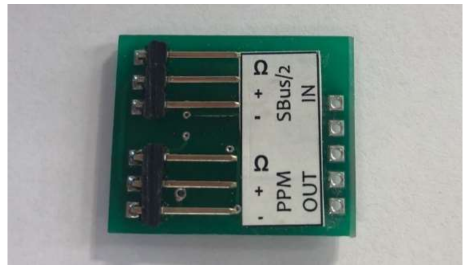
ESC Soft Off and Telemetry Sender V2.2

This device has been developed to solve two problems in F3A aircraft.



1. **ESC Soft Off**

We have noticed that some ESC / Receiver combinations react poorly when the receiver power is switched off while the flight batteries are still connected, resulting in a sudden (but short) kick of the motor. This situation presents some danger to the user, and mechanical stress to the motor and drive. This device resolves this issue, allowing you to turn off the receiver power with the flight batteries still connected. No programming changes to transmitter or ESC are required. Note it is extremely important you test this feature in a controlled environment, and regardless always treat the propeller as live with flight batteries connected.

Quick start hint: If you are only interested in this feature (and not telemetry), simply plug the THROTTLE PWM channel on your receiver into this device's 'SBus/2 Input' and plug the ESC into the 'PWM Out' on this device.

Most people won't run their ESC through this device – it is only there if you have an ESC / receiver combination that results in a motor 'kick' when you turn off the receiver power with the flight batteries still connected.

2. **Telemetry** - Receiver Frame Losses, Fail safes, Signal Quality and Frame Loss Rate

When using the device via SBus2 (and 18 channel FASSTest or T-FHSS), you can receive frame losses, fail safes, receiver signal quality and frame loss rate information on your transmitter – and set warning alarms for these parameters. Further, your ESC can be plugged into the PWM output of the device to use its soft stop feature (by default, the PWM output is set to channel 3 – throttle).

When used on SBus2 FASSTest 12 channel mode, or any SBus mode (with no telemetry), your ESC can be plugged into the PWM output of the device, and smooth stop used. Additionally, the device shows LED indication for failsafe condition, and LED indication for more than 999 frame losses during a flight.

Compatibility

Futaba FASSTest 18ch (or T-FHSS) mode on SBus2: ESC soft off plus frame loss, failsafe, receiver signal quality and frame loss rate telemetry. Receiver in hold LED indication, and greater than 999 frame losses reported by LED following your flight.
Futaba FASSTest 12ch mode on SBus2: ESC soft off. Receiver in hold LED indication, and greater than 999 Frame losses reported by LED following your flight.
Futaba FASSTest SBus (18 or 12ch mode): ESC soft off. Receiver in hold LED indication, and greater than 999 Frame losses reported by LED following your flight.
Futaba PWM: ESC soft off.

TELEMETRY QUICK START GUIDE

To save repeating them here, skip to the last page and read the warnings and legal stuff!

Always have the device plugged into the receiver before turning on receiver power – otherwise the wrong input mode maybe selected.

The device emulates four sensors, with each sensor having a unique ID.

The sensor with the lowest ID emulates a RPM Sensor - and in the transmitter this sensor must be configured as RPM ('magnet' and 'gear ratio = 6.0') for the correct readout of lost frames.

The remaining three sensors each emulate a temperature sensor with incrementing ID. The first (with second lowest ID) displays holds, the second signal quality and the third (with highest ID) lost frame rate.

Default telemetry configuration:
- Slot 28 RPM for lost frames
- Slot 29 Temperature for fail safes
- Slot 30 Temperature for signal quality
- Slot 31 Temperature for lost frame rate

Transmitter configuration

IMPORTANT: Please check your throttle failsafe is set to motor off and remove your propeller(s) for the transmitter off testing below!

1. System type must be FASSTest 18ch or T-FHSS, and the receiver must have a SBus2 port for telemetry to be active.
2. Bind the transmitter and receiver in the usual manner.
3. Confirm you have receiver battery voltage displayed on the transmitter screen (indicates telemetry working). The receiver can now be powered off.
4. Plug the SBus/2 INPUT header of this device into the SBus programming port in the back of your transmitter. You will need a male – male lead to do this (not supplied). Power the device (if required) using the free PWM output port header (careful of polarity!)– please see your transmitter manual – the 18MZ and 16SZ require SBus2 devices to be powered using a 4.8-8.4V battery during programming. The 32MZ does not – it supplies power internally. The device LED should be red indicating SBus programming mode.
5. In your transmitter, go to the sensor menu. Assuming telemetry slots 28, 29, 30, 31 are free simply touch RELOAD – this should load a RPM sensor on slot 28 and Temperature sensors on slots 29, 30, 31. If these slots were not available on the transmitter, please keep reading the full manual before proceeding.
6. Now unplug the sensor from the transmitter and plug the SBus/2 INPUT lead into your receiver SBus2 slot.
7. Next go to the transmitter sensor name menu (18MZ and 32MZ). Rename RPM slot 28 as Lost Frames, temperature slot 29 as Fail Safes, temperature slot 30 as Signal Quality and temperature slot 31 as Lost Frame Rate. If your transmitter does not have this function (16SZ) you will need to remember the slot functions as described above.

8. Next go to the telemetry screen and touch on slot 28 (RPM - lost frames) and configure this sensor as 'magnet' and 'gear ratio = 6.0'. The temperature sensors do not require any configuration.
9. Remember you can go to your 'Home 2' screen on the transmitter and display some sensor data on the Home 2 screen (which also then displays them on the auxiliary screen on the 32MZ).
10. Power on the receiver. The receiver LED should be solid green, and the device should also be solid green LED (indicating it has recognised SBus2).

11. Now go to the telemetry screen and you should see numbers like these:
    - Frame Losses = 0 (no frame losses)
    - Fail Safes = 0 (no fail safes)
    - Signal quality = 3 (good signal quality)
    - Lost Frame Rate = 0 (no rate of frame losses)
12. Next briefly turn your transmitter off then back on (please note the 32MZ takes a long time to turn on – so usually you will have > 999 frame losses with a power cycle – so you may skip directly to step #13). Now the numbers should look something like this:
    - Frame losses say 200 (200 frame losses recorded – they count at a rate of 66/second with the transmitter off)
    - Fail Safes = 1 (one fail safe has been recorded)
    - Signal quality = 3 (good signal quality)
    - Lost Frame Rate = 0 (no rate of frame losses)

    While the transmitter was off, the device has a red LED indicating receiver in fail safe condition.
13. Now turn the transmitter off for > 15 seconds
    - Frame losses say 1300 (1300 frame losses recorded – they count at a rate of 66/second with the transmitter off)
    - Fail Safes = 2 (there have now been two fail safes recorded)
    - Signal quality = 3 (good signal quality)
    - Lost Frame Rate = 0 (no rate of frame losses)

    While the transmitter was off, the device has a red LED indicating receiver in fail safe condition. Now with the transmitter back on, the device red LED will be flashing – indicating > 999 frames losses have been received.
14. Cycle the receiver power to reset the telemetry values.

The data explained

Frame losses – when the receiver does not receiver valid data from the transmitter, it outputs an indication of this state every 1/66 of a second. We note these events, add them together, and send them to the transmitter. 100-300 frame loss events per flight in quite normal. In some models and environments 300-500 may be normal. In our experience few models should experience more than 1000 frame losses in a normal flight. Eventually you can set your own alarm value here. If after ten flights you see an average of 400 frame losses each flight maybe set an alarm for 800. If this alarm triggers it may be an indication of RF interference or something has happened to an antenna in the model, etc. Best to check before flying again. Note that poor transmitter antenna position can also cause increased frame losses.

Fail safes – after receiving no valid date from the transmitter for approximately one second, the receiver enters failsafe condition. When it again receives valid date, it exits fail safe. We note each time the receiver enters failsafe, add them together, and send this value to the transmitter. One fail safe in a flight is really bad. In some models a brief fail safe may not be noticed – but best to set the alarm here to one!

Signal quality – The receiver outputs a signal quality value (0, 1, 2, 3). Zero indicates very poor or no signal. Three indicates good signal. We send this information back to the transmitter in real time. Again, you will learn what is normal for your model and flying environment. But signal qualities of 2-3 are normal, 1 is a bit worrying and 0 is time to panic!
Lost frame rate – this is a value we calculate (rather than passing on a value supplied by the receiver). Zero indicates no lost frame rate (averaged over two seconds). 100 means the receiver has got no valid date over the last two seconds. 50 means the receiver has received half the expected date over the last two seconds. Setting an alarm of 20-30 here may help identify areas of poor RF coverage.

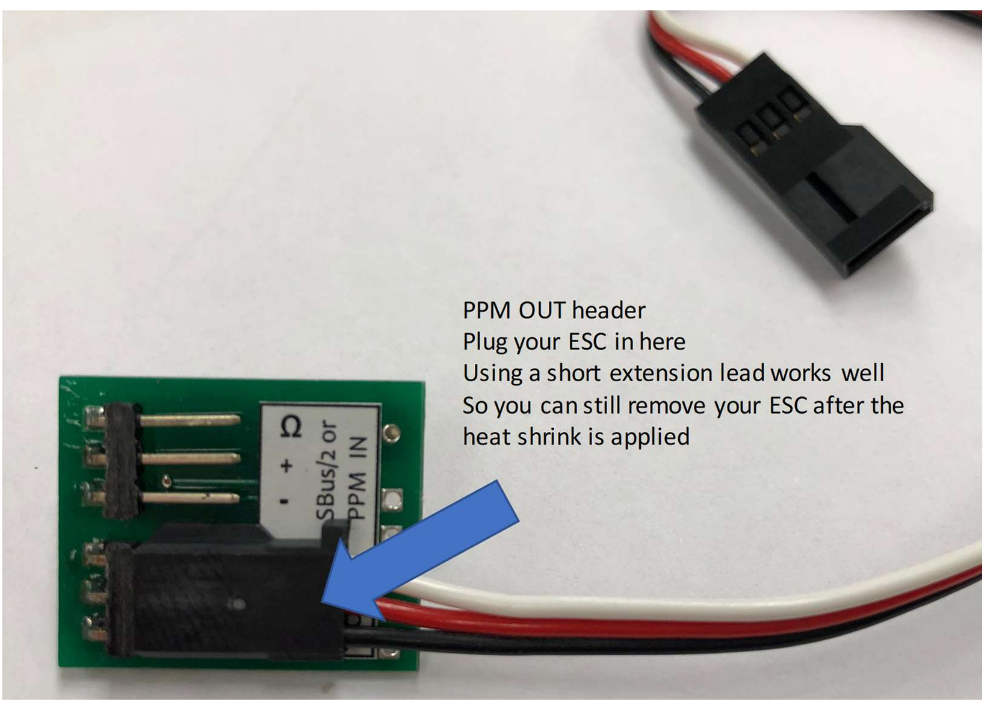
Logging
Insert a SD (or micro SD depending on the transmitter model) card into your transmitter and you can then turn on telemetry logging (please see your transmitter manual). With logging on, you can review data after a flight and perhaps identify parts of the flight where poor RF was experienced (easily indicated by looking for increased lost frame rates and poor signal quality).

That's the short version done! Time you headed out flying! On a rainy day, have a read of the rest…

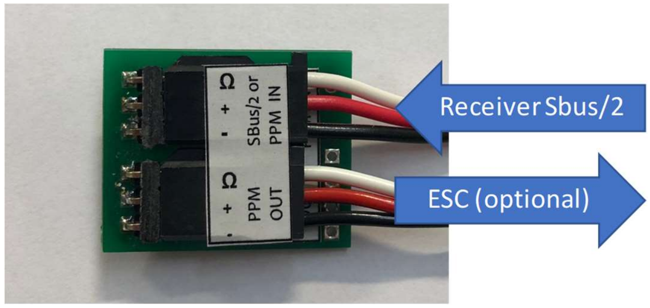
THE FULL GUIDE STARTS HERE

Wiring, Heat Shrink and Mounting
Correct polarity must be observed and is clearly marked beside the headers on the device.

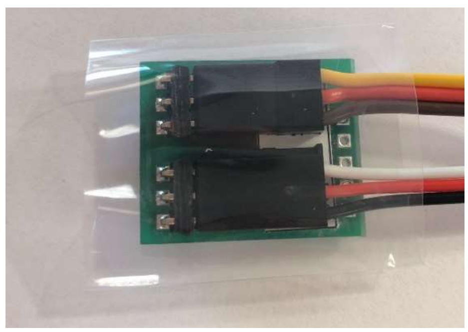
We recommend plugging a Futaba servo extension lead (not included) into the PWM Out header on the device before applying the heat shrink. The ESC can then be easily plugged in or removed as required. If the device will not be used to control an ESC, this header may be left empty.



A Futaba male – male jumper (not included) must be used to connect the receiver SBus/2 (or throttle PWM output) to the device SBus/2 input header. Again, this lead must be plugged in prior to applying the heat shrink.



Once the leads are plugged in (and after double checking the polarity and correct lead position), the heat shrink can be shrunk using a model covering heat gun or similar.



The small momentary press switch only needs to be accessed if you wish to change the PWM output channel or PWM output frequency (instructions below). You may need to make a small slit in the heat shrink to access this if required, or carefully use a bent paper clip, etc to press the switch.

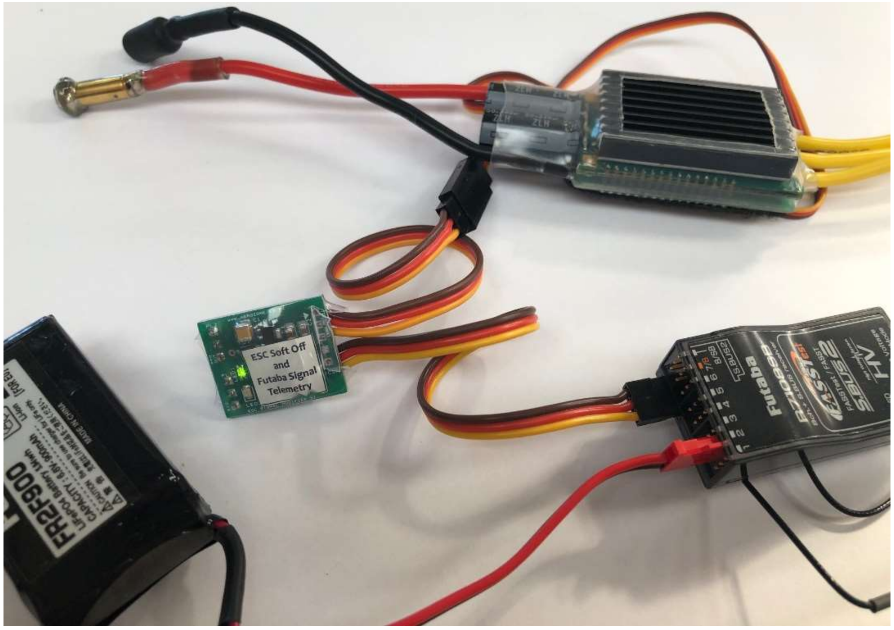
The unit is best mounted using a small piece of sticky back Velcro applied to the servo header side of the unit, and a corresponding piece of Velcro stuck inside your model somewhere convenient.

Modes of Operation

Futaba FASSTest 18ch (or T-FHSS) mode on SBus2 (ESC soft off + frame loss, failsafe, lost frame rate and signal strength telemetry + receiver in hold LED indication, and greater than 999 Frame losses reported by LED following your flight)

This is the preferred mode of operation, as it is the only mode that allows telemetry data to be sent back to the transmitter.

The input header is plugged into the receiver SBus2 output. Optionally the ESC is plugged into the PWM out header. The transmitter is set to FASSTest 18 channel (or T-FHSS) mode and bound to the receiver. A solid green LED on the device indicates valid 18 channel SBus2 input.



Telemetry slot selection:

Futaba telemetry slot assignment appears complicated unless you are familiar with this process. Please read all about telemetry sensors in your transmitter manual. This sensor requires four free telemetry slots, and we suggest using the sensor as supplied on slots 28, 29, 30 and 31 and assign these slots using ‘reload’ as described below. Following a device reset (see below), it defaults back to these four slots.

1. Turn on your transmitter.
2. Plug the device’s ‘SBus/2 Input’ into the TRANSMITTER SBus2 programming port – normally ladled “S.I/F” on the back of the transmitter.
3. If your transmitter requires sensors to be externally powered during setup (eg 16SZ, 18MZ), simply plug a battery (4.8 – 8.4v) into the PWM Out port on the device – be careful with polarity. There is no need to use a Y lead, but of course one can be used if required. Note some transmitters do not require (and it would be damaging to the transmitter) external power during sensor setup (eg 18SZ, 32MZ). The Red LED should be on solid.
4. If telemetry slots 28, 29, 30, 31 are free, go to the ‘Sensor’ menu and simply touch ‘Reload’, ‘yes’ – and slot 28 will become ‘RPM”, slot 29 ‘Temperature’, slot 30 ‘Temperature’ and slot 31 ‘Temperature’.

5. You should now unplug the device and battery from the transmitter – the device can now be plugged into the SBus2 port of the receiver. Be sure the receiver is bound (linked) to your transmitter. If required, your ESC can be plugged into the PWM output of the device (channel 3, throttle) to use the soft off feature. But please ensure the propellers are removed for safety during setup and testing.

6. Renaming the telemetry slots - if your transmitter allows (eg 18MZ, 32MZ)- go to the 'Sensor Name' menu, and touch 'RPM' – and rename slot 28 'RPM' to be 'Frame Losses', then rename 'Temperature' slot 29 to be 'Fail Safes', 'Temperature' slot 30 to be 'Signal Quality' and 'Temperature' slot 31 to be 'Lost Frame Rate'. If you are not familiar with this menu option in your transmitter, please have a read of your transmitter manual.

7. Now go to the Telemetry menu, and touch 'Frame Loss', and select the RPM sensor type as 'Magnet' and the 'Gear Ratio' as 6.0.

In this same menu you can also set a 'Frame Loss' alarm. 100-500 frame losses per flight can be typical for most models, so maybe set an alarm for 1000. You will get to know the right alarm threshold for your model after a few flights. In the same way, you can set a 'Fail safe' alarm (we use an alarm value of one here) and a Signal Quality alarm (signal strength is displayed in a range 0-3, with 0 being nil or very poor signal, and 3 being full signal strength). An alarm value of 1 would be appropriate here. Finally, an alarm can also be set for 'Lost Frame Rate' – 20-30% is a good value here.

8. Remember you can use your transmitter 'Home 2' screen to display sensor values. Again, please see the transmitter manual for this process.

Additional slot setting information – **using the transmitter to configure the device**:
If slots 28, 29, 30, 31 are not free, you can change the slots this device uses by using the transmitter slot change function.

PLEASE NOTE – our device requires you to enter the transmitter slot change menu and do one 'read' before proceeding with slot configuration. This sets the device into configuration mode. This is not required if RELOAD or RELOCATE is used first (in configuration mode the PCB switch does not operate until an option which uses a transmitter read operation has been performed).

Connect the device to the transmitter as described above. The red LED should be lit.

As described above (and in the quick start guide) remember if slots 28, 29, 30, 31 are free all you need to do is a RELOAD, then configure the RPM sensor as 'magnet' and 'gear ratio = 6.0'. Job done.

Slot Change: Slots can be changed automatically using the transmitter 'registration' option. With the sensor plugged into the transmitter as already described, touch REGISTER in the transmitter sensor screen to register slot #1. Then push in the PCB switch to advance to next sensor and touch REGISTER again. Keep repeating until all sensors are registered (note - each REGISTER operation may require a transmitter message cleared before proceeding). Note registration is not required - the preferred method if the default slots are free is to simply use RELOAD.

Slots can also be changed manually using the transmitter Slot Change function. This works on one slot at a time. The active slot/sensor must be selected using the PCB switch (note each press cycles through the sensors). This is described shortly.

The device will display four different LED colours, showing which slot you are registering or changing:
RED = Frame Losses (RPM sensor)
GREEN = Fail Safes (first temperature sensor)
BLUE = Signal Quality (second temperature sensor)
BLUE/GREEN (almost looks white) = Lost Frame Rate (third temperature sensor)

Change the LED colour by short pressing the button. You can cycle through these four colours. Though not necessary, it is often easiest to start at the RPM slot indicated by the RED LED.

Note that reload and relocate work for all four slots regardless of LED colour shown. The LED colour is only of relevance during manual slot change or registration.

Manual Slot Change

After completing steps (1), (2) and (3) but before starting step (4) above, go to the ‘Sensor’ menu, and touch ‘Change Slot’, then ‘Load’ (or ‘read’ depending on the transmitter) – you will see sensor type as RPM, and the slot will be listed. Simply change the slot to what you desire, and touch ‘Write’ to write this new slot back to the sensor.

Now short press the button to change to the next LED colour (GREEN) and again go to the ‘Sensor’ menu, and touch ‘Change Slot’, then ‘Load’ (or ‘read’ depending on the transmitter) – you will see sensor type as Temperature, and the slot will be listed. Simply change the slot to what you desire, and touch ‘Write’ to write this new slot back to the sensor.

Now short press the button again to change to the next LED colour (BLUE) and again go to the ‘Sensor’ menu, and touch ‘Change Slot’, then ‘Load’ (or ‘read’ depending on the transmitter) – you will see sensor type as Temperature, and the slot will be listed. Simply change the slot to what you desire, and touch ‘Write’ to write this new slot back to the sensor.

Finally short press the button again to change to the next LED colour (BLUE/GREEN – almost white) and again go to the ‘Sensor’ menu, and touch ‘Change Slot’, then ‘Load’ (or ‘read’ depending on the transmitter) – you will see sensor type as Temperature, and the slot will be listed. Simply change the slot to what you desire, and touch ‘Write’ to write this new slot back to the sensor.

Please be sure you set unique slots for rpm and the three temperatures – if not, the device will not work, and a device reset will be necessary (see below). Now you are free to continue with step (4) to allocate the sensor slots using ‘reload’ (or allocate the slots manually).

If you are familiar with your transmitter’s other sensor menu function (relocate) this command can be used as well. Relocate does not require you to use the button on the device – all four slots are handled together by the transmitter.

Slots can of course also be set up manually in the transmitter. If the device has been reset to factory defaults, assign slot 28 as RPM, and then slots 29, 30 and 31 as ‘Temperature’ (not Temp125 or anything else). We have found ‘Reload’ works great and saves this manual setup. Remember to set RPM sensor type as magnet, and the gear ratio as 6.0.

Setting the PWM Output Channel and Frequency

By default, the device is set to output PWM channel 3 (throttle) at the receiver update frequency (usually 66Hz) for all operation modes except if FASSTest 12ch mode is used, in which case the device will output the PWM channel at 1/3 the input frequency. This setting is compatible with all ESC’s, and normally does not require changing.

Note: Sensor programming is only available in the transmitter if it is set to FASSTest 18ch (or T-FHSS) mode. If you are using this device with the transmitter set to any other mode (where you can’t use external telemetry sensors) and you wish to change the PWM channel or frequency, please briefly set your transmitter to FASSTest 18ch mode to allow device programming, then change back to the mode you require.

It is possible to change both the PWM channel and PWM output frequency. Why would you do this? Say you are using a 7008SB receiver – with 8 PWM outputs – maybe your model requires 9 PWM outputs – this device could be set to PWM channel 9 (channels 1-18 selectable).

You can also change the PWM output frequency if required (the setting is only used if FASSTest 12ch mode is detected) – either 1/3 input frequency (1/3 of 156Hz = 52Hz) = default or the raw receiver output frequency (156Hz in FASSTest 12ch mode).

FASSTest 12ch mode uses a refresh rate of 156Hz and for both the SBus/2 data stream and receiver PWM output. If either SBUS/2 or PWM input is connected to our device the PWM out frequency can be reduced to 52Hz (default) or passed on at the full 156Hz (which may not be compatible with some ESC's or servos).

**** NOTE: ONLY THE SLOT CHANGE OPTION SHOULD BE USED FOR THESE ADJUSTMENTS. SHOULD ANY OTHER OPTION GET SELECTED (register, reload, etc) THE RESULT IS UNPREDICTABLE AND A DEVICE RESET WILL BE REQUIRED ********

Please be careful changing these two parameters. Remember, you can always reset the device to defaults if you end up with undesirable settings.

Please follow these procedures exactly step by step! And keep this procedure quite separate from slot allocation, etc as described above.

1. Turn on your transmitter.
2. Plug the device's 'SBus/2 Input' into the TRANSMITTER SBus2 programming port – normally ladled "S.I/F" on the back of the transmitter.
3. If your transmitter requires sensors to be externally powered during setup (eg 16SZ, 18MZ), simply plug a battery (4.8 – 8.4v) into the PWM Out port on the device – be careful with polarity. There is no need to use a Y lead, but of course one can be used if required. Note some transmitters do not require (and it would be damaging to the transmitter) external power during sensor setup (eg 18SZ, 32MZ).

4. **Go to the sensor menu, change slot, and touch 'load' (also called read in some transmitters). This is an important step – please do not miss this out!**

5. Now hold the small button on the device in for approximately 5 seconds – until you see the RED and GREEN LED illuminate together advising the device is ready for setting SBus/2 PWM channel selection.
6. Now again in the transmitter sensor menu, touch change slot, and perform another 'load' (or read).
7. The slot number now displayed is the PWM output channel number. You can change this to any channel between 1-18, and then hit 'write'. Performing another load will show the slot number (= channel number) has been changed. If you write a number greater than 18, this will be ignored.

If you do not need to change the PWM output frequency, simply power off the device to exit this mode.

However, if you need to change the PWM output frequency, please continue.

8. After setting the PWM output channel it is now possible to set the PWM output frequency. Short press the button to change the red/green LED above to red/blue.
9. Now in the sensor menu, slot change, perform a 'load' (or read)

If the slot number = 1 the output frequency will match the receiver
In FASSTest 12 channel mode the frequency will be 156Hz
In FASSTest 18 channel mode it will be 66Hz

If the slot number = 2 (default) the output frequency is 1/3 input frequency when the input frequency is > 71Hz (only occurs in FASSTest 12 channel mode)
In FASSTest 12 channel mode the frequency will be 52Hz (156Hz / 3) (device default)
In FASSTest 18 channel mode it will be 66Hz

So simply change the slot number as required (1 or 2) and hit 'write' to save the new setting. Picking any other slot number here will not be written.

This mode is finally exited by powering off the device.

<u>Testing</u>
With your transmitter and receiver (with device plugged into SBus2) turned on, your transmitter telemetry screen should show Frame Loss = 0, Fail Safe = 0 and Signal Quality = 3 and Lost Frame Rate = 0. If you briefly turn off your transmitter then back on, Frame Loss should increase (by 66 for every second the transmitter was off) and Fail Safe = 1 (one Fail Safe event), Signal Quality should still be 3 and Lost Frame Rate should be 0. While your transmitter was off, the LED will be solid red, indicating the receiver is in failsafe. With the transmitter back on the red LED will go out if there were less than 999 frame losses or will flash red if greater than 999 frame losses. The transmitter needs to be off for approximately 15 seconds to generate 999 Frame Losses.

Frame Loss Count:
If you are not using telemetry, it is possible to get an idea of the number of frame losses following a flight. After landing, but before powering off the receiver or transmitter, access this device.

First look for a red LED. If the red LED is solid you have turned off your transmitter already – so you can't check for frame losses as they are increasing quickly with no transmitter present!

If the red LED is flashing, you have >999 frame losses. No red LED means < 999 frame losses.

<u>Logging</u>
If you install a memory card in your transmitter (either a SD or MicroSD card depending on the transmitter), you can set up telemetry logging as shown in the Futaba transmitter manual. With logging active, your Frame Losses (cumulative total), Fail Safes (number of occurrences) and Signal Quality and Lost Frame Rate will be logged – this information can then be viewed on your PC after a flight. You will need to use the Futaba log conversion software to view the log.

At a competition, this log file may help provide proof of an interference event.

The 'RPM' sensor value in the log needs to be divided by 6 to match what is shown on the transmitter screen. The number on the transmitter screen is the real number of Fail Safes – the need to divide the log value by 6 is a Futaba limitation as the log does not match the transmitter display. If you log the flight data in your transmitter, you will notice Futaba records receiver signal – and this does not match our Signal Quality parameter all the time. Our best guess is Futaba is measuring transmitter received signal quality (or error rate), and our parameter is receiver received signal quality (or error rate).

Here is a log file on the PC after conversion using Futaba's log file converter. Note our four sensors do not have our custom names from the transmitter – but it is easy as the RPM Sensor is Frame Losses, the first Temperature Sensor is Fail Safes, the second temperature sensor is Signal Quality and the final Temperature Sensor is Lost Frame Rate.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
																	0	0	0	28	29	30	31
																	RECEIVER	RECEIVER	RECEIVER	RPM SENS	TEMPERA	TEMPERA	TEMPERATURE SENSOR
TIME	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	CH12	CH13	CH14	CH15	CH16	BATTERY	EXTERNAL	STATUS	ROTATION	TEMPERA	TEMPERA	TEMPERATURE
0	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	---	0	3	0	0	3	0
2056	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
4113	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
6168	1.5	-3.3	-77.5	-1	-31.2	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
8223	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
10280	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
12337	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
14396	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
16452	1.3	-3.3	-78	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
18508	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
20566	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
22621	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
24676	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
26731	1.5	-3.3	-77.5	-1	-31.2	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
28789	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0
30846	1.3	-3.3	-77.5	-1	-31.4	29.9	-31	0	0	0	0	0	0	0	0	-46.6	6.5	0	3	0	0	3	0

Remember the RPM Sensor value needs to be divided by six as Futaba does not log the correct value here. I have used Excel to do this for me here and re-labelled the sensors.

V	W	X	Y	Z	AA
29	30	31			
Fail Safes	Signal Quality	Lost Frame Rate		Frame Losses (RPM divided by 6)	
0	3	0		0	
0	3	0		0	
0	3	0		0	
0	3	0		0	
0	3	0		0	
0	3	0		0	
0	3	0		0	

Finally, here we can see the model in an area of poor signal strength – possibly too far away, poor antenna position, or even some outside interference present. Notice the Frame Losses quickly counting up, and concurrently low Signal Quality.

Fail Safes	Signal Strength	Frame Losses (RPM divided by 6)
0	3	49
0	2	52
0	2	57
0	3	58
0	3	58
0	3	58
0	2	69
0	2	69
0	2	69
0	2	69
0	2	69
0	1	238
0	1	238
0	2	268
0	2	285
0	2	285
0	1	365
0	3	365
0	3	365
0	3	365
0	3	367

Post flight LED information: Following your flight, prior to turning off your transmitter and receiver, if you see a flashing red LED on our device that is an indication of greater than 999 lost frames occurring during the flight. Once the transmitter is turned off, this LED will be solid red indicating the receiver is in failsafe. Of course, checking your transmitter telemetry is the preferred way of assessing all telemetry data.

Device reset

To reset the device to factory defaults hold in the PCB micro switch during power-on. The LED sequence you will see during reset is RED LED ON, then the GREEN LED, and finally the BLUE LED. The power must now be turned off then on again to complete the reset. The device can be plugged into the receiver to supply power, or when not plugged into the receiver use a battery (4.8-8.4V) to power the device (using either header is fine – just be careful of polarity).

The switch is hard to access and fragile – please use care – a bent paper clip is a good way of accessing the switch, or maybe cutting the heat shrink as necessary.

Note that in normal use, this procedure is never necessary.

ESC setup: To use the ESC soft off feature, the ESC plugs into the PWM out on this device. No connection to the ESC output on the receiver is used. No configuration is required.

If you don't require this device for an ESC, the PWM output header can be left free or programmed to drive a different PWM channel.

Important Safety Notes:
1. When using the PWM out on this device, always carefully check correct ESC operation with no propellers attached and the model restrained.
2. Always fully range check the transmitter after installing this device.

Futaba FASSTest 12ch mode on SBus2 (ESC soft off, receiver in hold LED indication, and greater than 999 Frame losses reported by LED following your flight): The input header is plugged into the receiver SBus2 output. The ESC can be plugged into the PWM out header. A flashing green LED indicates valid 12 channel SBus2 input.

Wiring is identical to FASSTest 18ch mode above. In this mode no telemetry data can be returned to the transmitter. However, frame loss information is reported by LED following your flight.

ESC setup: The ESC plugs into the PWM out on this device. No connection to the ESC output on the receiver is used. No further configuration is required.

If you don't require this device for an ESC, the PWM output header can be left free.

Post flight LED information: Following your flight, prior to turning off your transmitter and receiver, if you see a flashing red LED that is an indication of greater than 999 lost frames occurring during the flight. Once the transmitter is turned off, this LED will be solid red indicating the receiver is in failsafe.

Important Safety Notes:

1. When using the PWM out on this device, always carefully check correct ESC operation with no propellers attached and the model restrained.
2. Always fully range check the transmitter after installing this device.

<u>Futaba FASSTest (18 or 12ch mode) SBus</u> (ESC soft off, receiver in hold LED indication, and greater than 999 Frame losses reported by LED following your flight): The input header is plugged into the receiver SBus output. Optionally, the ESC is plugged into the PWM out header. A solid blue LED indicates valid SBus input.

In this mode no telemetry data can be returned to the transmitter. However, frame loss information is reported by LEDs following your flight.

ESC setup: The ESC plugs into the PWM out on this device. No connection to the ESC output on the receiver is required.

If you don't require this device for an ESC, the PWM output header can be left free.

Post flight LED information: Following your flight, prior to turning off your transmitter and receiver, if you see a flashing red LED that is an indication of greater than 999 lost frames occurring during the flight. Once the transmitter is turned off, this LED will be solid red indicating the receiver is in failsafe.

Important Safety Notes:

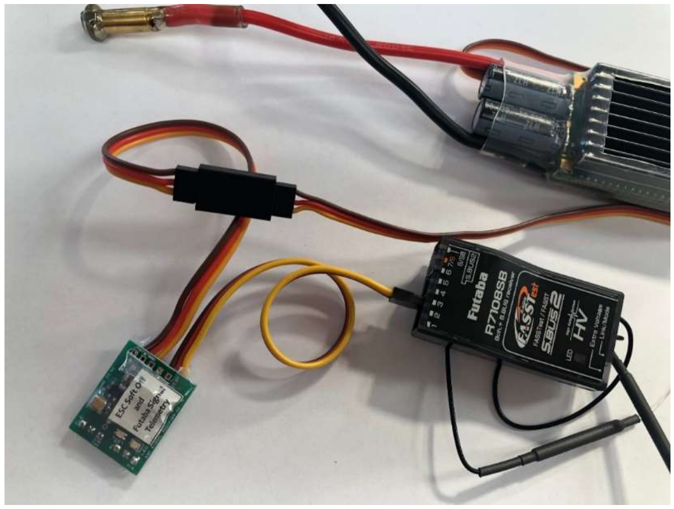
1. When using the PWM out on this device, always carefully check correct ESC operation with no propellers attached and the model restrained.
2. Always fully range check the transmitter after installing this device.

<u>Futaba PWM</u> (ESC soft off only):

This mode can be used with any Futaba receiver, regardless of receiver mode.

The input header is plugged into the receiver ESC output (typically channel 3). The ESC is plugged into the PWM out header. A blue/green flashing LED indicates valid PWM input.

In this mode no telemetry data is returned to the transmitter, and no post flight frame loss information is available.



ESC setup: The ESC plugs into the PWM out on this device. The receiver ESC output plugs into the input header on this device.

Important Safety Notes:

1. When using the PWM out on this device, always carefully check correct ESC operation with no propellers attached and the model restrained.
2. Always fully range check the transmitter after installing this device.

LED summary

Solid Green: Valid SBus2 input (18 channel mode) – ESC output + telemetry active
  Solid Green + Solid Red: Valid SBus2 input (18 channel mode), Rx in HOLD
  Solid Green + flashing Red: Valid SBus2 input (18 channel mode), greater than 999 frame losses

Flashing Green: Valid SBus2 input (12 channel mode) – ESC output active @ 52Hz
  Flashing Green + Solid Red: Valid SBus2 input (12 channel mode), Rx in HOLD
  Flashing Green + flashing Red: Valid SBus2 input (12 channel mode), greater than 999 frame losses

Solid blue: Valid SBus input (18 channel mode) – ESC output active
  Solid Blue + Solid Red: Valid SBus input (18 channel mode), Rx in HOLD
  Solid Blue + flashing Red: Valid SBus input (18 channel mode), greater than 999 frame losses

Flashing Blue: Valid SBus input (12 channel mode) – ESC output active @ 52Hz
  Flashing Blue + Solid Red: Valid SBus input (12 channel mode), Rx in HOLD
  Flashing Blue + flashing Red: Valid SBus input (12 channel mode), greater than 999 frame losses

Flashing Blue/Green: Valid PWM input, standard speed – ESC output active

Fast Flashing Blue/Green: Valid PWM input, high speed – ESC output active @ 52Hz

Solid red alone: No valid input signal or device programming mode active.

Specifications
Size: 20x28mm
Weight: 3.5g
Voltage: 4.8 – 8.4V
Current consumption: <5mAh
Auto recognition of input source (SBus2, SBus, PWM) and channel mode (12 or 18 channel)
Telemetry requires SBus2 18 channel mode or T-FHSS and four free telemetry slots
User selectable telemetry slots
In SBus2 or SBus mode, frame loss information available by LED after flight
PWM output channel user selectable (0-18). Default = channel 3 (throttle)
PWM output frequency user selectable in FASSTest 12ch mode – either 1/3 frequency (52Hz – default) or normal frequency (156Hz).

Included
ESC soft stop and telemetry unit x1
Heat shrink x 1

Required for Installation
Futaba servo extension lead x 1 (optional for ESC connection)
Futaba male – male extension lead x1 (required)
Sticky back Velcro
Modelling heat gun to shrink the PVC heat shrink

Warnings

- Never plug the receiver into the PWM OUT port
- Always be careful of polarity
- Never use without the included heat shrink in place
- Always carefully check failsafe and receiver power off behaviour with no propellers when using the ESC soft off function
- Always range check your radio before each flight
- Never use this device if you are unsure of correct setup
- Always have the device plugged into the receiver before power on

Legal Stuff
We cannot control the environment or configuration you are using this device in. While we have conducted extensive testing, it is you, the end user, who takes full responsibility for the use of this device. We cannot control all variables in the use of this device. Always perform a range test before each flight.