

FEIYU
TECH

FY-91Q DREAM CATCHER

Multi-rotor flight stabilization & Autopilot System
Installation & Operation Guide



FeiyuTech

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Dear Pilot,

Thank you for purchasing the FY-91Q multi-rotor flight control system from Feiyu Tech.

In order to achieve full potential and safe operation of this product, please carefully read this manual prior to installation.

ATTENTION:

- Set up and use of the FY-91Q requires a high degree of multi-rotor flight and RC experience.
- If you have never flown a multi rotor aircraft before, we highly recommend that you don't install this equipment on your own. Please seek assistance from an experienced multi-rotor pilot.
- If you are already an experienced multi-rotor pilot, you will find the installation mildly challenging but logical. Just follow the instructions as stated in this manual and you won't go wrong.
- Remember, *SAFETY ALWAYS FIRST.*

If you need any technical support you can email to us.

FY-91Q Multi-rotor System

Basics on how the system works:

- **Inertial Stabilizer:** The FY-91Q utilizes an attitude flight stabilization system (AFSS) which is inertial sensing based. The system also incorporates an autonomous flight control system.
- The FY-91Q AFSS integrates a three-axis gyroscope combined with tri-axial accelerometers to sense and create a drift-free 3 dimensional stabilization system.
- The FY-91Q also utilizes GPS and barometric pressure sensing to obtain accurate aircraft positioning and altitude.
- By combining sensor data from the gyros and accelerometers, together with altitude and GPS positioning, an accurate inertial navigation and autopilot system is formed. Fixed positioned and altitude hover and return to home is just a switch away.
- This product is still under intense Research and Development. FeiYu Tech has enabled firmware upgrading via a USB-TTL Connector. As new algorithms are developed for the autopilot system, you can download the upgraded firmware from FY website.

Barometer and GPS & COMPASS module:

FY-91Q control module incorporates an accurate barometric pressure sensor. At start up, the take-off air pressure is measured, providing the autopilot with an accurate relative height data.

- ❖ The GPS & COMPASS module provided with the FY-91Q Navigation Edition consist of a three-axis magnetic sensor and high sensitivity GPS receiver. This module enables the autopilot to sense the flight course and exact location of the aircraft.
- ❖ Note that if the FY-91Q is not connected GPS & COMPASS module, it will function as purely as a flight stabilizer for multi rotor aircraft. The autonomous flight system cannot be engaged.
- ❖ For the autopilot to function, the GPS Receiver must detect at least 5 satellites.

Autopilot Function

The current FY-91Q firmware supports two autopilot functions; fixed altitude Auto Hover and automated Return to Home. To enable autonomous flight, the GPS & Compass module must be connected to the FY-91Q:

- **Auto Hover**

1. 3 dimensional GPS positioning is used to automatically maintain aircraft hover position and altitude.
2. Accuracy of hover position (range) depends on wind conditions and speed.

- **Automated Return to Home**

1. By utilizing GPS positioning, the autopilot will return the aircraft to the starting point upon activation of the RTH Mode.
2. Upon reaching the starting point (home) the autopilot will activate Hover Hold, maintaining position and altitude while waiting for your further instructions.
3. To establish the Home point, a minimum of 5 GPS satellites must be detected.

- **On Screen Display and Data Radio**

1. The FY-91Q supports OSD data output via the UART interface.
2. By connecting this interface to the AP117 OSD, telemetric data such as GPS, flight navigation, AHI, and autopilot modes can be displayed on your downlink video.
3. The UART Interface can also be connected to the FY digital data radio system, which establishes a bi-direction radio communication between the FY-91Q and your portable computer.
4. By uploading our Ground Control Software (GCS) (free from our website), you can monitor your flight on the GCS map, display on-board telemetry data and control the aircraft flight path.

FY-91Q Navigation Edition Package Content

FY-91Q Navigation Edition contains the following hardware:

- FY-91Q control module x 1;
- FY-91Q RC receiver connection cable pack x 1;
- GPS & COMPASS Interface module x 1;

- FY GPS module x 1
- Double-sided adhesive Damper pad x 1;
- Self-adhesive Velcro sponge x 2;
- GPS connecting wires x 1
- Jumper for gyro resetting x 1

System Specifications

- **FY-91Q Module**

Operating voltage	:	4.0~6.0 Volt
Current consumption	:	50mA (5V input)
Dimensions	:	55 x 33 x 20 mm
Weight (not including wires)	:	20g
Operating Temperature	:	-25°C~ +70°C
The maximum allowable rotation rate	:	3 rotations per minute

- **GPS & COMPASS INTERFACE MODULE**

Operating voltage	:	4.0~6.0 Volt
Current consumption	:	60mA (5V input)
Dimensions	:	55 x 33 x 20 mm
Weight (not including wire)	:	20g
Temperature range	:	-25°C~ +70°C

Applicable Aircraft Models

The FY-91Q can be installed and flown it the following multi-rotor aircraft:

- 4 motored Quadcopters;
- Tri-axial rotary aircraft with 6 motors (Y6)
- Six-axial multi-rotor aircraft (Hexacopters)

Any other configuration, please contact us for confirmation: service@feiyu-tech.com

REMOTE CONTROL SYSTEM COMPATIBILITY

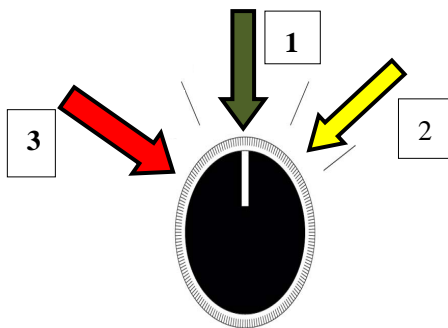
FY-91Q have been tested to work with the following RC systems:

- Robbe-Futaba PPM / PCM 1024 / PCM G3 mode, 2.4 GHz systems;

- Graupner/JR PPM 8, PPM 12, SPCM mode;
- MPX PPM8, PPM 12 with UNI mode ;
- Any remote control system using the standard of 1.5 ms *neutral position*.;

FY-91Q Flight Modes

1. FY-91Q has three operating Flight Modes, which is selected by using any free channel on your RC receiver.
2. You can set the 3 modes via a 3 way switch or use a dial knob. Example:



3. However, since switch flight modes is required during the setting for autonomous flight, **we highly recommend that you use the 3-way switch.**

Receiver PPM signal level	900-1200µs	1200-1800µs	1800-2100µs
FLIGHT MODES	Mode 3: Return to Home	Mode 1: Stabilized Mode	Mode 2: Automated Hover Hold

Mode 1: Stabilized Mode

In this mode, the FY-91Q will stabilize the multi-rotor aircraft for normal flight. Full flight direction control is given to the pilot.

Mode 2: Automated Hover Hold.

In Hover Hold, the aircraft will maintain hover altitude and position. The GPS and Compass Module must be connected to the FY-91Q with at least 5 GPS satellites detected.

Mode 3: Automated Return to Home Mode.

Activating this mode will automatically initiate the aircraft to fly back to the Home point. Requires the GPS and Compass Module to be connected to the FY-91Q with at least 5 GPS satellites detected.

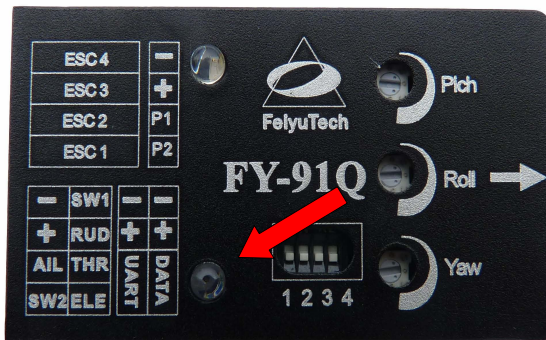
Flight Modes and LED Indicator

1. To indicate the flight modes of the FY-91Q, the Blue LED light will flash:



Flight Modes	Mode 1 <i>(Stabilized Mode)</i>	Mode 2 <i>(Hover Hold)</i>	Mode 3 <i>(RTH Mode)</i>
Blue LED Flashing	LED Always On	Single intermittent flashing	Three intermittent flashing

GPS Status & Vibration LED Indicator



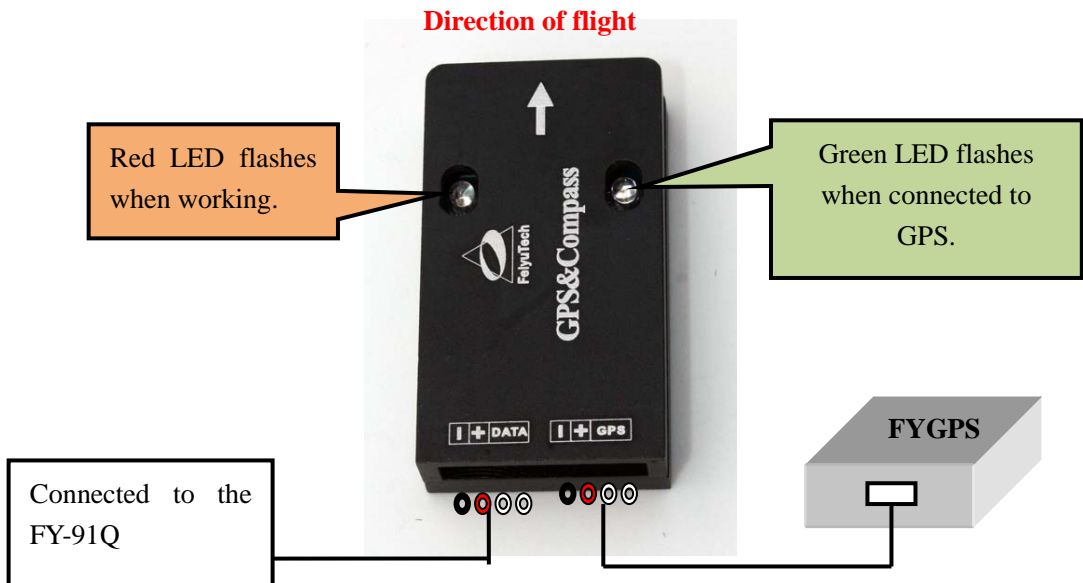
The GPS connection status & vibration level is indicated by the Red LED Flashing:

GPS & Vibration Status	Severe vibration	GPS & COMPASS module not connected	5 GPS Satellite detected (Home position Locked)	Shaking or Need to Initialize gyro
Red LED flashing	LED Always On	None (LED light OFF)	Double Intermittent Flashing	Continuous flashing

* In case severe vibration is detected reduce your aircraft vibration levels or improve vibration damping for the FY-91Q mounting.

GPS & COMPASS Module Interface & Function

- To enable the autopilot options you must have the GPS & COMPASS module connected to the FY-91Q.



- IMPORTANT:** The GPS & COMPASS Module is sensitive to vibration. Please use the included damper sponge when mounting this module.
- WARNING:** Wrong installation of the GPS & COMPASS Module will result in inconsistent



performance and even autopilot malfunction.

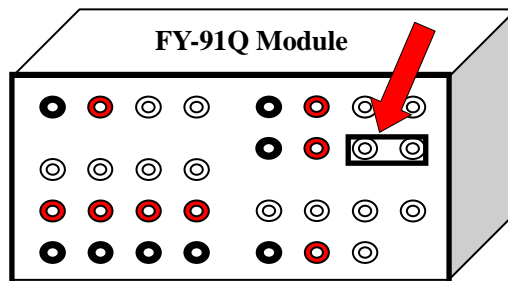
4. GPS & COMPASS module is utilizes a ceramic passive GPS Receiver. This FY-GPS Receiver must be installed face up as indicated on the sticker.
5. Do not allow any metal or carbon fiber material to block or shield the FY-GPS from detecting GPS satellite signal.
6. **WARNING:** The GPS & COMPASS Module is very sensitive to metal, magnets, electromagnetic fields and radiation. Keep such materials as far away from the Module as possible. Example: main power cables, servo and servo wires, video transmitters, ESCs, motors, etc. all can affect the GPS & Compass Module.

Gyro Resetting

1. Out of the box, the FY-91Q has already been initialized and is ready to use.
2. Generally the FY-91Q gyros do not need to be re-set, but under certain conditions initializing the gyros does become necessary:
 - a) The unit has not be used for a long time,
 - b) Extreme change in environmental temperature in excess of 30°F.
 - c) FY-91Q fails to start the motors
 - d) The red light of the FY-91Q is blinking continuously

If any of the above has occurred, please proceed with the initialization process.

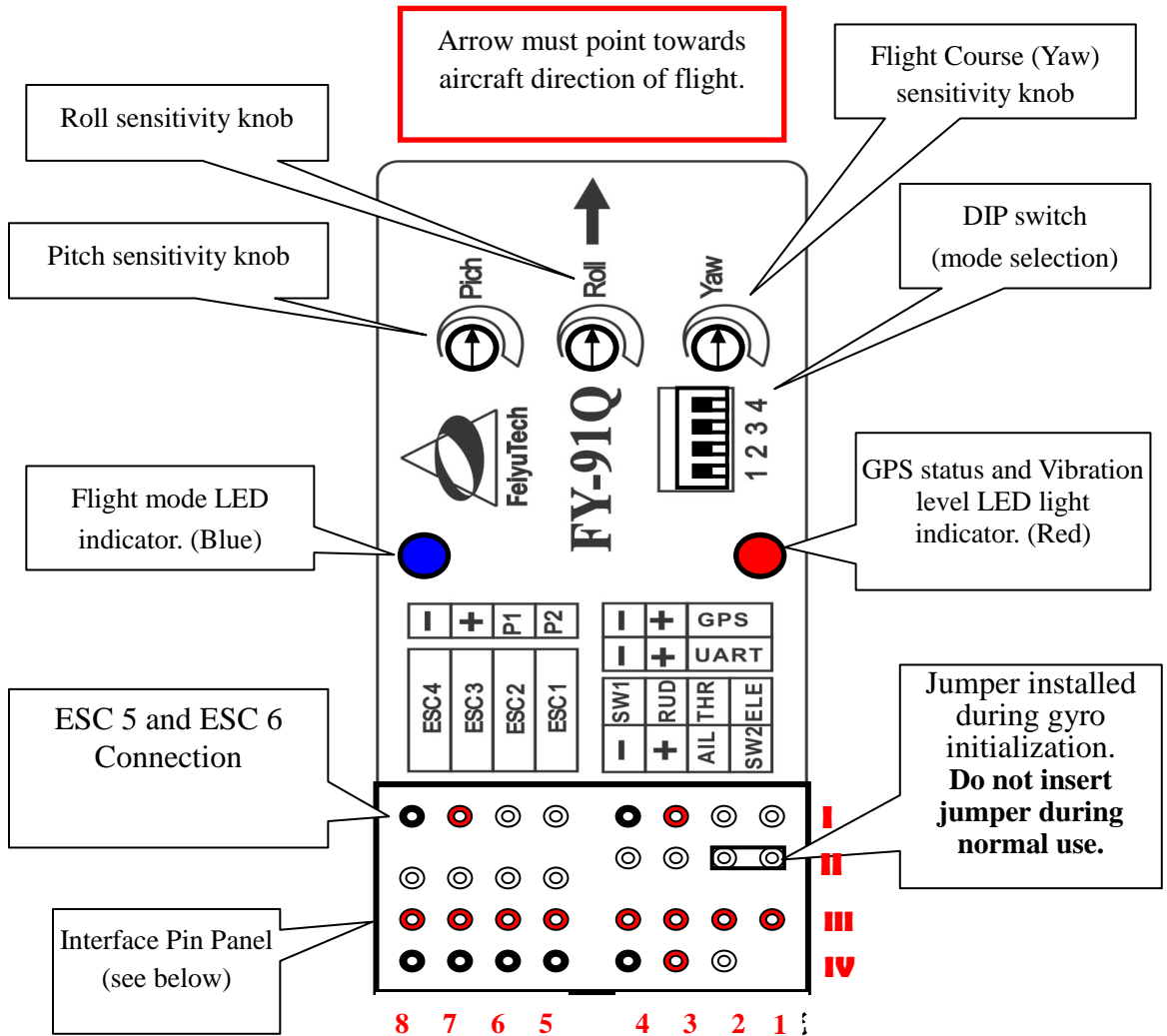
3. Note that routine gyro resetting is not necessary.
4. Gyro Resetting Process
 - a. The FY-91Q does not have to be leveled, however please ensure it is not moved, shaken or experience any kind of vibration during the initialization process. If movement / vibration did occur, please repeat the procedure.
 - b. Install the gyro initialization jumper as shown below:



- c. Supply power to the module and ensure it remains stationary for at least 20 seconds.

- d. The red LED light will flash in two different rates.
- e. After approximately 20 seconds, the initialization process is complete.
- f. Disconnect the power supply and unplug the jumper (please keep in a safe place for future use).

FY-91Q Connection Interface Diagram



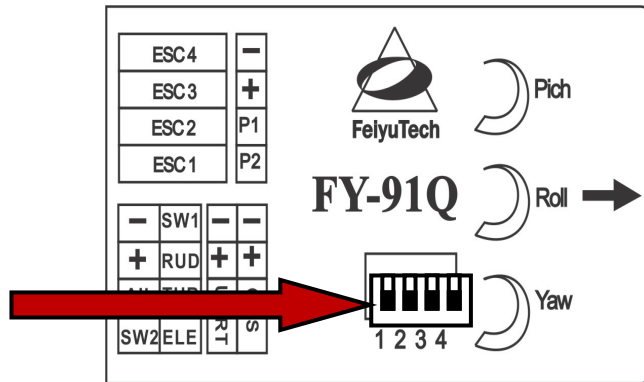
Interface Pin Panel Connection:

8	7	6	5	4	3	2	1	
GND	Null	P1	P2	GND	Power	TX0	RX0	I
ESC4	ESC3	ESC2	ESC1	GND	Power	TX1	TX1	II
Null	Null	Null	Power Input	Rx free channel (Switch 1)	Rx Rud (Ch 4)	Rx Throttle (Ch 3)	Rx Ele (Ch 2)	III
GND	GND	GND	GND	GND	Power	Rx AIL (Ch 1)	No Pin	IV

Null : Do not connect anything on these pins (leave open).

Dip Switch Setting

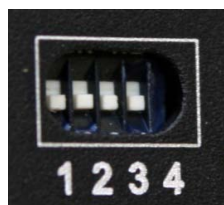
The FY-91Q utilizes a Dip Switch system for model selection, via Dip switch No. 2 to No.4:



Switch Position	1	2	3	4
ON	(Factory use only)	Flight mode debugging	X-format	Y6 flight mode
OFF	Always OFF	Normal flight mode	Cross format	X4 flight mode

Note: SW3 can be switched to any position when in Y6 flight mode.

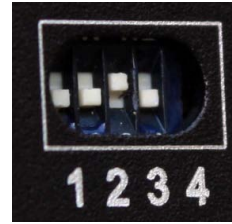
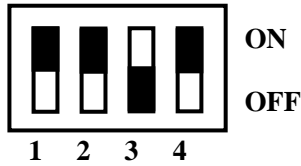
Switch Diagram Reference: the switches below are in the OFF POSITION:



Example:

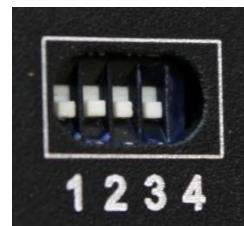
a. Dip Switch position for X-TYPE QUADCOPTER:

- 1 = OFF
- 2 = OFF
- 3 = ON
- 4 = OFF



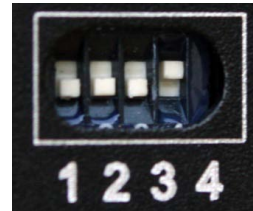
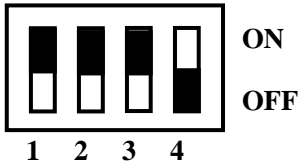
b. Dip Switch position for CROSS-TYPE QUADCOPTER:

- 1 = OFF
- 2 = OFF
- 3 = OFF
- 4 = OFF



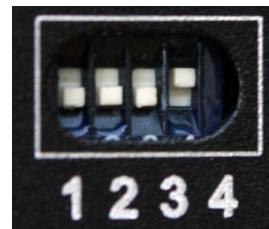
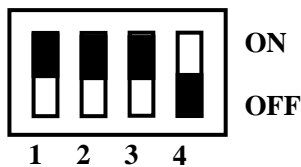
c. Dip Switch position for CROSS-TYPE Y6:

- 1 = OFF
- 2 = OFF
- 3 = OFF
- 4 = ON



d. Dip Switch position for Hexa-Copter:

- 1 = OFF
- 2 = OFF
- 3 = OFF
- 4 = ON



FY-91Q Power Supply Recommendations

1. The FY-91Q input power supply can range from 4 to 6 volts.
2. More importantly, the current input and voltage must be stable.
You may use an external BEC with 3A output or use ESC with good quality 3A BEC.
3. We recommend that power is supplied via the ESC 1 power input pin
4. Your radio receiver power supply is via the FY-91Q Aileron cable (channel 1).

FY-91Q Connection to the Receiver

1. The FY-91Q is connected to the receiver via this cable bundle:



2. The wire colors will help you trace the connection to your Receiver:

Wire Color	Receive Channel	
White (bundled with red and black)	Aileron	Channel 1
Orange	Elevator	Channel 2
Green	Throttle	Channel 3
Yellow	Rudder	Channel 4
Brown	Any free channel controlled by 3-way switch or dial (refer page 6)	Channel 5 (example)

3. Note that the open channel for Switch 1 (SW 1) must be controlled by either a 3-way switch or a dial on your radio transmitter. SW1 controls the Flight Modes of the FY-91Q.

Vibration Damping

- a) The FY-91Q flight controller algorithms can filter and operate under normal vibration levels, however if the vibration and shock experienced by the onboard sensors is too extreme, stabilization can fail and the system can shut down altogether.
- b) Because of this, to achieve the best stabilization and flight performance out of the FY-91Q, you must minimize the amount of vibration on the aircraft as best you can.
- c) Examples of vibration reduction steps that can be taken:
 - i) Ensure your motors are mounted properly and squarely.
 - ii) Balance your propellers regardless of the manufacturer's claim of perfect balance out of the factory.

- iii) Balance your motor bell housing (if possible).
 - iv) Ensure rigidity of your frame (will not flex with motor rotation).
 - v) Use appropriate propeller length and pitch for the weight of your aircraft.
- d) The FY-91Q is supplied with the shock absorbing mount and double-sided foam padding dampers. Please use them as shown below:



Checking for Vibration

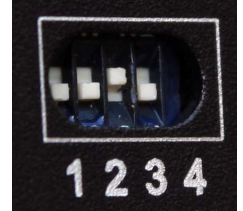
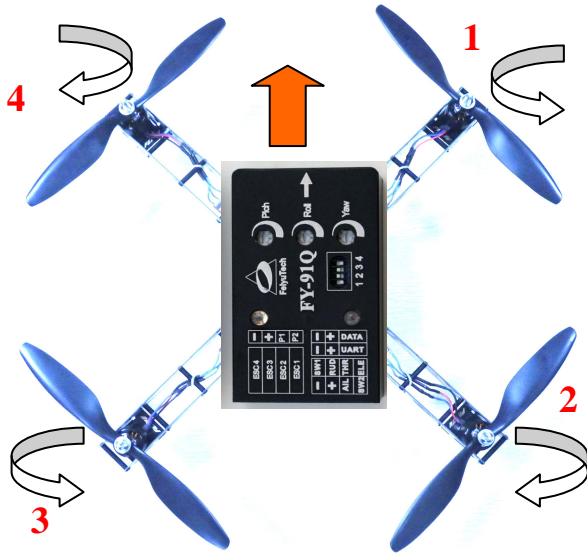
- a) Install the FY-91Q as per the recommendations of this manual, including directions of propeller rotation.
- b) Remove the connection to the GPS & Compass Module.
- c) Throttle up in Mode 1 (*Stabilized Mode*) but **do not take off!**



- d) Observe the red LED on the FY-91Q module.
- e) If the red LED light doesn't always on , this indicates your aircraft vibration level is acceptable.
- f) If instead the red LED light always goes ON and remains lighted, your aircraft does not meet the vibration level requirement. Please reduce the onboard vibration level.

Quadcopter Set Up

X-Type Layout

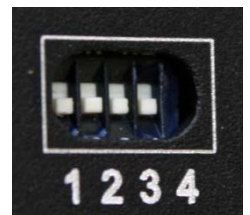
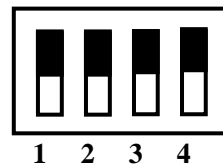
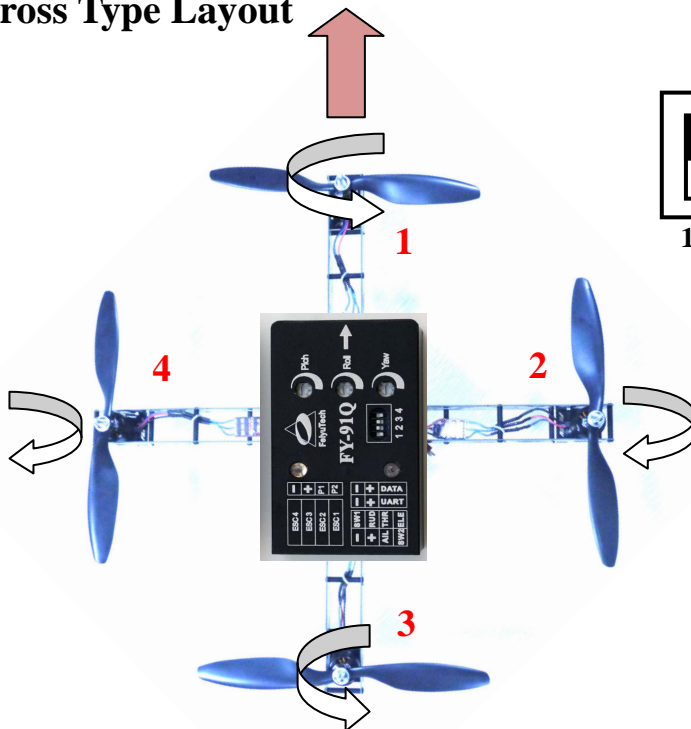


X-Type QuadCopter Layout:

- 1** = ESC 1 CCW
- 2** = ESC 2 CW
- 3** = ESC 3 CCW
- 4** = ESC 4 CW

cw = clock wise
ccw = counter clockwise

Cross Type Layout

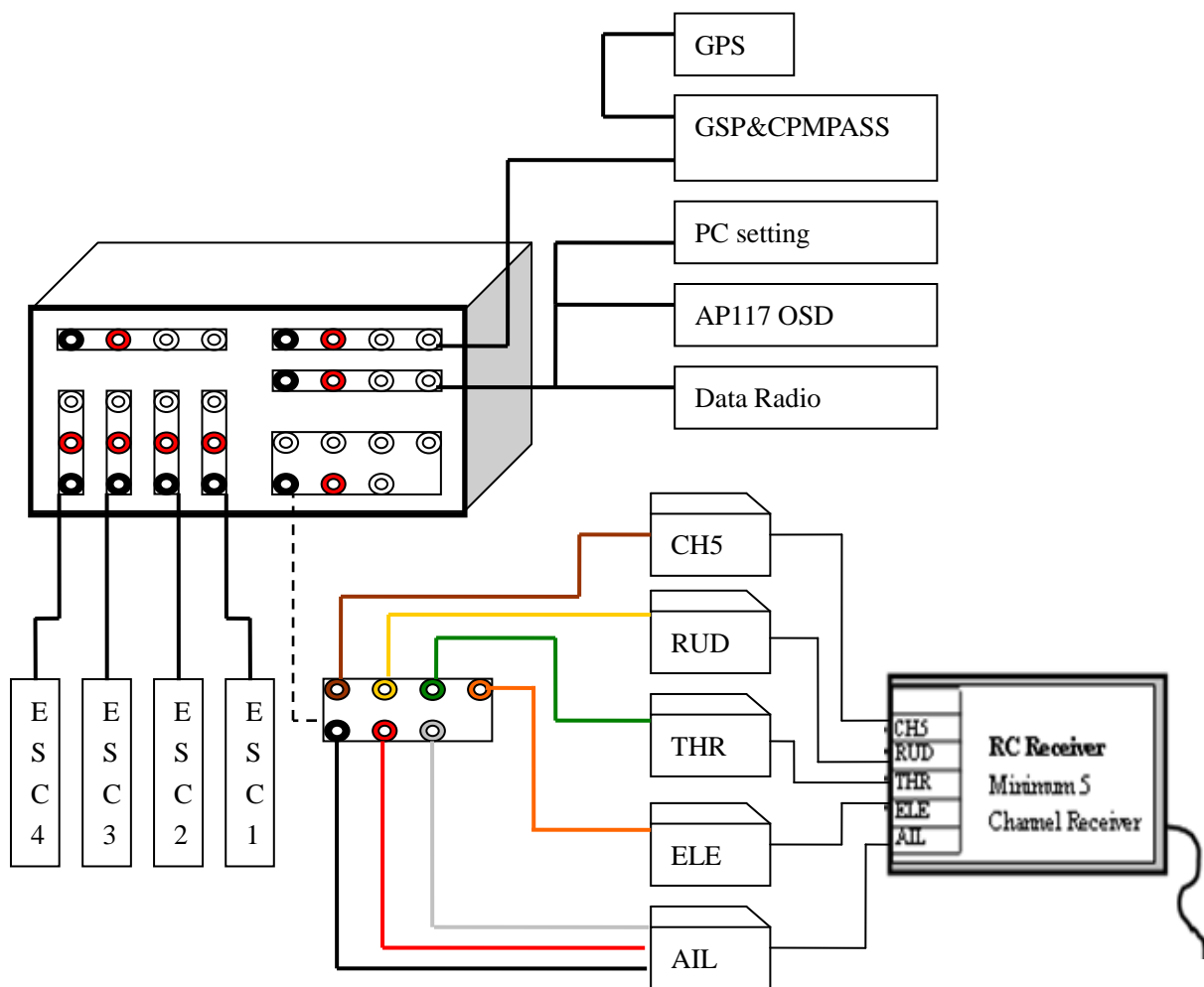


+ - Type Quad Layout:

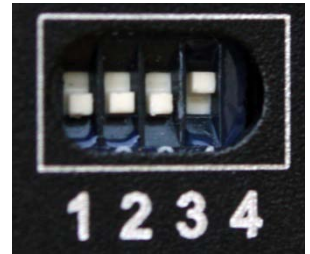
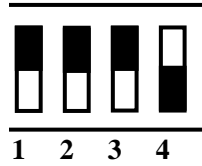
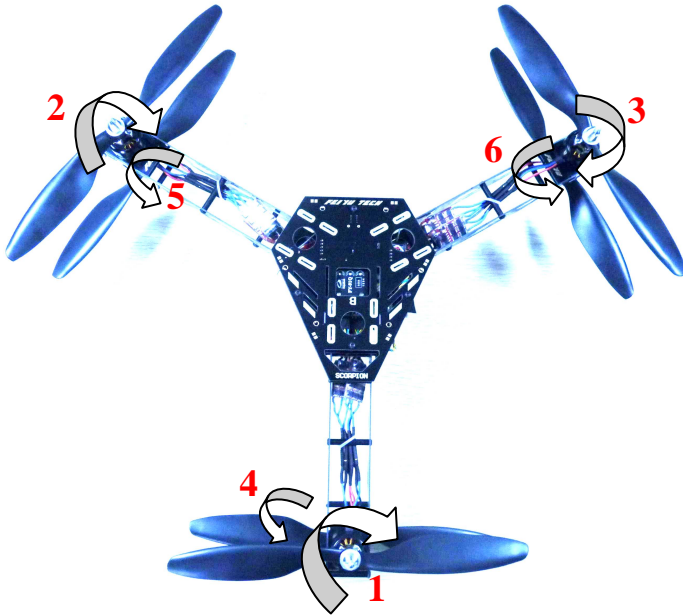
- 1** = ESC 1 CCW
- 2** = ESC 2 CW
- 3** = ESC 3 CCW
- 4** = ESC 4 CW

cw = clock wise
ccw = counter clockwise

Quadcopter FY-91Q Connection Schematics



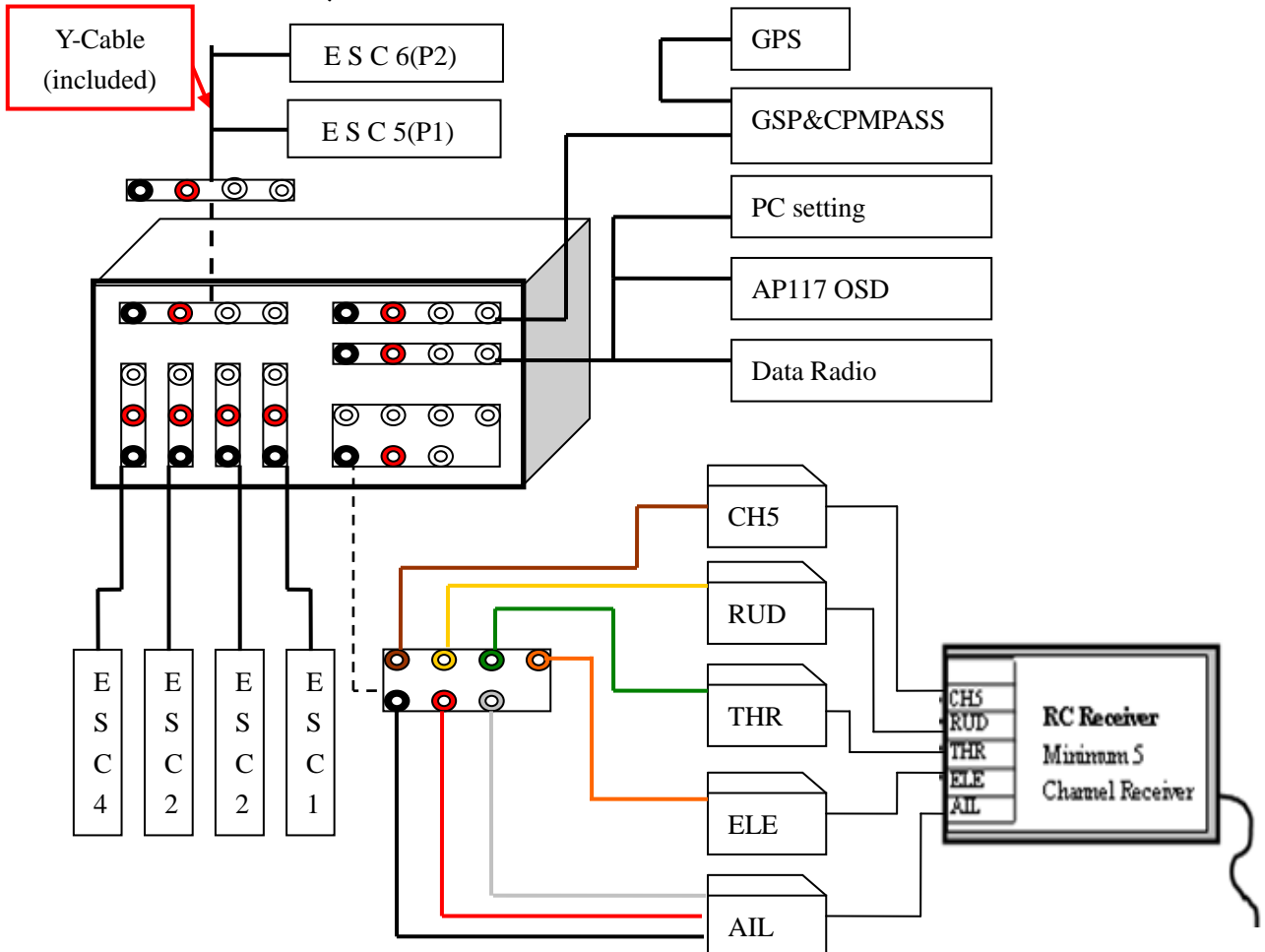
Y6 FY-91Q CONNECTION SCHEMATIC



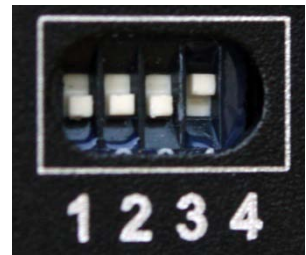
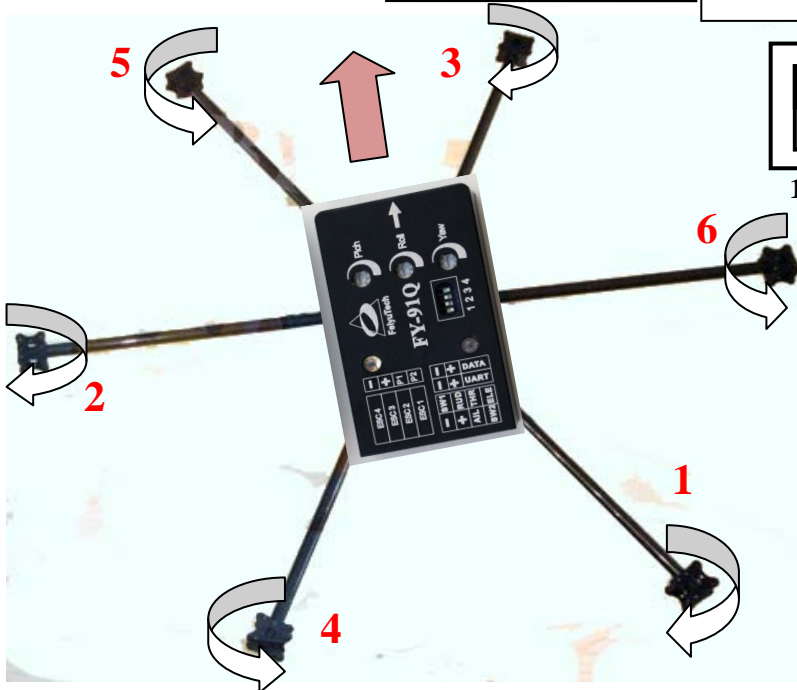
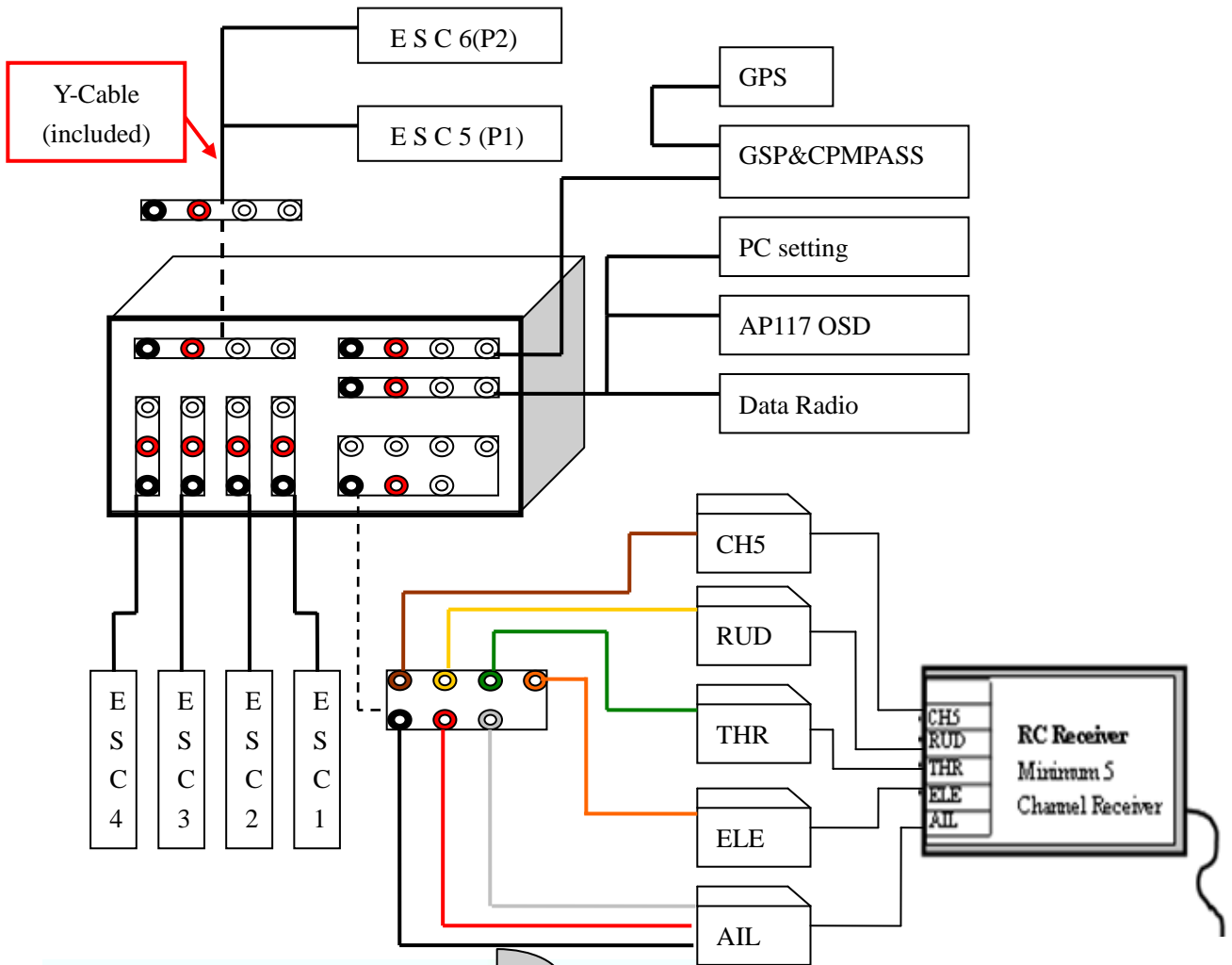
Y6 SCORPION FLYER

- 1 (top) = ESC 1 CW
- 2 (top) = ESC 2 CW
- 3 (top) = ESC 3 CW
- 4 (bottom) = ESC 4 CCW
- 5 (bottom) = ESC 5 CCW
- 6 (bottom) = ESC 6 CCW

cw = clock wise
ccw = counter clockwise



FY-91Q Hexa Copter Setup



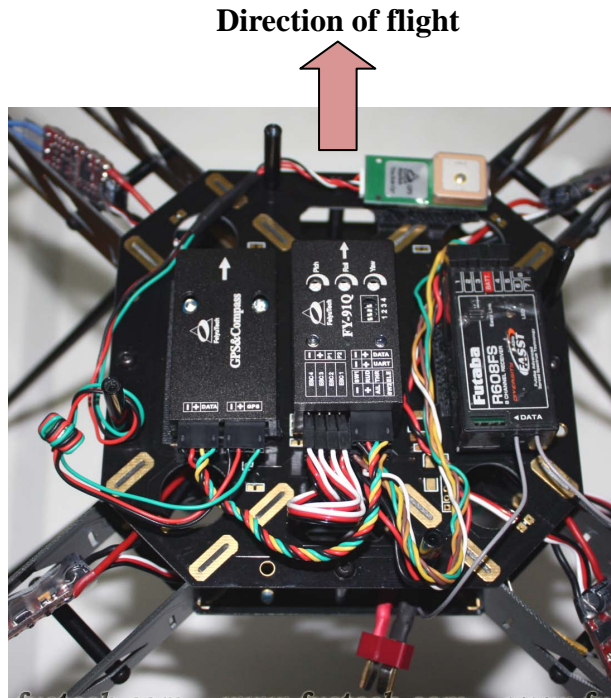
X - Type Hexa Layout:

- 1 = ESC 1 CW
- 2 = ESC 2 CW
- 3 = ESC 3 CW
- 4 = ESC 4 CCW
- 5 = ESC 5 CCW
- 6 = ESC 6 CCW

CW = clock wise

CCW = counter clockwise

FY-91Q Module Installation



1. FY-91Q has an arrow indicator on top. Please ensure this arrow is pointed towards the direction of flight.
2. Installed the module horizontally, and as close as possible to the aircraft center. A more centered installation will result in more stable drift free hover.
3. The FY-91Q sets its own benchmark of what is 'horizontal'. Install the module based on the hover characteristics of the aircraft in Mode 1 (Stabilized Mode). Shimming the module may be required to get the aircraft to hover perfectly.

FY-91Q Preflight Inspection and Initial Testing

Pre-flight testing for aircraft control:

1. Remove all propellers.
2. Activate throttle to start up the motors. Check the rotation direction of each motor and make sure it is turning in the right direction.
3. Re-Install propellers.
4. Check again that the rotation is correct.
5. Check the FY-91Q sensitivity control knobs. Please ensure the dials are beyond

- 12 o'clock. Anything less than that may result in no flight stability for this first flight.
6. **Tie down test:** Before proceeding, we highly advise that you tie down the aircraft to the ground to prevent any possibility it going out of control during this initial flight tests. Safety first.
 7. **First test lift off:** Advance your throttle stick, but do not take off (usually around 30% throttle). Let the aircraft float just enough so that you can see the aircraft reaction as you move your Aileron, Elevator and Rudder sticks.
 8. If the control movement is reversed, just reverse the channel on your RC transmitter.
 9. After step 8, you can take off higher. If the aircraft hovers well, you can proceed to remove the aircraft from the tie down test.
 10. Observe the flight for stability and oscillations as the aircraft hovers higher.
 11. If you feel there is not enough stability (e.g. excessive drifting), you can increase the sensitivity of the three dials.
 12. If there are rapid oscillations, reduce the corresponding sensitivity knob.
 13. More fine tuning adjustment can be done via the FeiYu software (you will need the TTL-USB cable for this).

Pre-flight Debugging

If your aircraft fails to lift off and hover for the initial pre-flight tests, please check the following:

- a) Check the ESC connections are all correctly plugged in. Take time to check and re-check that each ESC has been plugged in and that the plugs are correctly placed.
- b) Please ensure there is no short circuit of the power (positive) and GND wires. Short circuits can damage the internal processor chip beyond repair (voiding all warranty).
- c) Check that all motors are rotating in the direction noted in this manual.

- d) Ensure you have selected mid or high timing for your ESC (if you are not using FY ESCs).

GPS & COMPASS Module Set Up Debugging

1. The GPS & COMPASS Module contains an internal three-axis magnetometer. This module senses the earth's magnetic field, and uses this reading to accurately measure the aircraft direction of flight.
2. The magnetometer sensor is very sensitive to metallic objects and electric fields. Keep such objects as far away from the module as possible.
3. Before each flight, it is best to do a magnetic field calibration. With practice it is very easy to do (takes only 20 seconds).
4. Magnetic field calibration enables the GPS & Compass Module to calibrate for the environment in which it is installed.
5. Magnetic field calibration should also be done if new equipment is installed which may affect the magnetic field around the aircraft.
6. Magnetic field calibration process:
 - a) Place the aircraft on flat ground.
 - b) Continuously change (toggle) the flight modes between Mode 1 (Stabilized Mode) to Mode 2 (Hover Hold) six times:
 - (1) **balance mode** -> Hover Hold – (2) **balance mode** -> Hover Hold –
 - (3) **balance mode** -> Hover Hold – (4) **balance mode** -> Hover Hold –
 - (5) **balance mode** -> Hover Hold – (6) **balance mode**
 - c) Observe the blue LED go OFF after you toggle 6 times. This indicates the FY-91Q has entered the Magnetic Field Calibration Mode.
 - d) After the Blue LED goes OFF, move the aircraft slow and steady in a clockwise rotation one and a half times. The rotation should be done slowly, taking approximately 15 seconds to complete. If you do it too fast, calibration will fail (Blue LED will not light up), and you have to do it all over again.
 - e) After this rotation, the blue LED will light up again, indicating Field Calibration is complete.
 - f) Proceed to into GPS Detection.

GPS Detection (Home Lock)

- a) GPS is required to enable autopilot flight positioning.
- b) Ensure you are outdoors to maximize GPS satellite detection

- (minimum 5 required).
- c) Upon power up, the FY-91Q will automatically search for GPS satellites.
 - d) Upon detecting 5 satellites, the red LED will begin flashing twice continuously, indicating GPS Home Position has been locked.
 - e) You can safely fly the FY-91Q system without GPS locking 'home' position (red LED flashing twice). However, both Hover Hold and RTH autonomous flight **cannot** function.
 - f) Without GPS lock, the FY-91Q can only hold altitude if Hover Hold is activated. Position hold cannot be activated, and therefore the aircraft will drift randomly.
 - g) If during the RTH function GPS lock is lost, the aircraft will stop moving and begin to drift randomly. However, it can still fly while maintaining altitude.

Hover Hold and Automatic Return to Home Testing

1. After carrying out the above Setting Up procedures and confirmation of 5 satellite detection (red LED double flashing continuously) you can proceed with Hover Hold and RTH testing.
2. We recommend carrying out the first autonomous flight tests in light winds (wind speed less than 3 mph).
3. After successfully engaging Hover Hold (at least 2 seconds), you may proceed to test the RTH function.
4. Move the aircraft to any location (not too far in the first few tests) in Stabilized Mode, when you switch to RTH Mode, the aircraft should automatically fly back to Home position while maintaining current altitude.
5. Upon reaching the Home position, the aircraft will automatically activate Hover Hold (maintaining position and altitude).
6. Again, note that FY-91Q must have successfully recorded your hover benchmark (setting Aircraft Neutral Gain) to execute RTH. Failure which, the RTH function will not work.

Additional Notes On Return to Home (Mode 3)

1. For FY-91Q autonomous RTH flight, similar principles to Hover Mode is utilized, with differences in critical areas. These are:
 - (a) RTH utilizes **the last recorded** Flight Neutral Gain value.
 - (b) RTH will only activate after the aircraft has stabilized into a hover.
 - (c) There is a timed delay (between 2 to 5 seconds) between activation of RTH and the actual procedure of returning to the home position. This delay is to stabilize the aircraft into a hover before proceeding with RTH.
 - (d) Note that due to (c) above, if your aircraft is moving forward during the time of RTH engagement, it will not stop immediately. Time is required for it to stabilize into a hover before proceeding with RTH function.
2. Due to the reason (a) above, we highly advise that you carry out the Hover Hold procedure **at the start of every flight** so that the FY-91Q has a record of your latest Neutral Gain value incase RTH needs to be engaged.
3. Engage the Hover Mode Switch for at least 2 seconds for the system to learn and record your latest Neutral Gain values.

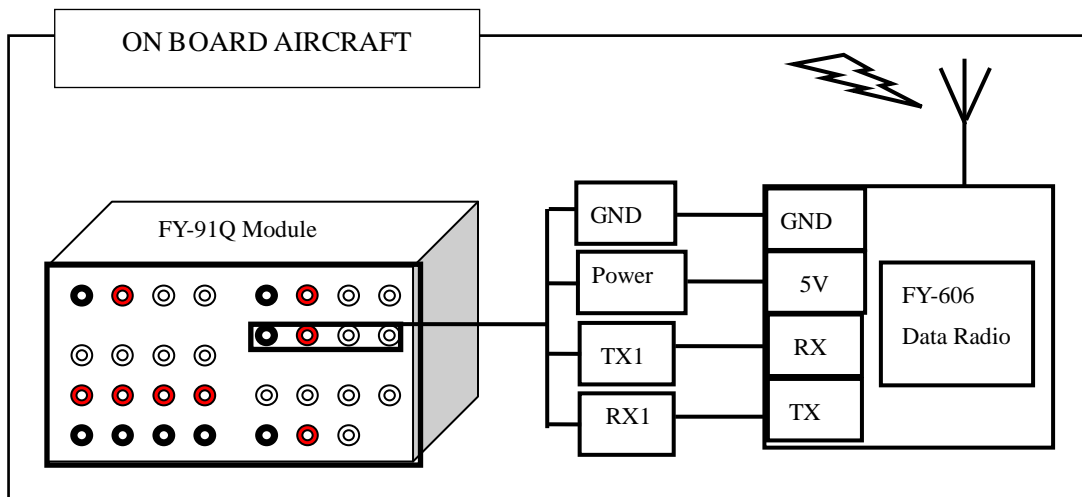
FY-91Q Ground Control Station Function

1. The FY-91Q the UART interface can be connected to the FY digital Data Radio, such as FY606 (2.4 Ghz) and FY602 (433 MHz) for bidirectional communication between your field PC (GCS) and the FY-91Q autopilot.
2. You will require to download the latest FY-GCS software to utilize the GCS function of the FY-91Q.
3. FY-GCS enables you can display the onboard autopilot telemetry data on to your GCS display, including the GPS position of the aircraft on Google Map.
4. You can remotely adjust the flight parameters of the FY-91Q via the GCS software.

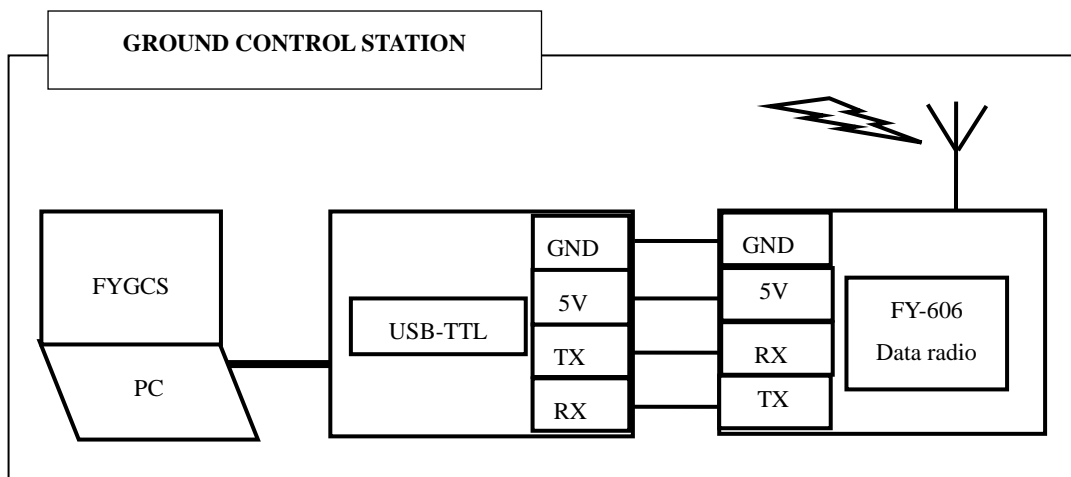
We will release more information about this feature in future FY-91Q manual updates.

5. Data radio Parameters:

FY-91Q interface panel have 4 Pin for UART	GND, Power, TX1, RX1
Baud rate	19200
Interface characteristic	TTL



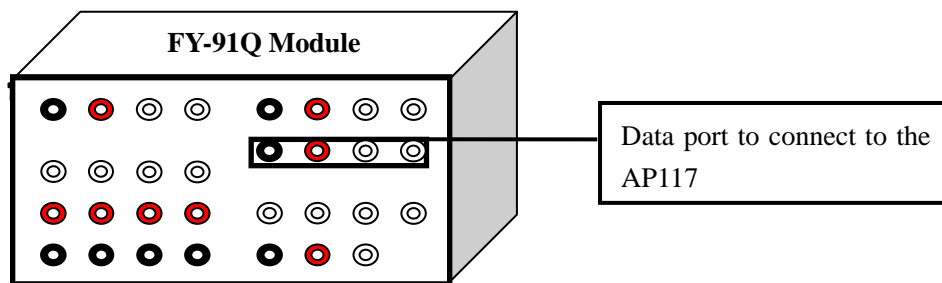
Two Way Communication



6. Refer to FY-606 Manual on more details on the FY-606 (to be updated).
7. Refer to FYGCS Manual on more details of the FYGCS (to be updated).

FY-91Q Connection to AP117 ON Screen Display

1. You can connect the FY-91Q to the AP117 OSD module to display the telemetry data onto your On Screen Display.
2. Connection is as shown below:



Refer to AP117 Manual on more details of the display.

Flight Modes	Mode 1 <i>(Stabilized Mode)</i>	Mode 2 <i>(Hover Hold)</i>	Mode 3 <i>(RTH Mode)</i>
AP117 Display	ABM	FAF	RTL

FY-91Q / FY-90Q Basic System Requirements

Electronic Speed Control (ESC) Requirements:

1. ESCs that can handle an input signal pulse frequency over **400Hz is a must**.
2. Use only ESCs that has a manually settable throttle end points. All endpoints **MUST** be manually matched.
3. ESCs with Fast response rates are recommended (high and mid timing settable). Too slow response will result in failure to maintain Quad flight stabilization and control.
4. Do not use ESCs that lose their throttle endpoint settings at each power off (e.g. Castle Thunderbird series).
5. **Do not use** ESCs that must be "armed" before you can set the throttle endpoints (Castle Thunderbirds, Hobby King SS ESCs, etc.). With this ESC

type, you must power up all motors and go to full throttle to set the endpoints, making it impossible to use on multi-rotors.

Pre-Flight Check & Sensitivity (Exponential) Adjustments

STEP 1 - Radio Transmitter Settings

- I.** Select the Model for Traditional Airplane, where there is **no mixing** of the throttle, elevator, aileron or rudder controls.
- II.** For transmitters with helicopter settings only, choose MCCPM model setup where throttle, pitch, elevator, aileron and rudder are not mixed.
- III.** For a start, we recommend you use your Transmitter EXPO to reduce control responsiveness by 50 percent for Aileron and Elevator.
- IV.** If the throttle responsiveness is too high, use EXPO to reduce this too.
- V.** For rudder, we recommend no EXPO setting (keep at normal).

STEP 2 – Matching ESC Endpoints

- (a) Only use ESCs that you can manually set the throttle endpoints. All endpoints **MUST** be manually matched.
- (b) To manually match your ESC endpoints, refer to your ESC Manual.
- (c) As a general guide to ESC end point matching, carry out the following:
 - i. Install the FY-90Q/FY-91Q, 4 x ESCs and 4 x motors as directed in the manual.
 - ii. For added safety, remove all four propellers.
 - iii. Ensure your radio Transmitter is set up as in STEP 1 above.
 - iv. Activated your radio and set throttle to maximum - be sure that throttle endpoints are set at more than 100%.
 - v. Power up the quad, therefore activating your RC Receiver, FY-90Q / FY-91Q and ESCs.
 - vi. All four ESCs should give out the signal of detecting the maximum throttle level.
 - vii. Push down your throttle.
 - viii. All four ESCs should give out the signal of detecting the minimum throttle level.
- (d) If your ESC does not show detection of the Maximum and Minimum throttle levels, please check with your ESC manual on the correct procedure.

- (e) If this procedure is successful, proceed with flight tests as per the manual.

ESCs Not Arming

1. Many types of ESCs have an arming protection set up where they expect to see an incoming signal as soon as they are powered up. If the ESC does not 'see' this input signal, it will automatically inhibit the arming process.
2. Upon powering up, the FY-91Q takes about 1 to 2 seconds to initialize. During this time, signal is not immediately sent to the ESCs. Due to (1) above, the ESC will not arm even after the FY-91Q begins sending signal to the ESC.
3. As a result, the ESC refuses to arm.
4. To confirm this, carry out the following:
 - (a) **Remove all your ESC red wire** (positive) connection to the FY-91Q.
 - (b) Install an external BEC (at least 3A output).
 - (c) Turn ON your Radio Transmitter and set the minimum to -30%.
 - (d) Power up the FY-91Q and your RC receiver via the external BEC, but NOT the ESCs.
 - (e) After the FY-91Q initializes, power up your ESCs.
 - (f) Decrease your throttle to - 100 until the ESC arms.
 - (g) This proves your ESC has the delayed activation protection.
5. An easy set up to solve this is to have a two plug power up system. i.e. power up your BEC first, before powering up your ESCs.