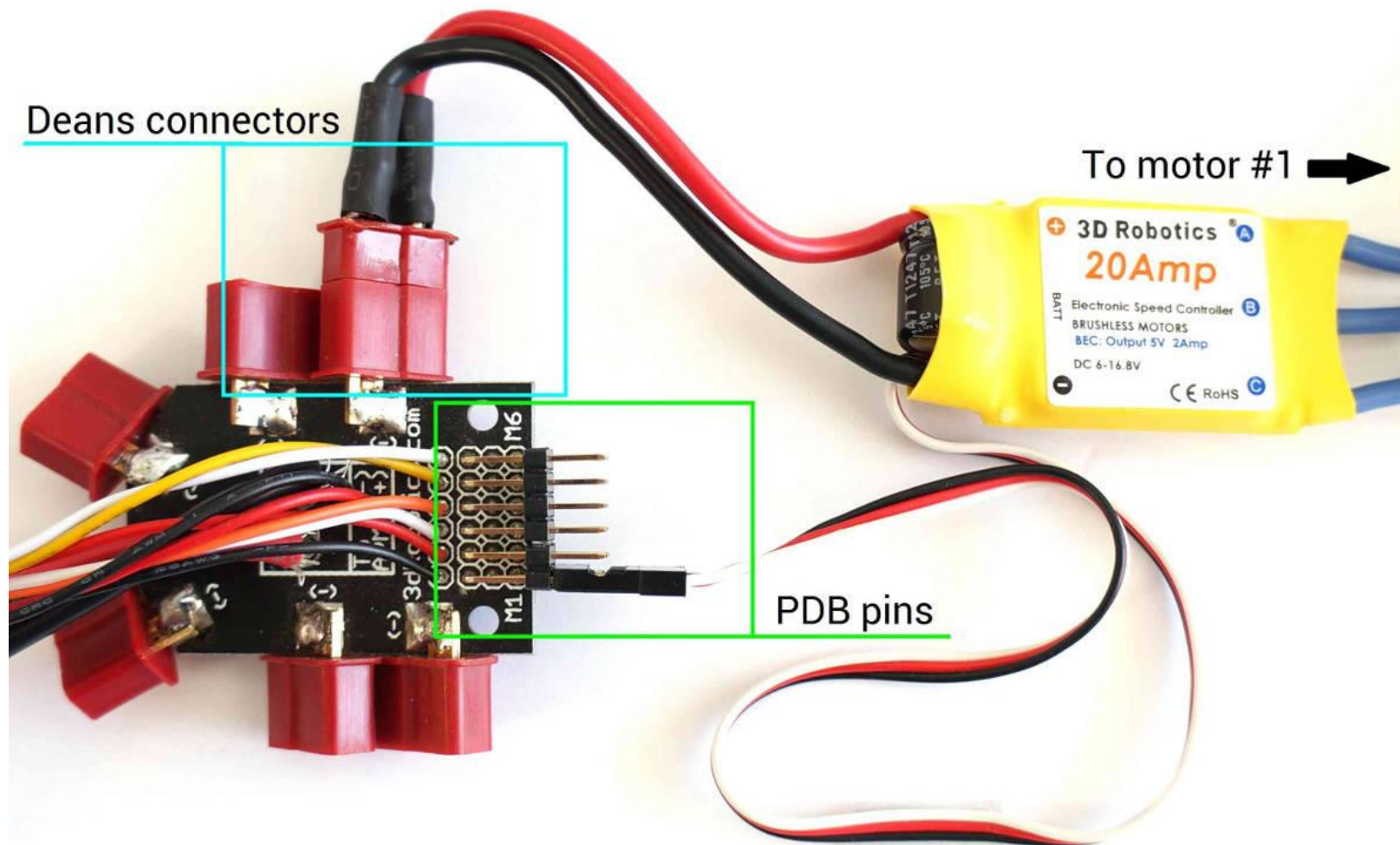
Power Module Configuration in Mission Planner

- <http://ardupilot.org/copter/docs/common-power-module-configuration-in-mission-planner.html#common-power-module-configuration-in-mission-planner>

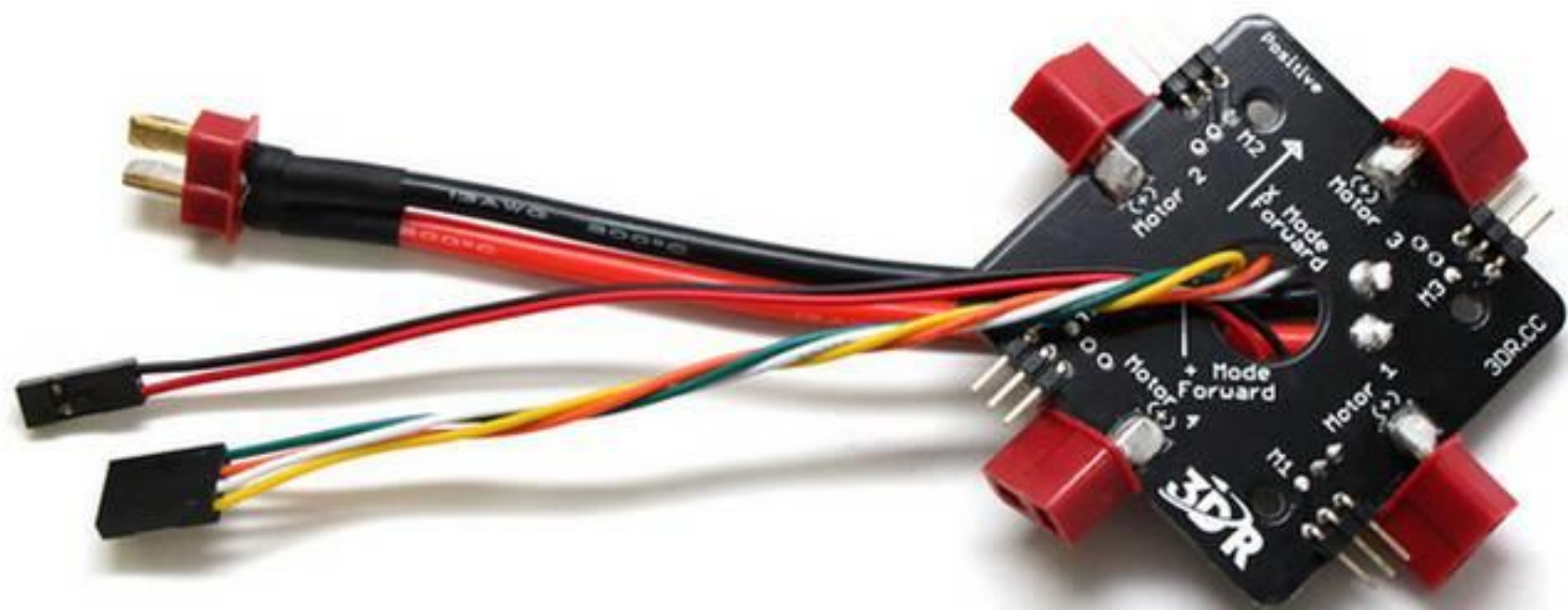
Connect ESCs and motors



- Connect ESC Deans connectors to Power Distribution Board (PDB) Deans connectors. Connect three-wire cables from the ESCs to the PDB signal pins according to motor number (see link above to find the motor number configuration for your frame). Connect the ESC for motor 1 to the PDB pins marked M1, motor 6's ESC to the pins marked M6, etc.



- When using a PDB, connect the power (+), ground (-), and signal (s) wires for each ESC to the PDB according to motor number. Find your frame type below to determine the assigned order of the motors. Then connect the signal wires from the PDB to the main output signal pins on the flight controller board (ensuring that the motor order numbers match the main output pin numbers on the controller). If you are using a power module, it is optional to connect the power and ground wires from the PDB to the flight controller board. If you would like to use these cables in addition to or instead of the power module or as a common point for low current servos, connect the ground (-) wire to a main output ground (-) pin and the power (+) wire to a main output power (+) pin.



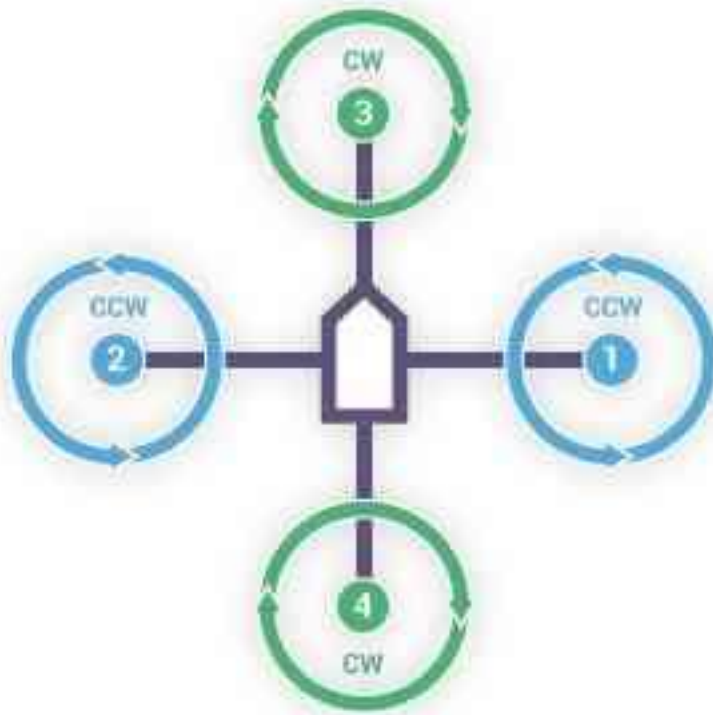
Motor order diagrams



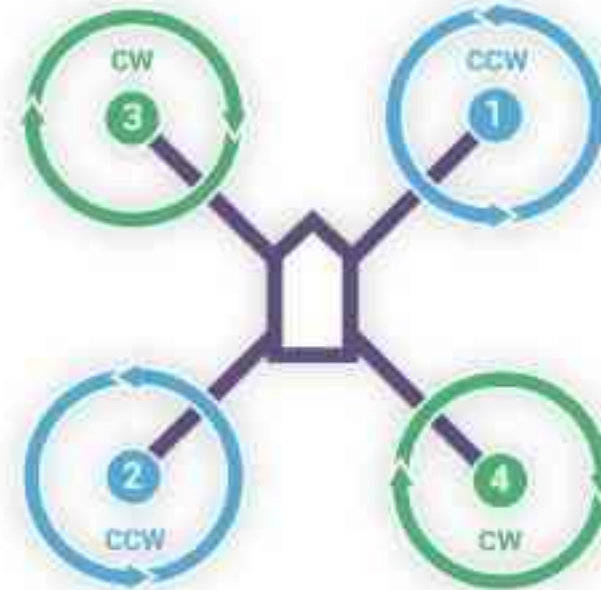
*CLOCKWISE ROTATION
USE PUSHER PROPELLER*



*COUNTER-CLOCKWISE ROTATION
USE NORMAL PROPELLER*



QUAD +



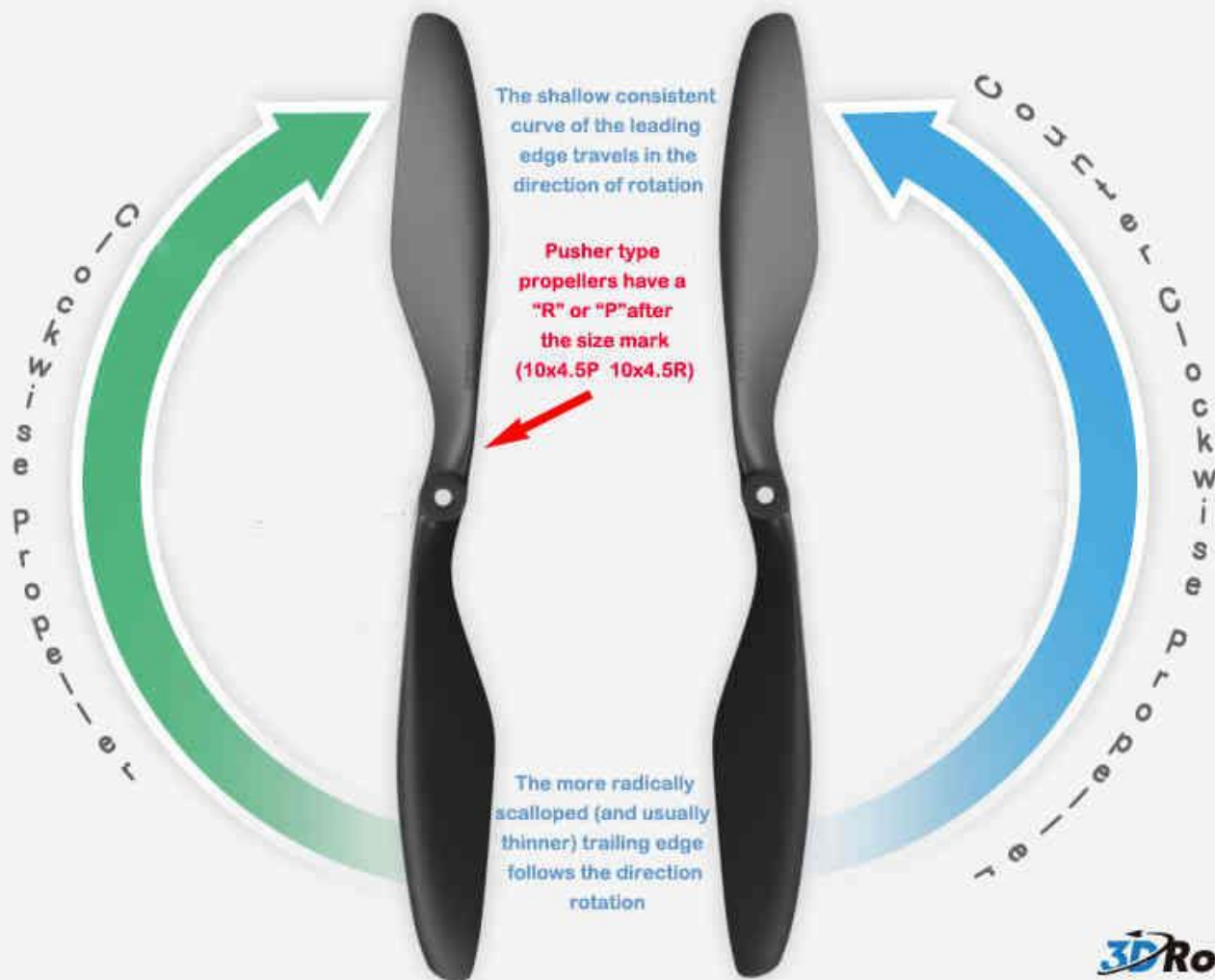
QUAD X



CLOCKWISE ROTATION
USE PUSHER PROPELLER



COUNTER-CLOCKWISE ROTATION
USE NORMAL PROPELLER



Testing motor spin directions

- If you have completed the Radio and ESC_calibration, you can check that your motors are spinning in the correction direction:
- Make sure there are no propellers on your copter!
- Turn transmitter on and ensure the flight mode switch is set to Stabilize.
- Connect battery.
- Arm copter by holding the throttle down and rudder right for five seconds.
- If it fails to Arm with the throttle down and to the right and the motors will not spin, it has probably failed the Pre-Arm Safety Check.
 - Pre-Arm safety check failure is also indicated by the red arming light double flashing and then repeating.
 - If the Pre-Arm check fails go to the Pre-arm Safety Check Page and correct the problem or disable the check before continuing.
- When you can Arm successfully, apply a small amount of throttle, and observe and note spin direction of each motor. They should match directions shown in the images above for the frame you've chosen.
- Reverse any motor spinning in the wrong direction.
- Motor Direction is reversed simply by interchanging two of the three ESC to motor power leads.

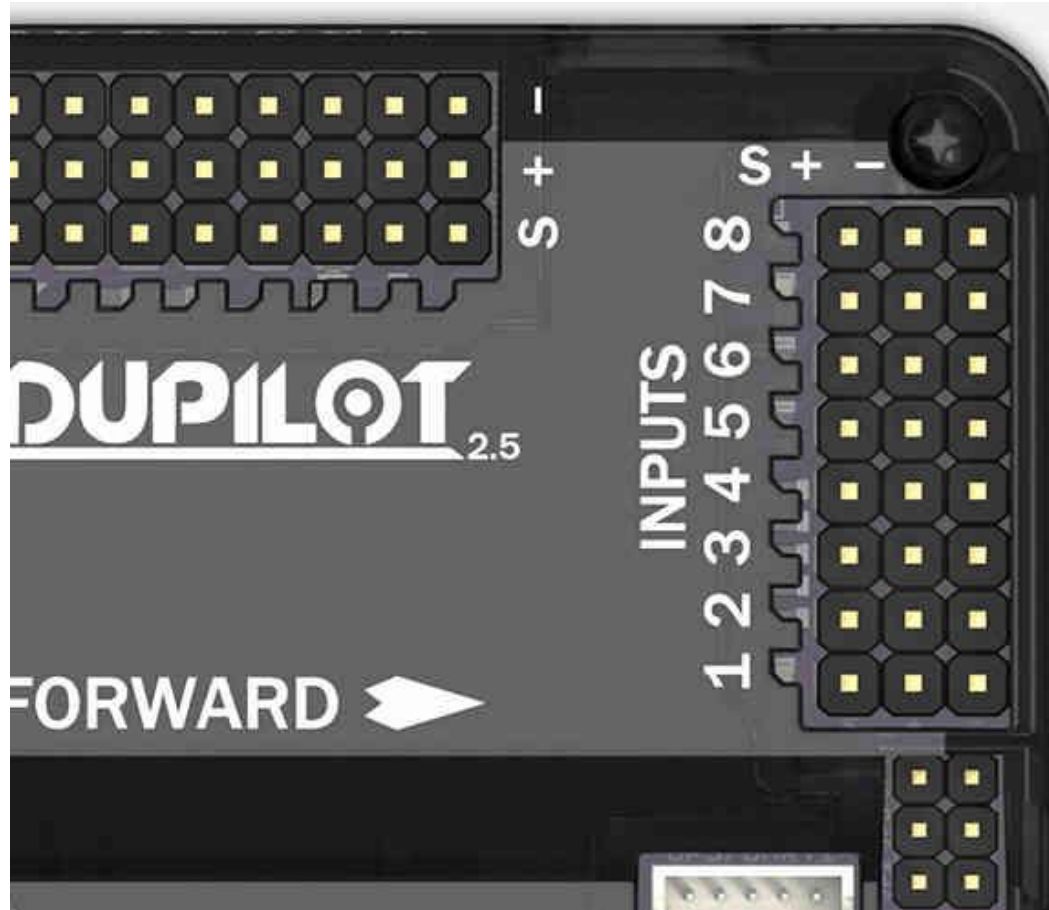
Checking the motor numbering with the Mission Planner Motor test

- <http://ardupilot.org/copter/docs/connect-escs-and-motors.html#checking-the-motor-numbering-with-the-mission-planner-motor-test>

Connecting a Receiver

- Connect your RC receiver “S” (signal) pins to the “S” pins on Inputs of APM using a (minimum 5 pin) jumper cable (6-pin-to-6-pin-individual-female-15cm). You must connect at least channels 1 ~ 5. Channels 6 ~ 8 are optional.





CONNECT TO CORRESPONDING
CHANNELS OF RC RECEIVER

- 8 AUX 4 (OPTIONAL)
- 7 AUX 3 (OPTIONAL)
- 6 AUX 2 (OPTIONAL)
- 5 AUX 1 (MODE SWITCH)
- 4 YAW / RUDDER
- 3 THROTTLE
- 2 PITCH / ELEVATOR
- 1 ROLL / AILERON