MindPX

MINDRACER
USER MANUAL

Highlights

- Ultra mini size, weight only ~6g
- High performance F4 168MHz floating point processor, super fast throttle response
- Support OneShot ESC
- Support PPM/SBUS/DSM radio receivers, support D.Port/S.Port/Wifi telemetry
- On board flight data recorder
- Support IMU isolation
- DroneCode standard compliant connector

Quick self check

Before mounting please perform following quick check for any potential damages to MindRacer during logistic:

1. Check if any pin headers on the rear are bended or contacted

2. Check if the enclosed case is broken or damaged

3. Check if accessories are intact

If any situation above, please contact your local sales representatives for replacement.

In package list

1. MindRacer main board

2. 3M tape

3. heat sink

4. cable set: FrSky telemetry cable, power cable, debug cable, main output cable, RC input cable, usb cable

5. racing breakout board

Table of Content

Physical

	MindRacer
Flight controller / Processor	F427 VIT6
Weight	~6g
Dimension	35 x 35mm
PWM outputs	maximum 6
IMU	10DOF
IMU isolation	YES/Optional
Radio receiver	PPM/SBUS/SPEKTRUM DSM/Satellite
Telemetry	FrSky D.Port, S.Port, Wifi, 3DR radio
on board TF card for flight data recording	YES
OneShot ESC support	YES
Expansion slots	2 x 7(pin) x 2
on board Real time clock	YES
connector	JST GH (compliance with DroneCode standard)

Power

MindRacer can be powered through its power port. The input voltage must be within the range from +4.7V ~ +5.2 V.

MindRacer can also be powered using an USB cable. This is usually the case when it is connected to the ground station for configuration or calibration.

> ⚠️ **Important**
>
> Input voltage exceeds the specified range may damage the flight controller permanently.

MindRacer can powering small peripheral devices through its ports. MindRacer can provide 2 kind of voltage, +5V and +3.3V. Check MindRacer specification for the pin out of power supply.

MindRacer can supply maximum 100mA@5V or 100mA@3.3V.

> ⚠️ **Important**
>
> Please make sure peripheral devices do not draw more currents than the specified range as in
>
> specification, or the MindRacer may reboot or even be damaged.

Mounting

Direction of head

Before mounting, please make sure the head direction of MindRacer board(see the 'front' direction mark) is consistent with the head direction of airframe.

There are 2 ways of mounting your MindRacer onto your airframe,

1) heat sink mount

2) header pin mount

Heat sink mount

Heat sink is a piece of processed metal can be mounted on the bottom side of MindRacer. You can directly adhere the MindRacer with heat sink together onto the supporting carbon board of airframe using 3M tape. The 3M tape should be attached to the bottom side of the heat sink.

Heat sink mount is a very flexible mounting method with minimum weight, extremely suite-able for cases like racing match or irregular airframe.
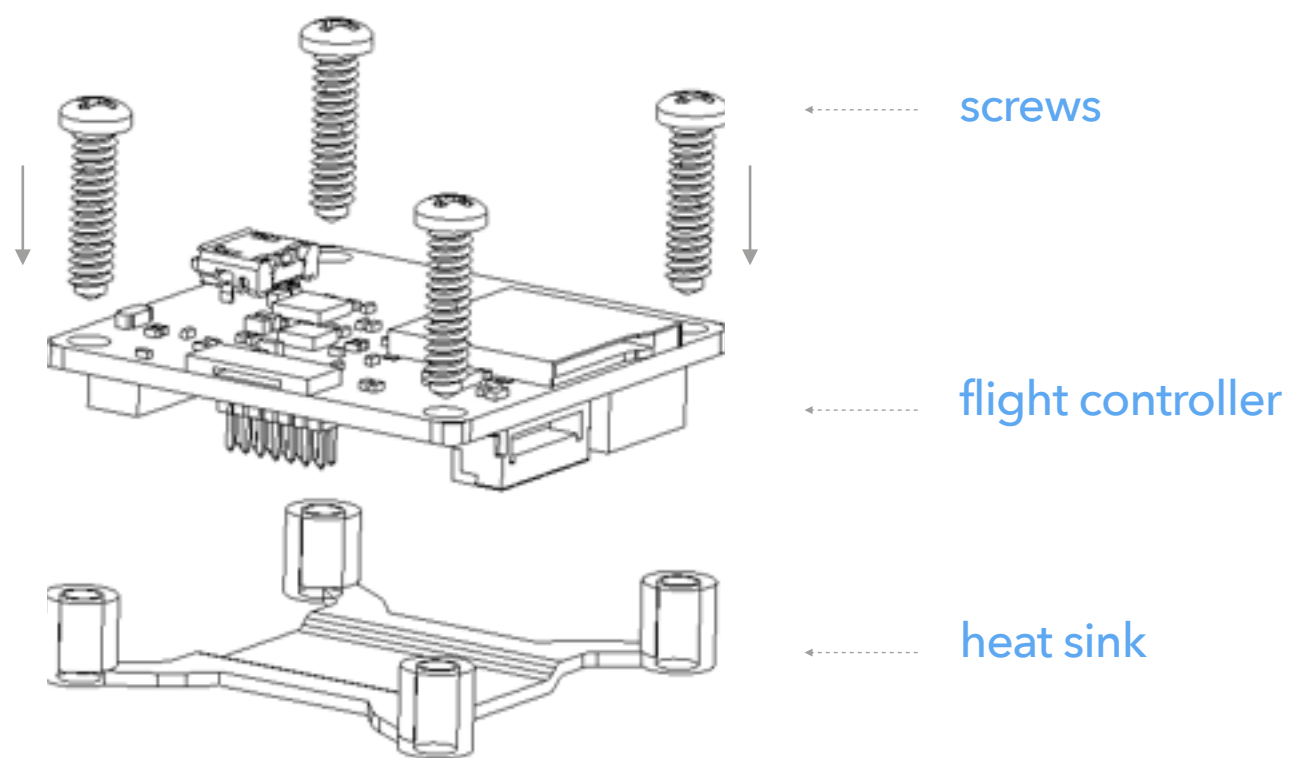
screws

flight controller

heat sink

Fig. 1 heat sink mount

Header pin mount

MindRacer can also be mounted into a base PDB board through its 2 header pins on the bottom side. In this mounting method MindRacer's ports are led out through the header pins to the PDB boards, so that pilots can utilize most features out of MindRacer.

Header pin mounting requires a PDB board with matching female headers. This PDB board can be obtained from AirMind website, or you can download the open PCB files to made yourself.

Header pin mounting can lead to a very clean build of copter - most of wiring has gone through the header pins so in rare case you need to jump wires. Only peripheral devices may need further wiring.

IMU isolation mount

Though has a complete set of IMUs on board, MindRacer can support a redundant set of IMUs in an isolated and vibration dampening rack.

The isolated mounting rack can help reduce the impact of vibration and improve the flight performance.

The rack can be mounted directly on MindRacer board through 4 mounting hole using M3 screws.

* If you use barometer during flight, please use a piece of foam to cover on the surface of it (on the corner of bottom side of the board).
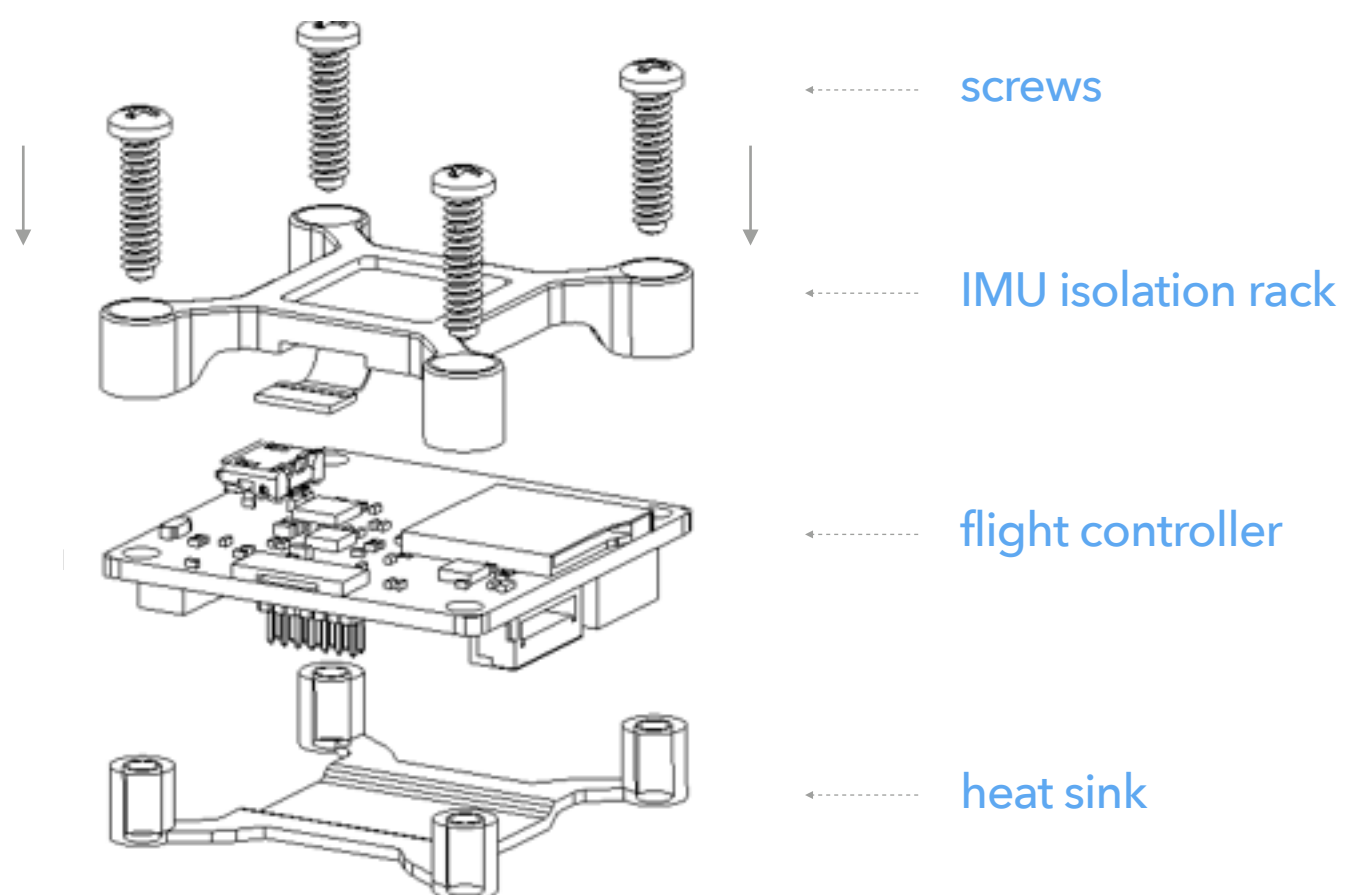
.... screws

.... IMU isolation rack

.... flight controller

.... heat sink

Fig. 2 IMU isolation mount

PDB (power distribution board) mount

MindRacer mounts even perfectly when using specially designed PDB. Although MindRacer is compatible with other PDBs, using MRPDB is soldering-free, and can result in a very clean mount with minimum wiring for safer racing.

The MRPDB (the 'fishbone') is a power distribution board specially designed for racing frames, with female pins right matching MindRacer's pin headers. MindRacer's PWM outputs are routed to the MRPDB's specially designed ESC ports, making connecting to ESCs is soldering-free, very fast and clean.
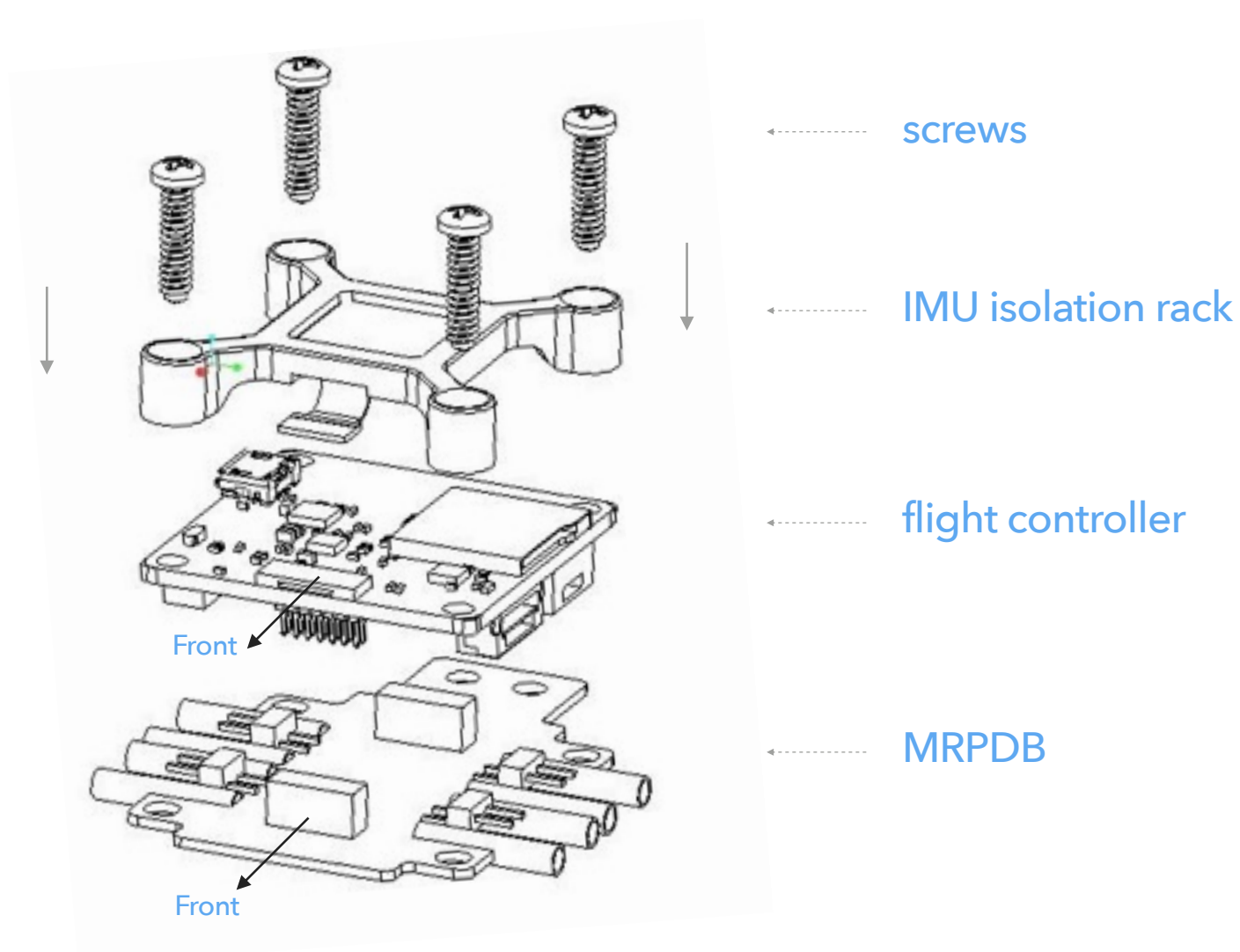

.... screws

.... IMU isolation rack

.... flight controller

Front

.... MRPDB

Front

Fig. 3 MRPDB mount

> ⚠️ **Important**
>
> **MRPDB is directional.** Please make sure the PDB's "front" direction align with the MindRacer's "front" direction, or the MindRacer board will be damaged.

Wiring

The wiring methods can be little different depending on the airframe you choose. The most important thing is motor mapping that ensure the copter will fly correctly.

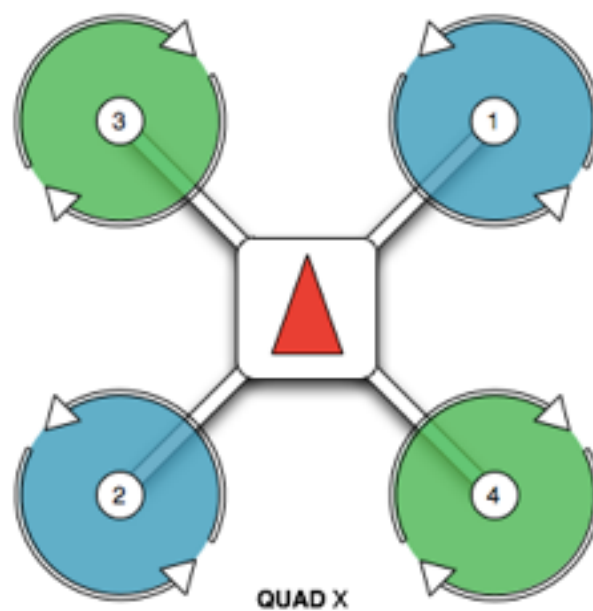MindRacer's motor mapping is shown as following map. The digital numbers map to MindRacer's output pin number.

Fig. 4 Quad X motor map

Below is a real mounting & wiring case. Wire the MindRacer's PWM output pin to corresponding numbered ESC/motor.
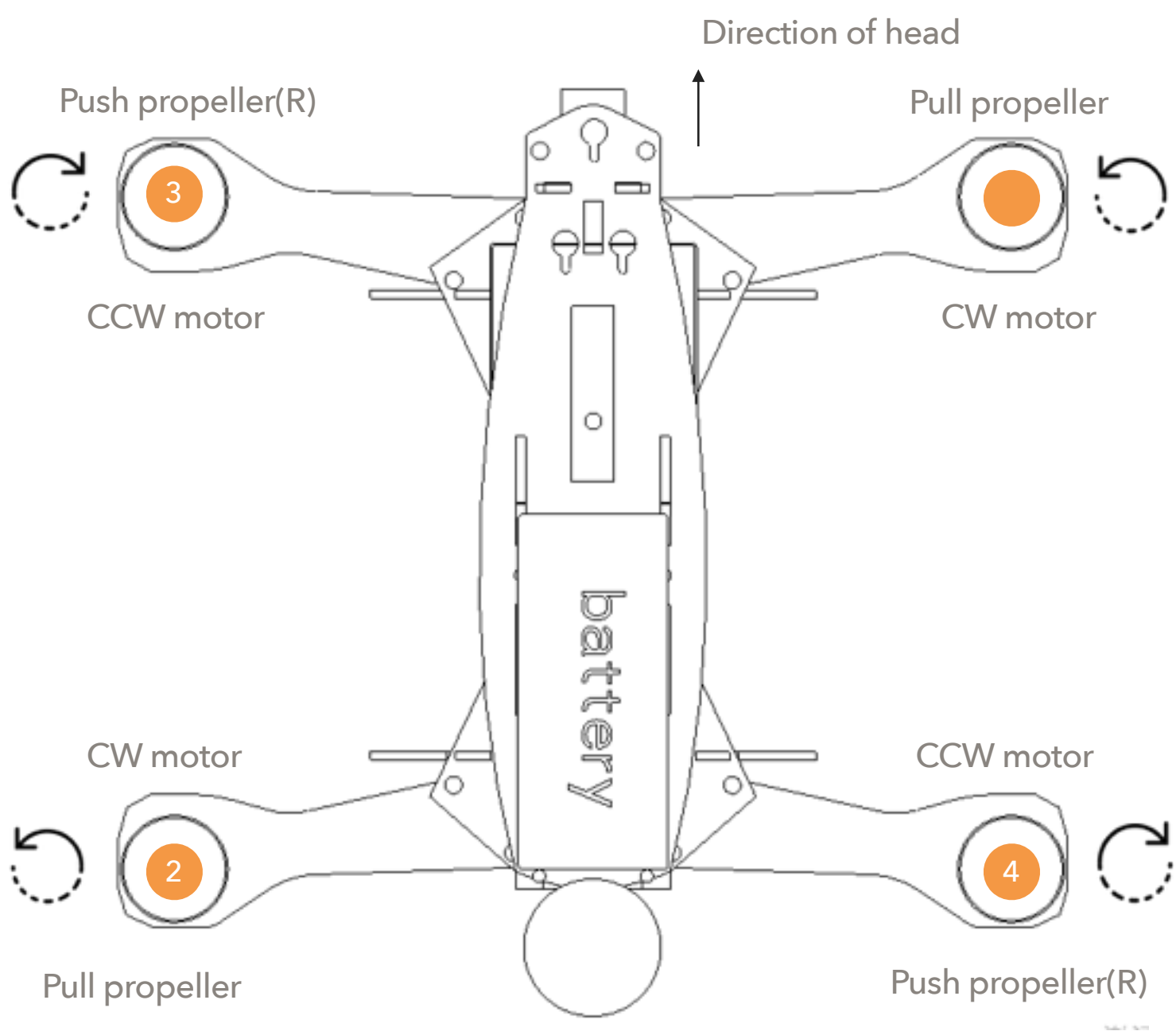
Direction of head

Push propeller(R)   Pull propeller

3   ●

CCW motor   CW motor

battery

CW motor   CCW motor

2   4

Pull propeller   Push propeller(R)

Fig. 5 mounting & wiring example

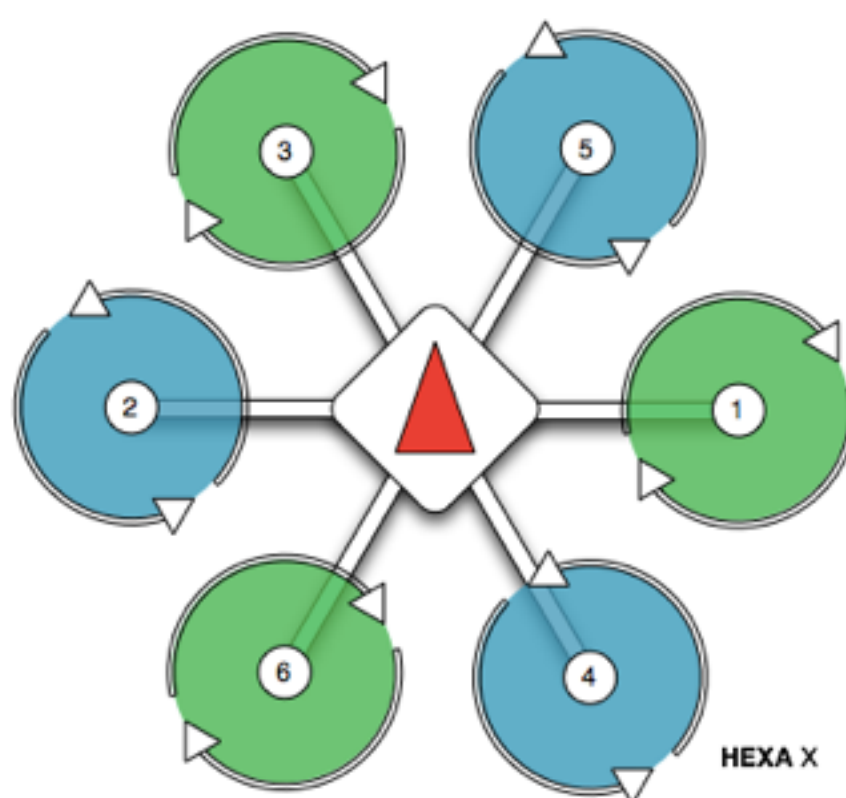In some cases you may need a hexarotor layout.

HEXA X
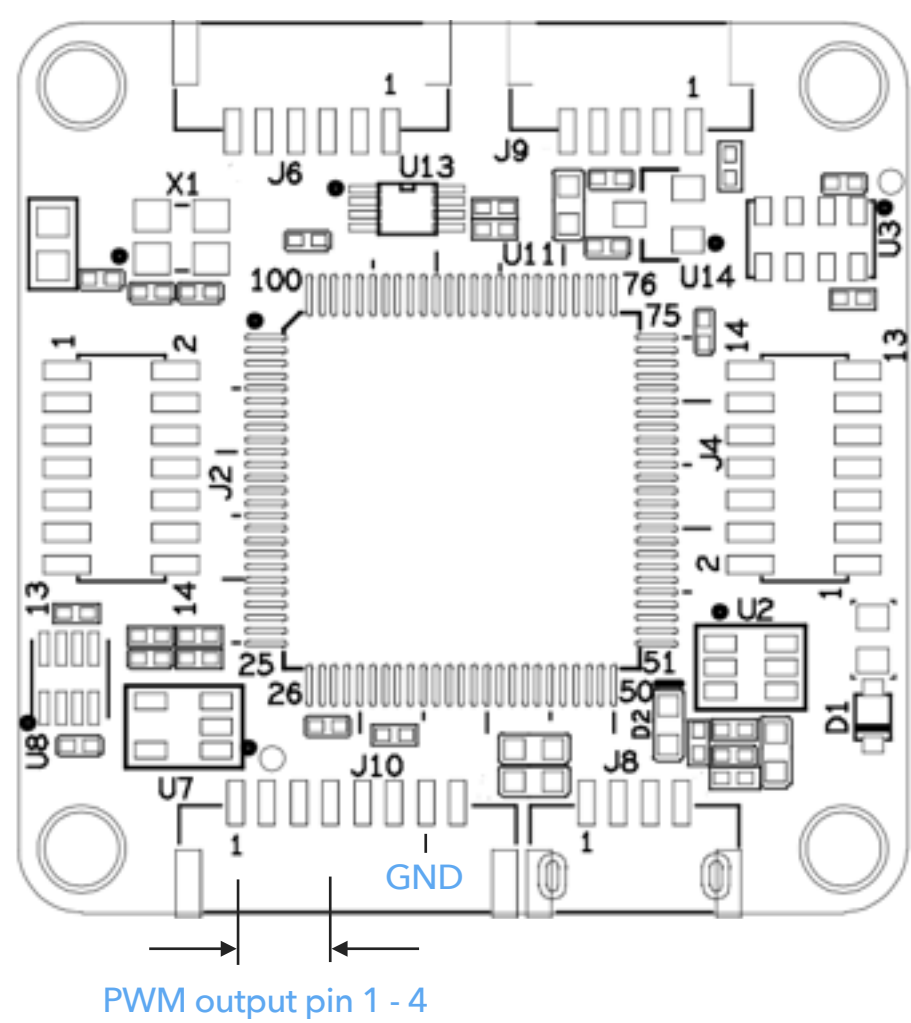
Fig. 6 HEXA motor map

Heat sink mounting wiring

Fig. 7 on board PWM outputs

When use heatsink mounting, just wire the PWM output pin 1-4 to the corresponding numbered motor/ESC on the frame (and do not forget to wire GND at any possible).
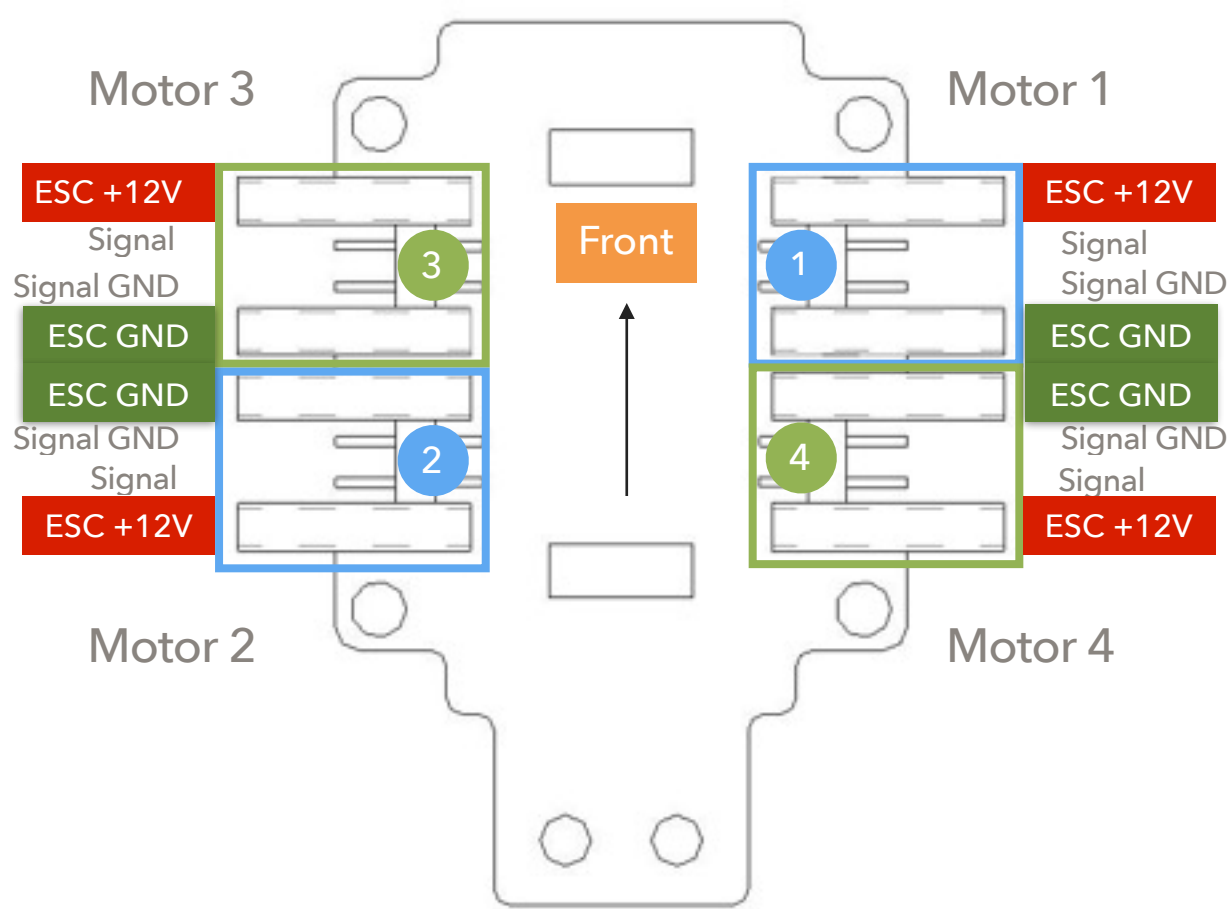
MRPDB mounting wiring

Fig. 8 MRPDB pin out map

Using MRPDB the wiring process is soldering-free. When mounted on MRPDB, the PWM outputs is routed to the MRPDB. The wiring work is as simple as just plug the ESC headers into corresponding numbered motor ports on MRPDB, as illustrated in above picture, and that is all.

On board Connectors

The MindRacer board provide all necessary interfaces in a racing configuration, including power, RC in, TELEM2, and PWM outputs.

Remote

MindRacer can support most of the popular remote controller on the market through its one-wire input interface.

For PWM output receiver, please use a PWM-to-PPM encoder to convert the signal and connect to MindRacer's RC input port.

For most of the PPM/SBUS remote controller, you can directly connect the output of the receiver to MindRacer's RC input port.

For Spektrum DSM/Satellite series, +3.3V power supply is used. The connection cable between the receiver and MindRacer's RC input is different.

Before any flight, you need to make sure the remote controller is already paired with the receiver. Please check remote controller/receiver vendor's product manual on how to pair.

Calibration

MindRacer needs to be calibrated before it can fly. Use QGroundControl(QGC) to connect MindRacer, and calibrates the flight controller following the instructions in QGC.

Connect to Ground Station

As a professional flight controller, MindRacer has hundreds of parameters that user can tune. Using QGroundControl software from computer is the best way to carefully adjust these parameters.

QGroundControl is a free software that anyone can download and use it on the fly. It can be downloaded from http://www.qgroundcontrol.org. Currently it can support all major PC OS platforms including Windows, MacOS, Linux, etc. Select the right version for your OS.

To connect, launch QGroundControl on your PC (Fig. 7).

Fig. 9 Launch QGroundControl

Power OFF the drone first. Use a micro-USB cable to connect the USB port of MindRacer to a PC USB port. The MindRacer flight controller should be powered on. Wait for a few seconds until the flight controllers main LED turns in to any stable color.

For elder version of QGroundControl, click on the 'Wifi' icon on the up-right corner, and select the displayed drone name to connect. For version after V2.9.0, QGroundControl can recognize MindRacer and connect automatically.

After connecting is successful, the ground station will update its UI with drone's status information.
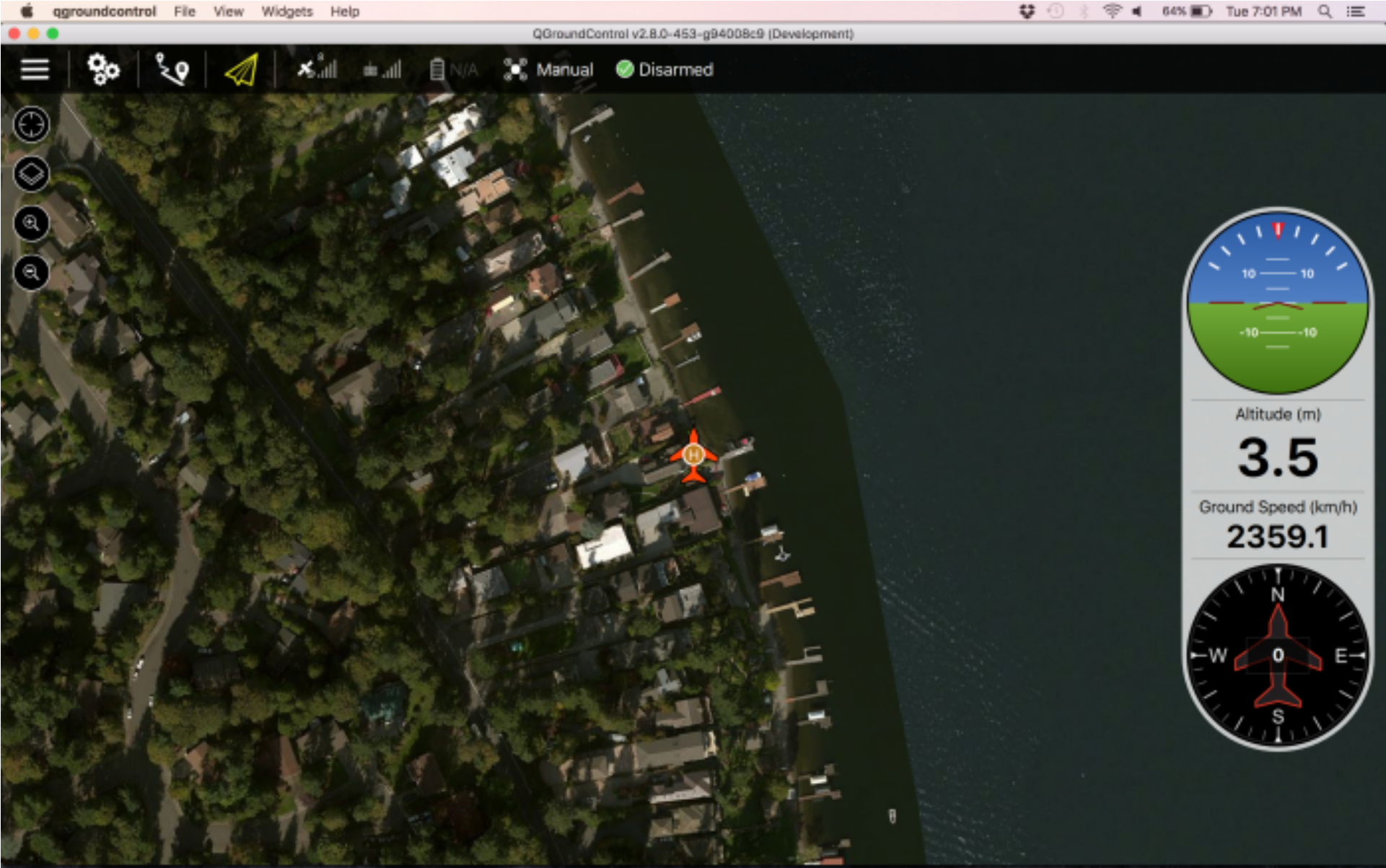

Fig. 10 drone status information

Select Flight Mode

Flight modes is pre-set on remote controller as in Fig. By default 4 flight modes are configurable through remote controller: manual, assist/altitude control, assist/position control, and acro mode.

The modes can be chosen by switches in the remote controller (use WFLY/7 7-channel remote controller as an example) as in Fig. 5.
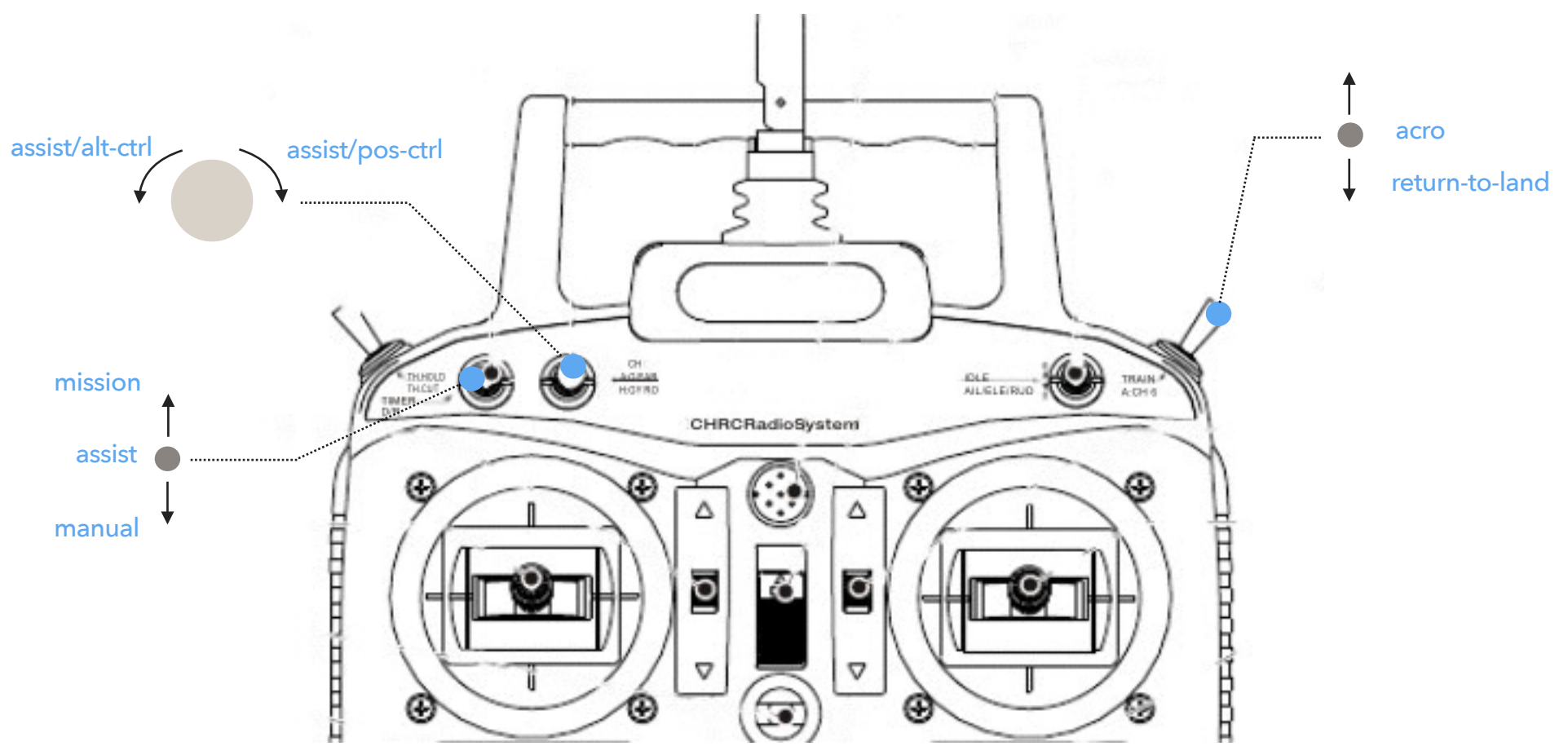

Fig. 11 remote controller mode switch setting

You can customize and define more flight modes through QGroundControl. Please refer to MindRacer User Guide document for details.
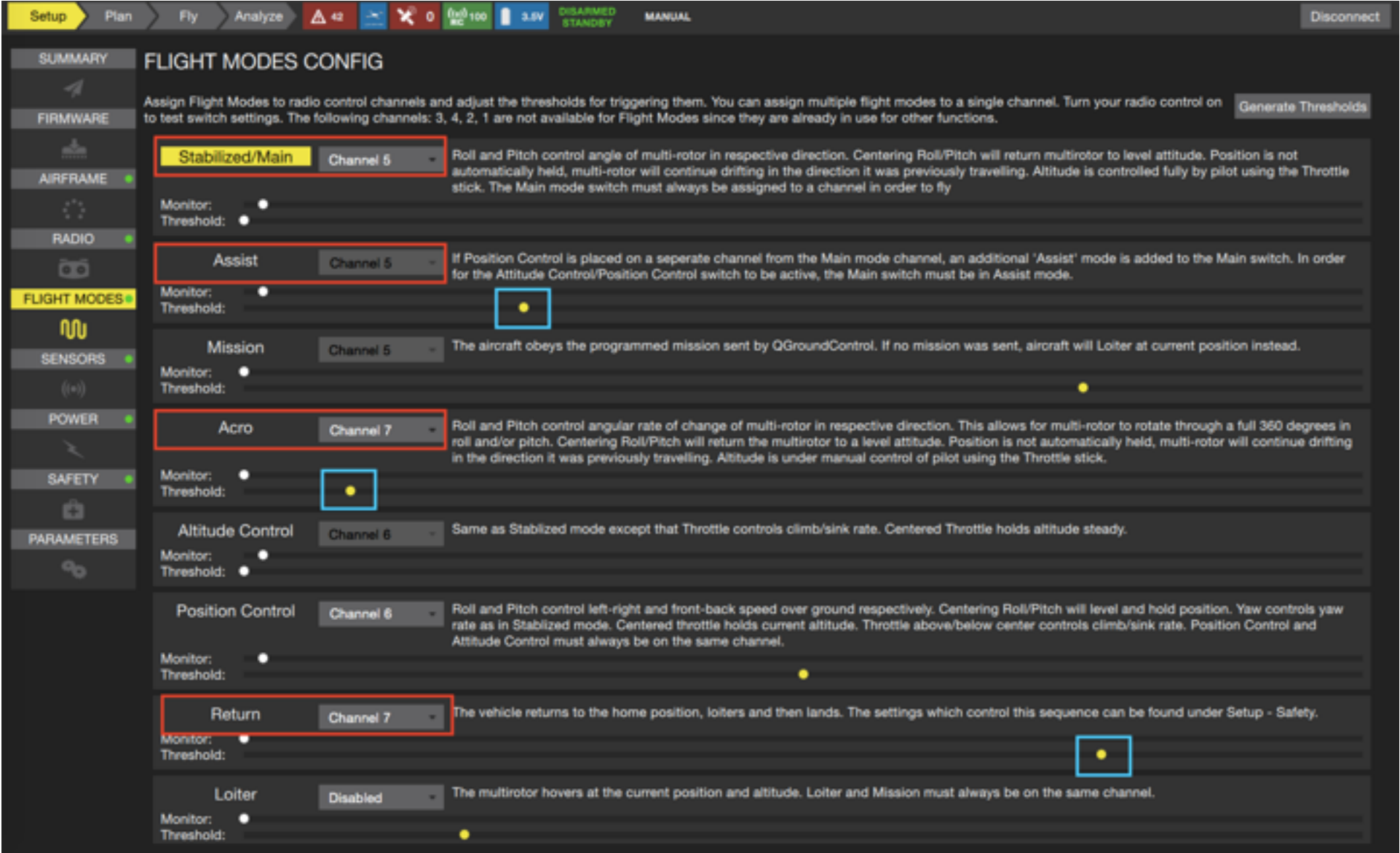
Fig. 12 flight modes selection

Arm/Disarm

Warning: before arm, please make sure no obstacle can be occluded with drone's spinning propeller.

After the remote controller is powered on and paired, lower the throttle stick to the low-right corner for a few seconds. The propeller will start to spin at a minimum speed. The drone is then in armed state and ready to take off.
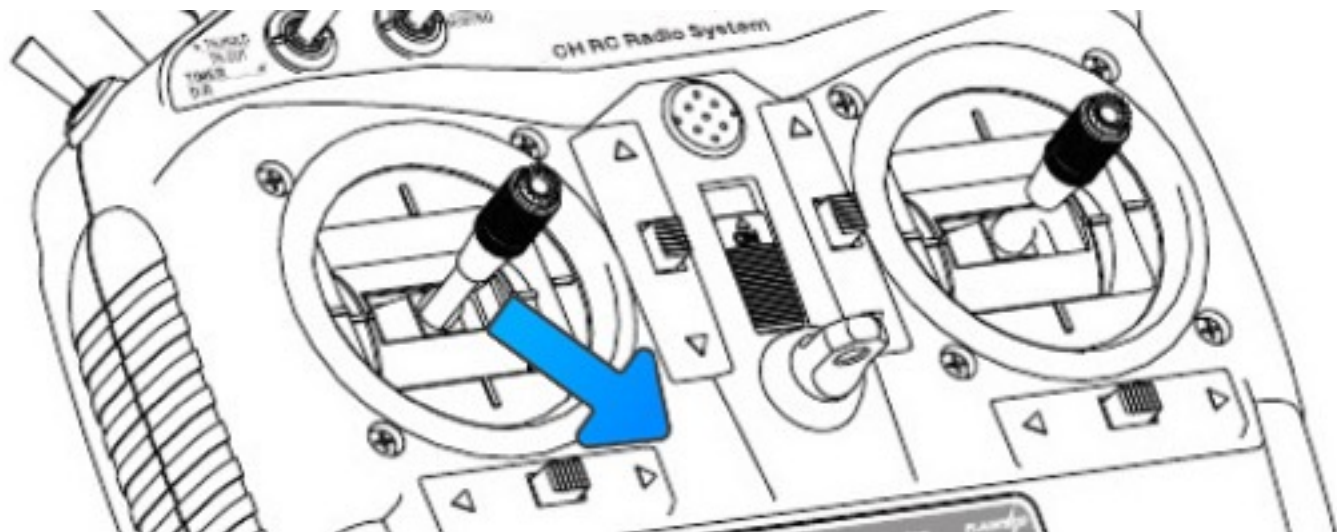

Fig. 13 Arming

To disarm, lower the throttle stick to the low-left corner for a few seconds, the propellers will stop spinning.
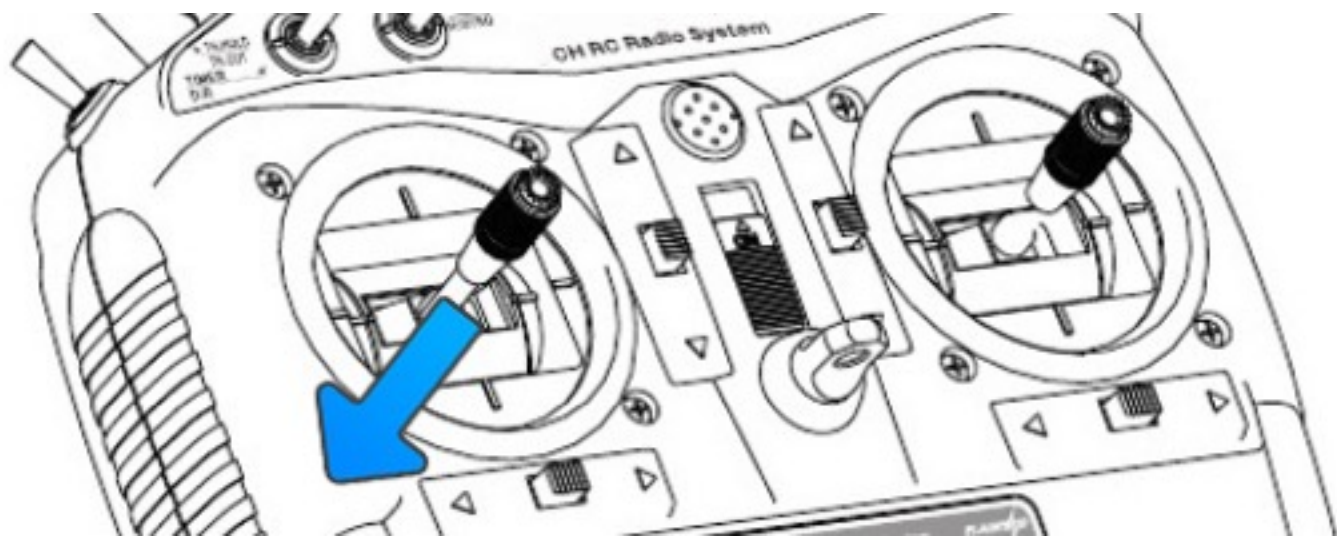

Fig. 14 Disarming

Flight Black Box - Using a SD Card

MindRacer has a micro SD (TF) card slot. MindRacer will record flight data into the SD card. It is important for reproducing flight course either for training or maintenance purpose. So it is strongly recommended that user inserting a SD card before take off.

The SD card must be formatted with FAT32.

OSD

To use an OSD, connect it to MindRacer's TELEM2 port. You may need to adjust baud rate from QGroundControl depends on the model of OSD you are using.

The interface breakout board

When using MindRacer in situation other than racing, you may need the breakout board to access other interfaces provided by MindRacer through the pin headers. The breakout board leads out almost all ports available of the processor including GPS, CAN, I2C, UART, etc.

You can also customize your own breakout board on your needs. Check MindRacer's specification for header pin out definition.
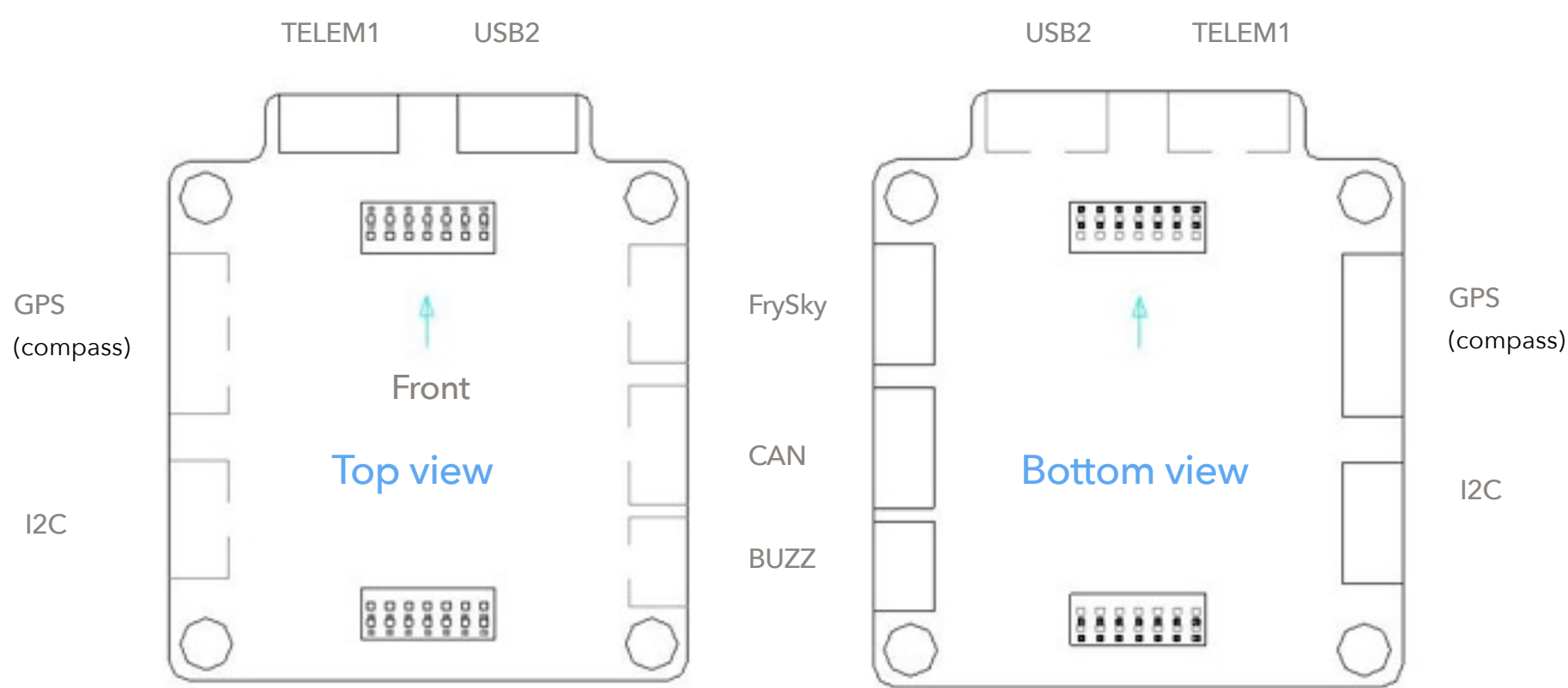

Fig. 14 interface board pin out map

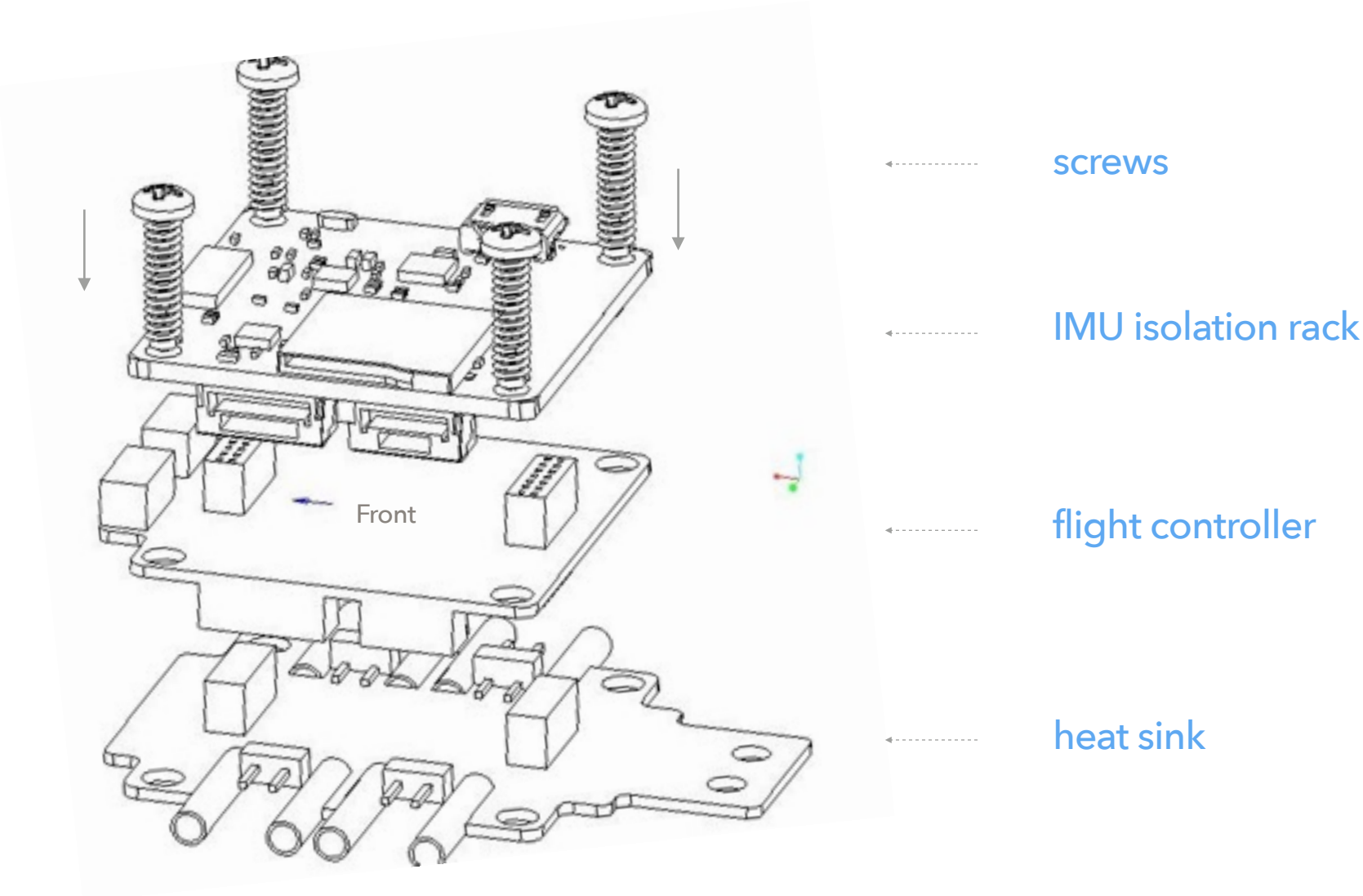The interface board can be stacked together with MindRacer and MRPDB as illustrated in Fig.

Fig. 15 interface board mounting

Telemetry

MindRacer supports Wifi/FrSky telemetry besides of 3DR and other compatible telemetry.

3DR and its compatible telemetry

3DR and other compatible telemetry can be connected to either onboard TELEM2 port, or the UART1 port on breakout board.

Wifi telemetry

Wifi telemetry module can be connected to MindRacer board's TELEM2 port, or UART1 on breakout board.

FrSky telemetry (Smart Port)

FrSky telemetry can be connected to UART4/FrSky port on breakout board.

Connect a GPS

MindRacer can also use an external GPS to locate its global position. Connect GPS module's connector to MindRacer's 'GPS' socket on breakout board.

Check the signal strength before take off using a GPS. When connect to QGroundControl you can see the GPS signal strength indicator on screen. More bars mean better signal. The GPS can only work well when there are at least 3 bars.

In order to use external compass instead of internal compass, you need to re-calibrate the compass sensor in QGroundControl.

Color LED Indicator

The main LED indicator is a tricolor LED and can show different status information with the combination of different colors and blinks. The status information it indicates is listed below:

LED color	meaning (status)	remark
Solid any color	Armed	
Breathing any color	Standby	
Amber	Low battery or Failsafe	(Return to home, etc)
Blue	GPS not locked	
Green	GPS Locked	
Fast Blink & Red	Arming error	
Blink & Red	Other error	
Transitional Green	Mode switch success	

Fig. 16 LED indicator

Support

Please visit www.mindpx.org for more information. Or you can send email to support@mindpx.net for any inquiries or help.