FEIYU TECH.

FY-21AP GCS UPGRADE
2.4 GHZ FY606 Data Radio & Remote Adapter Board Interface
INSTALLATION & OPERATION MANUAL

Dear Pilot,

Thank you for purchasing the FY-21AP Version II Ground Station Upgrade from FY-Tech.

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

ATTENTION:

- This manual describes the FY21AP Ground Control Station (GCS) FY606 2.4 Ghz Upgrade pack installation only.

- To fully understand the entire system, you should read through and fully understand the FY21AP Version II AFSS Autopilot System manual.

- Installation of this upgrade pack without first understanding how the FY21AP autopilot system works will lead to frustration, hair pulling and despair.

- If you are already an experienced user of the FY21AP, you will find the installation of this upgrade to be very easy and logical. Just follow the instructions as stated in this manual and you won't go wrong.

Fly Safe!

Fyetech Team

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INTRODUCTION

FY21AP Autopilot and Ground Control Station (GCS) – What's it about?

1. The FY21AP version II when coupled with the FYGPS and FYOSD is a fully functional stand-alone autopilot system.

2. By upgrading your FY21AP set up with the FY606 Radio Data and GCS software, you further expand the capability of this autopilot system.

3. The Data Radio enables a by-directional digital communication between the aircraft FY21AP and your computer on the ground. Your computer now acts as your aircraft GCS!

4. The major advantage of the FY21AP GCS is real time telemetry display on the ground, data downloading and instant playback. The data display includes:

   a) Flight route display via FY-GCS Google Earth version:

   b) If you have FYOSD, all parameters will be displayed including GPS longitude & latitude, altitude, speed, course, positioning, autonomous flight mode, servo control output, voltage and power consumption, all in real-time.

c) If FY-OSD is not installed, the current sensor will not be displayed. You will have to use your existing OSD with current sensor displayed on your video downlink.

Auto Circling by the click of your Mouse

5. The system allows one flight control signal to be sent from the GCS to the FY-21AP; which is the *auto circling mode* anywhere on the flight route map:

   a) While already in the air, you can click one point on the map (you may click only one point at a time).

   b) When the aircraft reaches the selected point, it will automatically go into auto-circling path flight, with a fixed flight radius of 120 meters.

   c) You may now click another point on the map and the aircraft will exit the auto circling mode and fly towards the new point for auto circling at the new point.

6. Software upgrades will be available in future, including open source coding for the Radio Data communication protocol.

SYSTEM REQUIREMENT
(Stuff you'll need that is not included in the upgrade pack)

To complete the FY21AP Ground Control Station (GCS) FY606 2.4 Ghz upgrade, you will require the following:

a) Two RC Receivers of the same frequency so that <u>both receivers</u> can be controlled by your RC transmitter:

- 1 x RC Receiver on the Ground Station with a minimum of 7 channels, with Channel 5 and 6 with 3-position switches and Channel 7 with a 2-position switch.
- 1 x RC Receiver with minimum 6 channels for the On Board Setup. If you wish to assign an ON-OFF switch for your FYOSD you will need a 7 channel Receiver.

b) Ground Station Battery Supply – we high recommend you use an external 5 volt Receiver battery or lipo powered BEC with minimum 3A current output instead of using power from your computer USB Port. Remember to remove the red wire from the USB servo plug is you choose to use this external power source:

c) If you still wish to use your FY-OSD to display telemetry on your video downlink, install the 'Y-harness' as shown below. This will tap the signal output from the FY21AP autopilot UART port and split it to the FY-OSD and FY606 Data Radio.

FY-3ZT Remote Adapter Board Interface Diagram
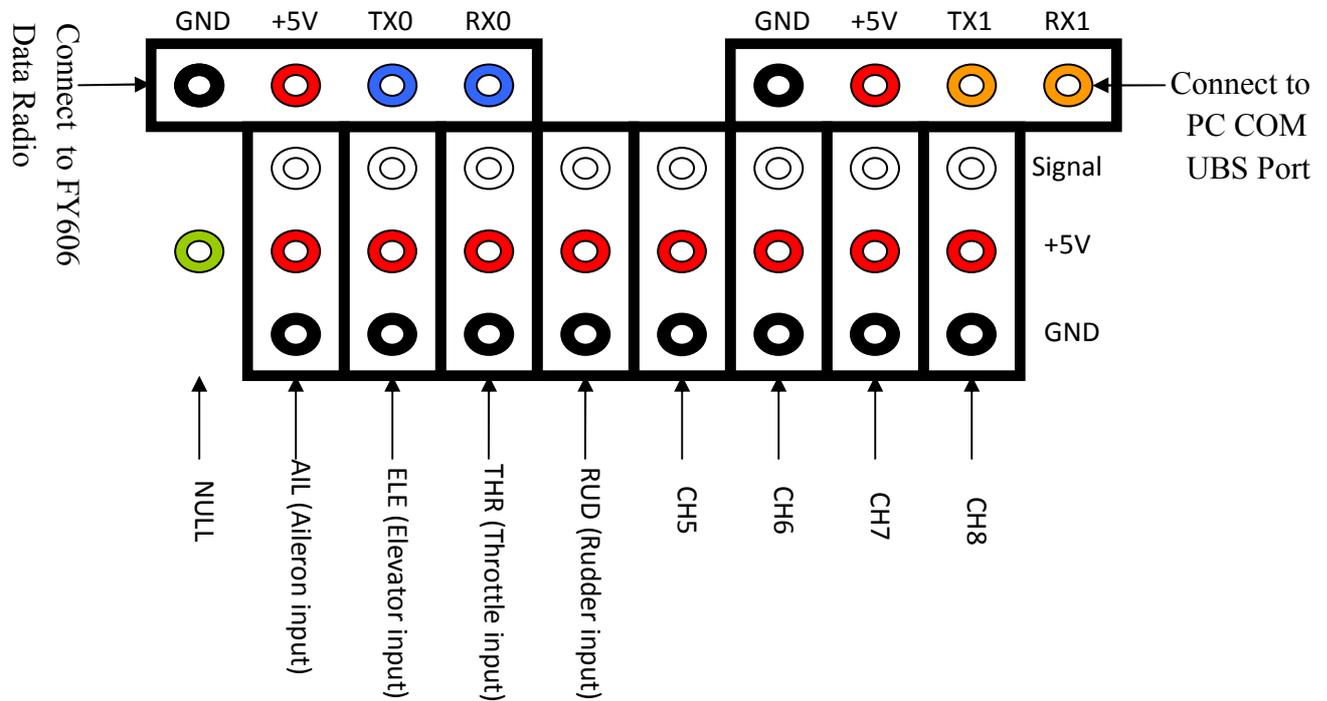
FY-3ZT Remote Adapter Board

1. By coupling the FY-3ZT Adapter between the FY606 and your GCS computer, bi-directional digital signals can be displayed, downloaded and instantly played back.

2. Flight data (e.g flight path, flight parameters, circling point, etc) and all telemetric data is captured and stored into your computer.

3. FY-3ZT remote adapter board consists of Receiver port, Data Radio port and USB TTL port:

EXAMPLE OF GROUND CONTROL STATION (GCS) SET UP

FY606 Data Radio

FY-GCS Software

FY-3ZT Autopilot Remote Adapter

BEC minimum 3A power supply

Remove UBS red wire if BEC is used

Minimum: 7 channel Receiver

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Remove Red wire
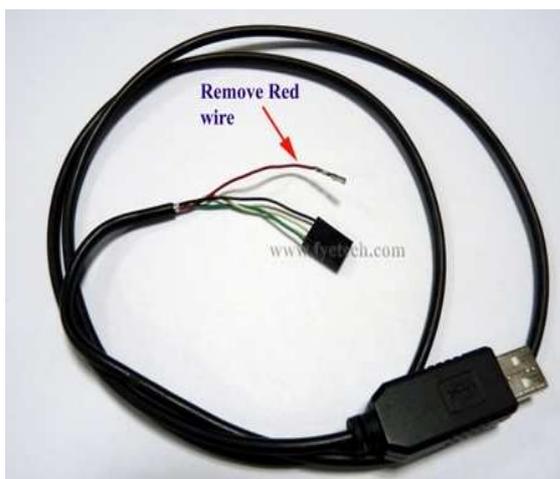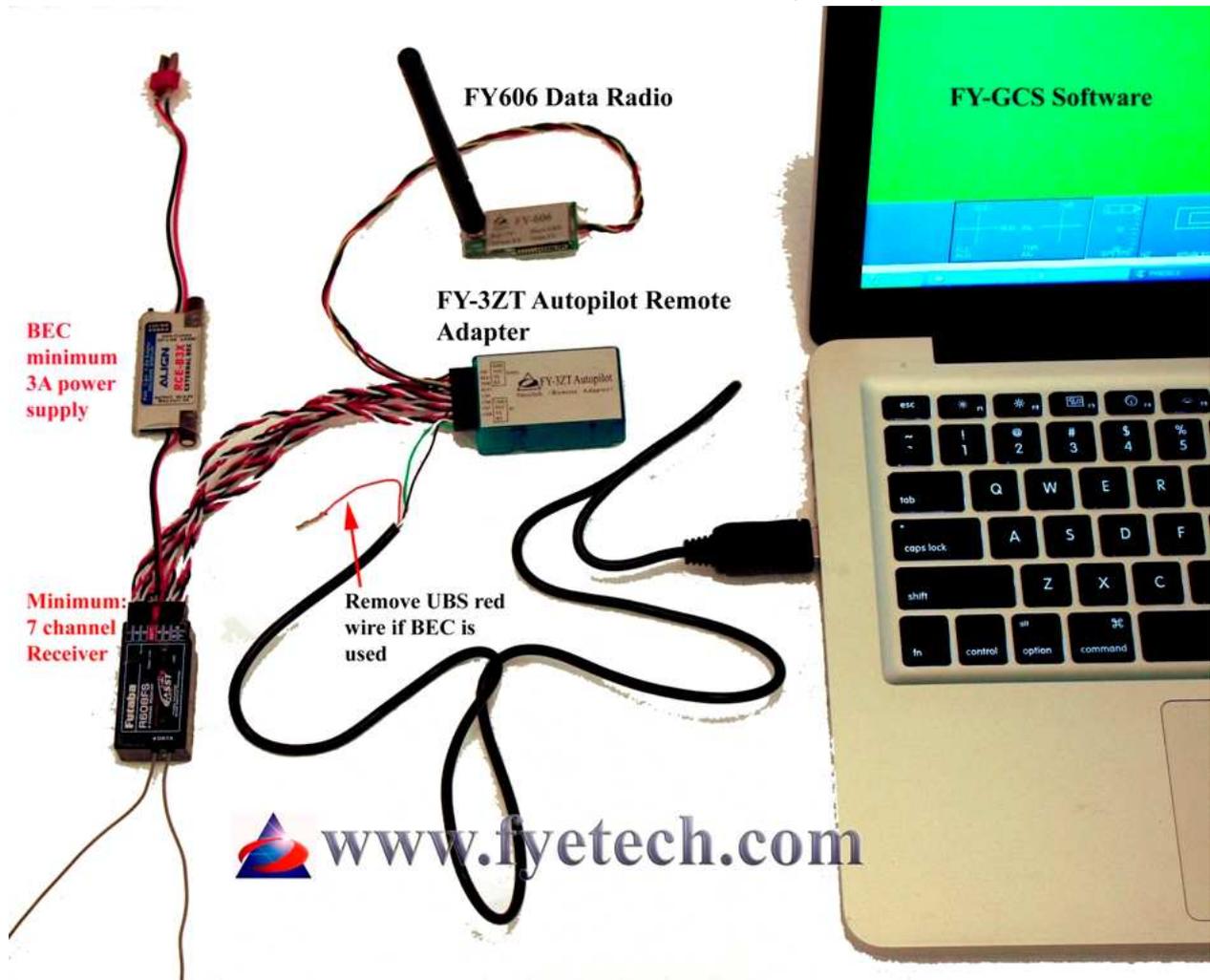
Reminder: Due to the large power consumption of the RC Receiver, Remote Adapter and Data Radio transmitter, we highly recommend that you use a separate 5 volt battery or Lipo-BEC setup as shown in the example above.

WARNING: To use a separate battery supply, you MUST disconnect the red wire as show in the picture at left (arrow). Failure to do this can result in damage to your computer or the RC-Remote Adapter system.

GROUND CONTROL STATION (GCS) SET UP DIA...

FY-3ZT Remoter Adapter

FY606 data radio

USB -- TTL

RC Reciever
The receiver has at least 7 channels, two channels with 3-position switch or slider.

AIL
ELE
THR
RUD
CH5
CH6
CH7

5V supply battery or BEC with 3A output

Note: Please always disconnect the red wire from the USB cable plug when an external power source is used instead of from the computer.
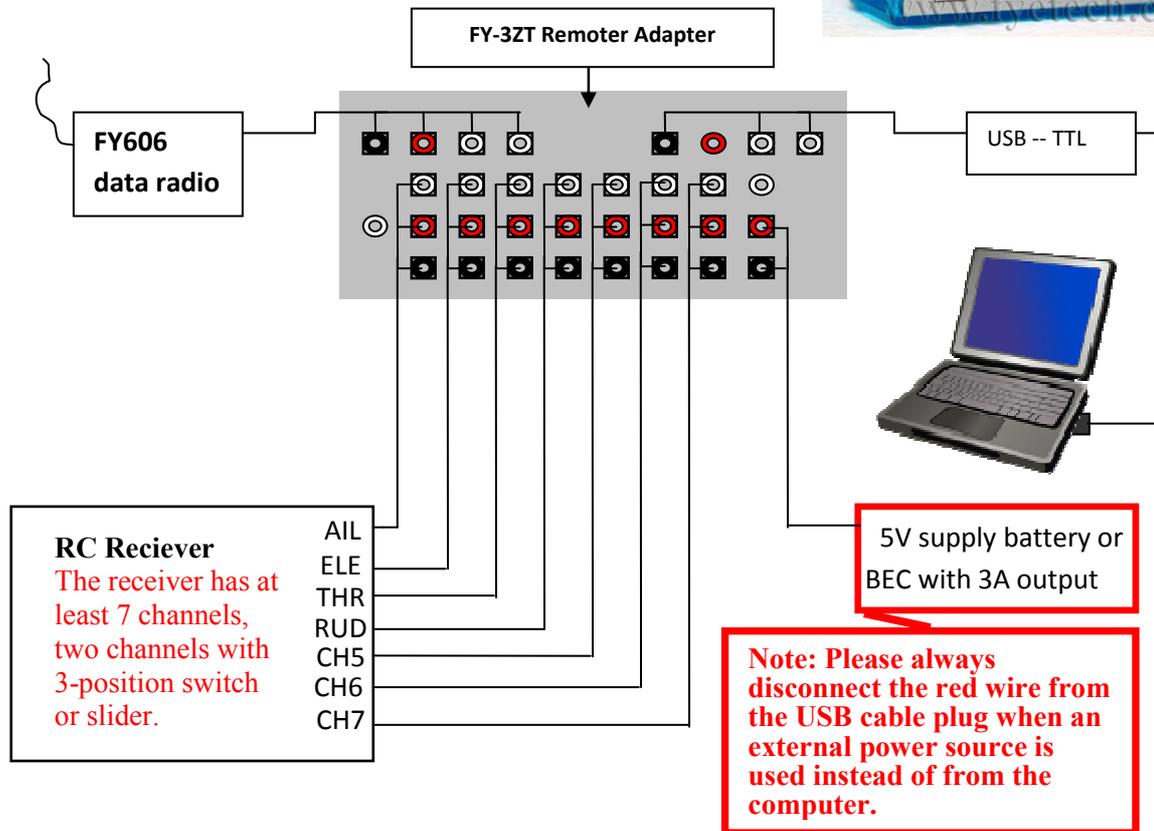
Auxiliary Channel Assignment:

Channel 5 = *3 position switch* will control **Switch IN1** of the FY21AP attitude stabilization flight modes;
- Mode 1 - Stabilization Deactivated,
- Mode 2 (stabilized flight) and,
- Mode 3: (Fixed Altitude Flight Mode).

Channel 6 = *3 position switch* will control **Switch IN2** of the FY21AP Autopilot Modes;
- Autopilot Mode 1 (Deactivated)
- Autopilot Mode 2 (Return to Base)
- Autopilot Mode 3 (Auto circling)

Channel 7 = *Two position switch* for switching between RC Transmitter control or GCS control of the aircraft.

Channel 8 = Can be used to power the system via 5 volt Battery or BEC with 3A current output.

EXAMPLE OF ON BOARD SYSTEM SETUP
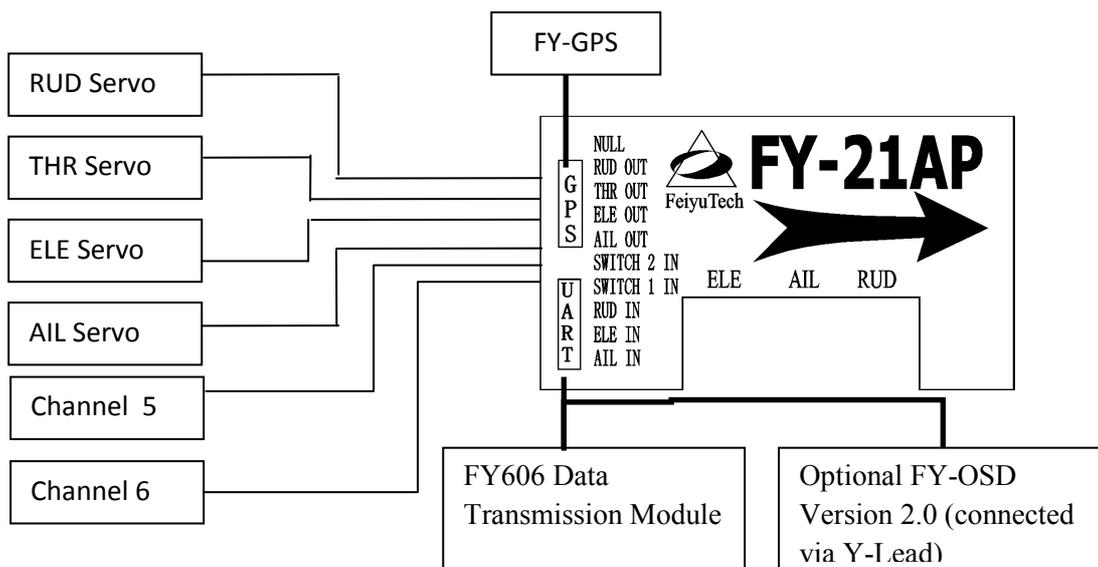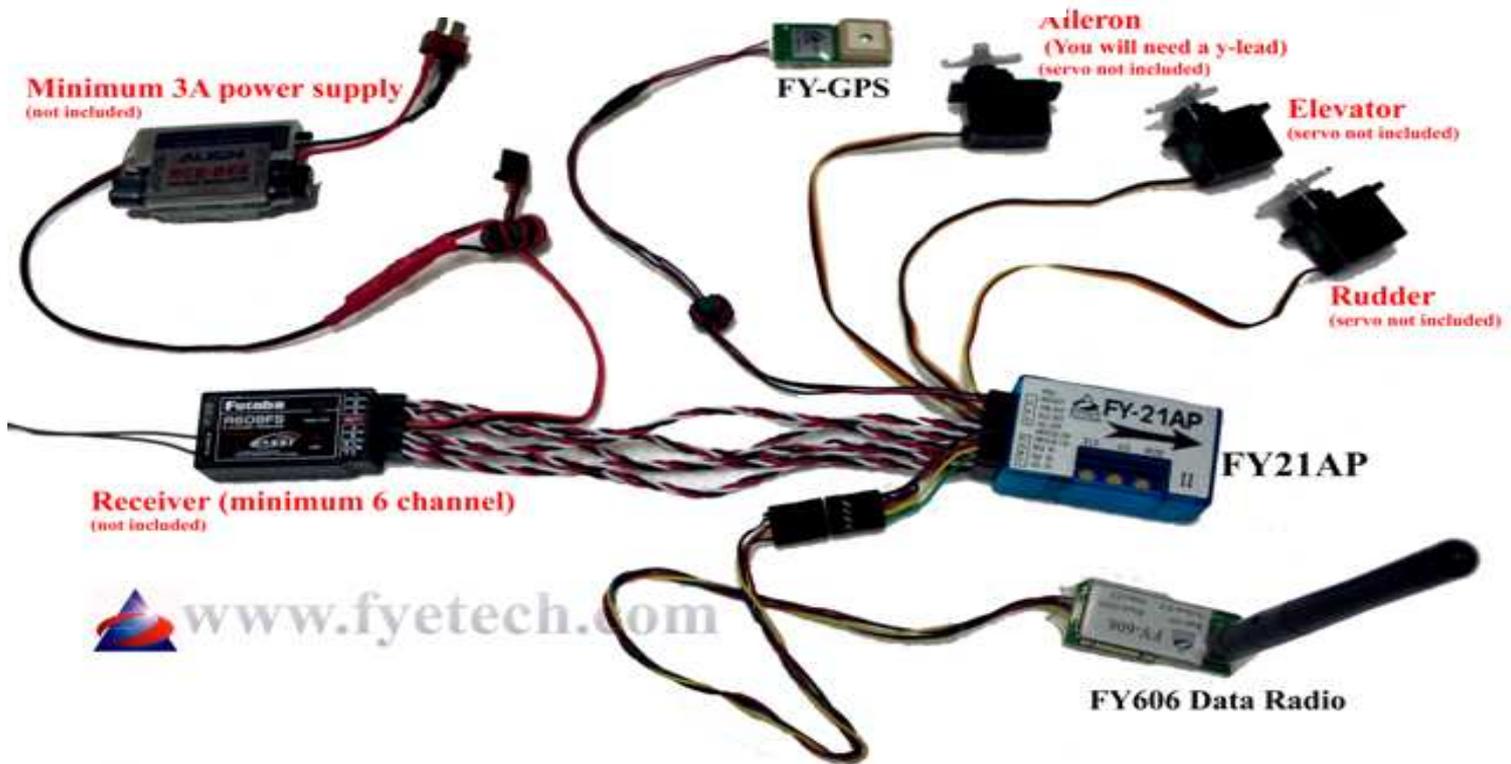
Channel 5 = to **Switch IN1** of the FY21AP for attitude stabilization flight mode control.

Channel 6 = to **Switch IN2** of the FY21AP for Autopilot Modes control.

Important Notes:
- You must have at least 3A stable current BEC or use Receiver Battery to power the on-board system.
- If you have an FY-OSD version 2.0, you will need a seven channel RC Receiver. Channel 7 is to turn part of the FY-OSD display ON or OFF.

FY-GCS: Ground Control 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) with auto circling by the click of your mouse (one point at a 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.

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:
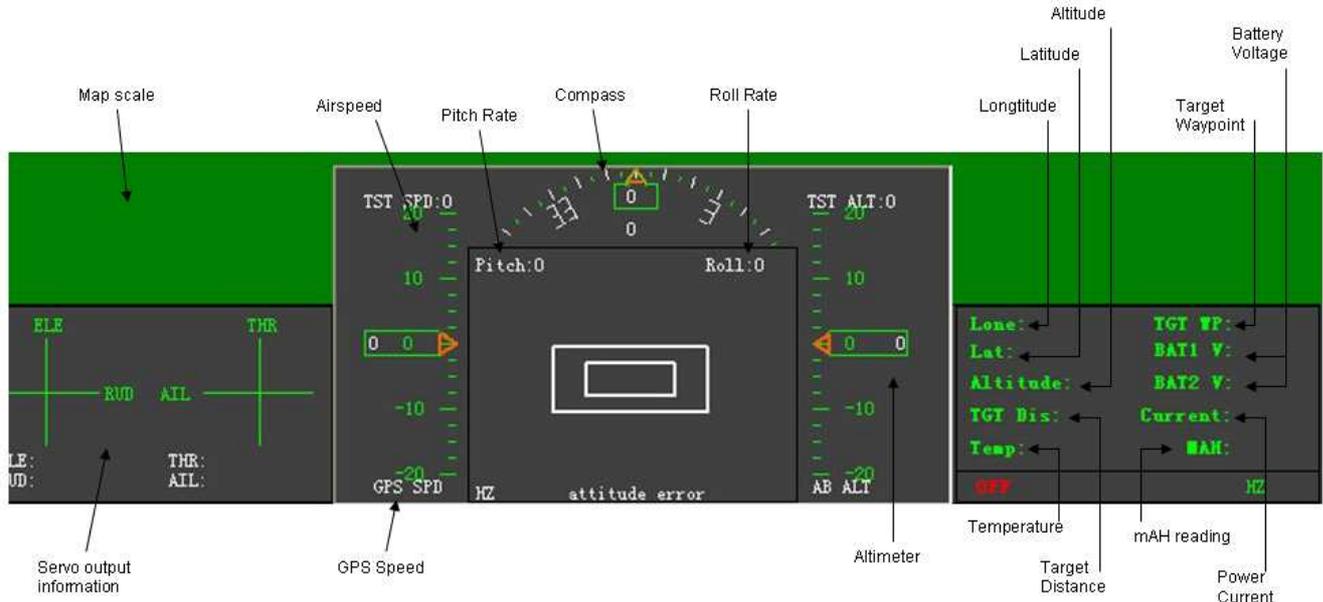
1. **Flight Attitude Instrument:** Displays the current pitch and roll angle of the aircraft.

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).

5. The solid triangle indicates the current course of the aircraft.

6. The orange double-triangle indicates the current target flight path.

Software Connecting Instruction
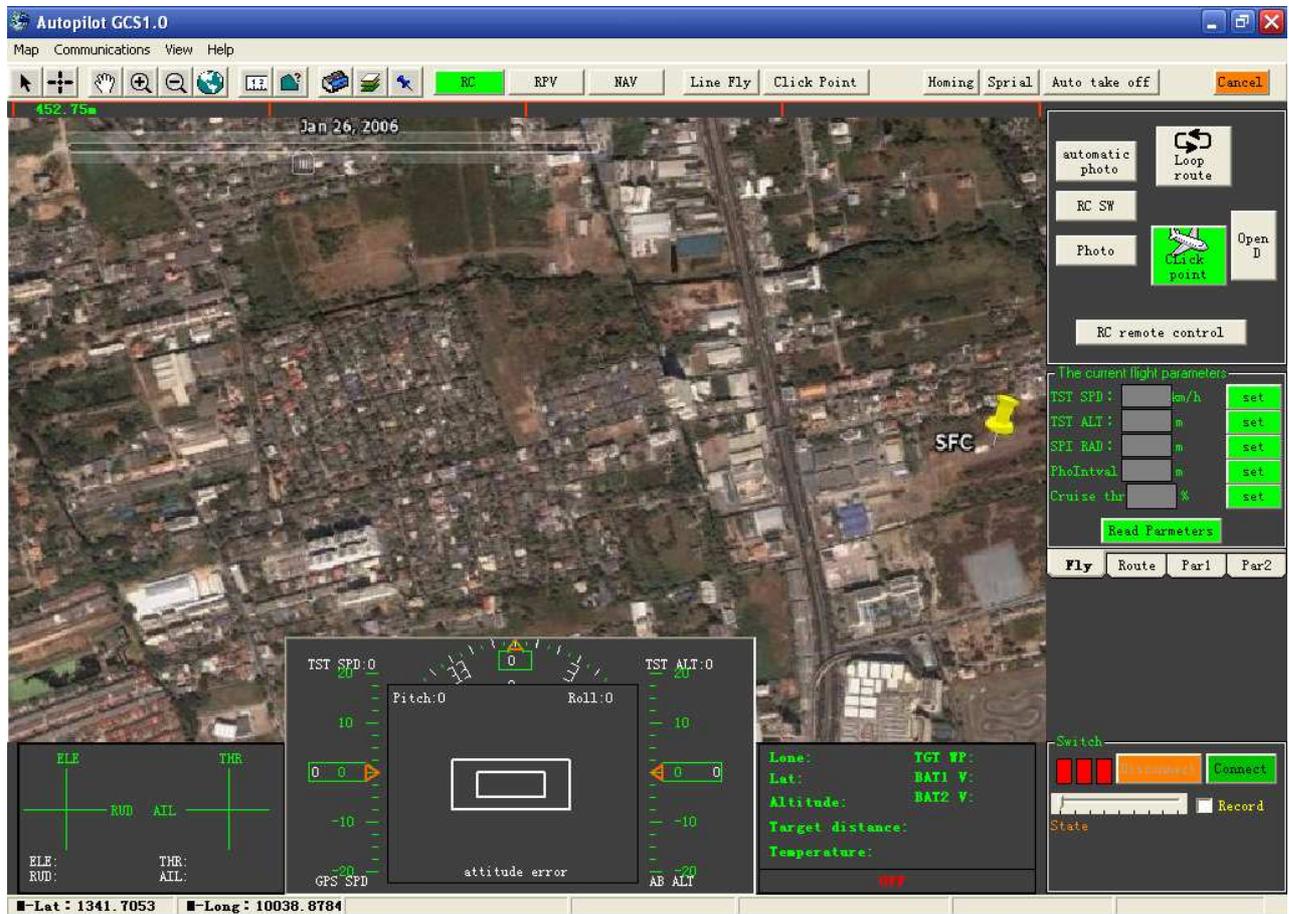
Once the hardware has been setup and installed flight data (e.g. Flight Tracking, Flight Parameters, etc) and conducting automated circling at selected point (one point at one time) can be monitored via FY21AP's Ground Station Software.

Basic function procedures

1. At the "MAP" menu bar —"Open map", select MapInfo MapX Geoset file with the file extension type .GST, and then click "Open" to load up to the main map interface.

2. At the "Communication" menu bar — Select "Port", select a port that is connected to data radio (e.g COM1). Then, through menu bar "Communication" again — Select "Baud rate " and select 19200 .

3. Locate the switch at the right bottom corner on the software interface, click "connect" button will bring up the "save track log" file dialog box, you must then enter the track you wanted to save to a location and file name (it is recommended that you use the current

date or named, such as track date: 20100801-1.txt), and then click on "Save", the ground station software will start to communicate with FY-21AP and start recording telemetry data to the log files.

4. Once connection established successfully, the ground station software will display the flight path, flight attitude and flight parameters and etc.

RC and Data Radio remote control description

1. FY-21AP is directly connected to either the RC Transmitter or Data Radio system.

2. Default setting is RC Receiver Control mode.

3. To switch between RC Transmitter control and Data Radio control, use the two position switch on your RC Transmitter. The GCS display will confirm which control system is active:
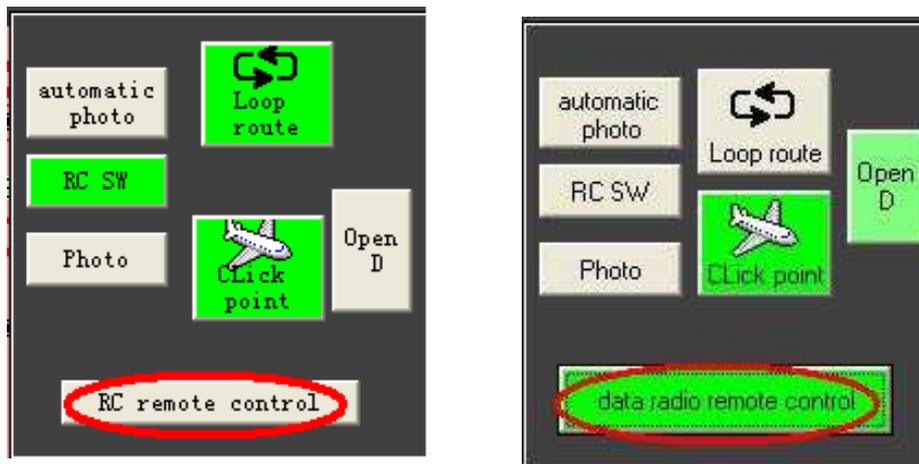
4. If during the Data Radio Remote Control mode the digital communication is disconnected between FY-21AP and Ground Station for over 10 seconds, the FY21AP's RTB (Return to base) will automatically be activated, and your plane will make a turn back to you.

AUTO-CIRCLING AND "CLICKPOINT"

The following is the procedure to activate auto circling via the GCS software and Google Earth Map.

1. Your aircraft is already in the air and in stabilized mode. You can activate autopilot Mode 3 (stabilization active with fixed altitude) via Channel 5.

2. Surrender your aircraft control to the Data Radio Remote Control (use your RC Transmitter switch Channel 7). You should see this (arrow):
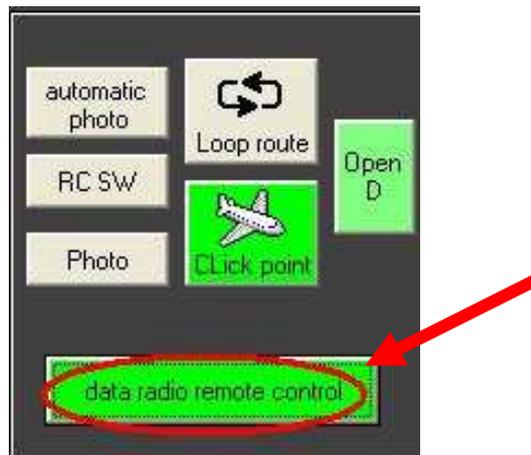
3. Now the aircraft is under Data Radio Remote Control. All instructions from your transmitter is sent via the FY606 and FY3ZT interface.

4. To start selecting the point for auto circling on the Google Map, use your mouse and click on the "CLick point" button (arrow):

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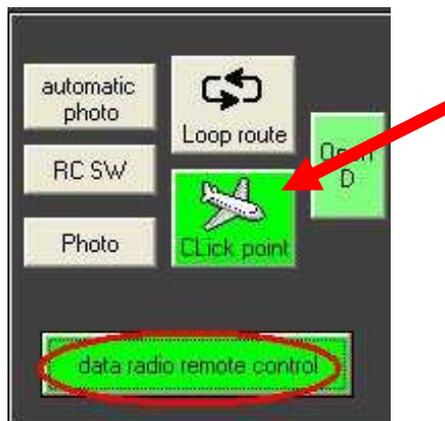
5. Go to the Map and click to the point where you wish the plane will fly to and auto circle.
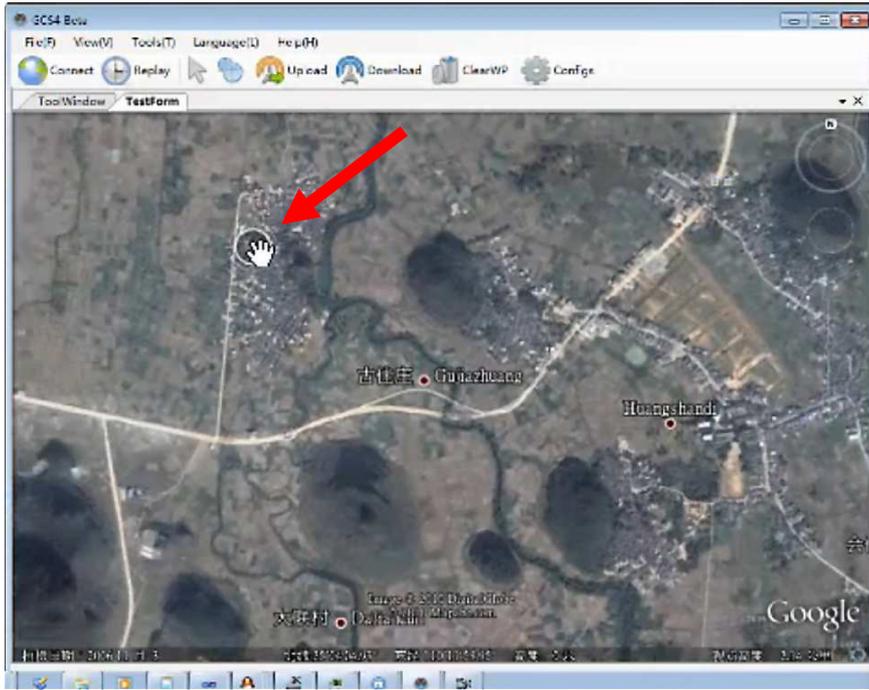
Point of auto circling successfully selected (arrow):
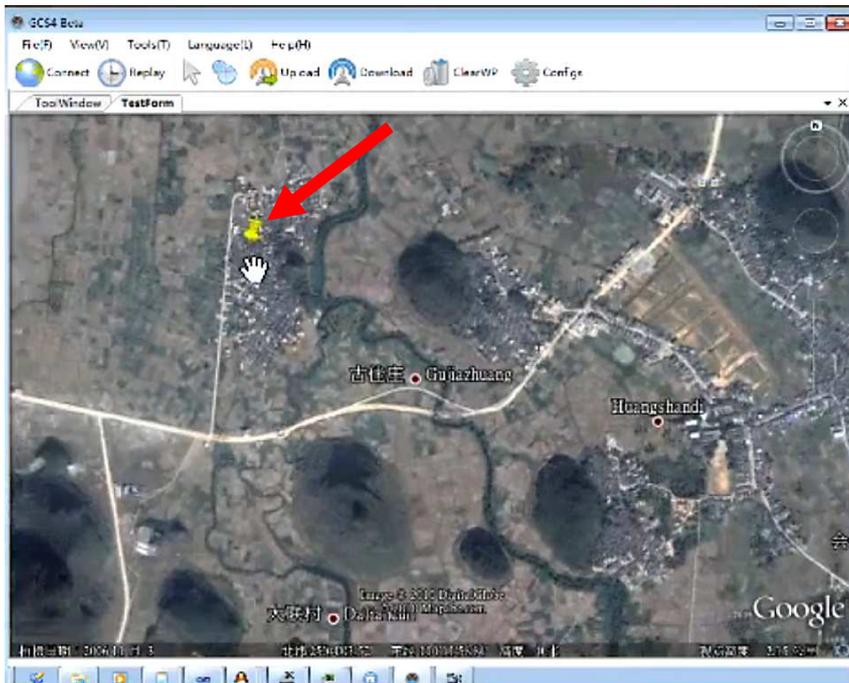
6. At any time, you may change the point to fly to by clicking on "CLick point" again, and selecting another point on the map.

7. After the plane reaches the selected point, it will automatically engage auto circling with a radius of 120 meters and at a fixed altitude.

8. To exit auto-circling, you may choose any one of these options:

    a. Select another point to go to on the map. Just press "CLick point" again and select the point on which you wish the plane fly to on the map.

    b. Or, you may disengage Data Radio Remote Control via your Channel 7, regain RC Transmitter control and manually fly the plane home.

    c. Or you may activate Autopilot Return to Base (Mode 2) via Channel 6 and the plane will automatically return to you.

WARNING: THROTTLE CHANNEL CONTROL OPTIONS

1. You have two options concerning Throttle channel control:

   (a) Connect the Throttle ESC plug directly into your onboard RC Receiver. The Data Radio system does not play any part of the throttle channel control.

   (b) Connect the Throttle Channel of your Ground Station RC Receiver to the FY3ZT adapter board. Also connect your on-board ESC signal plug to the FY21AP "THR OUT" channel. In this option, all throttle input control will be from the 606 Data Radio system.

The implication for Option (a):

   I. The range of you throttle control is dependent on the range of your RC Transmitter.

   II. In case of RC link failure (e.g. out of range), your on-board RC Receiver **failsafe** for Throttle Channel can be activated. It is important to have throttle failsafe to prevent aircraft stalling during the Return to Home (RTH) procedure (see **Stall Warning** in FY21AP manual).

   III. No data transmission delay for Throttle control as when the FY606 Data Radio is used.

The implication of Option (b):

   i. The range of your throttle control is dependent on the range of the FY606 Data Radio transmitter. (An advantage if our existing RC Transmitter range is less than 4 km).

   ii. *Disadvantage*: In case of FY606 Data Radio link failure, no failsafe signal is sent to the throttle channel. Your plane motor will be deactivated and your plane may stall during the RTH procedure.

Adjustable Parameters via GCS

The remote control will have some slight delay to control the plane due to the receiver signal that send from the control adapter boards to FY-21AP just only 10Hz of transmitting frequency as default. Higher refresh rate can be achieved by using high performance full-duplex data radio. As a result, frequency can be raised up to 50Hz

To change the frequency, go to "Communication" – "RC Data" and select the appropriate refresh rate.

Please be aware that the higher the fresh rate, the more stress on the data communication channel. 30Hz is the preferable refresh rate.
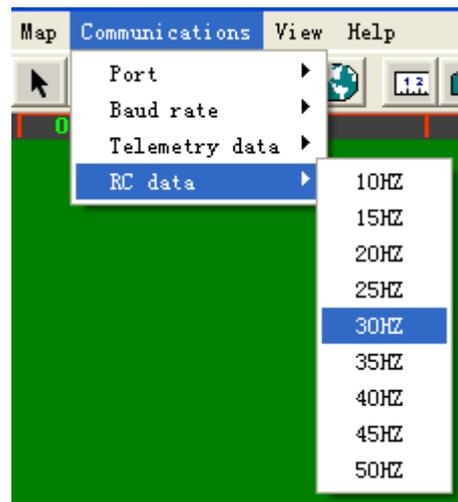
FY-21AP REMOTE DATA DOWNLOADING FREQUENCY ADJUSTMENT

1. FY21-AP flight data such as longitude, latitude, altitude, airspeed, heading course, position and flight status can be downloaded through data radio. The default data frequency is 10Hz. Please be aware that the higher the fresh rate, the more stress on the data communication channel.

2. 2 Hz is the preferable refresh rate. To change the frequency, go to "Communication" – "Telemetry data" and select the appropriate refresh rate.
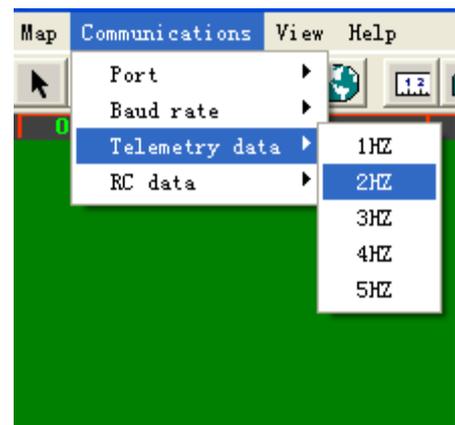
3. *Note: When FY606 in use, the following frequency is preferable. Choose 2-4Hz for "Telemetry" and 15-30Hz for "RC Data".*

4. For FY602 Data radio, choose 1-2Hz for "Telemetry" and 10-15Hz for "RC Data".

5. *Always note that transmission signal may possibly reduce when higher refresh rate is used. This shortens your flight range.*

Telemetry frequency can be raise more than 5Hz to enhance OSD overlaying refresh rate. This can be done after you have disconnected all cable from the computer, including FY21-AP's TX1 and other transmitting unit RX.

FINAL NOTE:

Please be aware that this manual is still very much a Draft. The final version will be published soon.