

Setting up FrSky S6R and S8R Receivers

Introduction

S6R and S8R receivers from FrSky operate with any transmitter which uses ACCST protocol. This includes Transmitters from FrSky, Jumper, RadioMaster and others. The S6R and S8R receivers are essentially the same, and are programmed in exactly the same way. The S6R has 6 channels and does not have the RSSI or SBUS connectors. Each receiver has a built in three-axis accelerometer and three-axis gyroscope, and can be configured for a conventional model layout, a delta wing or a V-tail configuration. In the conventional model layout, there are four flight modes, stabilization, automatic level, hover and knife-edge. In practice, few if any pilots use the hover or knife-edge modes. The four modes are all switchable from the transmitter, and all can be switched off so the receiver operates as a standard receiver. The delta wing and V-tail configurations only allow stabilization and automatic level. In each mode, gain is controlled by a knob or slider on the transmitter. The quick mode only allows stabilization and automatic level. The receivers are shipped configured with quick mode, and that's all most folks ever want.

At this point, some might be wondering how all this works given the receivers are only 6 or 8 channels. The reality is that all the X and S series receivers are actually 16 channels. The control functions for stabilization use four of these spare channels that are normally only accessed by the S-Bus. Both receivers are telemetry equipped and will automatically send receiver battery voltage and signal strength back to the transmitter together with any sensor data from sensors plugged into the Smart Port. An 8-page set of instruction comes with each of these receivers. However, these instructions can be a little hard to follow. Fortunately, there are folks in the club that can walk you through your first encounter with these stabilization receivers.



There are 2 distinct ways of setting up the stabilized receivers. The first, and more difficult is to use is the computer and program the receiver using an inexpensive tool called the Smart Port

Tool Kit or STK for short, and a program downloaded from the FrSky website. This program is not the easiest to use and sometimes the STK can be difficult to get working on the computer. To overcome this, the thoughtful developers at **OpenTX** have produced two very clear, and frankly much simpler, LUA scripts (think Apps that reside in the Transmitter) that allows the user to fully program either stabilized receiver from the transmitter. These LUA scripts can be run from any FrSky transmitters, I don't know if other brands support LUA. This **How To** will be using **OpenTX** LUA script. During the setting up process it is often necessary to go back to the programming to say, reverse a servo. It is so much simpler to do this wirelessly from the transmitter. **Several of the steps should be completed before installing in the model.**

Step 1. Update the Receiver Firmware.

The first task is to check that the receiver has the latest version of the firmware loaded. In 2017 alone, there were 5 releases of firmware. Sadly, there is no easy way to tell which version is loaded on the receiver; even a brand-new receiver may have been in stock for many months so could have an older version installed. If in doubt install the latest version, just to be sure. From the FrSky website load the latest firmware for the receiver. FrSky has made this a little more confusing by releasing a version-2 of ACCST firmware in December 2019. Receivers that have Version-2 firmware will not work with transmitters having version-1, likewise, receivers with version-1 won't work with new transmitters with version-2. Fortunately, both receivers and transmitters can be upgraded or retrograded to the version of your choice. Version-2 is the preferred version, however upgrading your transmitter requires that all existing receivers are also upgraded. To find the version 1 firmware on the FrSky website you'll need to use the "History firmware **DOWNLOAD** (not compatible with v2.x.x)". Once downloaded, there should be two versions available for each receiver:

 s8rfcc_20171213.frk	 S6RFCC_171204.frk
 s8rlbt_20171213.frk	 S6RLBT_171204.frk

The S6RLBT/s8rlbt is the EU version, the S8RFCC/s8rfcc is the rest of the world version. Do ensure you use the right version for your transmitter setup (FCC in U.S.A.). Now copy this file onto the SD card. Probably the easiest way is to remove the card and pop it in the computer. Copy the file to the folder called **FIRMWARE** and replace the SD card back in the transmitter. Next flash the firmware to the receiver. Flashing the receiver is done using a smart port connection to the transmitter. For more information on flashing receiver see my June article on OpenTX. Various FrSky radios have different locations for this port, and some older Taranis are connected to the pins in the module bay.

Step 2. Bind the Receiver

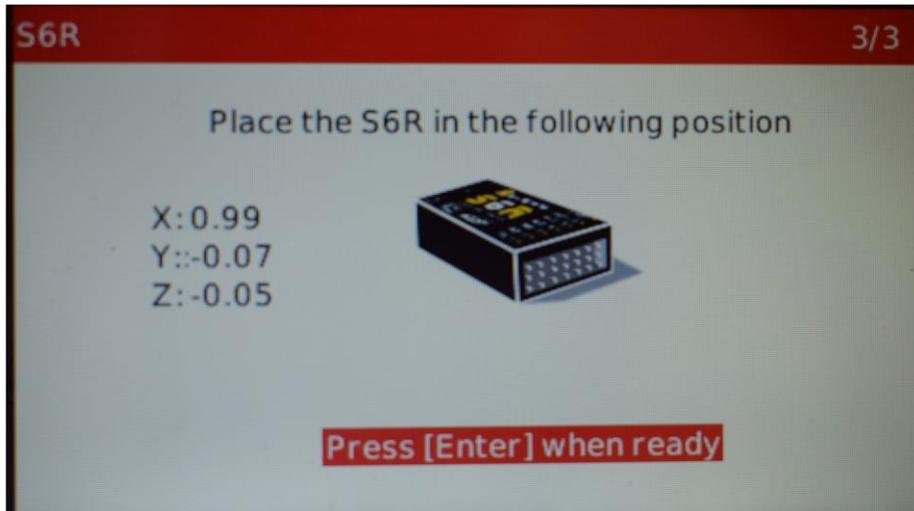
Select the correct model on the transmitter and put the transmitter in bind mode. Next power up the receiver with the F/S button pressed. For the programming following later in this **How To**, when selecting bind mode, select channels 1 to 8, not 9-16. An easy way to power up the receiver is to use a receiver battery with a switch in line. Much easier to then hold down the F/S button with one hand and switch on with the other. When binding, the green light will be on, and the red light will flash. Come out of bind mode on the transmitter and switch the receiver off then on again, and if all is well, the green light should come on.

Step 3. Calibrating the receiver.

The receiver does not need to be physically connected to the transmitter for the next step, all is done wirelessly. With the receiver still on the bench and powered up, select the **SYSTEM** menu on the transmitter and go to the SD card page. Then scroll down and select the SxR folder and you should see the following LUA files:



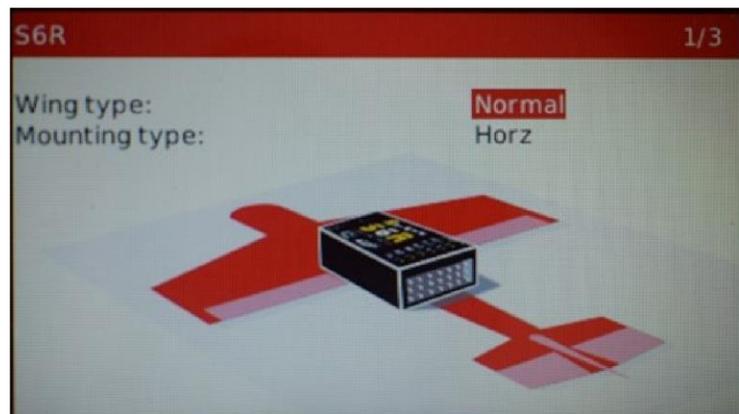
Select **SxR_Calibrate** and execute it. The yellow light should flash whilst each part of the calibrating process is taking place.



Step 4. Setting up the receiver for the model.

This time load the SxR Lua script. The first page selects the wing type and the mounting. Use Page Down to go to the next page.

Finally, the **OpenTX** software needs to be configured to control the stabilisation features. On the setup screen, normally just 8 channels are enabled. This must be changed to 16 channels before anything will work. The instruction sheet is less than helpful in setting up each mode. For stabilisation, the instructions say that channels 10 and 11 should be set to:



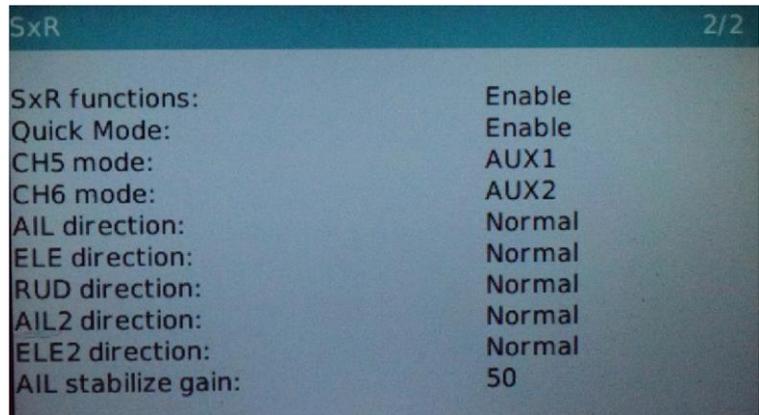
Channel 10 **CH10>M+H**

Channel 11 **M-H<CH11<M+H**

Where M=1500 μ s represents the neutral signal, and H=50 μ s represents the required signal change to activate the change.

To switch stabilization off, channel 10 must have a weight of 0

OpenTX uses a pulse width of $1500\mu\text{s} \pm 512\mu\text{s}$. Thus M has a weight of **0**. For **H** a weight of 75 seems a reasonable figure at the time to be on the safe side, and certainly works. It is not necessary to program all four modes available into the transmitter.



SxR		2/2
SxR functions:	Enable	
Quick Mode:	Enable	
CH5 mode:	AUX1	
CH6 mode:	AUX2	
AIL direction:	Normal	
ELE direction:	Normal	
RUD direction:	Normal	
AIL2 direction:	Normal	
ELE2 direction:	Normal	
AIL stabilize gain:	50	

Thus, a simple program to enable just stabilization and automatic level mode would look like this. First set up three flight modes as shown.

This screenshot shows the configuration for Flight Mode 0 (default). The interface includes tabs for Flight Mode 0 (default), Flight Mode 1 (Off), Flight Mode 2 (Stabilise), Flight Mode 3 (Auto level), Flight Mode 4, and Flight Mode 5. The 'Name' field is set to 'Off', 'Fade In' is 0.0, and 'Switch' is SE↑. The 'Fade Out' is also 0.0. There are two vertical sliders on the left and right sides. The control settings are as follows:

Control	Source	Value
Thr	Use Trim from Flight mode 0	0
Ele	Use Trim from Flight mode 0	2
Rud	Use Trim from Flight mode 0	0
Ail	Use Trim from Flight mode 0	0

This screenshot shows the configuration for Flight Mode 2 (Stabilise). The 'Name' field is set to 'Stabilise', 'Fade In' is 0.0, and 'Switch' is SE-. The 'Fade Out' is 0.0. There are two vertical sliders on the left and right sides. The control settings are as follows:

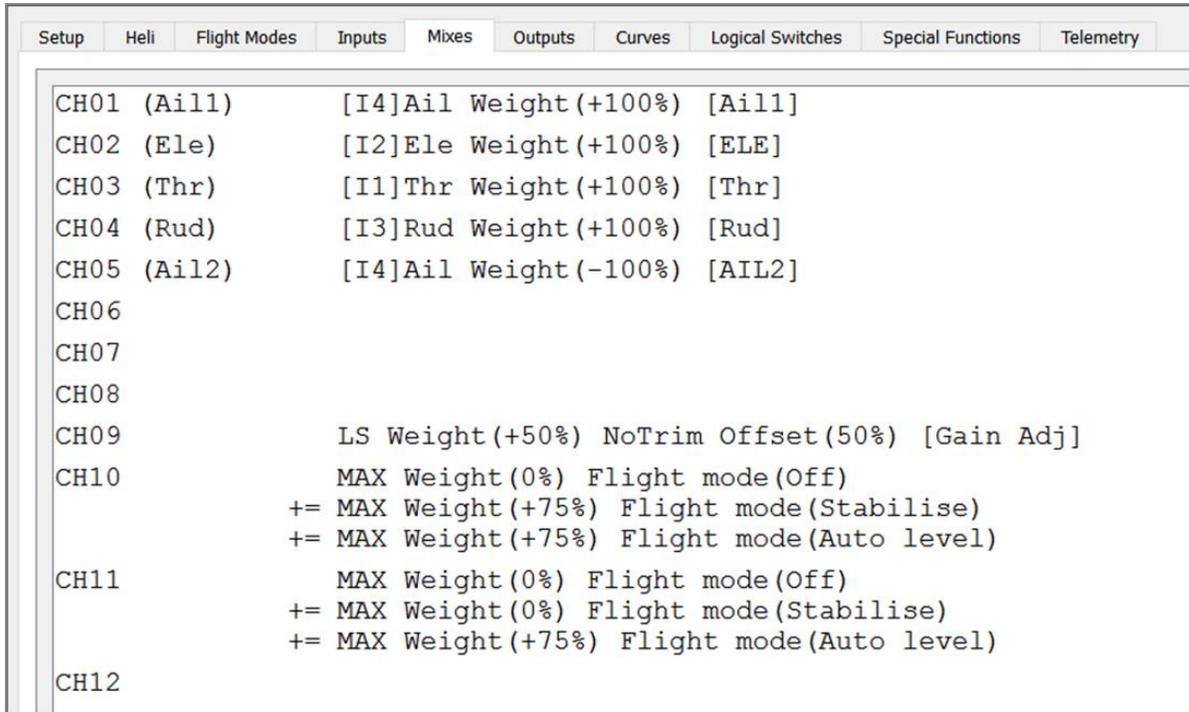
Control	Source	Value
Thr	Use Trim from Flight mode 0	0
Ele	Use Trim from Flight mode 0	14
Rud	Use Trim from Flight mode 0	-2
Ail	Use Trim from Flight mode 0	-25

This screenshot shows the configuration for Flight Mode 3 (Auto level). The 'Name' field is set to 'Auto level', 'Fade In' is 0.0, and 'Switch' is SE↓. The 'Fade Out' is 0.0. There are two vertical sliders on the left and right sides. The control settings are as follows:

Control	Source	Value
Thr	Use Trim from Flight mode 0	0
Ele	Use Trim from Flight mode 0	14
Rud	Use Trim from Flight mode 0	-2
Ail	Use Trim from Flight mode 0	-25

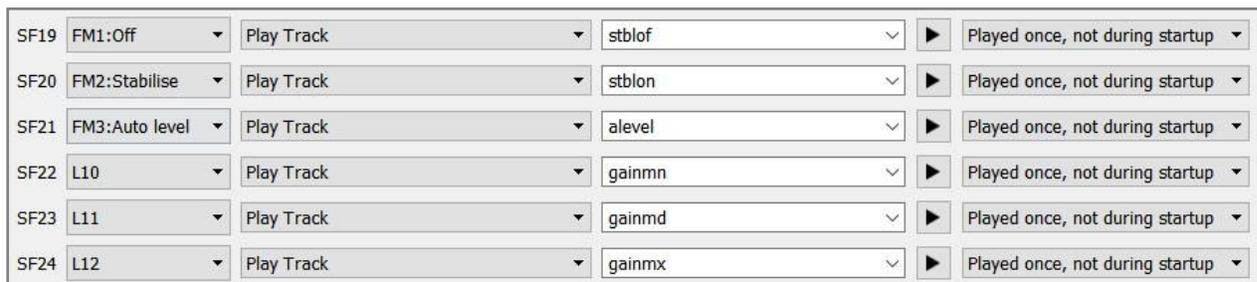
Then the **Mixes** screen needs to set weightings for these three flight modes for channels 10 and 11.

This screenshot shows the **OpenTX Mixes** screen on the **Companion**. Channels 1 to 5 are the



channels used for the plane control surfaces and throttle. Notice here that the inputs for the 5 channels are mixed up, so the throttle on channel 3 takes its input from Input 1. This is because I used an existing model with the channel order set to my own convention, but with the **SxR** receivers I had to use the channels designated on the receiver. Channel 9 uses the left slider on a Taranis/Horus to alter the gain which must have a weight between 0 and 100. Channels 10 and 11 control the two functions.

Sounds can be added in **Special Functions** for the verbal warnings:



Many of these sounds you may have to create yourself. **Gainmn** is gain minimum etc.

Step 5. Final setting up

When installing the receiver in the model, make sure the orientation is the same as set earlier when the receiver was configured. It is also advisable to always try and have the bind button accessible. Once everything is installed in the model and the model is complete with the throws set as desired, there are two further steps that need to be taken:

Check the deflection of each control surface.

Power up the model (without the propeller connected if electric) and switch to auto level mode. In stabilisation mode, the control surfaces should twitch and then return to their normal positions when the plane is moved. In auto level mode, when the model is moved and held in that position the control surfaces will stay in a different position. Thus it is far easier to check their correct movement in auto level mode.

Tilt the plane down, the elevator should move up to correct the dive. Roll the plane to one side and the ailerons should move to correct the roll. Similarly with the rudder. If any deflection is incorrect, use the LUA script to reverse the movement, and then check again.

Perform the self-check.

This check is necessary to attain the auto level angle and gimbal neutral position. Once the selfcheck is initiated, the model must not be moved until complete. There are two ways to undertake the self-check.

Self-check method 1. The bind button

This method is used if the bind button is accessible with the model level and the right way up.

- Ensure the ailerons, rudder and elevator controls are in the neutral position.
- Ensure the model is on a level surface, and press the bind button and release.
- The blue LED will turn on and the self-check process will start.
- Once the self check has finished, the control surfaces will deflect then return to their normal position and the blue LED will turn off.
- After completion, move the sticks from channel 1 to 6 apart from the throttle to their channel limits to complete the set-up.

The receiver will store all the settings after being powered down. It is not necessary to repeat this every flight.

Self-check method 2. Using the transmitter

This method is used if the bind button is not accessible with the model level and the right way up.

- For this method, channel 12 needs programming by adding the following line in the **Mixes Screen**.

```
CH12          MAX Weight(+100%) Switch(!SC-) [Initia]
```

Any 3 position switch can be used, in this example switch C is used. When switch C is in the mid position, it will have a weight of 0, otherwise it will have a weight of 100.

- Ensure the ailerons, rudder and elevator controls are in the neutral position.
- Ensure the model is on a level surface, and move switch C through the mid point 3 times and the self-check will start.
- Once the self-check has finished, the control surfaces will deflect then return to their normal position.
- After completion, move the sticks from channel 1 to 6 apart from the throttle to their channel limits to complete the set-up.

The receiver will store all the settings after being powered down. It is not necessary to repeat this every flight.

A word of caution: It is very important that this switch is not accidentally operated either before a flight or during a flight. Thus it should be disabled after the self-check. There are several ways this can be achieved.

- Delete the channel 12 instruction once the self-check is completed.
- Move the channel 12 line to a channel higher than 16.
- Add a **Special Function** to disable the mixer line:

```
SF33 SC-  Override CH12  100   ON
```

Do remember to ensure the **ON** box is ticked.

Either of the latter two methods are preferred, as sometimes the self-check does need repeating. Months later when it is needed again it is often difficult to remember what was actually programmed in.

The S6R/S8R LED Status:

Green LED	Red LED	Status
ON	Flashing	Binding
Flashing	OFF	Normal
OFF	Flashing	Signal lost
Yellow LED	Status	
ON	Accelerometer module value out of [0.9 G , 1.1 G] / Calibration	
OFF	Accelerometer module value in [0.9 G , 1.1 G]	
Flashing	Complete accelerometer calibration	
Blue LED	Status	
ON	Self-checking	
OFF	Complete self-checking	