

Set-up of FlySky FS-i6 Transmitter (Tx) and FS-iA6B Receiver (Rx)

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Background

These notes are written to help the beginner set-up the FlySky Tx/Rx system to operate with the DF yacht.

The FlySky FS-i6 system operates under the Digital Proportional Protocol using an Automatic Frequency Hopping Digital System to avoid frequency clashes with other users. It is a pulse digital system on carrier frequencies unique to a particular transmitter. The manufacturer claims there is no risk of interference from another transmitter.

Why I Bought the FlySky TX/Rx System

1. It is used by most DF owners.
2. Low cost for excellent functionality.
3. Minimal risk of interference from other sources.
4. Using its built-in telemetry capability, the condition of both batteries is displayed on Tx monitor. Visual and audible alarms for Rx battery can be set.
5. Expo (exponential) and or proportional control can be used on rudder and winch movements.
6. The same Tx can be used with up to 20 Receivers (different boats).

Compatibility

The FlySky Tx will only operate with a FlySky Rx of which there are several types – FSi6A is a circuit board wrapped in cardboard and exposed to water and is not suitable for a marine environment. The FSi6B has a hard plastic case for better protection. The Turnigy and Park Fly products appear to be FlySky re-badged?

FlySky Product Range

The DF65 requires only a two channel Tx to control rudder and sail winch.
The FS-i6 is a 6 channel controller (the FS-i6X provides 10 channels which is not necessary)
The supplied Rx is the FS-iA6B with 7 ports and for neatness the three cables (battery switch, rudder and sail winch) plug-in vertically from the end with the black/brown cable on the bottom.

Instruction Manual

A 32-page Instruction Manual is available from the web. Search “**FlySky FS-i6 manual**”. These notes should be read alongside the manual which is incomplete; some functionality is not explained. There are several of videos about the FlySky system used with RC yachts available on YouTube. Most others relate to control of model aircraft. Search on “FS-i6/rc yachts”.

Waterproofing

The Tx should not be used in the rain without a waterproof cover (mitt). Mount as high as possible in the hull and keep the inside of the hull dry. Remove the small screws and spray with a corrosion inhibitor)

Switching Sequence

It is recommended that a particular switching sequence be observed, which is: Tx ON, Rx ON: Rx OFF, Tx OFF. This is a safety sequence for aircraft and is not essential here. After turning on the Tx, return the sail winch gimbal to the central position to avoid over sheeting the winch and damaging the hull or fittings.

FlySky Operational Range

The operational range of the FS-i6 is dependent on the condition of batteries, the environment and the orientation of both Rx antenna and how the Tx is held. The Rx has two antenna that should be mounted at a right angle on the underside of the deck or as high as possible. Unless there is electromagnetic interference, or signal attenuation from external sources (metal yacht masts, other Wi-Fi systems etc), range should never be a limiting factor (the range for aircraft is over 2 km). Line-of-sight transmission is always important.

LCD Brightness

LCD brightness can be controlled using [System setup/LCD brightness](#) . Might be useful when operating in bright sunlight.

Screen Saver

If the Tx is not used for a short period of time the screen brightness will fade, and an audible alarm will sound. The alarm can be switched off and the brightness restored by pressing any button. This can be changed by upgrading the software. Search YouTube for “FlySkyi6 Upgrade” videos.

Binding

As explained above, each Tx has a unique ID, and the matching Rx must be programmed to process only those signals from the master transmitter.

Flysky state that the supplied Tx/Rx combination is already “bound” but you may wish to operate two or more Rx from the one Tx in different boats. Hence the need for further “binding.”

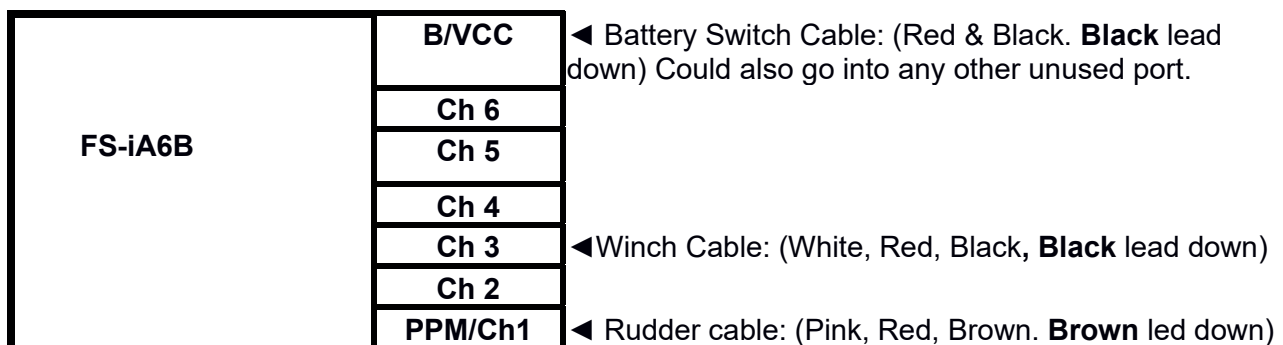
To bind a second Rx, you must first select a new model no. This is explained below.

Both the Instruction Manual and YouTube tutorials are clear enough as to how binding is done. Follow the sequence exactly.

Binding Procedure

1. Rx should be adjacent Tx.
2. Insert battery in Tx but do not switch on.
3. Insert black binding plug into B/VCC port 6 on Rx.
4. Insert Rx battery into any port (Ch1-Ch5). Red LED will flash indicating the Rx is not bound.
5. Hold down **BIND KEY** on Tx and switch on Tx - labelled **POWER**.
6. Release **BIND KEY** when binding is complete. The Red LED will remain steady.
7. Switch off both devices.
8. Remove the binding plug.
9. Remove Rx battery lead and insert in Rx B/VCC port.
10. Switch on both devices in the correct sequence. Red LED will be steady.

FS-iA6B Receiver Connections



Note that labels shown on Rx do not exactly align with ports below.

Number of Models

Additional Rx can be purchased and assigned a new model number using **System setup/Model select**. The binding procedure must follow for each new model number. The model can then be given its own name and be loaded with its own unique settings.

Settings - General

FS-i6 Tx has six channels and therefore offers six controls that usually are required to operate aircraft. Only two are required for the DF yachts – to control rudder and sail winch. These two controls are variously referred to as the gimbals or control sticks. Most sailors use the left-hand stick (up & down) to control the sail winch and the right-hand stick (left & right) to control the rudder. These can be reversed using the **Sticks** mode in **System setup** menu. Additionally, the rudder control can be reversed so that it operates like a tiller. Select **Ch 1** (rudder) and **Reverse** in menu.

There are four buttons on the Tx that are used to navigate through the menu and establish winch and rudder settings. The menu is arranged in a hierarchical structure. The four buttons and their function are:

- OK** Press to activate the displayed screen so that setting changes can be made. To select **MENU** a long **OK** is required.
- CANCEL** Short **CANCEL** to cancel any changes and exit the screen. Default screen will be the screen at the next level.
Hold the **CANCEL** button for a longer period to **save** any changes to the current setting/s. (I know, it doesn't make sense!!)
- UP** Change the displayed or selected parameter upwards
- DOWN** Change the displayed or selected parameter downwards

It is helpful to navigate through the menu to become familiar with the use of the buttons and the range of settings. Use a Model No. that is not in use. Alternatively, Exit the screen with a short **CANCEL** to ensure any changes made are not saved. A long **CANCEL** will save the changes.

FlySky Menu

The MENUs are selected by switching on Power and holding down **OK**. Two choices become available: **System setup** and **Functions setup**. Toggle between these using **UP/DOWN** buttons. Exit progressively to main display at any time by Short **CANCEL**.

Selecting Model

The example below shows the steps required to assign your DF65 A+ rig to Model 10 in FS-i6 system

	Action	Result on Screen
1	Power up Tx	Main screen
2	Long OK	MENU <ul style="list-style-type: none">• System (Crown icon)• setup (Spanner icon)
3	Using UP/DOWN buttons select "System"	System icon boxed

	Action	Result on Screen
4	Short OK to select this SYSTEM MENU	SYSTEM <input type="checkbox"/> Model select Model name Type select etc.
5	If necessary, use UP/DOWN buttons to select Model select	SYSTEM <input type="checkbox"/> Model select Model name Type select etc.
6	If necessary, use UP/DOWN buttons to select required mode	Model select <input type="checkbox"/> Model 10 Flysky 10 Aircraft icon
7	Short CANCEL to exit next screen	SYSTEM <input type="checkbox"/> Model select Model name Type select etc.
8	Long OK to select and use UP/DOWN buttons to select Model name	SYSTEM Model select <input type="checkbox"/> Model name Type select etc.
9	Short OK to select	
10	Using cursor, and OK button, type model name e.g. "DF65 A+"	Model Name Model 10 DF65 A+ Alphabet
11	Exit to upper level with short CANCEL and select "Type select"	MENU Model select DF65 A+ <input type="checkbox"/> Type select
12	Short OK to select Type of Aircraft	MENU Model select Model name <input type="checkbox"/> Type select
13	Use UP/DOWN buttons to select Airplane or Glider	
14	Short OK to select Airplane Or Glider	Type select Model 10 DF65 A+ <input type="checkbox"/> Airplane or <input type="checkbox"/> Glider Aircraft icon

	Action	Result on Screen
15	Long CANCEL to save and several short CANCELs to exit to Main Menu	Main screen

Tx Battery

For convenience use four 1.5v AA alkaline no-rechargeable cells, or four 1.2v NiMH 2500mAh AA rechargeable cells giving a nominal 4.8v output. Both have similar capacity in terms of mAh. When the rechargeable NiMH cell is used, the voltage shown on the LCD screen would be typically Tx.V1:4.8v. Additionally the number of bars in a screen battery icon provides a quick visual reference.

Note that the Tx Product Specification shows a power source of four 1.5v AA Alkaline cells. Thus, when 4x1.2v NiMH cells are used the visual indication shows the reduced voltage i.e., fewer bars. The Tx battery voltage does not have to be set and there are no alarms available.

Alternatively, the TX may be adapted to fit a LiFe battery for higher voltage power (6.6 volts) and higher mAh for longer usage – typically 4-6 hours depending on Tx use, boat trim and weather conditions

It is strongly recommended that Tx battery be recharged after every outing.

Rx Battery

Use a 2S (meaning 2 cells in series) 850mAh LiFe (LiFePO₄) rechargeable battery with a nominal output of 6.6v (2 x 3.3v) when fully charged.

The DF Class Rules require a minimum Rx battery weight of 45g. Glue a washer or coin to the battery to bring it up to the minimum weight, if required.

The battery is usually mounted on the keel box with Velcro in the DF65, and this will require a 15cm battery extension cable. Since there are two cells in series it is important the charger has the capability to give a balanced charge to equalise the voltage in each cell.

Using **System setup/Rx Setup/Rx Battery** the FlySky6 allows the user to setup the following Rx battery voltages:

High: If LiFe battery is used, set to 6.6v. The Rx battery charge status will be reflected in the number of bars shown in the battery icon. This is a quick reference guide to the battery condition. The actual Rx voltage will also be shown digitally in the screen below.

Alarm: Set this to a voltage at which you would like to initiate an audible low battery voltage alarm, say 5.2v. Time to recover boat and replace battery.

Low: Set this to a voltage 4.9v. Anything less than about 4.6v will cause battery damage, loss of signal and boat control.

It is strongly recommended that the Rx battery be recharged after every outing.

RXL Pane

The lower part of the LCD display shows the RXL pane which shows:

IntV1:6.6v (Rx voltage from an Internal source)

Tx.V1: 4.8v (Tx voltage)

Signal Strength

Signal Strength

A typical reading is **Err1:1%**. This is the percentage loss of signal strength - the higher the percentage number, the weaker the signal strength.

Failsafe

Use **System setup/Rx Setup/Failsafe** to preset the fail-safe setting when control is lost. This is a useful function to avoid the boat sailing away. Set a permanent rudder deflection and eased sheets when there is a loss of signal from Rx battery failure or interference.

Setting Rudder End Points

A rudder angle of no more than 35 degrees is recommended to minimise speed loss. Higher angles will mean the rudder acts as brake. (This can be useful in pre-start manoeuvres when you want to stop close to the start line).

Select **Function setup/Endpoints/Ch1** on Tx.

- Position hull so that physical mid-point and 35 deg. markings can be seen (these should be applied during assembly).
- Place steering stalk fully to starboard and using **Up/Down** controls to move rudder until aligned with 35 deg. mark.
- Repeat for port side.

If the display reaches the maximum setting of 120 % before the 35 degrees. mark is reached, then an increased rudder throw may be achieved (but not recommended) by repositioning the connection point on the rudder arm towards the rudder fulcrum. The existing hole on the arm will have to be enlarged to accomplish this. It may be necessary to bend the connection rod to ensure it does not come in contact with the hull opening in the black rubber bellows. The bellows may have to be temporarily removed to check this.

Setting Sail Winch End Points

The winch line travel should be about 115mm. Change the number of turns on the drum to locate the main sheet clip at the back of the main hatch opening when fully sheeted in.

Alternatively, undo the retaining screw on the winch drum and rotate in the desired direction. Slightly ease bowsies to ensure the winch servo does not become over tightened, then Power-up, and sheet-in. Set the close-hauled position for both booms using their bowsies. Hold the hull horizontally and ensure both booms fall under gravity. The fully eased point of both booms can be adjusted using **Function setup/Endpoints/Ch3/Up-Down** so that the main is at about 80 deg. and jib about 85 deg. In very windy conditions it may be appropriate to reduce the sail load to prevent nosediving by either easing both booms well beyond their normal settings or haul them in. This can be done by manual winch control or using SwA to invoke Sports mode. See later explanation.

Rudder Mid-Point Trim and Weather Helm

It is not uncommon for the yacht to sail to windward perfectly balanced (i.e., no rudder adjustment necessary) on one tack but to have a marked tendency to round-up on the other tack i.e., weather helm. This may be due to asymmetrical sheet settings, and this should be checked, particularly the position of main sheet bridle on both tacks. It may also be due to the rudder being slightly off centre. This mid-point can be reset during racing by the rudder trim tab below the stick. When used, the audible tone indicates the direction of movement and the mid position. Alternatively, when not racing the rudder mid-point can be set using **Functions setup/Subtrim/Ch 1** and the **UP/DOWN** buttons.

Rudder Movement - Rate

In its factory setting, rudder movements are linear. i.e. a 50% movement of the stick to the right will result in a 50% movement of the rudder to the right, within the pre-set range.

There are two ways of controlling the relationship between stick movement and rudder movement. The first is **Rate**, the other is **Expo**. They can be used alone or together. The impact of the setting is shown graphically in the LCD display.

When **Rate** is used, a default setting of 100 will result in a full rudder throw. So, if the **End point** has been set at 35 deg. a full stick movement will result in a rudder movement of 35 deg. If a rate of

50 is used the rudder will move halfway or 17.5 deg. A rate of 50 and a 50% stick movement will result in a rudder movement of $0.5 \times 0.5 \times 35 = 9$ deg.

In effect, use **Rate** to de-sensitise stick movement in a linear way over the entire stick range. This can be useful when running downwind in strong winds, or when even very slight rudder movements can have a dramatic effect on direction.

Rudder Movement - Expo (exponential)

Expo is the other way of controlling the relationship between stick and rudder. **Rate** and **Expo** can both be used to control rudder movement. A second set of **Rate/Expo** settings can be used using Switch A (SWA) to invoke the **Sports** mode. More later.

With the use of **Expo**, the stick/rudder relationship changes from linear to proportional. For example, with **Expo**, a 50% stick movement to the right (or left) might result in only a 30% rudder movement – depends on the **Expo** setting. More rudder movement leads to proportionally higher response.

The extent of **Expo** applied is a matter of personal preference.

So, both **Rate** and **Expo** alter the default linear curve to one that either is less sensitive (positive expo) or more likely, more sensitive (negative expo) around the middle range. When using **Expo**, a typical starting point might be 30%. - depends on whether **Rate** is also used.

Rudder Movement Using Sport mode

Use Switch A (SWA) to invoke the **Sports** mode to provide a second **Rate/Expo** setting. Only one set of **End points** can be used.

How to Set Dual rate/Exp. For Alternative Rudder Control

Power-up Tx/Rx

- Select model number as described above
- Using the **Function setup** menu, and short **OK**, index through to **Dual rate/expo**. Select with **OK**
- Short **OK** and if necessary, index to **Ch1** (Rudder is selected)
- Throw Switch A (down) and **Sport** will be displayed
- Set-up **Rate** using **Up/Down** buttons. Index to **Expo** and again using **Up/Down** buttons select an **Expo** setting.
- Long **CANCEL** to save.

Experimentation on the water should give an indication of the optimal rudder settings for **sport** mode. Depends on its intended use.

Control of Winch in a Gust – Use of Throttle curve

In a gust it is better to ease sheets rather than use the rudder to counter the inevitable rounding-up. With fine motor skills, sheets can be fractionally eased at any time however it is suggested that a desensitised winch may be appropriate. This can be set-up using **Throttle ease** and Switch B (SWB). The curve should be not dissimilar to that used in the Rudder **Sports** mode. At Position 1 I have used 8%.

Assigning Switches

Strangely, **Switch A** on the left side, controls to right hand gimbal, and **Switch D** on the right controls the left gimbal! This can be swapped to match the gimbals using the **Switch Assign** function in the tools menu.

Back Up of Settings

When using FlySky it is very easy to initiate system changes that don't work and to then forget what has been changed.

It is possible to either reset model settings using System **setup/Model reset** (Manual 7.4) or reset factory settings using **System setup/Factory reset** (Manual 7.12). The manual does not make clear what model setting is being reset.

A safer way would be to establish a dummy model using a unique model number and name. In the event of losing or corrupting the working model the back-up version could be copied to it using the Model Copy function described below.

Model Copy

This function can be used to copy settings from one model to another. Any settings on the target model will be over-written.

To copy, Model 3 to Model 4 say, ensure Model 3 has been selected. This becomes the source model.

Select **System setup/ Model copy**

Select **Target model** and long **CANCEL** to save, then several short **CANCEL**s to return to main screen.

Check settings on target model

Model Reset

As the Manual says “This function will reset selected model settings to default but does not make clear what these default settings are.

The other models will not be affected. May be useful when a set-up is going nowhere and needs a fresh start.

Other FlySky Functions

The FlySky system provides the rich functionality required for model aircraft and many features have no relevance to RC yacht racing. Not described here are **Model name**, **Sticks mode** (useful for changing from wheel operation to tiller operation), **Reverse stick** operation for left-handed sailors, **Display** (mid position and end points of all channels) and **Sub trim**. Refer Manual for more details.

Advanced Settings

There is a “secret” Factory Setting Menu for experienced users. It is accessed by holding both sticks down at 45 degrees to the left before turning Tx on. The menu options are not discussed here, and more information is available by searching YouTube videos.

Questions and feedback would be very welcome.

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