

FC150rft_ET (Engineering Testing) instruction Manual by Dualsky

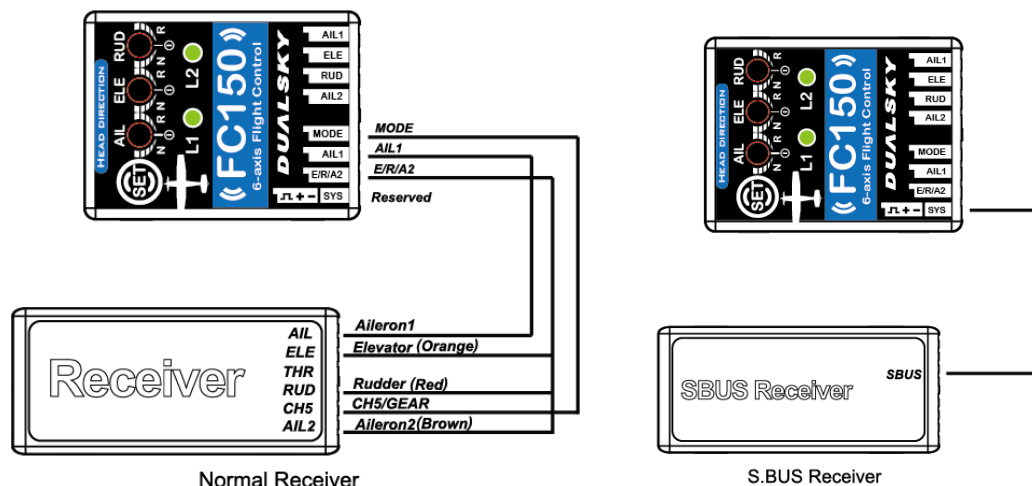
* Before install FC150rft_ET, please test fly your airplane, make sure all channel directions and trims are set to the correct position.

Install instruction

1. FC150 install principal:

- **FC150's heading direction must be the same as airplane heading direction**
- **FC150rft_ET MUST be mounted in line with the flight path perfectly.**
- FC150 should be installed inside of the airplane, close to the receiver and CG
- Install platform must be level, rugged (recommend to use plywood), but do not use servo platform
- Must use the double sided tape comes with FC150, do not use belt, velcro or 3M Dual-Lock
- Do not use foam to cover FC150
- FC150 cannot be touched by servo horn, linkage or other movable parts
- FC150 must stay away from motor, engine, ESC and batteries
- FC150 cannot be installed at the outside of airplane, such as wings or tail

2. Connect the FC150 to receiver as shown below



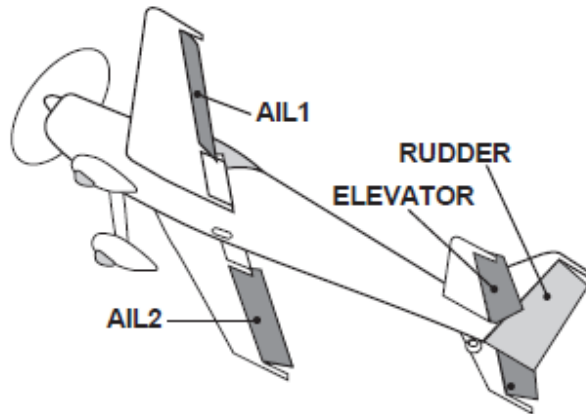
- Input/output signal wires are close to the top of FC150, middle is VDD and bottom is GND
- Input signal supports Futaba S.BUS, only one wire is needed to connect to SYS port on FC150 when using S.BUS link. SYS port has higher priority than other input ports. When SYS port is using, other input ports won't work, transmitter channel sequence must be the same as following chart:

Sequence	CH1	CH2	CH3	CH4	CH5	CH6
Channel	Aileron 1	Elevator	Throttle	Rudder	Mode Switch	Aileron 2

Caution: Futaba and S.BUS is the trademark and technology of Futaba Corp., we don't provide technical support to future incompatibility.

3. FC150 corresponding control surface

- Normal wing type airplane W/ single or double ailerons



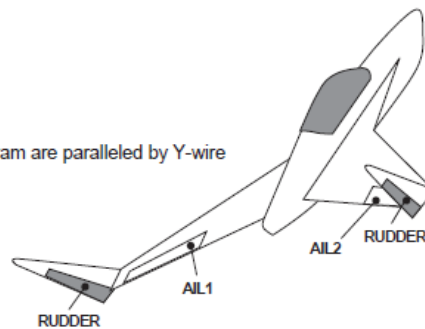
* Diagram show double aileron airplane

Normal Airplane		PIN Location		
		TOP	MIDDLE	BOTTOM
	OUTPUT	Aileron	VDD	GND
		Elevator	VDD	GND
		Rudder	VDD	GND
		Aileron 2	VDD	GND
	INPUT	Switch	VDD	GND
		Aileron	VDD	GND
		Elevator	Rudder	Aileron 2
		S.BUS	VDD	GND

* VDD is positive lead. * GND is negative lead.

- Fly-wing(delta-wing)

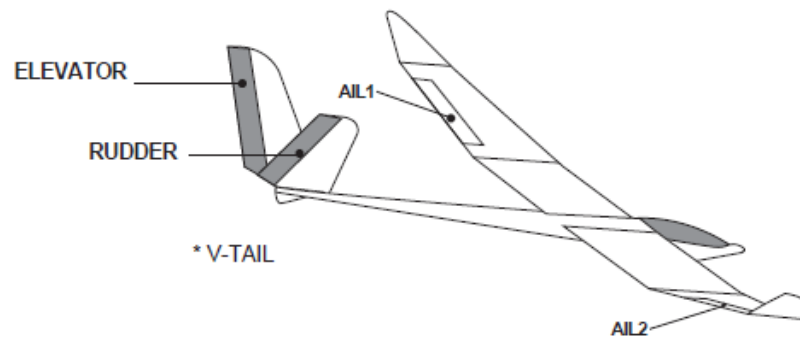
* Fly wing, rudders in diagram are paralleled by Y-wire



Fly-wing/Delta-wing		PIN Location		
		TOP	MIDDLE	BOTTOM
	OUTPUT	Aileron	VDD	GND
		N/A	VDD	GND
		Rudder	VDD	GND
		Aileron 2	VDD	GND
	INPUT	Switch	VDD	GND
		Aileron	VDD	GND
		Elevator	Rudder	N/A
		S.BUS	VDD	GND

* VDD is positive lead. * GND is negative lead.

- V-tail airplane



V-tail Airplane		PIN Location		
		TOP	MIDDLE	BOTTOM
	AIL1	Aileron	VDD	GND
	ELE	Elevator	VDD	GND
	RUD	Rudder	VDD	GND
	AIL2	Aileron 2	VDD	GND
	MODE	Switch	VDD	GND
	AIL1	Aileron	VDD	GND
	E/R/A2	Elevator	Rudder	Aileron 2
	SYS	S.BUS	VDD	GND

* VDD is positive lead. * GND is negative lead.

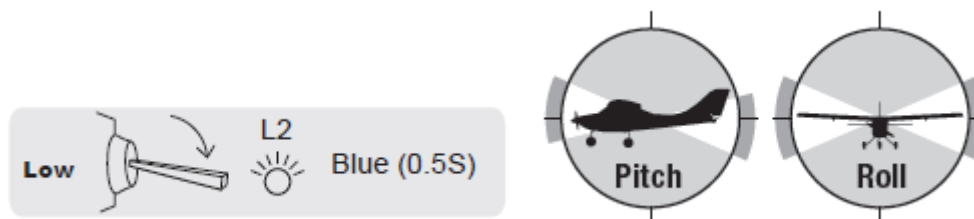
4. FC150 Power Supply

FC150 supports 4.8V-8.4V power input, share same power input with receiver, input power voltage should meet the requirements of receiver, too. Power supply could be battery or ESC.

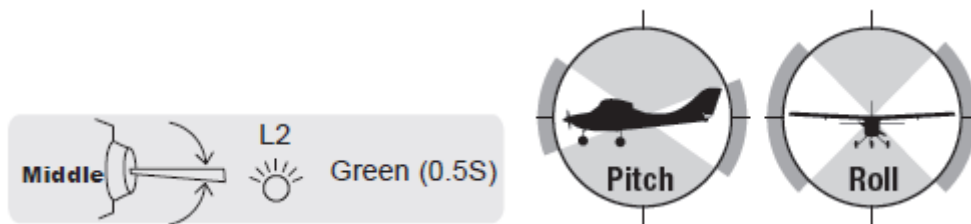
Set mode switch

Connect a switch channel to the Mode/SW port. Then you can switch the flying model with it. Please assign a 3-position switch to mode channel and make sure that channel doesn't have other function. Switch channel pulse width range should be low 1020~1180us, middle 1420~1580us, high 1820~1980us. If the mode channel is not connected, or the positive pulse width of mode channel is out of the range that mentioned above, the FC150 will work in **Beginner mode**.

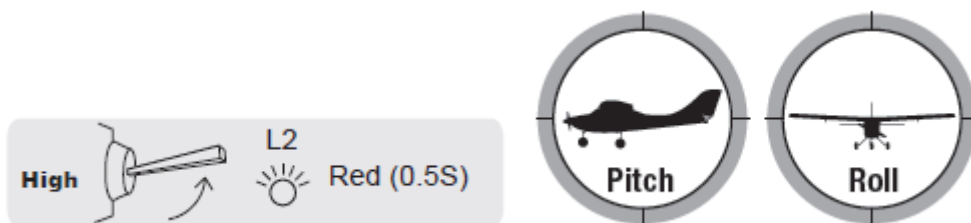
Beginner Mode: position low, self-stability, low rate(small angle limit), roll to pitch mixing.



Advance Mode, position middle, self-stability, high rate(large angle limit).



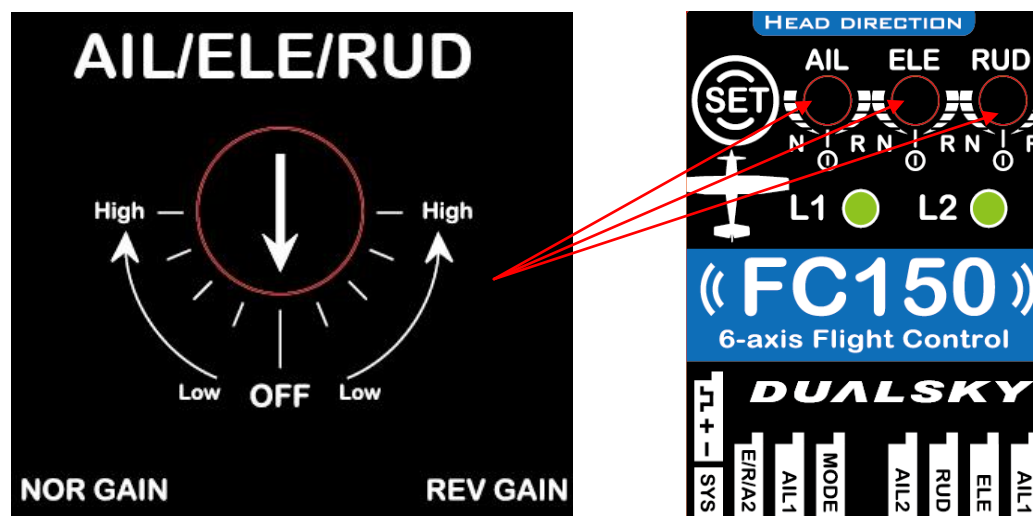
Aerobatic Mode: Position high, 3 axis gyro only, you can do loops and rolls.



NOTE: You may need to reverse mode channel for correct switch operation.

How to setup the gain and correction direction?

There are 3 pots for aileron(roll), elevator(pitch) & rudder(yaw) channel to physically adjust the correction direction and gain setting. Please see the below sketch.



- Correct Gain setting requires test flight to determine, it's recommend to use more conservative Gain (low) during test flight
- Fly in aerobatic mode at safety altitude, accelerate the airplane to its maximum speed, observe if there is oscillation in Pitch, Roll and Yaw axis. If there is oscillation, it indicates the Gain is too high, please slow down the airplane, decreasing the Gain after landing.
- Please do not adjust the Gain too much a time, it's recommend to adjust 2-5 degrees a time
- Gain too low will cause the airplane become blunt, a basic principal is ---- Gain cannot be too low to decrease the maximum travel of control surface.

Ground Test

- Please do a ground test before flight
- Test if the mode switch is working properly. Do not turn on the motor/engine, toggle the mode switch on the transmitter to high position, LED2 will turn RED for 0.5 sec, now FC150 is under Aerobatic mode (Gyro only).
- Test gyro moving direction. Move the model on each axis, corresponded control surface should have excursion the same as moving direction. If moving direction is different, please reverse the pot of that axis.
- Test transmitter moving direction. Move the sticks (except the throttle) to observe if each control surface moving at correct direction.

Trim system

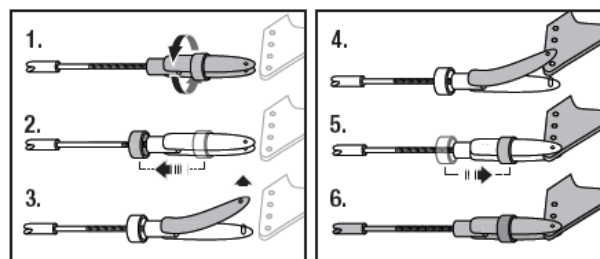
- Please trim model under Beginner/Advanced mode firstly, then trim model under Aerobatic mode.
- Normally, it is not necessary to trim a RTF model under Beginner/Advanced mode.

How to trim the neutral point offset of beginner/advanced mode(New for V2.2 firmware)?

- 1/ Turn on the radio, ZERO the trim/sub-trim in radio.
- 2/ Connect the power to the model.
- 3/ Take off and fly the model in beginner mode(not advanced mode).
- 4/ Don't switch to Advanced or Aerobatic mode during the flight
- 5/ Adjust/Trim neutral point(offset) of accelerometer if model don't fly horizontally.
- 6/ Record the offset after landing. Note: don't turn off the model or radio.
- 7/ Fast toggle the mode switch until the LED1 turn off, then turn on in bule. The offset will be saved automatically.
- 8/ Fast toggle the mode switch to save and quit. // Canceled
- 9/ The offset of accelerometer is recorded by FC150rtf_ET.
- 10/ "Zero" the trim of radio, and fly and trim the model in Aerobatic Mode.

How to trim the model under Aerobatic mode

- 1/ We prefer disable FC150, fly and trim model without gyro.
- 2/ If trim is larger than four steps. Zero the trim. Turn the clevis on the linkage to change the length of the linkage between the servo arm and the control horn.

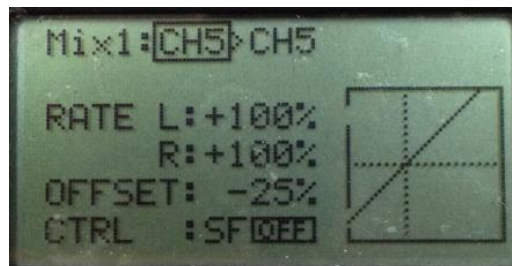


- 3/ Enable FC150.

4/ The new neutral point of Aerobatic mode will not take effect in Beginner or Advance model after FC150 is restarted. FC150 will map sub-trim to neutral point of accelerometer under Beginner/Advanced mode.

Recovery mode (new for V2.35 firmware)

Setup a "Recovery Mode" with transmitter. When "Recovery" switch is triggered in any flight mode, the airplane will roll wings level and pull out of a dive.



Programming Mix Example

Flying Mode	Positive pulse width of Mode Channel
Beginner mode	[1020us, 1180us)
Advanced mode	[1420us, 1580us)
Aerobatic mode	[1820us, 1980us)
Recovery mode	[800us, 1020us)
	[1180us, 1420us)
	[1580us, 1820us)
	[1980us, 2200us)

Note: If the signal width of mode channel is in Recovery mode. The model will return to level flight ASAP. All of the control inputs would be dumped.

Recovery timeout (New for V2.3 firmware)

Recovery mode automatically disengages/stops after 10 seconds(5 seconds for V2.35) of being enabled, user must release and retrigger to get recovery mode to activate again.

Fail Safe Strategy (New for V2.3 firmware)

If no signal inputs when the FC150 powers on, the LED 1 blinks RED, no servo output. You need to reconnect the battery after turn on the TX.

If a channel of FC150 loses the input signal during the flight. The FC150 treats it as the stick back to neutral point. The Gyro and accelerometer still play a role.

FC150 Setting(Programming)

- How to enter Setting Mode: Turn on radio controller, move the throttle to lowest position; turn on power to the model, wait until the L1 LED finishes flashing Green and then changes to RED; Long Press "SET" button(2 sec) to enter Setting Mode. After you enter Setting Mode, L1 displays the corresponding SETTING ITEM menu attributes (color), and L2 displays the corresponding SETTING VALUE menu attribute (color).
- "SET" Button usage:
 - 1) Long Press (more than 2 sec) under flight mode: enter Setting Mode
 - 2) Single Click under Setting Mode: switch between SETTING ITEM
 - 3) Double Click (finish within 0.5 sec) under Setting Mode: change SETTING VALUE
 - 4) Long Press (more than 2 sec) under Setting Mode: Save and Quit to flight mode
- Please check the below chart for all settings

ITEM		VALUE			
LED1(L1)		LED2(L2)			
		Blue(default)	Green	Red	Yellow
1 Blue	Install direction	Face up	Face down	Face right	Face left
2 Green	Stability Mode (In Aerobatic mode)	Aileron - normal Elevator - normal Rudder - normal	Aileron - heading locked Elevator - heading locked Rudder - normal	Aileron - heading locked Elevator - heading locked Rudder - heading locked	
3 Red	Airplane Type	Trainer – Cannot inverted flight	Sport – Can inverted flight		
4 Yellow	Wing Type	Normal	Delta Wing	V-Tail	

NOTE: Some settings will take effect after the FC150 is restarted. Cut the power to the FC150 and reconnect after 5 seconds to apply the new settings

===== Internal usage for technicians of model factory =====

How to read a numerical gain & correction direction of each channel?

We added a universal reading function to the FC150rtf_ET, the correction direction and gain settings will be read from gyro no matter what transmitter you use. We can preset those parameters which are tested with special model into FC150rtf (Ready to Run). Key and Pots are not necessary for FC150 ready to run version.

Enter the reading model:

- 1/ Disconnect the gyro from the model.
- 2/ Hold the set button which is at the top face of gyro.
- 3/ Turn on the gyro with an external power.
- 4/ Release the set button. The gyro will enter the gain reading mode. The 2 LEDs indicate solid blue and solid blue.
- 5/ Connect the ground lead and signal lead of each channel to a oscilloscope. The format of signal is PWM, the same as servo.
- 6/ Give us the number of "ms", that contains the correction of direction and gain value.

Direction of Axis	Gain of Axis
Reverse	1100us(REV,100%) – 1440us(REV, 0%)
Gyro Off	1440us – 1560us
Normal	1560us(NOR, 0%) – 1900us(NOR, 100%)

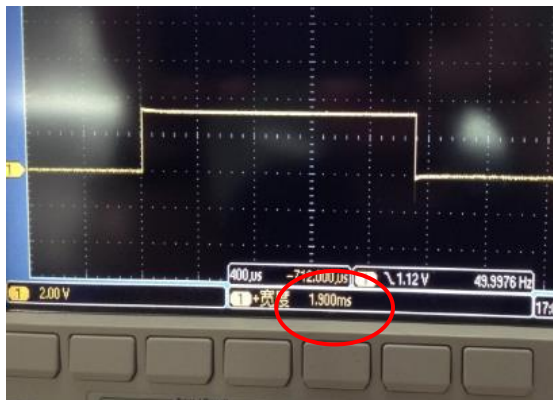
An example of electric powered trainer:



Aileron 1900ms : NOR, 100% Gain



Elevator 1100ms : REV, 100% Gain



Rudder 1900ms : NOR, 100% Gain