



**FEIYU
TECH**

**FY-3ZT
GCS & AFSS AUTOPILOT SYSTEM
INSTALLATION & OPERATION MANUAL**

Dear Pilot,

Thank you for purchasing the FY-3ZT Full Function Autopilot with GCS & AFSS from FeiYu Tech. In order to achieve full potential and safe operation of this product, please carefully read this manual prior to installation.

Attention:

- The installation and use of this autopilot require advance skill and knowledge in flying remote controlled fixed wing aircraft, the operations of amateur autopilot system and ground control station (GCS).
 - If you are a complete beginner in autopilots, we do not recommend you install this system on your own.
 - Please find assistance from an experience flier who may provide you with the basic knowledge in autopilot systems to ensure successful installation and safe use of this device. Alternately, you may gain experience by using our FY-21AP first.
 - If you are already an experienced pilot and have used autopilot systems before, you will find this step by step manual intuitive and logical. Just follow the instructions as stated very carefully and you won't go wrong.
-

FY-3ZT Autopilot: User Agreement

- a) The FY-3ZT autopilot system complies with all regulations within the People's Republic of China (PRC).*
 - b) It is the end user's responsibility to ensure compliance to regulations in their own country if the FY-3ZT is used outside of the PRC.*
 - c) FY-3ZT autopilot system is prohibited to be used for any illegal activity. It is the end user's responsibility to take all safety measures in using this product.*
 - d) The Guilin Feiyu Electronic Technology Co. (herewith known as Feiyu Tech) and our associates are not responsible for any damages or liabilities caused by the use of this product.*
 - e) The FY-3ZT is internationally patented. It is unlawful to reverse engineer, copy or modify this product in any way.*
 - f) Feiyu Tech reserves the right to update, upgrade or modify the product at any time as we see fit. We will to the best of our abilities inform existing users if such updates need to be carried out in units already in use.*
 - g) Feiyu Tech reserves the right to amend this manual and the terms and conditions of use of the FY-3ZT at any time.*
 - h) By using this product you agree to these terms and conditions effective on the date of purchase.*
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Please do not hesitate to e-mail us directly for assistance: feiyudz@hotmail.com

Introduction: What it Does

FY-3ZT is an advanced autopilot with patented Attitude Flight Stabilization System AFSS™ that allows you to view and change in real time the flight parameters of your flying aircraft via your Ground Control Station (GCS).

The parameters include (but are not limited to);

- Waypoint setting while in flight,
- Automated altitude control,
- Ground speed control,
- Activation of circling at given points,
- Control of circling radius,
- Automated Return to Base (RTB),
- Automated take-off.

Real time telemetry data transmitted to the GCS include:

- Main battery voltage and mAh consumed,
- GPS signal strength,
- Plane attitude flight stabilization system (AFSS) status,
- All parameters as shown on the On Screen Display (OSD)

With the FY-3ZT, autopilot flight via the GCS has never been simpler.

Aircraft Suitability

1. Normal / Traditional fixed-wing planes
2. Delta-winged plane with rudder
3. Delta-winged plane without rudder
4. Plane without aileron
5. V –tail plane with and without aileron
6. Any other configuration, please e-mail us for enquiry: feiyudz@hotmail.com



Major Auto Pilot Components

1. FY-3ZT provides high-precision flight attitude measurement and control through the utilization of an integrated 32 ARM7 microprocessor, GPS receiver, three-axis MEMS gyros, three-axis accelerometer, barometric pressure sensor, attitude algorithm, Kalman filtering and data fusion algorithms.
2. 10Hz data rate GPS receiver, 35 seconds fast positioning time and accuracy of 2.5 meters CEP.
3. 50HZ inner attitude control, 10HZ outer navigation control.
4. Multi-channel mixed-control output can be adjusted with ease. The control options include:
 1. Elevator and rudder navigation
 2. Elevator, aileron and rudder navigation
 3. Elevator and aileron mixed-control (elevon) navigation
 4. V-tail rudder may be used, however a third party mixer have to be supplied by the user.
5. Three control modes:
 - I. Manual Mode ;
 - II. AFSS activated (Active Stabilization) ;
 - III. Automatic navigation control.
6. Two automated navigation control modes:
 - I. Air route navigation mode ;
 - II. Mouse controlled flight mode.
7. Three special flight modes:
 - I. Fixed circling mode;
 - II. Auto Return to Base (RTB) mode;
 - III. Auto take-off mode.
8. Any standard RC transmitter and receiver can be used with this system.
9. Automated RTB (Return to Base) protection when there is a break in GCS communication link via the data radios. This time the system is working in the dataradio control mode.
10. Integrated automatic and manual aerial photography triggering.
11. The GCS software helps integrate Automated and Manual flight control modes in an easy to use display interface.
12. The GCS software includes electronic map formatting. By using the electronic map, aircraft route and tasks can be modified in real-time via your GCS computer.
13. Real time display on the the GCS includes flight parameters such as main pack voltage, mAh consumed, Amp draw, GPS satellite strength and temperature of the autopilot unit.
14. All flight parameters are downloaded automatically by the GCS for instant playback.
15. **IMPORTANT: GCS Function**
 - When using the Data Radio to control the aircraft, the controlling signals from the RC Receiver is directly sent to the Remote Adapter and converted to digital signals. The Data Radio will then upload the commands to your aircraft via the data radio.
 - The uploading of data to the aircraft does not involve the GCS. The GCS is only used to monitor telemetry and flight status of the aircraft. Transmission of commands is minimal. i.e. the aircraft is mainly controlled by your RC Transmitter.

Technical parameters

Table 1: Unless specified, values are at operating temperature of 25 °C.

Component	Min Value	Standard Value	Max Value	Units	Remark
Main Supply Voltage	4.0	5	6.5	Volt	
Main Supply Current		60		mA	At 5V supply voltage
Altitude Measurement Range	-500		6000	Meter	
GPS Ground Speed Measurement Range	0		350	Meter/Sec	
GPS Horizontal Navigation accuracy		2.5		Meter	Repeat Precision
Barometric Pressure Altitude accuracy		2		Meter	Repeat Precision
Waypoints setting		98			98 point programmable
Rudder Servo		3		Channel	
Throttle Channel		1		Channel	
Servo Output Frequency		1		μS	
Updated Servo Frequency		50		Hz	
Flight status PID Control Rate		50		Hz	
Navigation Control PID Rate		10		HZ	
Data Telemetry's Track Frequency		1		Hz	
Data Telemetry's Mission Frequency		1		Hz	
Data Telemetry 's Flight Status frequency		1		Hz	
RS-232 Baud Rate		19200		Bps	TTL Level
Operating Temperature	-20	25	60	°C	
Temperature		25		°C	
Controller Module dimension	55×33×20			mm	Bare board weight
Weight	19			grams	
AHRS&GPS Module Dimension	55×33×20			mm	Bare board weight
Weight	19			grams	
Remote Adapter Module Dimension	55×33×20			mm	Bare board weight
Weight	17			grams	
GPS Module dimension	37×29×8			mm	Bare board weight
Weight	17			grams	

FY-3ZT INSTALATION

1. Before installation, please check and ensure your FY-3ZT pack contains the following main components:
 - a. Flight controller module
 - b. AHRS & GPS module
 - c. Remote adapter module
 - d. GPS module



Flight Controller Module



AHRS & GPS Module



Remote Adapter Module



GPS Module

- 2. Optional components:
 - a. OSD Video overlay modules
 - b. Current sensor
 - c. Data radio module
 - d. Other fittings



FY-605 Data Radio (433mhz)



FY-606 Data Radio (2.4ghz)

Note: Data Radio selection please refer page 8.

FLIGHT CONTROLLER MODULE INSTALLATION

FLIGHT CONTROLLER MODULE

1. The flight Controller Module has no special requirements for installation. It can be placed anywhere in the airframe as you wish.
2. The Attitude and Heading Reference System (AHRS) & Global Positioning System (GPS) module must be placed horizontally and as close as possible to the plane's CG (Center of Gravity). The arrow direction must be pointing towards the nose of the plane (i.e. direction of flight).
3. When installing please make use of the supplied damper mount (shown below). Otherwise the vibrations will cause a large data inconsistencies which will adversely affect the autopilot accuracy.

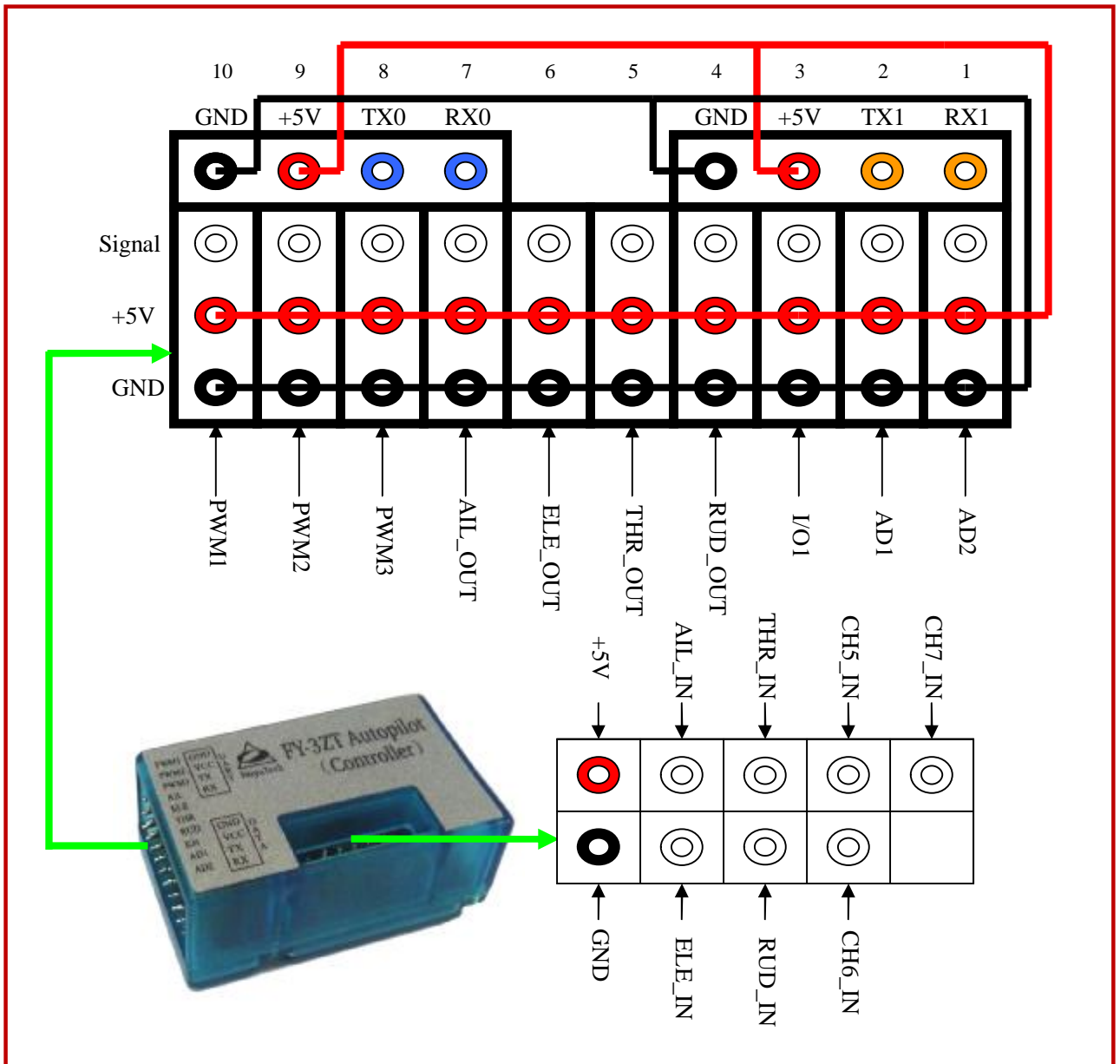


4. FY-3ZT autopilot integrates a GPS module including a flat-GPS passive antenna. This is a sensitive antenna for GPS signals, while false signals reflected from the ground is effectively filtered out. Install the GPS unit horizontally.
5. Keep metal objects and other conductive materials such as carbon fibre away from the GPS unit. Additionally no transmitting antenna should be around the GPS antenna. The communication link antenna (FY-606) or your video transmitter should be kept as far away from the GPS unit as possible.
6. Radio transmissions will increase the noise signals which lead to instability in the positioning data. The higher the radio noise, the more difficult for the GPS to lock in position.
7. FY-3ZT can integrate with either one of Feiyu Tech's two Data Radio modules, the FY-606 (2.4 Ghz) or the FY-602(433 mHz).

8. The Data Radio uplink is responsible for receiving flight navigation data from the GCS. At the same time, the Data Radio also transmits flight status and other remote sensing information back to the GCS. The asynchronous serial interface protocol between FY-3ZT autopilot and communications link is RS232-TTL level, the baud rate is 19200.
9. Place the Data Radio module as far as possible away from the GPS module, AHRS, GPS and servos in order to avoid interference to these equipments. The Data Radio antennas should be installed vertically upward or downward.
10. The Data Radio communication link range depends on your specific application. If your aircraft will only be operated within a 5km radius then the FY-606 radio modem will be sufficient. If you wish longer range then the FY-605 radio modem should be selected.
11. Also consider your Data Radio frequency selection based on your existing radio control system, to avoid frequency interference.
12. Alternately, you can utilize your own full duplex data modem. The communication link used by FY-3ZT autopilot can be either a half-duplex or a full-duplex data modem.
13. **Warning:** Certain frequency bands from the Data Radio (e.g. 433 mHz) can interfere with servos due to electromagnetic emission. To resolve this issue either avoid placing the Data Radio transmitter close to sensitive components or use a magnetic core (as shown below) to reduce the interference.



Defined Interface of the FY-3ZT Flight Controller Module



FY-3ZT Controller Module:

Serial port 0

Baud rate: 38400

Data bits: 8

Stop bits: 1

Parity: None

TX0 connected to the RX 's AHRS & GPS

RX0 connected to the TX 's AHRS & GPS

Serial port 1

Baud rate: 19200

Data bits: 8

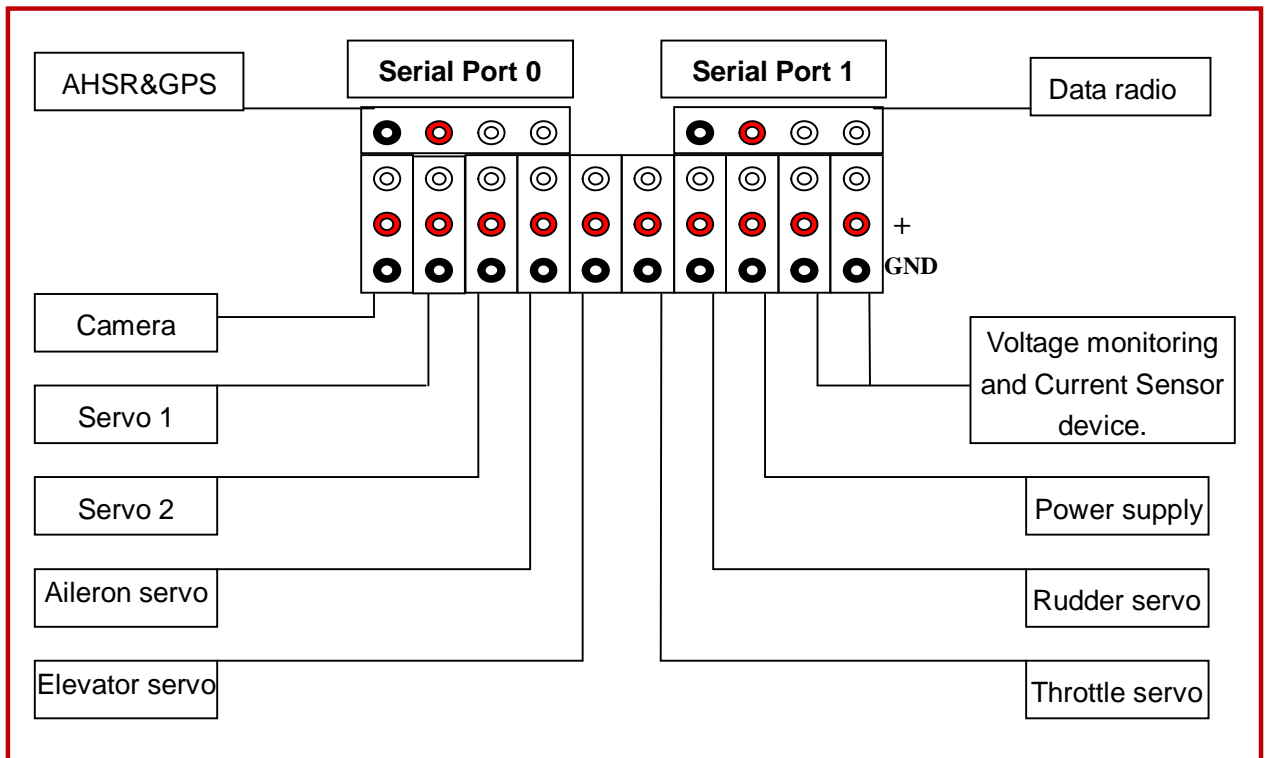
Stop bits: 1

Parity: None

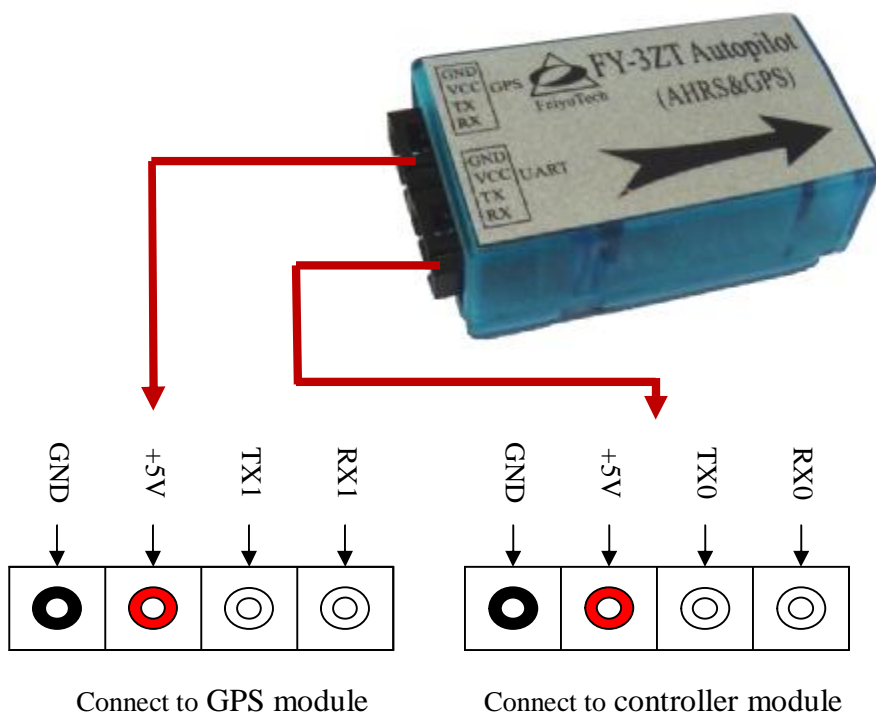
TX1 connected to the RX 's data radio

RX1 connected to the TX 's data radio

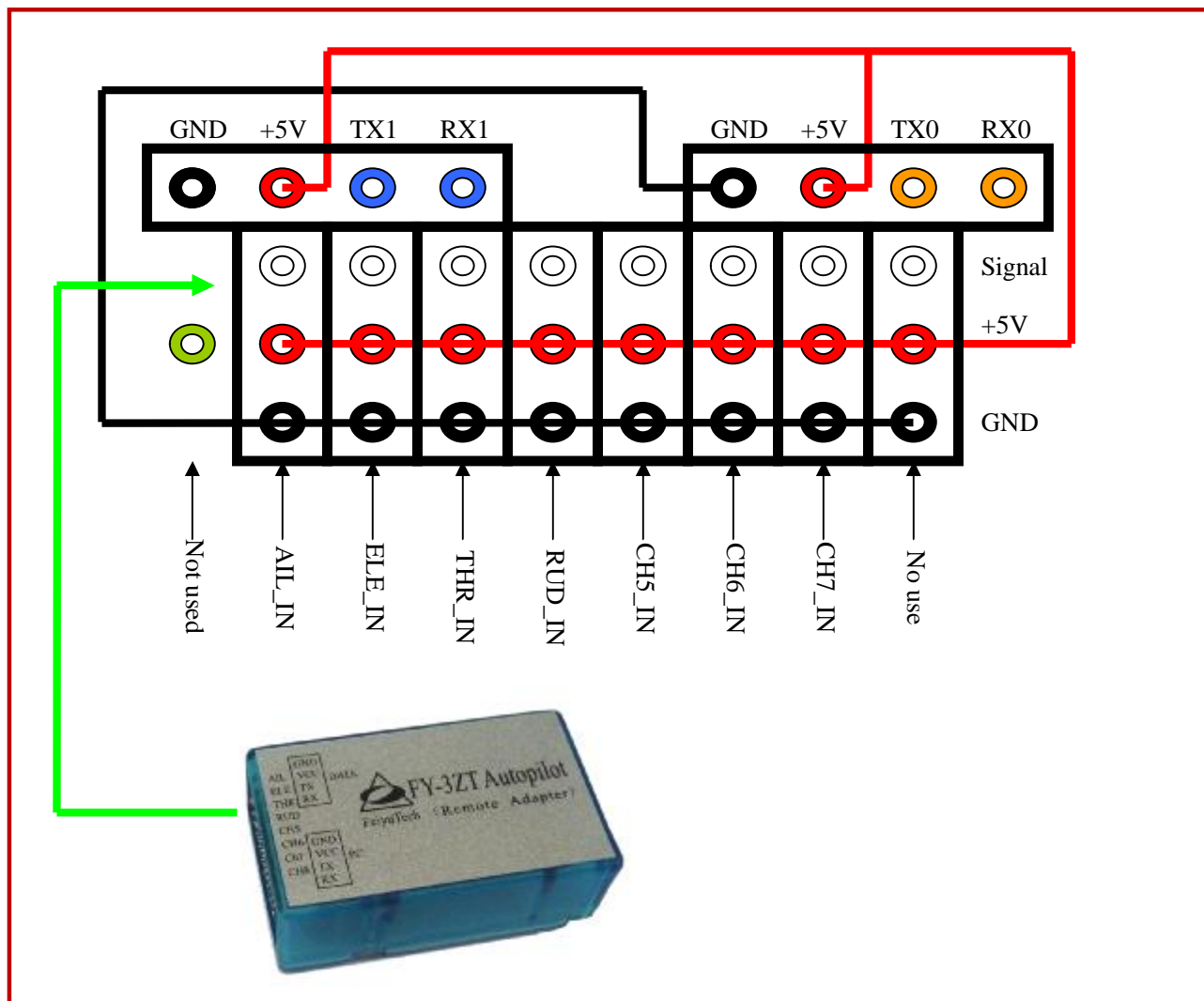
Connection diagram



FY-3ZT AHRS & GPS Module Interface

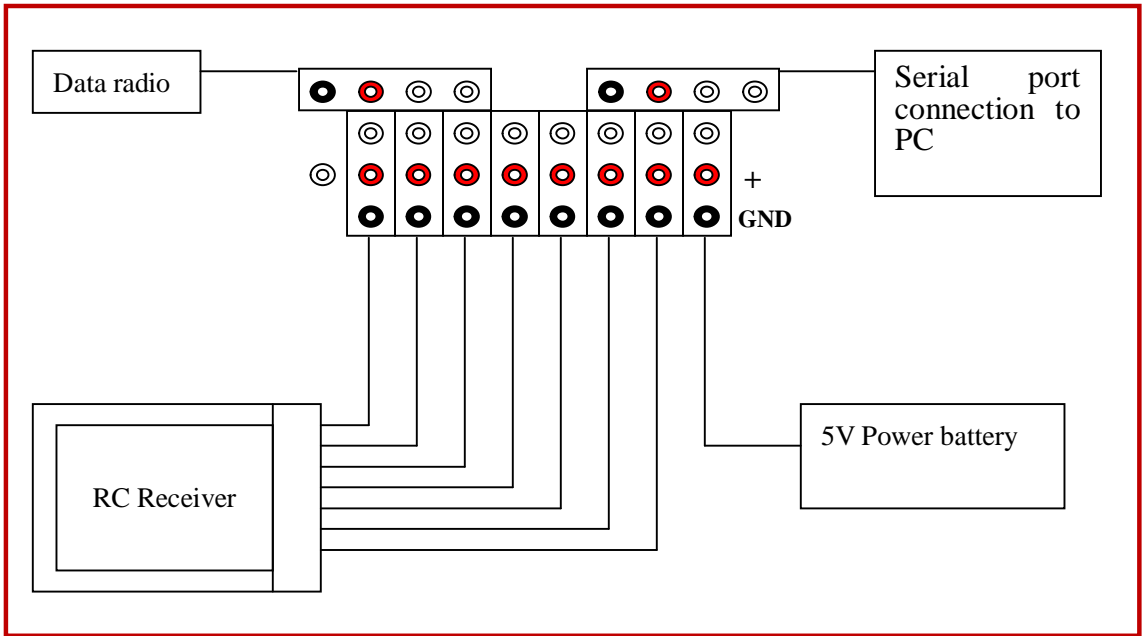


FY-3ZT Remote Adapter Module Interface



Functions	Description
UART0	Data radio module connection
UART1	Serial port connection to PC
AIL_IN	Aileron
ELE_IN	Elevator
THR_IN	Throttle
RUD_IN	Rudder
CH5_IN	Channel 5
CH6_IN	Channel 6
CH7_IN	Channel 7

Connection diagram:



The interface and features of the GPS circuit board

TX: For Data transmission to the AHRS&GPS

Module (RX1)

RX:For Receiving data transmitted from AHRS&GPS module (TX1)

Interface Features: TTL level

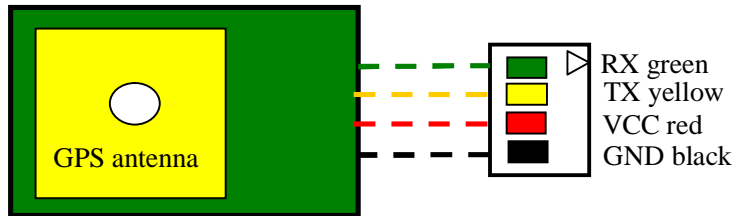
Baud rate: 38400

Data bits: 8

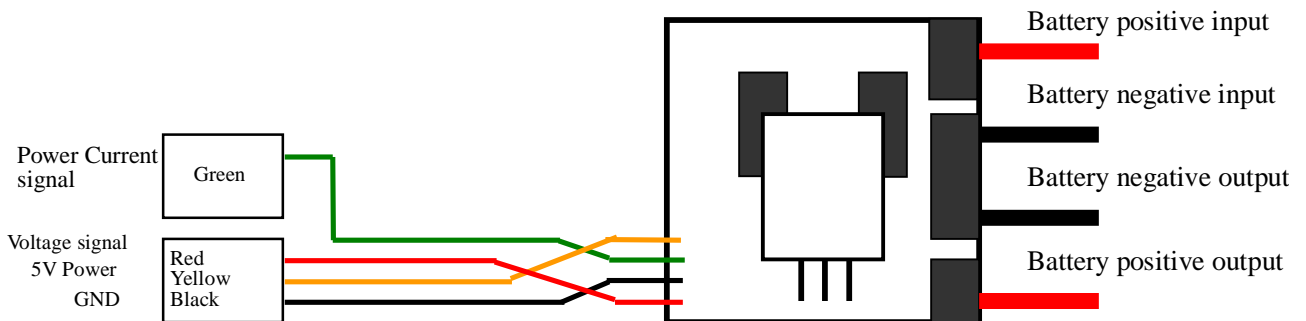
Stop bits: 1

Parity: None

GPS Data refresh rate: 10Hz



Current sensor:



FY-3ZT Power Supply

1. To ensure uninterrupted autopilot function, it is critical that your power system outputs a stable and clean 5 volt power source to the FY-3ZT system.
2. To avoid current fluctuations, ideally the power source supply to the servos should be separate from the autopilot.
3. If the power source for the Autopilot system and servos are the same, then we highly recommend a battery or BEC supply with higher than **3 amps output**. Do check this rating especially if you are using your ESC's internal BEC supply as some ESC BECs are not rated for 3amp output.
4. We highly recommend a separate power source for the autopilot system from the receiver and servos, as this has shown to produce the best results.

AUTOPILOT CONNECTION OPTIONS

There are three options when setting up your FY-3ZT system. Please review them all and choose the one that best suits your needs.

Option 1: Ground Station Controlled Flight

- a) In this option, your aircraft is controlled only by the GCS (**Figure 1**). With this setup you do not have a RC receiver in the plane (**Figure 2**).



Figure 1: At your ground Station, the signals from your RC Transmitter is sent to the RC Receiver which is connected to your computer via the FY-3ZT Remote Adapter.



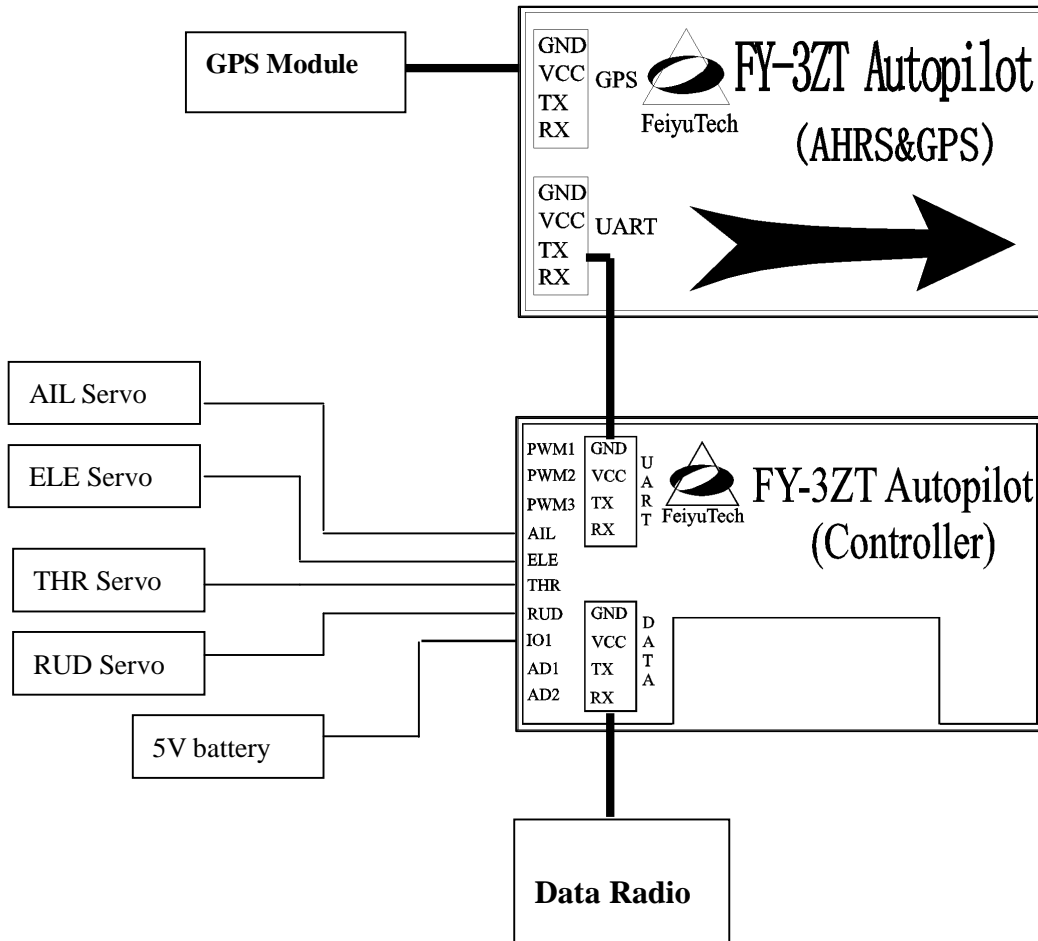
Figure 2: On the aircraft, the radio modem controls all flight parameters. No RC receiver is installed in your aircraft.

- b) Your RC Receiver is installed at your ground station. The Receiver servo signal output is fed into the Remote Adapter.
- c) The signals received by the Remote Adapter will be converted to digital signals. The Data Radio system then up-loads these digital commands to your aircraft.
- d) The uploading of data to the aircraft does not involve the GCS. The GCS is only used to monitor telemetry and flight status of the aircraft. GCS involvement in flight control is

minimal.

- e) **Warning:** In Option 1, the Data Radio range will dictate your flight range. Additionally, due to the digital signal conversion and processing, some delay in manual control transmission will occur. Refer page 13 on notes on data transfer frequency (Hz).

OPTION 1: ON BOARD AIRCRAFT DIAGRAMME



OPTION 1: ADVANTAGE

- Option 1 will make on board installation easier since the RC Receiver does not need to be installed on board.
- You save on weight and installation area.
- The entire radio and autopilot settings can be carried out at the Ground Station without involving the aircraft.
- Only a 6 channel receiver is required.





OPTION 1: WARNING

- If you choose to use the 5.0 volt power from your ESC BEC, you can plug the throttle control wire directly into the “THR” port. However please ensure that your ESC internal BEC can supply a minimum of 3.0 A current. We highly recommend that you have an external BEC instead.
- The 5.0 volt External BEC power input is connected to the **I/O1 port**.

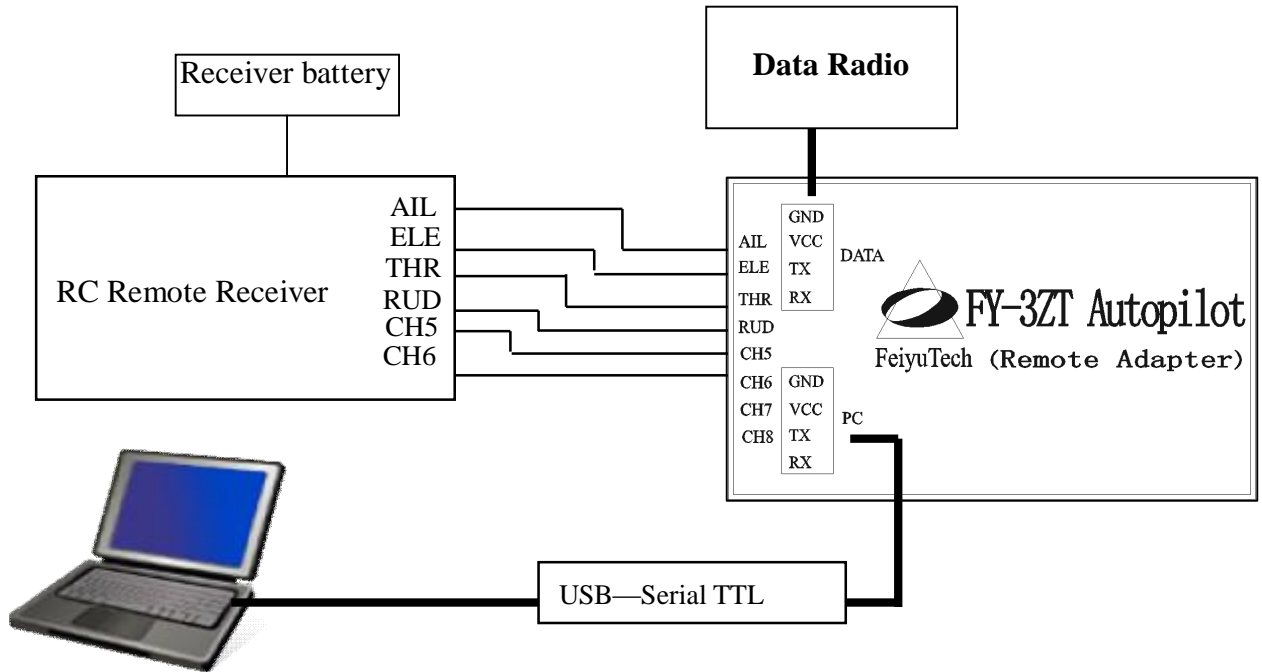
OPTION 1: Activation and Deactivation of safety feature

- When the plane is controlled by the remote adapter board, it contains a communication interruption protection function.
- If the autopilot detects communication interruption lasting 20seconds or more, it will enter into auto return mode and come safely home. This is the Default setting.
- You can however deactivate this Safety Feature if you so wish. One reason to for deactivation is that the aircraft will continue flying the set route even without Data Radio communication. This way, it can complete its flight mission fully autonomously. Of course it would make sense to have the mission end at the base station so you won't lose your plane!

Safety Deactivation Procedure:

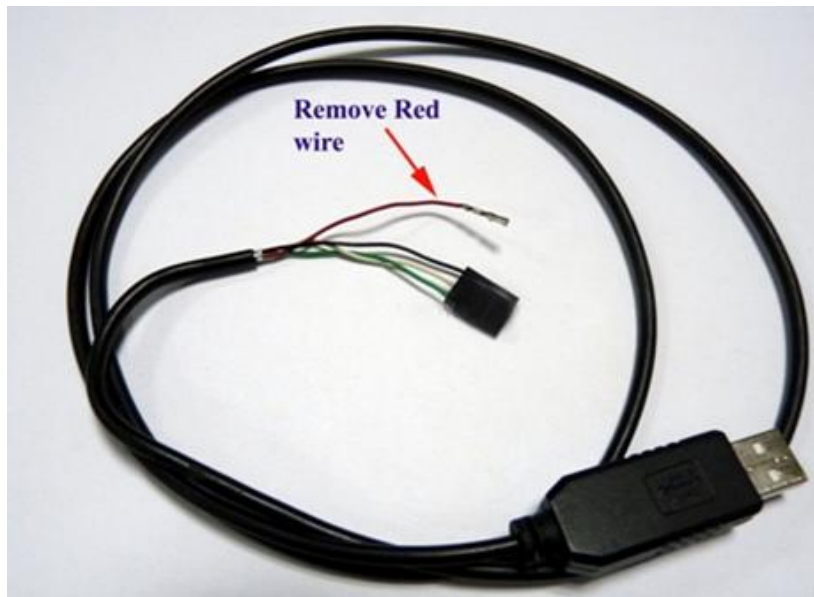
- a) Shut down (close) the RC SW: 
 - b) Change the Remote Control mode to “RC remote control”: 
 - c) By doing the above, all control is transferred to the GCS. All RC Transmitter controls have been deactivated.
 - d) If during the flight mission the Data-link is lost, the plane will not activate RTH. It will continue the planned flight.
- The Safety function can be restored at any time (even in flight):
 - a) Ensure the link of the Data Radio is OK (you can control the plane by the Data Radio.
 - b) Change the Remote control mode to "Data radio remote control" 
 - c) Open “RC SW” . The Safety function is now restored.

OPTION 1: GROUND STATION DIAGRAMME



OPTION 1: Ground Station Requirements:

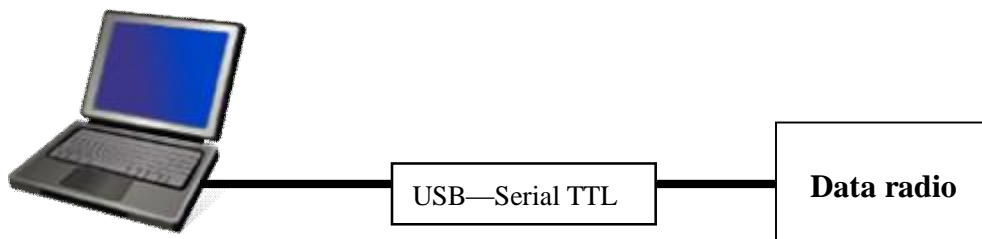
- a) You will need at least a 6 channels Receiver
- b) You will also need at least two, 3-position switches on your Radio Transmitter.
- c) If you wish to use a 5 volt Receiver battery to power the ground station system, please disconnect the 5 volt power coming from the USB Interface cable (picture below):

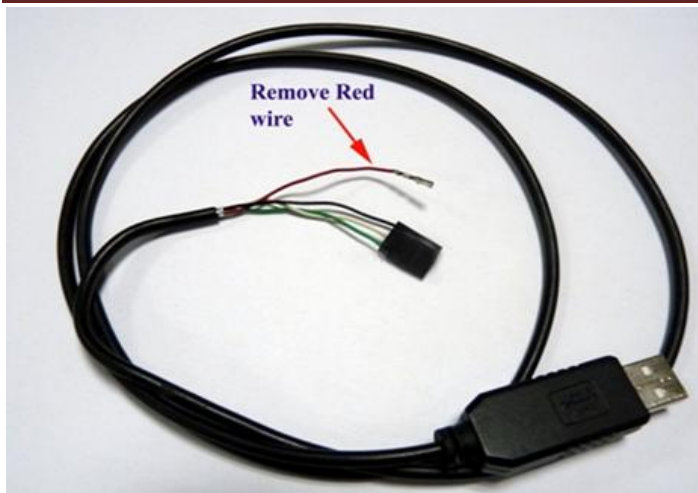


OPTION 2: RC RECEIVER ON-BOARD

- a) In Option 2, both the RC receiver and Data Radio is installed onboard the aircraft.
- b) Since both systems can be used to control your aircraft, the maximum flight range is either your RC Transmitter or the Data Radio, whichever can reach further out.
- c) e.g. If your RC Transmitter is out of range, while Data Radio is still within range, the Data Radio can still fly the plane via the planned GCS flight route.
- d) In Option 2, you have direct RC Transmitter control of the aircraft, therefore avoiding the data transfer delays of **Option 1**.
- e) For Option 2, you will need at least a 7 channel Receiver.
- f) Two of the channels require a three-position switch (e.g. Channel 5 and 6), while Channel 7 is used to select either the Data Radio (RC receiver on ground) or by the RC Transmitter to control the aircraft.

OPTION 2: GROUND STATION CONTROL DIAGRAMME

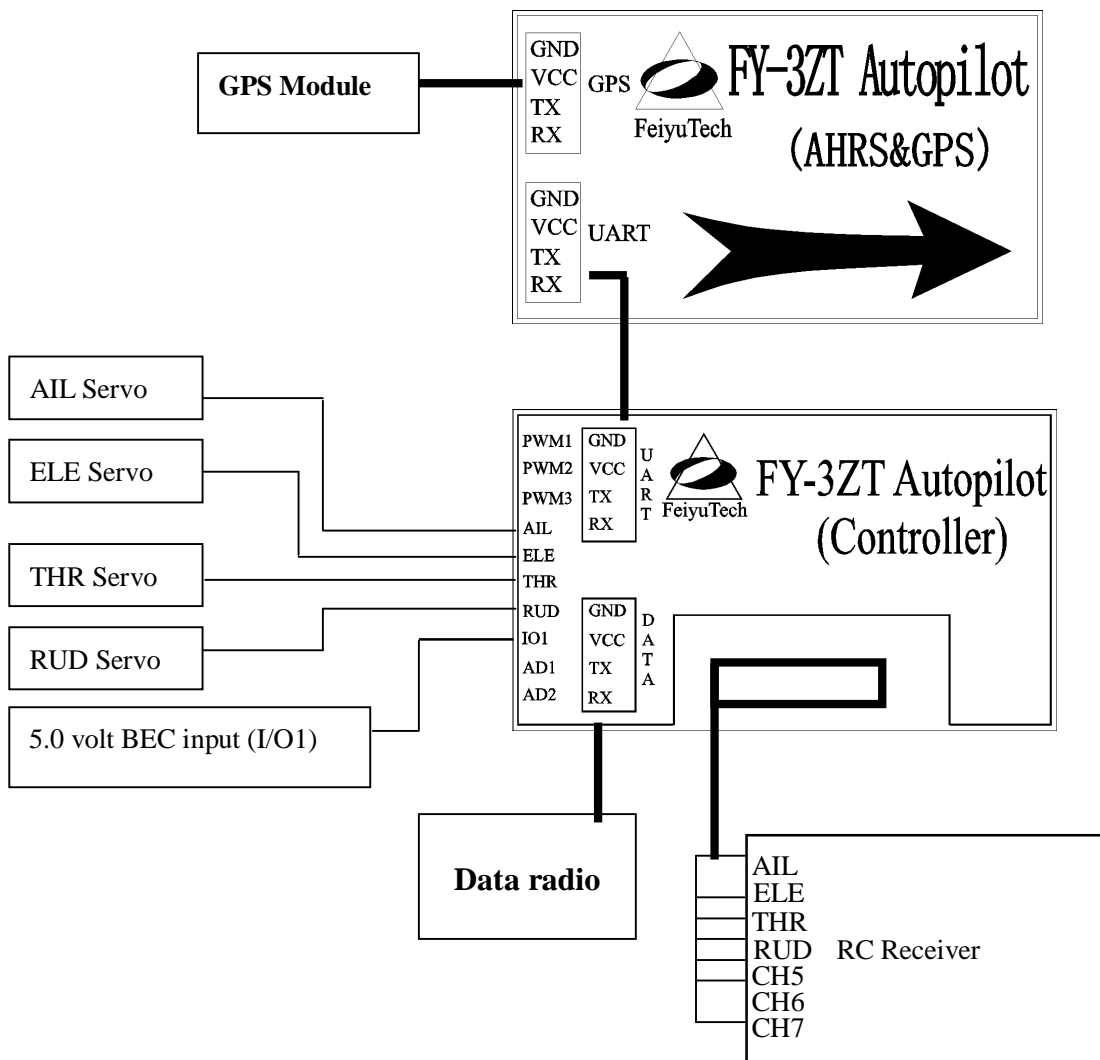




NOTE: If you wish to use a 5 volt Receiver battery to power the ground station system, please disconnect the 5 volt power coming from the USB Interface cable.

OPTION 2: ON-BOARD AIRCRAFT SYSTEM DIAGRAMME





OPTION 2: POWER WARNING

- If you choose to use the 5.0 volt power from your ESC BEC, you can plug the throttle control wire directly into the “THR” port. However please ensure that your ESC BEC can supply a minimum of 3.0 A current.
- However, we highly recommend that you use an external BEC with 3.0 A current output.
- The 5.0 volt External BEC power input is connected via **I/O1 port**.

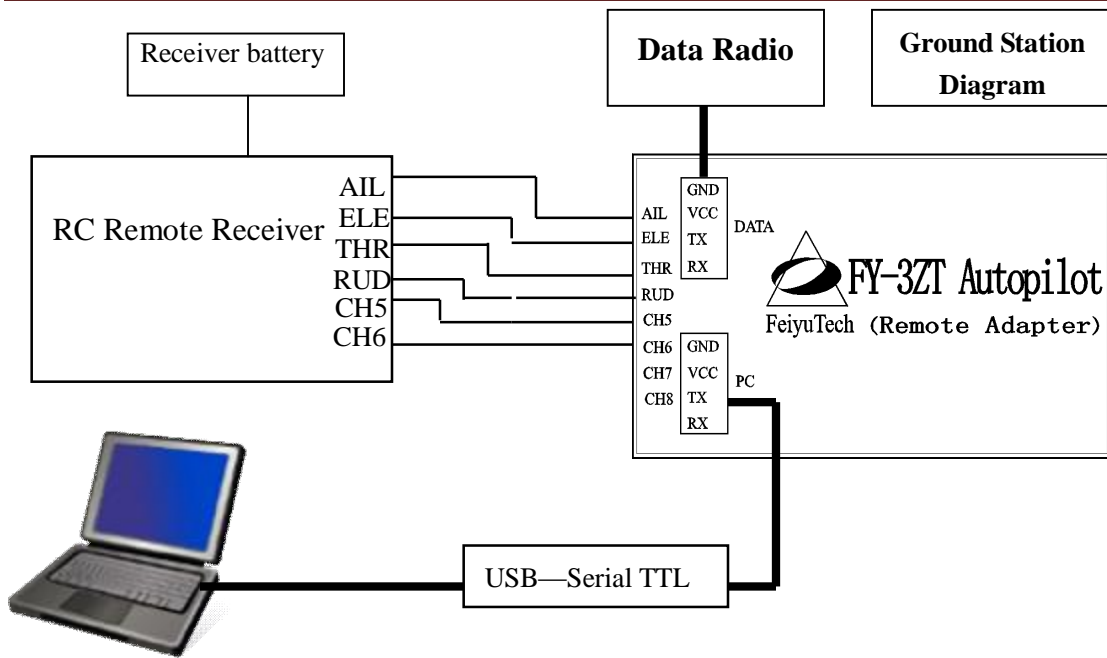
OPTION 3: TWO RECEIVER SYSTEM

- a) Option 3 is the combination of Option 1 and Option 2.
- b) In Option 3, you will require two receivers of the same frequency.
- c) Ensure that both receivers can be controlled by your RC transmitter.
- d) One receiver is installed on board the aircraft (as per Option 2), while the other receiver is installed at the Ground Station (as per Option 1).
- e) The Channel utilization on both the on-board receiver and Ground Station receiver must be the same.
- f) The Ground Station Receiver must be at least 6 channels, while the On-Board Receiver must be at least 7 channels.
- g) Two of the channels require a three-position switch (e.g. Channel 5 and 6), while Channel 7 is used to select either Data Radio (RC receiver on ground) or by the RC Transmitter to control the aircraft.

OPTION 3: GROUND STATION CONTROL DIAGRAMME



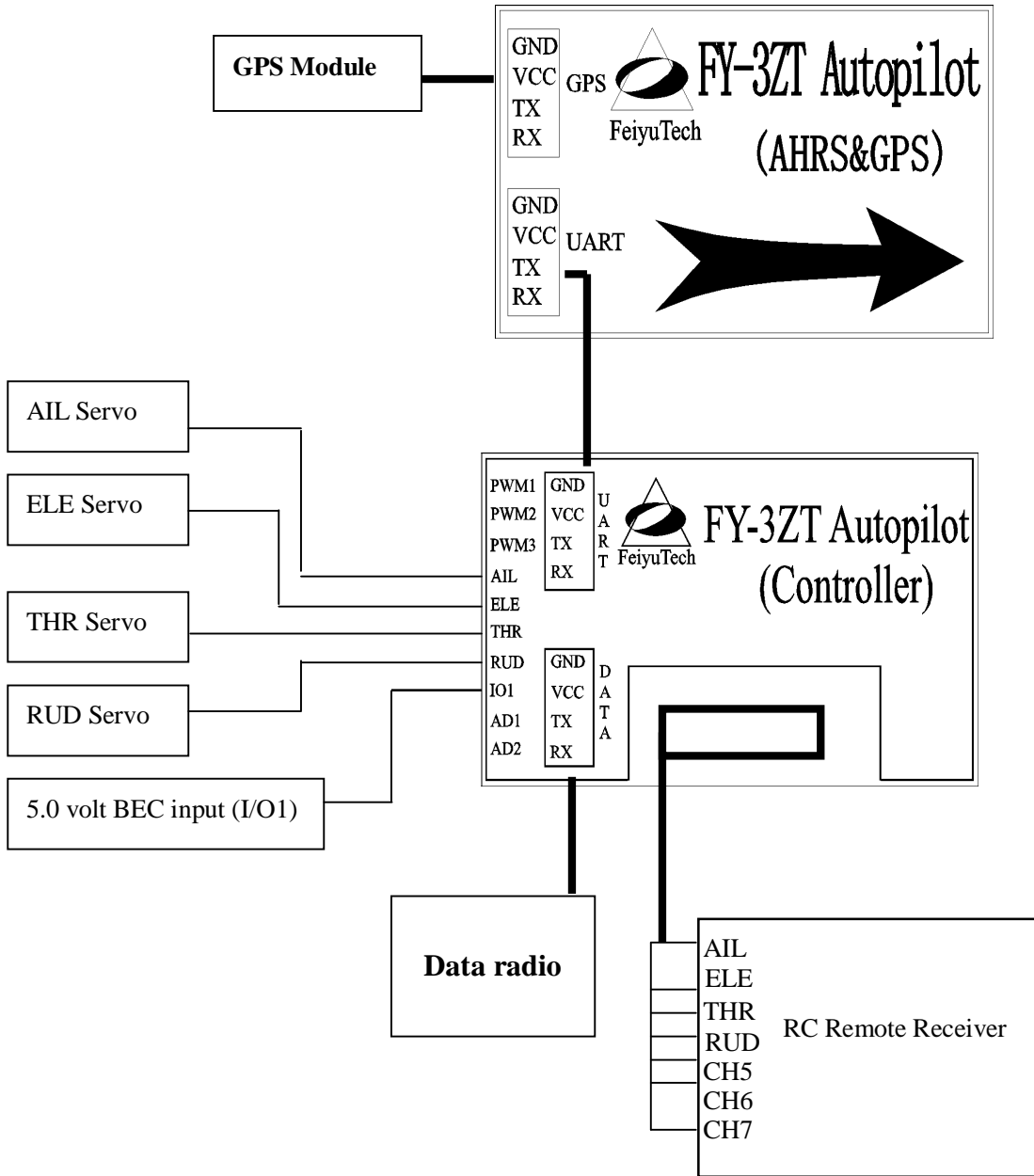
WARNING: If you wish to use a 5 volt Receiver battery to power the ground station system, please disconnect the 5 volt power in-coming from the USB Interface cable.



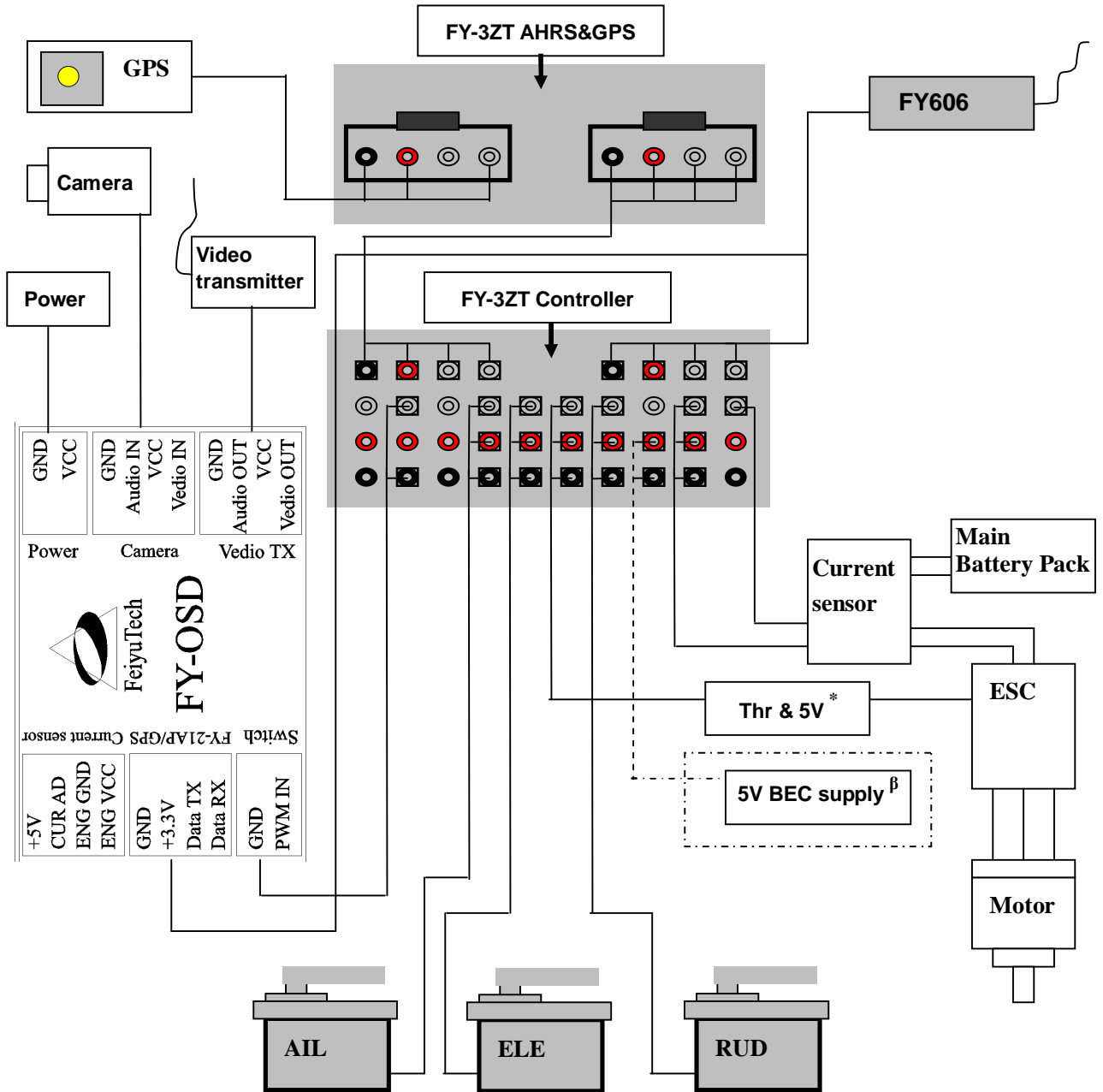
OPTION 3: ON-BOARD AIRCRAFT DIAGRAMME



OSD & FY-606 DATA RADIO INSTALLATION (ON-BOARD AIRCRAFT)



The following is connection diagram between FY-3ZT and the FY-606 Data Radio and OSD module

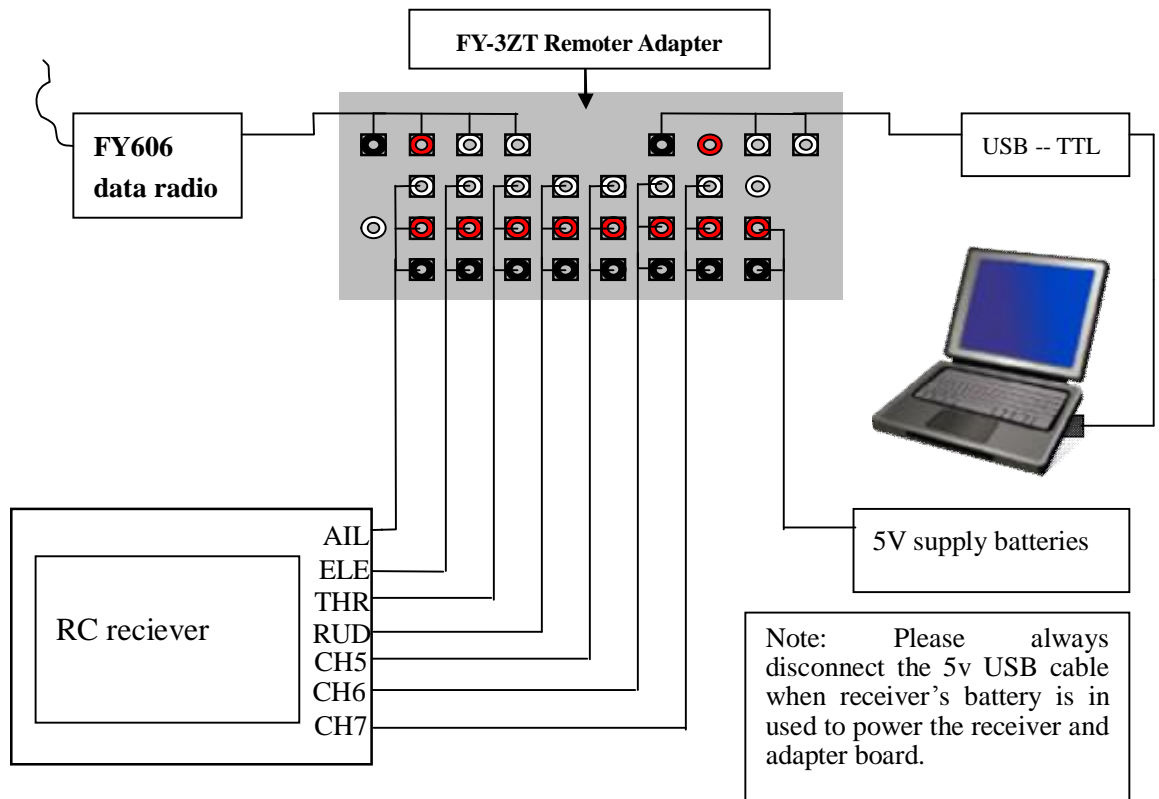


* **Thr & 5 Volt** – Throttle signal input and 5 volt power supply from ESC. Use the ESC BEC input only if it can output stable 3A current.

^β**5V BEC supply** – We highly recommend using an external switching BEC instead of powering via the ESC BEC. Disconnect the power supply (red wire) from the ESC if you use an external BEC.

FY-606 DATA RADIO INSTALLATION (GROUND CONTROL)

Below is the connection diagram of the Data Radio and GCS:



Note: Signals of RC Receiver Channel 7 will output directly from the PWM 2 Pin of FY3ZT. This Channel is used to active or de-active the OSD display function.

DATA RADIO FREQUENCY CONSIDERATION

1. FeiYu Tech provides two options for Data Radio frequency:

- FY606 – 2.4 GHz, Full Duplex
- FY602 – 433 MHz, Half Duplex

2. When considering which Data Radio to choose, consider the following factors:

a) **Frequency interference** – select a Data Radio that will least effect your existing radio system (Video and RC Transmitter).



b) **Speed of Data Transfer** – Full Duplex (FY606) will transfer data at a faster rate compared to half Duplex (FY602). This is important especially when you are using the Data Radio to manually control your aircraft. The FY606 has a higher data transfer rate (15 to 30 Hz) compared to FY602 (10 to 15 Hz) resulting in less flight control delays.

c) **Transmission Range:** The FY602 (433 MHz) has a far longer range compared to the FY606 (2.4 Ghz). The FY606 has a tested range of 4 kilometers.

3. The FY system allows you to utilize your own third party data modem. However, please be careful not to use Data Radio with too high data transfer frequency. The higher the transfer rate, the more stress on the data communication channel. 2Hz is the preferable refresh rate. (To change the frequency:- go to “Communication” – “Telemetry data” and select the appropriate refresh rate).

4. If the outgoing transmission has very high data transfer frequency, as there is a possibility that the incoming 10Hz telemetry data (longitude, latitude, altitude, airspeed, heading course, position, flight status, etc.) from your plane to your ground station can be blocked.

5. We advise you choose 2 - 4Hz for Telemetry and 15 - 30Hz for Remote Control when using the FY606 to avoid two-way signal blockage. Whereas for the half-duplex FY602, choose 1 - 2Hz for Telemetry and 10 - 15Hz for Remote Control.

6. Because of communication ‘stress’, too high data transfer rates will also reduce the Data Radio flight range.

FY-GCS: Ground Control Software

FY-GCS SOFTWARE END USER AGREEMENT

- a) The FY-GCS complies with all regulations within the People's Republic of China (PRC).*
 - b) It is the end user's responsibility to ensure compliance to regulations in their own country if the FY-GCS is used outside of the PRC.*
 - c) FY-GCS Software system is prohibited to be used for any illegal activity.*
 - d) The Guilin Feiyu Electronic Technology Co. and our associates are not responsible for any damages or liabilities caused by the use of this product.*
 - e) The FY-GCS software is internationally patented. It is unlawful to reverse engineer, copy or modify this product in any way.*
 - f) Feiyu Tech reserves the right to update, upgrade or modify this product at any time.*
 - g) Feiyu Tech reserves the right to amend this manual and the terms and conditions of use of the FY-GCS Software at any time.*
 - h) By using this product you agree to these terms and conditions effective on the date of purchase.*
 - i) Please read through the manual carefully and if there is any doubt or questions please do not hesitate to contact us and our support team.*
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Software Parameters

- a) FY-GCS is the ground control software for the FY-3ZT autopilot system.
- b) The main features include (but not limited to):
 - Electronic mapping
 - Telemetry data monitoring of flight parameters (airspeed, location, flight attitude)
 - Route (mission) circle radius, flight speed, etc editing in real-time.
 - Recording and playback of telemetry data into Ground Station Computer.
 - Map loading, electronic conversion and management
- c) The FY-GCS software interface consist of:
 - Shortcut toolbar,
 - Status display bar,
 - Flight instrument display,
 - Electronic map display area, and
 - Air route and navigation parameter setting.

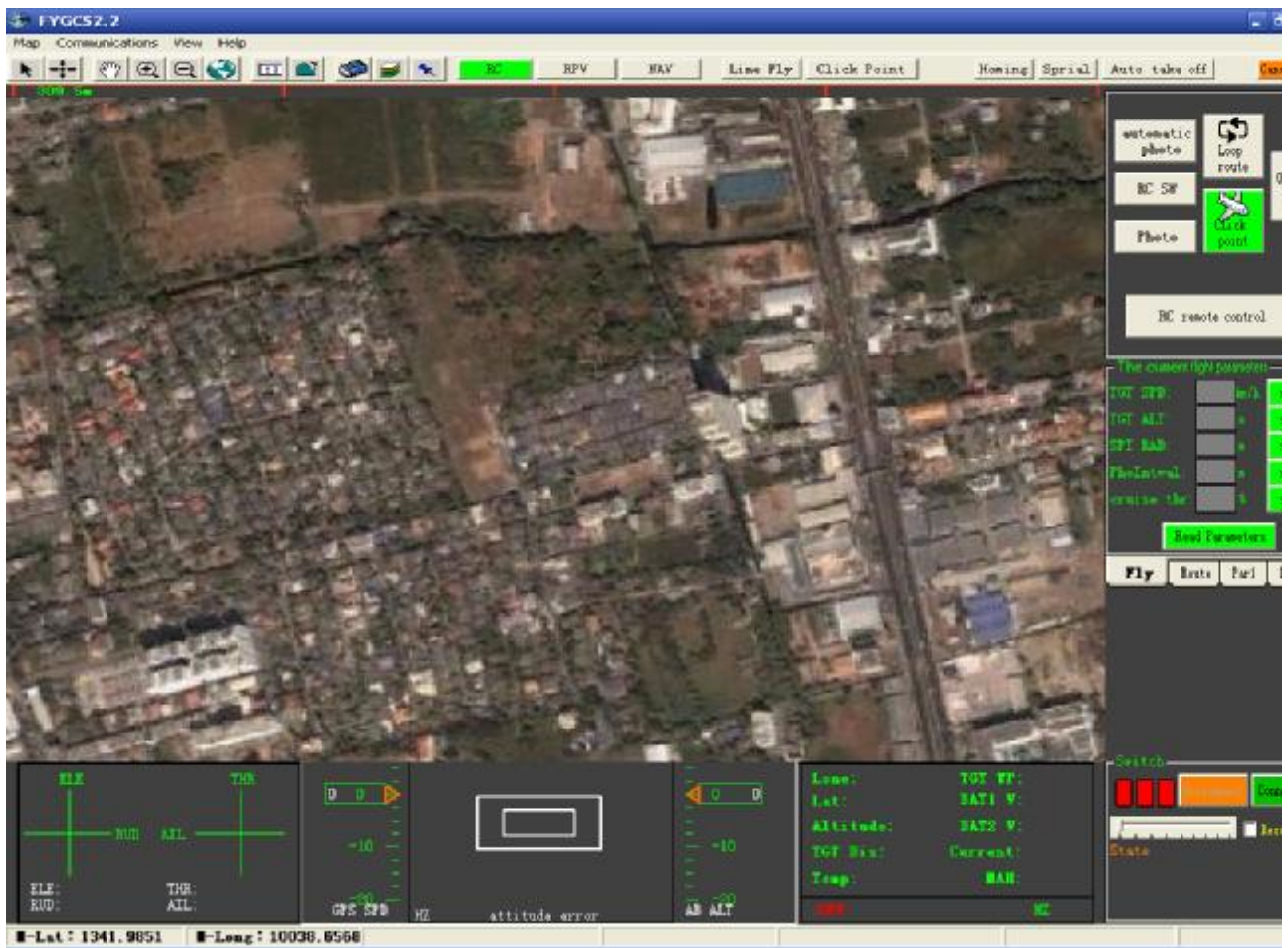
FY-GCS SOFTWARE OPERATING REQUIREMENTS

- CPU frequency:** 1GHz or more.
Memory capacity: 256MB or more.

- Hard disk space:** At least 50MB free disk space.
- Operating System:** Windows98, Windows2000, Windows XP system.
- Monitor resolution:** 1024x768 or above.
- Port:** Support 9-pin serial port or USB Serial converter (Baud rate19200 or more)
- Other Peripherals:** Keyboard, Mouse.

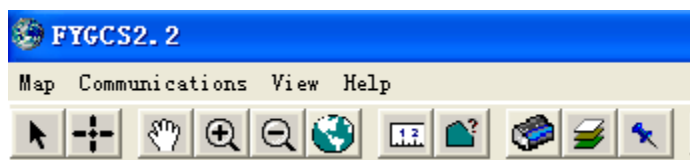
FY-GCS MODULE INTRODUCTION

Below is the overall view of the GCS Module display on your computer screen:



FY-GCS Graphic User Interface (GUI)

The FY-GCS menu and tool bar interface is as follows:



FY-GCS Menu Bar

The Menu Bar consists of MAP, Communication, View and Help.

MAP MENU

1. The Map menu consists of:
 - Map,
 - Load Layer,
 - Save Map and
 - Save as image:
2. **Click on Map:** Load map by selecting Map with the extension **.GST**
3. **Load Layer:** To add the new layer on top of the original map with the extension **.TAB**.
4. **Save a Map:** To save updated Map with the extension **.GST**
5. **Save as Image:** To save current Map contents as images with the extension **.BMP / .JPG / .GIF / .PNG** or other image format.





COMMUNICATION MENU








1. Communication menu consists of, Initialization, Port and Baud Rate.
2. **Initialization:-** start-up software related flight remote control functions.
3. **Port:-** Setup your COM port by selecting from COM1 to COM16, depending on your computer setup.
4. **Baud rate:-** Setup your baud rate by selecting from 300 to 115200, depending on your computer setup.

AIR ROUTE MANAGEMENT, CONNECTION & SCREEN DISPLAY

1. **Air Route Management:-** To setup your flight path and other settings, menu windows can be hidden or unhidden on the right side of the main menu.
2. **Connection:-** To activate or deactivate a connection. Menu windows can be hidden or unhidden on the bottom right side of the main menu.
3. **Screen Display:** Click to change map size.

TOOLBAR

1.  Pointer: Used for pointing to the element on the map.
2.  Target: Keeps the target plane in the center of the map.
3.  Drag: For this tool, you can pan the map by dragging the mouse.
4.  Zoom in: Zoom in the map view.

5.  Zoom out: Zoom out the map view.
6.  Full Map Display: Full map view.
7.  Distance Measurement: To measure distance on the map.
8.  Area Measurement: To measure area on the map.
9.  Flight path eraser: Used to delete all the track points auto generated during the flight in the e-map. However, the path eraser will not delete waypoints planned before the flight.
10.  Layer Control: Manage each layer of the map.
11.  Place marker: Add a temporary marker on the map.

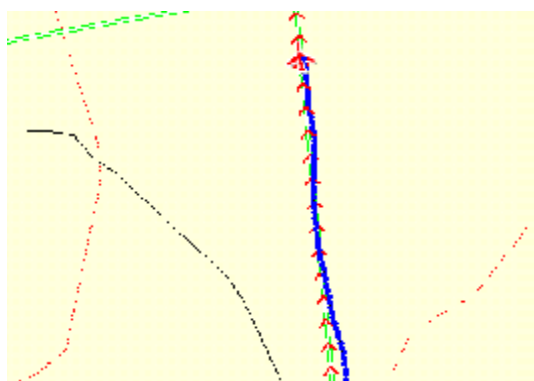
G CS Button Color

A change in Button colour represent the following:

Green – represent OK

Yellow – represent in progress, if it stays, an error has occurred and it will re-send the command automatically until the problem has been resolved.

ELECTRONIC MAPPING



You can utilize the electronic map to plot the:

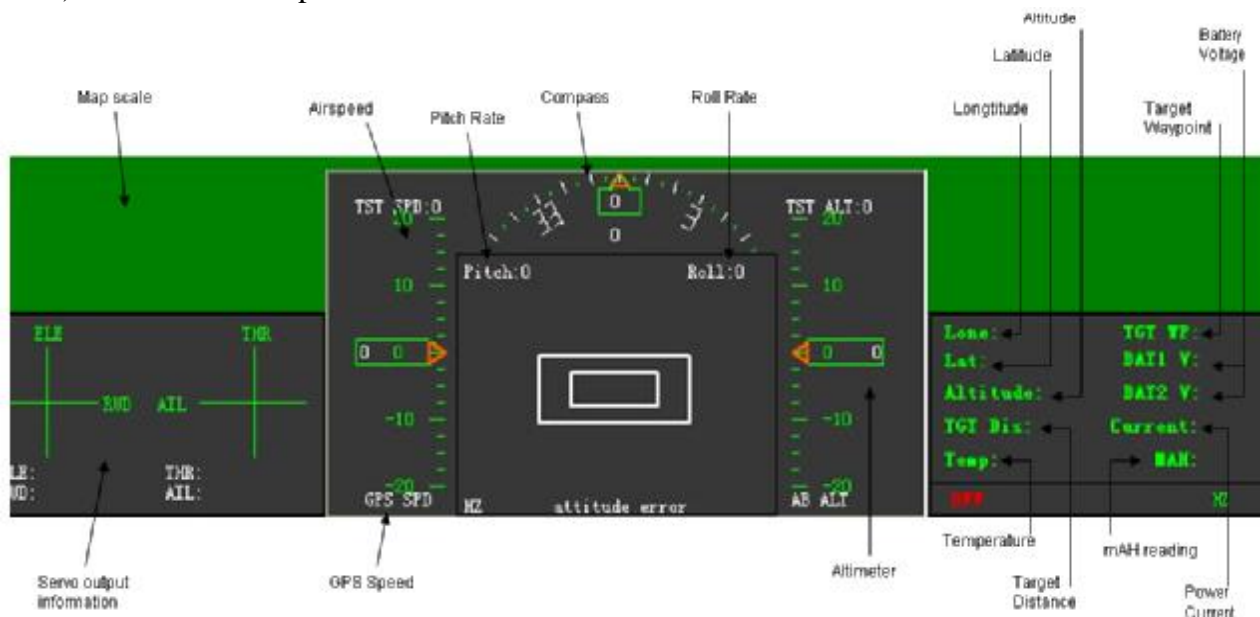
- aircraft current location,
- flight course,
- the current target route,
- flight tracks,
- flight plan objectives and
- target destinations can be shown on the map.

Aircraft Route Colour Indicator

- RED - Plane Icon:** The current aircraft's position and heading;
- BLUE - Dotted Line:** Shows the actual path the aircraft has flown.
- RED Virtual Line:** The current target route.
- GREEN - Double Line:** Flight path.
- RED - Flag Icon:** Target destination.

METER BAR DISPLAY

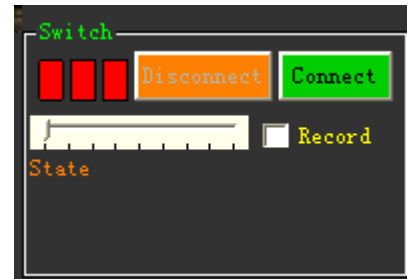
- a) The meter bar provides a graphical aircraft instrument display area.
- b) The instrument panel is divided into 6 sections as shown below:



1. **Flight Attitude Instrument:** Displays the current pitch and roll angle of the aircraft.
2. **GPS Speed:** GPS measures the relative velocity, the unit and km/h between the aircraft and ground. This is otherwise known as ground speed.
3. **Barometric altitude:** This displays the difference in altitude between the aircraft and the take-off location in meters.
4. **Heading Table:** The figures inside the dial represent aircraft heading in degrees x 10. For example:
 - "3" represents the 30 degrees
 - "33" represents 330 degrees.
 Compass heading is given for North (N), South (S), East (E) and West (W).
 The solid triangle indicates the current course of the aircraft.
 The orange double-triangle indicates the current target flight path.
5. **Air Route and Navigation Parameter Setting.**
6. **Flight Control and status interface** - When the button color is green this means the online mode is enabled.

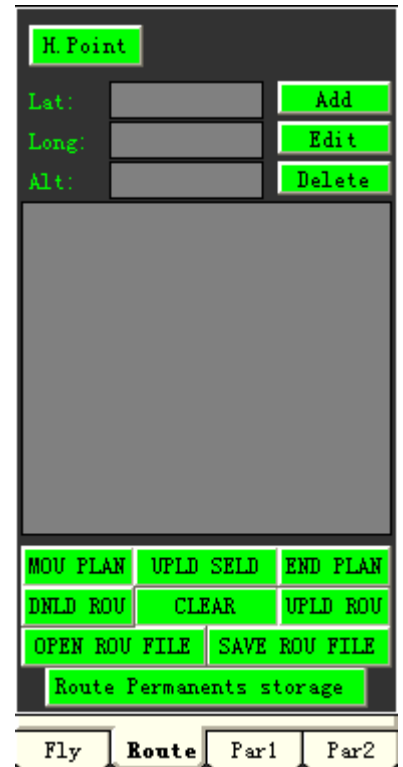
Connection interface:

1. **Connect:** To established a connection
2. **Disconnect:** To disconnect a connection
3. **Data playback:** Start recording by clicking on the checkbox.



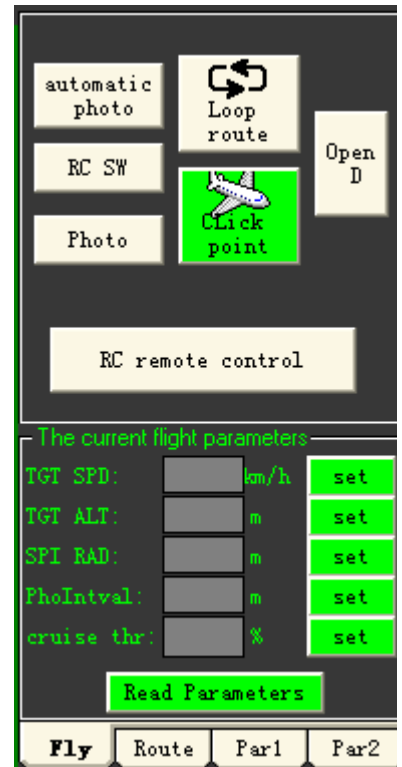
Air Route setting:

1. **H. Point:** Sets your Return to Home (RTH) point. To set this click the “H.Point” button then click your home location on the map. The system will automatically upload the Lat, Long & Alt. The RTH position has to be manual confirmed. This feature enables you to set RTB at any point within the Electronic Map.
2. **Fly now:** After you set your latitude, longitude, altitude and return point you can then fly by wire using the mouse pointer.
3. **Add, Edit and Delete:** Use these buttons to add, edit, or delete planned points in the list box below.
4. **MOU PLAN:** This allows you to upload multiple waypoints to the aircraft. Use your mouse to add navigational points to the list by selecting the point then selecting the “Add” button.
5. **UPLD SELD:** This uploads the selected navigation points from the list box.
6. **END PLAN:** This will exit the mouse click navigation function.
7. **DNLD ROU:** To download Autopilot’s air route to the local air route list.
8. **CLEAR:** Delete all the navigation points from the local air route list.
9. **UPLD ROU:** This uploads the air route from the local air route list to autopilot.
10. **OPEN ROU FILE:** Load air route file (*. wpt) to the list.
11. **SAVE ROU FILE:** Save a local air route file (*. wpt) from the list.
12. **ROUTE PERANENTS STORAGE:** Saves waypoints permanently to FY-3ZT.



TOP RIGHT BUTTON FUNCTION

1. **Automatic photo:** Enable automatic photography function.
2. **Photo:** Captures a photo immediately.
3. **RC SW:** Enable or Disables Remote control mode switch (CH5 and CH6)
4. **Loop route:** This will repeat the current air route (only works in the *air route flight* mode)
5. **Click point:** Fly anywhere on the map by using a mouse pointer
6. **Open D:** Opens aircraft parachute (if applicable).
7. **RC remote control:** Enable / Disable manual remote control.

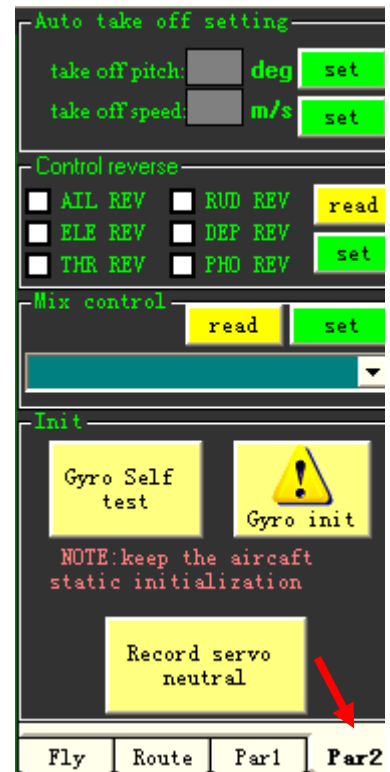


Flight Parameter Setting:

1. **TGT SPD:** Target ground speed setting in kilometers per hour (km/h).
2. **TGT ALT:** Target altitude setting in meters (m).
3. **SPI RAD:** Circling radius setting in meters (m).
4. **Phointval:** Set automatic photography interval for photo's along flight path in meter (m).
5. **Cruise thr:** Set throttle hold.

Parameter Setting 1 and 2

1. **Par1:** Sets the parameter of each flight control gain.
Par2: Sets Auto take off, control reversal, mix control and Gyro initialization.
2. **Mix control:** Sets up the mixed control mode of the autopilot. This adapts controls for elevons, ailerons, rudder etc.
3. **Control reverse:** Set up the servo and throttle control direction.
4. **Permanents storage:** Save the setting parameters to FY-3ZT permanently.
5. **Gyro Self test:** Gyro testing to see if it works OK.
6. **Gyro init:** Gyro initialization.
7. **Record servo neutral:** Record servo neutral when in Level flight.



GYRO INITIALIZATION via GCS

After activation of the Autopilot system (on the ground) you observe the pitch and roll shown in the GCS screen does not match the actual pitch and roll of the aircraft you may need to re-initialize the gyro.

Re-Initialization Procedure

1. Click 'Gyro init'.
2. Keep aircraft static for at least 20 seconds
3. Ensure no movement or vibration occurs.
4. After 20 seconds, gyro initialization is complete.
5. Test that the GCS screen now shows correct pitch and roll movement.



FY-GCS Software Operation Process

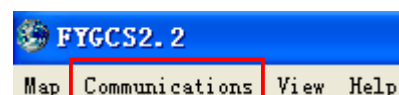
• Basic Operation Sequence

1. Connect the serial port to the Data Radio.
2. Software installation: please install the *MapInfo Map control* if the map does not work properly.
3. Run the *Ground Control Software*.
4. Go to Menu – select Map and load map by selecting Map with the extension **.GST**

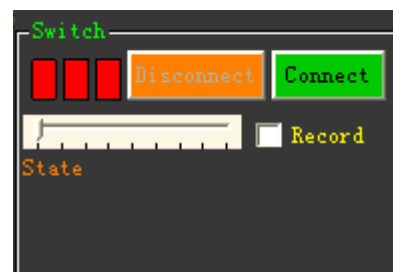
Example:



5. To set up the Baud rate, open: "Communication" the "Port" and "Baud rate", set to 19200. The default baud rate of FY-3ZT is 19200.

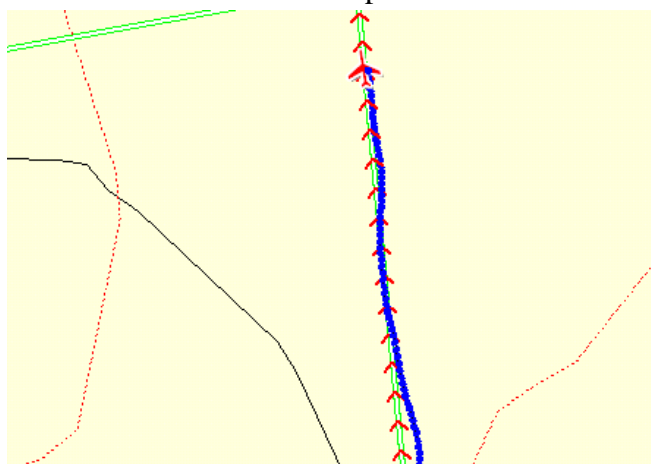


6. Click the green "Connect" button from the "Switch" interface.
 - A "Save track log" file dialog box will pop up:





- Save your file and it will start communicating with the autopilot panel and began to record telemetry data to the track log file.
 - If a port connection is established successfully, the “Connect” button will turn from **Red to Green**.
7. A Red plane icon will appear at your current position and direction will be shown on the map after the GPS has a lock and the autopilot connection is successful. The flight path will be shown in blue if the plane is flown to a different location.



8. If the GPS status shows satellites signal strength as more than 4 bars, please proceed to check if the autopilot control parameters, servo and plane condition work OK. Otherwise, perform Gyro initialization again (go to Parameter Setting: Par2).

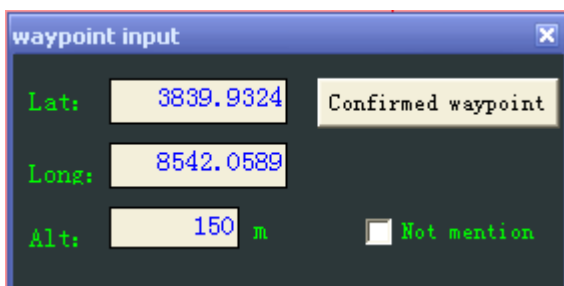
Setting flight route and Return Point

- Next create practical route and return point settings for your mission. Also double check your parameters settings are correct for your plane (Refer Parameter Setting: Par1 and Par2).
- Please **always** do a pre-flight checklist. Ensure the status of the following:
 - your plane condition,
 - flight path,
 - altitude,
 - waypoint setting, etc.

If everything goes well, you are cleared to take off.

Flight path Planning

- Click on “Route” tab and select “Mou Plan” (see Right).
- The flight path designing mode is now enabled on the map, simply navigate your mouse pointer and select your flight path, a “Waypoint Input” dialog box will pop up:

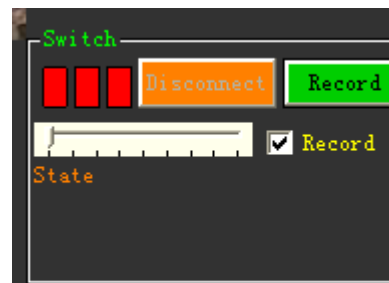


- Please enter your desire altitude in meters, latitude and longitude can be edited and entered manually if you wish, click “Confirmed waypoint” to proceed. This waypoint will be added to the waypoint list.
- Flight path will be formed automatically when another waypoint is set. Additional waypoints will be added to the waypoint list automatically.
- To modify the waypoints, just double click on your desired waypoint in the list, then you can move the waypoint on the map by navigating with your mouse. Click “UPLD SELD” when you have finished setting up your flight path. This will upload the selected waypoints from the list.
- The program will automatically send the navigation points in the local air route list to the autopilot gradually.
- Note:** Please don't click any other buttons when the air route is in the uploading or downloading status. The entire navigations point information must be successfully loaded before you click anywhere else or the air route transmission will be interrupted.



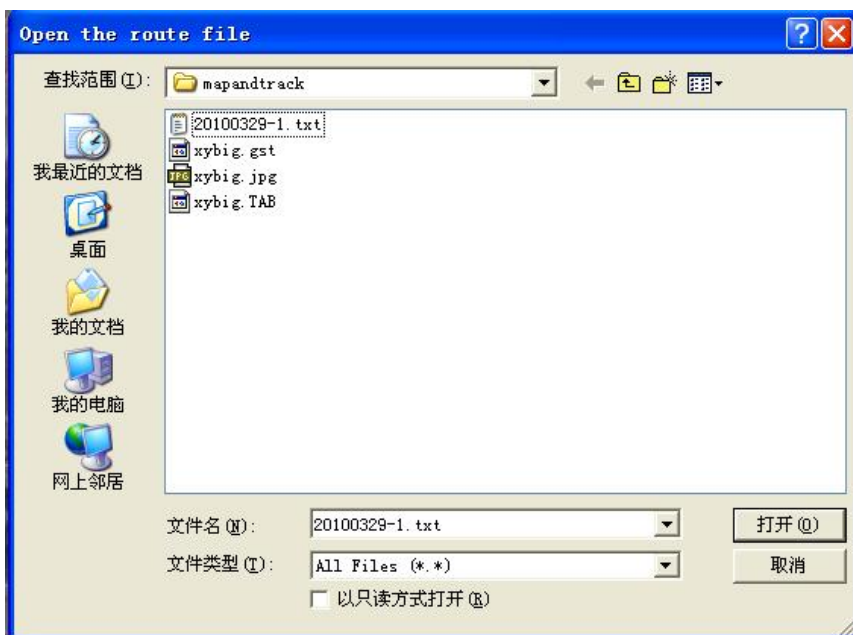
Track Record Playback

1. Click on the “Record” checkbox and the “Connect” button will change to a “Record” button.
2. To “Open Track log” dialog box, just click on “Record” button. After a saved track log file has been loaded 3 red bars can be seen on the interface.



The 1st bar will change to Blue-white color when the track is in play-back. After finished play-back, the color will turn to yellow.

3. You can adjust playback speed by dragging the slide bar forward and backward even while play-back is running.
4. Select a track file with the extension of .TXT which you wish to open.



5. Then click "Open" the GCS will start to playback the record event.

FY-3ZT Debugging instructions

The setup of the FY-3ZT can be started once you have finished installing FY-3ZT and the GCS software.

Autopilot Function

Flight Control Mode Description:

1. There are three flight control modes: Manual, Auto Balance and Automatic navigation mode.
2. You can utilize **Channel 5** to determine Flight Control Modes. Use a 3-position switch on your radio transmitter.
3. Set CH5 to any 3-position switch on your transmitter.

The pulse width of CH 5	1000-1199 μ S	1200-1800Ms	1801-2000 μ S
Function	Manual mode	Auto Balance mode	Automatic Navigation mode

4. **Note:** Do not set CH5 to Automatic Control Mode when the Autopilot is on.
 - **Manual mode:** This is normal RC manual operation. You have full control over the plane. The autopilot is DISABLED.
 - **Auto Balance mode:** This provides stabilization only. The pilot still has full control over the direction, altitude and throttle of the plane.
 - **Automatic navigation mode:** In this mode, the autopilot will implement the corresponding automatic control according to the navigation mode which has been set in the GCS.

AUTOMATIC NAVIGATION MODE VIA GCS

1. There are two types of Navigation modes:
 - Waypoint flying and
 - Mouse pointer flying.
2. The operation of the autopilot is by default set to waypoint flying.
3. The ground station software is required to change the navigation mode.
4. **Waypoint Flying Mode:** The plane will fly according to the pre-set flight path. When it has reached its final waypoint, it will circle that point.
5. **Mouse Pointer Flying Mode:** To enable this mode, click "Click point" button as shown and use your mouse to click your designated waypoint on the map. The plane will fly to that waypoint immediately and wait for your next command by performing circling flight hold pattern.
6. **Special Flight Mode Description:** There are three types of special flight modes:
 - Return to Base (RTB),
 - Autopilot Deactivated (Idle) ,
 - Automatic Circling
7. You can set **Channel 6** to a 3-position switch to select the Special Flight Modes.
8. The middle position of your three position switch is "idle mode" which means no special flight modes are active:



Pulse width of CH6	1000-1199 μ S	1200-1800 μ S	1801-2000 μ S
Function	Return to Base	Idle	Auto Circling

9. **Return to Base (RTB):** No matter what mode your autopilot is in, once RTB mode is enabled, the plane will initialize RTB (Return to Base). Upon reaching RTB, the aircraft will initiate a circling holding pattern.
10. **Auto Circling:** No matter in which mode, once Circling Mode is enabled, the plane will perform flight holding pattern by circling the current waypoint immediately. The circle radius is determined by the circle radius you have set. The default value of the circle radius is 100 meters when autopilot is enabled.
11. **Autopilot Deactivated (Idle):** In this mode the autopilot is deactivated. You have full control over your aircraft.

AUTO TAKE-OFF

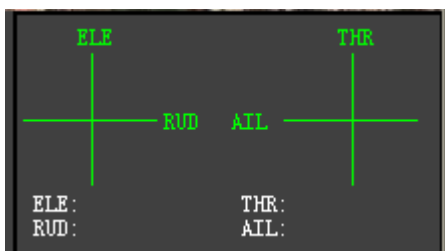
1. As part of the GCS Auto Navigation Mode, you may select auto take-off by clicking "Auto take off" on GCS software.
2. Note that this feature is for inherently stable **hand launched planes** only.
3. Auto Take-Off will initiate climb to 50 meters before entering level flight.
4. The GCS will then wait for your next command via switch CH5 and CH6.
5. You can cancel Auto Take Off at any time by clicking "Cancel" during the take off procedure.
6. Please refer chapter on Auto-Take off for more information.

COMMUNICATION DEBUGGING

1. Turn on your computer, and run the GCS ground station software.
2. Turn on the adapter board power supply, the adapter plate light will flash slowly.
3. Select the correct communications port from GCS software. Baud Rate 19200.
4. Turn ON your RC Transmitter.
5. Turn ON the autopilot power.
6. If everything is connected correctly, you will see the received telemetry data through the ground station software.
7. When the pressure altitude is 0 meters (**Note:** Auto-Initialization initial boot height is 0 meters).



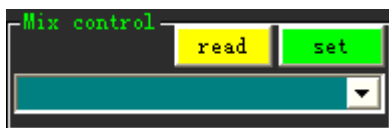
8. Move your rudder control on the RC transmitter, you will see the rudder output through the rudder display table. This means the ground station has connected properly with the autopilot.



9. TheFY602 data radio has red and green status lights.
10. FY-602 Red light – Data Radio is “transmitting”.
11. FY-602 Green light – Data Radio is “receiving”.
12. If you find that transmission of the data radio causes the rudder to “twitch” from interference, please move the Data Radio transmitter away from the rudder or other effected servos.

SERVO CONTROL DIRECTION AND DEBUGGING

ATTENTION! It is recommended that you remove your prop or disable your motor while performing these setup procedures!

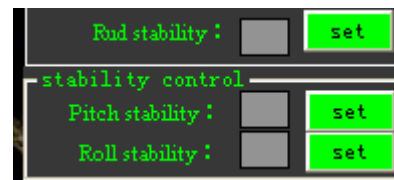


1. The FY-3ZT module has its own mixing function. Therefore the RC transmitter can be programmed for a “normal” layout aircraft.
2. Please choose the correct mixing mode in “Mix control” to change the layout of the aircraft. Following is a table describing the possible layouts:

Layout	Options
Normal layout plane	No mix (AIL NAV) or No mix (AIL&RUD NAV)
Delta-winged plane with rudder	ELE and AIL mix (AIL NAV) or ELE and AIL mix (AIL&RUD NAV)
Delta-winged plane without rudder	ELE and AIL mix (AIL NAV)
plane without aileron but with elevator and rudder	No mix (AIL NAV)

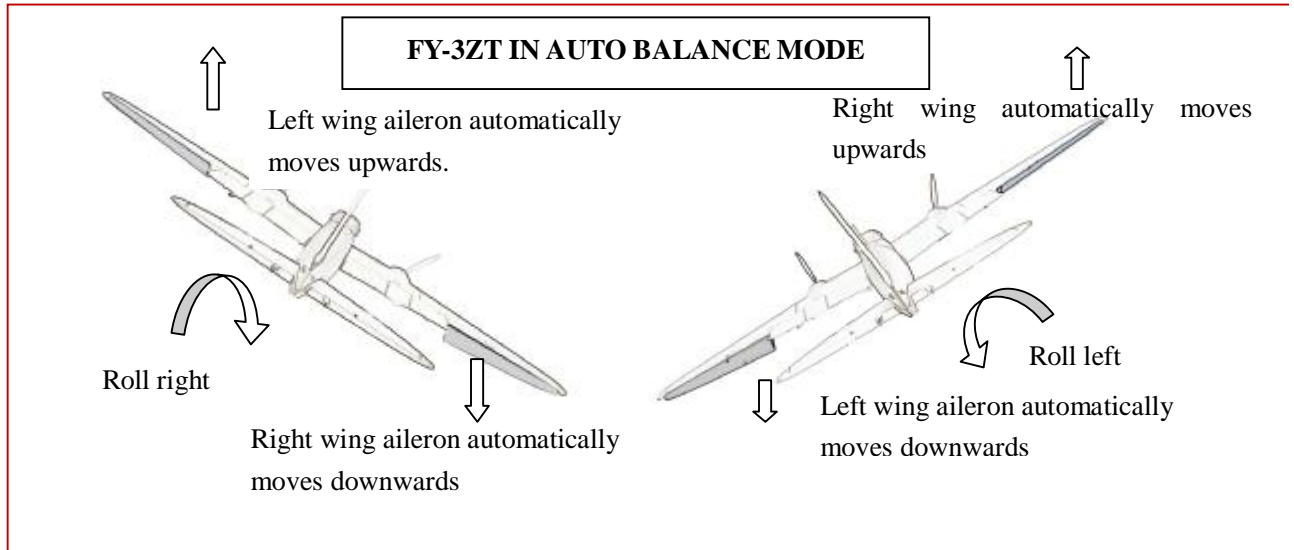
PRE-FLIGHT CHECK:

3. The following procedure explains how to correct servo control direction upon FY-3ZT activation.
4. Control direction check: Please set the:
 - "Rud stability" = 20
 - "Pitch stability" = 50
 - "Roll stability" = 50
 then switch to the "Auto Balance Mode" mode, check the control direction as explained below.



Aileron Check

5. Holding the plane in your hands roll the plane to the right. The ailerons should give a signal to counter this roll direction as shown below.

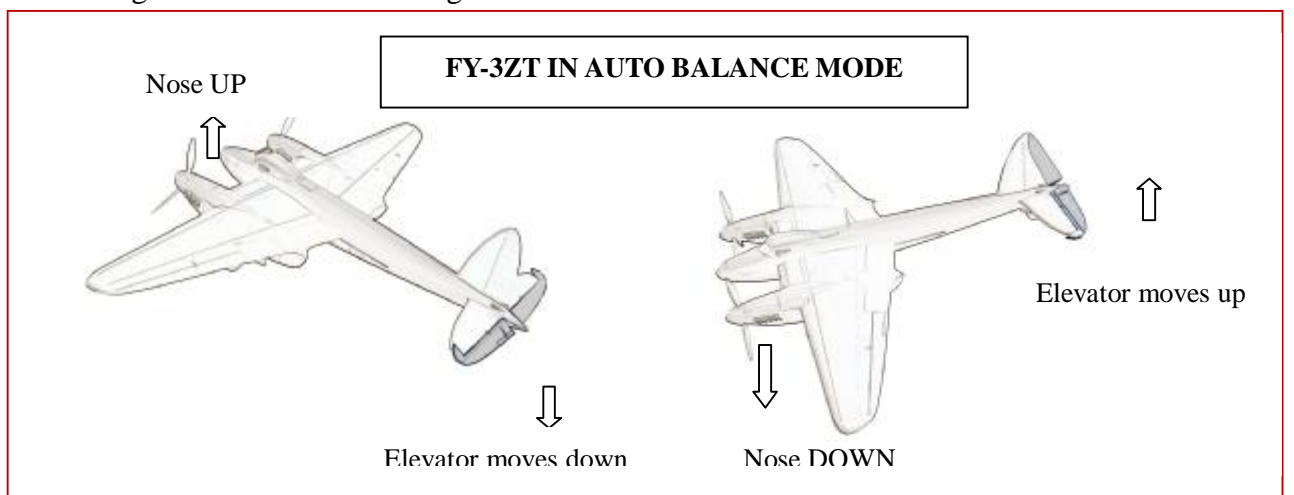


6. If the ailerons move correctly, then you have the correct "AIL REV" setting.
7. If the ailerons do not follow the correct movement, please set "AIL REV" in the "Control Reverse" box. You should now see the correct servo movement after 'checking' reverse.

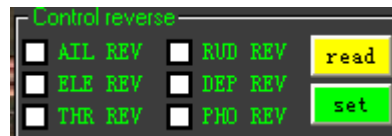


Elevator check:

8. Holding the plane in your hands tilt the nose up and down. The elevator should give a signal to counter this tilting motion as shown below:

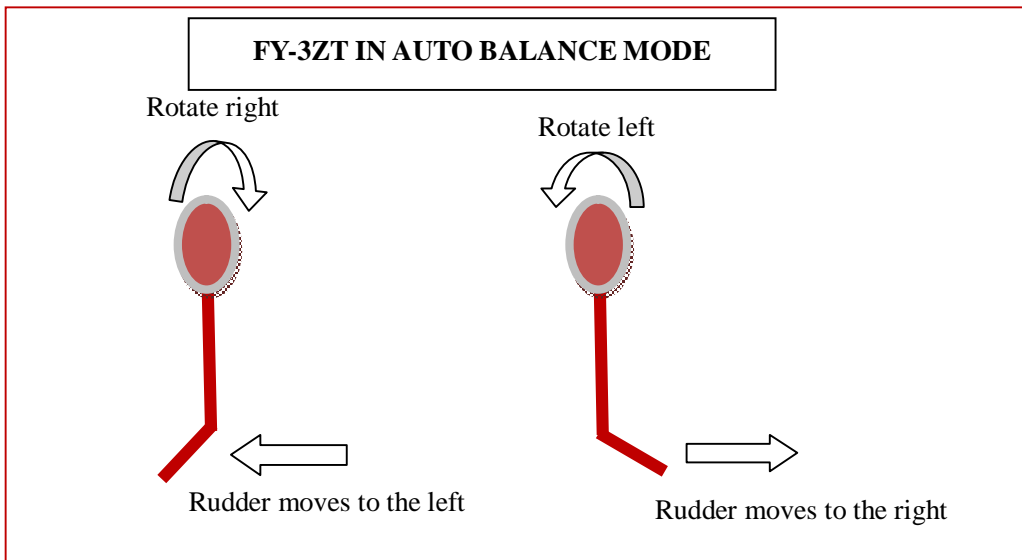


- If the the elevator does not follow the correct movement, please set “ELE REV” in the “Control Reverse” box. You should now see the correct servo movement after ‘checking’ the box.



RUDDER CHECK:

- Holding the plane in your hands “yaw the plane” from left to right. The rudder should give a signal to counter the yaw motion as shown below:



- If the rudder does not follow the correct movement, please set “RUD REV” in the “Control Reverse” box. You should now see the correct servo movement after ‘checking’ the box.

Throttle Detection:

- Warning:** It is recommended that you remove your prop or disable your motor while performing these setup procedure.



13. Please refer to the throttle output at the servo display as shown to the right.
14. With your throttle at the **lowest setting** the number should read **1000**. As your throttle up this number should get larger.
15. If instead the number reads 2000 and **gets smaller** as you increase the throttle then check the “THR REV” in the “Control reverse” box:



Flight Parameter Setting

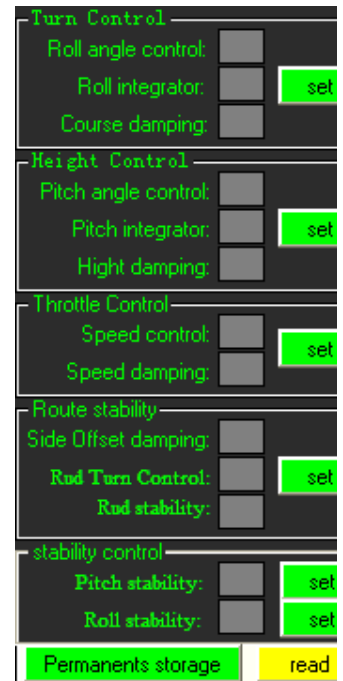
1. The following will explain the function of each flight parameter setting:

Aircraft Turn Control

2. **Roll angle control:** indicates the rate coefficient of turning angle control.

The higher the value, the greater the turning angle in degrees. This Parameter can be set in range from 0-99 degrees. The maximum attitude angle during the turning procedure is 45 deg. The Matrix below shows the relation between Parameter value and angle of the plane during a turning procedure, with total heading changed bigger than 60 degrees.

Value set	30	50 (default)	70
Turning angle			
60° Corresponding angle	18°	30°	42°



3. **Roll integrator:** Indicates the (side) angle correction between the designated Flight path and the plane’s current position. The higher the value, the faster the system will react to match the actual flight path and the planned (designated) flight path. This Parameter will be activated once the plane enters an area less than 30 meters from the planned flight route.
Range from 0 to 9, default value is 2.
4. **Course damping:** This is to counter the heading change by controlling the gain for angle control. The higher the value, the greater the angle movement. Range from 0-99. Default value: 50.

Height control

- Pitch angle control:** The higher the value, the higher the pitch up or down of the aircraft nose. Maximum pitch up setting is + 20 degrees.

Maximum pitch down setting: - 20 degrees.

Range is 0 to 99. Default value: 50.

- The following table shows Pitch angle control when the plane reaches 10 meter altitude:

	Value set		
Attitude up	30	50 (default)	70
10 m	6°	10°	14°

- Pitch Integrator:** Also known as Attitude Deviation Integration. This setting controls the gain to integrate the aircraft current altitude to the target altitude. The higher the value, the greater the speed to match current and target altitude via pitch control.

Value Range: 0 to 9, Default value: 2

- Height damping:** Pitch control gain to counter aircraft altitude change. The higher the value, the greater the pitch action.

Value Range: 0 to 99. Default value: 50.



Throttle Control

- Speed control:** This setting controls the aircraft speed in reference to the GPS speed change. The higher the value, the greater the throttle control gain.

Value Range: 0 to 99. Default value: 40.

- Speed damping:** This setting controls the throttle control gain to counter changes in airspeed.

The higher the value, the greater the control will gain.

Value Range: 0 to 99. Default value: 40.



Route stability

Rudder Turn Control:

- Side Offset Damping:**

Adjust gain to control the change in Side Offset damping.

The bigger the value, the bigger the control gain.

Range: 0-9. Default value: 5

- Rudder Turn Control:**



When Selecting “**no mix (AIL&RUD NAV)**”or “**ELE and AIL mix (AIL&RUD NAV)**” in the Mix Control mode manual, the Parameter will be effected.



in these Two control mode (“no mix (AIL&RUD NAV)”and “ELE and AIL mix (AIL&RUD NAV), the turning of the plane is complete via both the Aileron and Rudder.

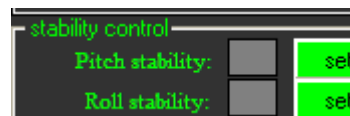
The ‘Rud Turn Control’ adjusts the gain of the rudder during automated aircraft turning. This gain is linearly proportional. i.e, the value should be adjusted according to the Rudder sensitivity. If your Rudder control sensitivity is high this parameter value should be reduced, and vice versa.

For **all other** mix-control modes, the turning is complete via aileron only. Therefore this ‘Rud Turn Control’ parameter has no effect on the aircraft.

Range :0-99.Default value:60.

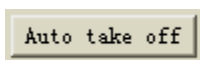
- 13. **Rudder stability:** Control gain to counter the rotation of Z Axis (perpendicular to the body of the plane).The higher the value, the greater the control gain would be.
Range: 0-99. Default value: 20.

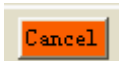
Stability Control



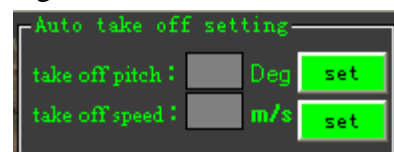
- 14. Pitch Stability: The amendment control gain given by the change of the flight pitch angle .The higher of the setting, the greater of the control gain. Setting Range: 0-99. **Default value: 60.**
- 15. Roll Stability: The amendment control gain given by the change of the flight roll angle .The higher of the setting, the greater of the control gain. Setting Range: 0-99. **Default value: 60.**

Automatic take-off



- 16. You can select auto take-off by clicking the “Auto Take Off” button on GCS software, the plane will automatic climb to 50 meters, keep level flight, and then decide the next task according to the current switch state of the CH5 and CH6.
- 17. You can cancel the auto take off at any time during the auto take-off procedure by clicking the  button.

- 18. **Take-off pitch:** Use this to adjust the Auto take-off pitch setting.
Setting Value Range: **0 to 40 Degrees**



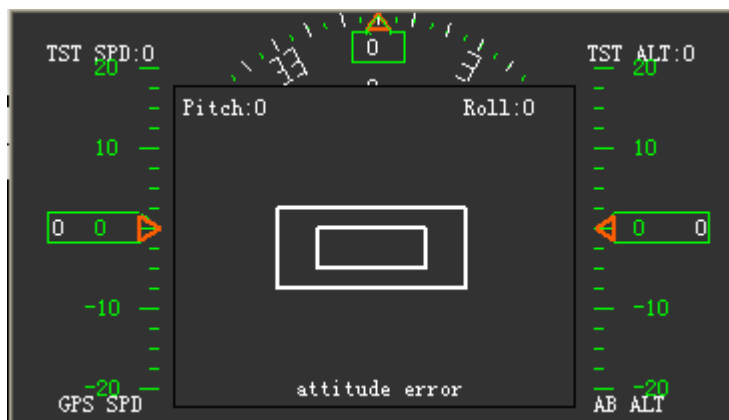
- 19. **Take-off Speed:** Ground speed setting during take-off.
Setting Range: **0 to 60 meters per second**

Vibration Detection and Adjustment

1. It is critical that the installation of the autopilot meets the vibration damping requirements.
2. If the installation does not meet the requirements it will affect the accuracy of the attitude stabilization greatly.
3. Excessive vibration can cause unpredictable flight characteristics.

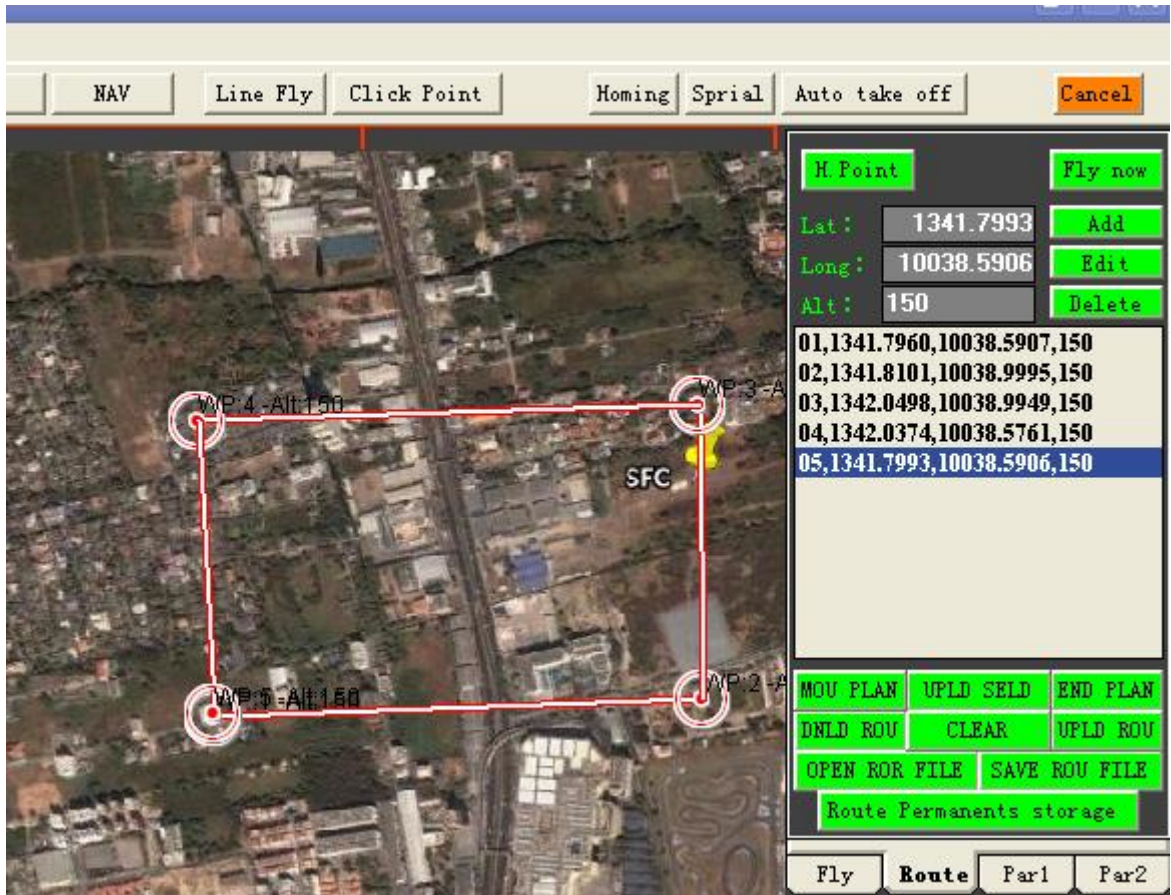
Vibration Damping Test Procedure:

1. Connect the power to the system and switch ON the plane.
2. Move the Control Mode switch to Auto Balance Mode.
3. Observe the attitude of the autopilot screen and ensure that the attitude shown is correct.
4. Slowly activate throttle and spin the motor / propeller. Do not take off!

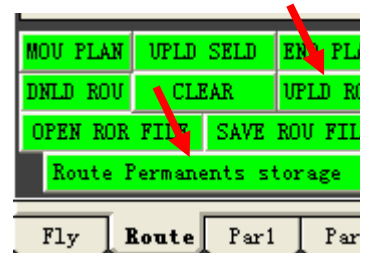


5. Increase throttle and hold for 20 seconds at different increments.
6. Ensure that the pitch and roll indicators are moving properly and do not deviate.
7. During this throttle increment tests, observe your GCS Screen (above).
8. If the “Attitude error” sign is activated as shown above, that means the system is experiencing excessive vibration and the autopilot cannot function properly.
9. Attitude error corresponds to 1000 attitude errors during the test process.
10. Check your installation. Provide additional vibration damping if necessary and restart the test from the beginning.

Flight Path Setting



1. After the autopilot has attained a lock on the home position, a little red plane will show up on the map at your current position.
2. Set the current location as return point (**H. Point**) if you wish.
3. To familiarize yourself with flight path setting, try a very simple autopilot flight plan first.
4. In this example, set a “Box” pattern (above).
5. Ensure that the first tests are done well within visual sight of the plane.
6. When you are more confident with the system is working properly, you can setup a more complicated flight path.
7. **UPLD ROU** – After setting the aircraft flight path, store the flight route to the RAM of the Autopilot by clicking “UPLD ROU”. This flight path will be lost when the autopilot is powered off.

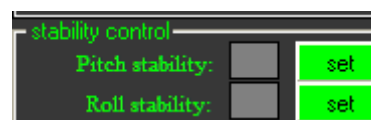


If you wish to save the flight path for a repeat flight), you can click “Route Permanents Storage”. This will save route even after you power OFF the autopilot.

Note that you can store only one route in the autopilot RAM at a time. When you save a new flight route using “Route Permanents Storage”, the previous path will be replaced.

The Debugging of after Take Off

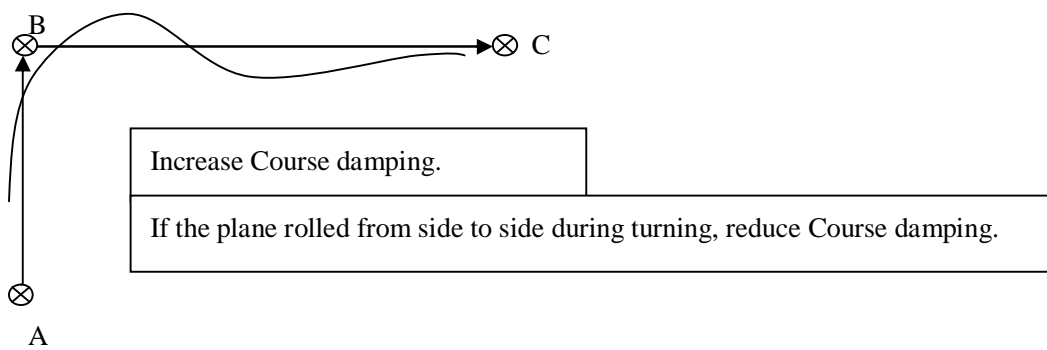
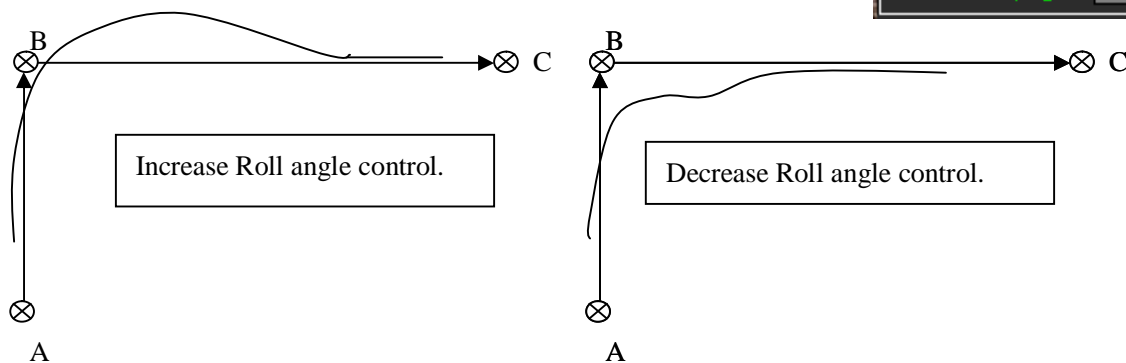
1. This debugging procedure is carried out while the plane is in the air.
2. To carry out this procedure, your plane should be set up well enough to fly straight without constant correction when in manual mode.
3. Always check the **Servo Autopilot Control** carefully. For more details, please refers to **Servo Direction Setting**.
4. Switch to “Auto Balance Remote Control” check to see if there is any unusual movement of the control and that the auto-balance is functioning properly.
5. Try rolling and ascending the plane, then let go of the sticks. Ensure the plane recovers by itself in both pitch and roll. If it doesn’t, adjust the “pitching stability” and “rolling stability” on the stability control and try again until you feel that the auto balance function is working perfectly.
6. **Pitch & Roll Stability:** If the plane is pointed down and the sticks are released, and you observe the plane returning to level too slowly, you need to increase the pitch stability control. Alternately, if the plane pitches up quickly resulting in and up-down oscillation, then you need to decrease the pitching stability control. The same is true for the roll, if the plane returns to level flight too slowly then increase the roll stability control. If the plane rocks back and forth then you need to decrease the roll stability control.
7. After you have finished adjusting in the Auto Balance Mode, adjust the remote control trims to fly level without input from you.
8. If the Neutral position in this Manual Mode (flight stabilization de-activated) is different from Auto-balance Mode, then please adjust the angle of installation for the AHRS Module on the aircraft, so that the two are the same.
9. Alternately, you may use your transmitter trims to level the plane in Auto Balance Mode. While flying in a straight line and having no input through the transmitter sticks, click “record servo neutral”. This saves the trim settings in Auto Balance Mode.
10. Note: If the plane attitude is level and straight while in the Auto balance Mode, the Deviation off Neutral position between Manual Mode (Stabilizer Off) and the Auto-Balance Mode won’t affect the GCS Auto Navigation.



Next test is "Automatic Navigation Mode". Test this mode only after you have reached a safe flying altitude. In this mode, observe the auto navigation flying condition from the ground station software, and adjust the automatic navigation parameters such as:

- Turning Control Adjustment
- Route Stability Adjustment
- Throttle Control Adjustment and etc.

Turning control Adjustment. For Example: From Point A to Point B and then to Point C.



Route Stability Adjustment

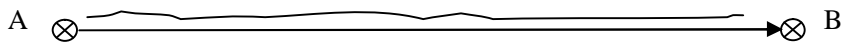
1. “Rudder Stability” is useful. It’s used to improve the course stability during flying .
2. **Notice:** The plane will not fly in a straight line if the settings are too high. For an example, flight path from A to B.



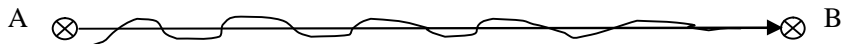
Increase “Side Offset damping” if plane fly like a “Big S” pattern.



Decrease “Side Offset damping” if plane fly in a “Tight S” pattern.



Increase “Roll integrator” if the plane roll to one side only.



Reduce the “Roll integrator” if the plane repeatedly and quickly roll on both sides.

Rudder Turn Control for Heading Adjustment

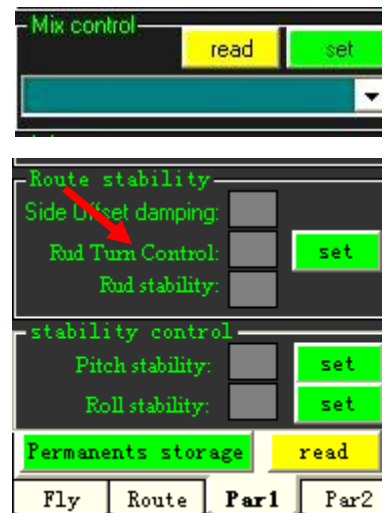
For planes using **Mix Control Mode** - When working in the “**no mix (AIL&RUD NAV)**”and“**ELE and AIL mix (AIL&RUD NAV)**” modes, the turning is controlled by the ailerons.

But after entering the planned flight route, the ailerons function will change from *turning* to **maintaining flight stabilization**. At the same time, the rudder will take over the function of heading adjustment. Therefore, the heading adjustment gain (see right) using ‘**Rud Turn Control**’ becomes very important.

If “Rud Turn Control” is set too high, the plane will swing left and right, making a tight S-route.

Whereas if “Rud Turn Control” is set too low, the plane will not be able to follow (deviate) the planned flight route.

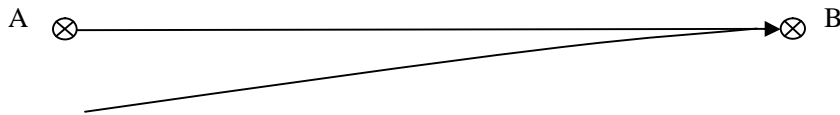
So remember, if you are using either “**no mix (AIL&RUD NAV)**”and“**ELE and AIL mix (AIL&RUD NAV)**” modes, you need to adjust the control gain of “Rud Turn Control”.



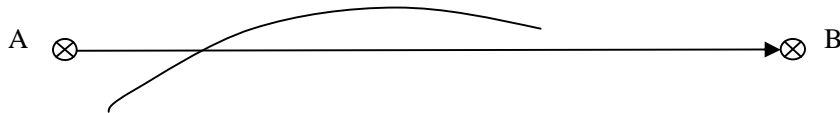
Additional Note: If your aircraft is normal / traditional fix-wing plane but uses both aileron AND rudder to navigate, the above also applies. You need to set “Rud Turn Control” to adjust heading accuracy when following the planned flight route.

Altitude Control Adjustment

For an example, Altitude from A to B.



If the plane climbs too slowly, increase the “pitch angle control.”



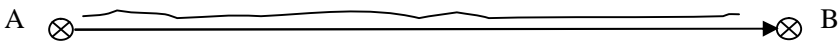
If the plane climbs too fast, reduce the “pitch angle control.”



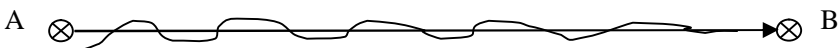
Increase “Height damping” if your plane flies in this pattern.



Decrease “Height damping” if your plane flies in this pattern.



Increase “Pitch integrator” if the plane flies higher or lower from your fixed altitude



Decrease “Pitch integrator” when your plane flies in this pattern.

Throttle Control Adjustment

Speed control: Sets the gain to maintain the actual aircraft speed and the target speed. The higher the gain, the faster the aircraft will react to changes in actual aircraft speed.



Speed damping: sets the amount of ‘buffer’ for throttle change initiation. If there is a change in flying speed, that change must exceed the damping value before throttle is reduced or increased. Generally, you can change the above settings during cruise flight.

Warning: We suggest not to increase the settings too high, it may cause very unusual flying behavior and may result in damage of your aircraft due to excessive throttling.

The normal setting is around 10-40.

Auto Take Off

1. The auto take-off feature is designed mainly for hand launched planes.
2. Please select a fairly stable plane if auto take-off is to be used.
3. The Auto Take-off should not be attempted unless you have completed setting up Auto Balance mode and fill in the Navigation parameters.
4. **Critical Parameter Examples:**
 - Set the climb pitching angle for auto take-off.
 - Set the climbing Groundspeed for auto take-off
 - Set a return point and the altitude for return point (default is 200 meters).
 - Mission: Circle over home-point after auto take-off.

Auto take off procedure

1. After located by the GPS, click “Auto take off” in the GCS.
2. When the menu button background color turn to green, set Channel 6 switch to the position of “Return to home”
3. Set the throttle level to the position for taking off.
4. Throw out the plane in a level and straight way.
5. You will notice the plane will fly in a straight line first.
6. When the autopilot detects groundspeed has increased at a value needed for climbing, the plane will climb up to approximately 50m altitude.
7. Upon reaching 50 meter altitude, the auto take off Procedure is over. Control is automatically transferred back to your RC transmitter.
8. However, the plane will still continue flying autonomously, gradually circling and increasing height to 200 meters over the home-point. At this height, the aircraft will hold altitude.
9. Remember that if you had done any adjustments to the Flight Parameters (e.g. Pitch and Roll stability), remember to click “Permanents storage” to store your settings in the Autopilot RAM. Failure to save these settings before powering OFF will result in lost of all adjustments done.

This manual is just a guideline to help you set up your aircraft for autonomous flight. As each aircraft is unique, you will need to fine tune the settings to suit your aircraft's flight characteristics.

FY-TECH AUTOPILOT TEAM

