X20 and Ethos User Manual

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Main Views

Ethos allows the user considerable flexibility in what is displayed in the Main Views. Initially only the basic information shown below is displayed, until the user customizes or adds views and widgets to be displayed. Note that up to eight Main Views may be defined.

All Main Views share the top and bottom bars. Please refer to the Configure Screens section for details on configuring the views.

The Top Bar

The top bar displays the model name on the left, and RSSI, sound volume and radio battery status on the right. Touching the time, speaker and battery icons will bring up the relevant Date & Time, Sound & Vibr. and Battery control panels.

The Bottom Bar

The bottom bar has four tabs for accessing the top level functions, i.e from left to right: Home, Model Setup, Configure Screens, and System Setup. The system time is displayed on the right.

The Widgets Area

The middle area of the Main Views consists of widgets which may be configured to display images, timers, telemetry data, radio values etc. The default main screen has a widget on the left for a model image and three widgets for timers, as well as displaying the trims and pots. The widgets are user configurable to display other information. Once multiple screens have been configured, they can be accessed using a touch swipe gesture or navigation controls.



User Interface and Navigation

The X20/X20S has a touch screen, making the user interface quite intuitive. Touching the Model Setup (Airplane icon), Configure Screens (Multiple Screens icon), and System Setup (Gear icon) tabs take you directly to those functions, which are described in those sections of the manual. They can also be accessed using the [MDL], [DISP] and [SYS] keys respectively.

A long press on the [RTN] key will return you to the Home screen from any sub-menu.

Touching the system time on the right of the bottom bar takes you to the Date & Time section, allowing you to set the time and date.

Touching the speaker or battery icons in the top bar will bring up the relevant Sound & Vibr. and Battery control panels.

Editing Controls

Virtual Keyboard

Ethos provides a virtual keyboard for editing text fields.

< Ailerons			ETI	HOS			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	dB О dB	
Name			ļ	Ailerons	5				100%
Active conditio	on		Alw	vays Or	n 🕶				
Flight Modes		D 1	2	Ed	dit			».	
Curve		Ехро	▼		30%				
q w	е	r	t	У	u			0	р
а	s c	I 1	f	g	h	j	k	I.	
<u>+</u>	z >	((c	v	b	n	m	×	1
?123			<u>ب</u>					ENT	ER

Simply touch on any text field (or click [ENT]) to bring up the keyboard.

Touch the '?123' or 'abc' key to toggle between alpha and numeric keypads. There is also a Caps lock for entering uppercase letters.

Number Value Controls



When touching a Number Value a dialog pops up with keys for setting the value to Min, Default or Max, and also 'plus' and 'minus' keys for incrementing or decrementing the value.

In addition, the slider across the bottom allows for the rotary encoder output per click to be adjusted from 1:1 or fine on the left, and coarse on the right. The slider may also be adjusted with the rotary encoder while the [Page] key is held down.

Control Con	nsor ET	-105	²⁴⁶ 7.9∨ _{Tx5att}
Value			
Name			Altitude 2.4G 🛃
Unit			ft 🔻
Decimals			2
Range		-328.0	98ft - <u>3280.77ft</u>
	Min - De	fault + Max	
	•		

Another example is a Telemetry Range value, which can be edited in a similar way.

Options feature

Ethos has a very powerful 'Options' feature. Almost anywhere a value or source is expected, a long press of the Enter key will bring up an Options dialog.



Fields with this feature can be identified by the square dot in the top left corner of the field.



Value options

The Value Options dialog shows which parameter is being configured. In this example you have the choice of setting the Weight/Rates to maximum or minimum, or to use a source. Using a source like a Pot would allow the Weight/Rates to be adjusted in flight.

< Ailerons	ETHOS	
	+ Add a new weight	
Differential	Differential	
Channels count	Set to maximum	
	Set to minimum	
сні	Convert to value	-100%
	Options	2
Output2	CH5 (Aileron2) 🔻	
CH5		

If you click on a Value field that has already been changed to use a source, a dialog pops up allowing you to convert the source's current value to a fixed value. Clicking on 'Options' will bring up options for the source, see below.

< SF1	ETHOS	\$\$\$ 246 900M
Action		Play value 🔻
State		Disable Enable
Active condition	Options	∔ ISW2 ▼
	Invert	1.00.12
Value 	Edge	VFR 🗸
Repeat		

Source Options

Invert

Invert allows a source such as a switch position to be negated or inverted. For example instead of being active when switch SA is up, it would be active when switch SA is NOT up, i.e. in either the mid or down positions.

Edge

You can select the 'Edge' option if you need a one-time action when the source transitions from False to True. Only the transition is acted upon, not the True or False state.

Please refer to the X20 and Ethos thread on rcgroups.com for more details and discussion on the use of this new feature.

Sensor Options

< Widget	ETHOS	
Widget		Value 🔻
Source	Options	SC Temp 2.4G Max 🔻
	Invert	
	Min	
	Max	

On a Telemetry source the Options dialog allows the sensor to be inverted, or its maximum or minimum value to be used. Some sensors have additional options specific to that sensor.

Emergency Mode

Emergency Mode is the radio's response to an unexpected event like a watchdog reset. The watchdog is a timer that is continually restarted by different parts of Ethos. If a failure of any kind prevents the watchdog timer from being restarted, it will time out and cause a hardware reset of the radio. In this Emergency Mode the radio restarts extremely quickly, without any of the normal startup checks so that you get back control of your model as quickly as possible. The SD Card is not accessed in Emergency Mode.

Emergency Mode provides only the essential functions for controlling your model but none of the high level functions. The screen will go blank and display the words Emergency Mode, accompanied by a 300ms beep repeating continually every 3 seconds. Voice alerts, running of scripts, logging etc. will cease operating. If Emergency mode occurs, you should obviously land as quickly as possible.

The most common cause of Emergency Mode is SD Card failure.

System Setup

The System setup menu is used to configure those parts of the radio system's hardware that are common to all models, and is accessed by selecting the Gear tab along the bottom of the screen. Conversely, model specific setup is performed in the Model menu, which is accessed by selecting the Airplane tab along the bottom of the screen.

Please note that the settings to determine whether the internal or external RF module is used are model specific, so these are handled in the 'RF system' section of the Model menu.

Overview

File Manager

The File Manager is for managing files and for access to flash firmware to the TD-ISRM, external S.Port, OTA and external modules.

Alerts

Configuration of the silent mode, battery and inactivity alerts.

Date & Time

Configuration of the system clock and time display options.

Display

For configuring the menu style, system language, and LCD Display attributes such as brightness and backlight.

Sound & Vibr

Configuration of sound and vibration options and the vario options.

Battery

Configuration of battery management settings.

Hardware

This section allows checking of the hardware physical input devices, and analogs and gyro calibration. It also allows the switch type definitions to be changed.

Sticks

Configuration of the Stick Mode, and the default channel order. The 4 stick controls can also be renamed.

Wireless

Configuration of the Bluetooth module.

Info

System information for firmware version, gimbals types and RF modules.

File Manager



The File Manager is for managing files and access to flash firmware to the TD-ISRM, external S.Port, OTA and external modules.

Note that when updating the system firmware, the files in the flash drive and SD card may also need updating.

File Manager ET	
/	
[audio]	<u>~</u> _
[bitmaps]	
[Firmware]	
[Logs]	
[models]	
[output]	File name: audio
[screenshots]	

Tap on File Manager to open the file explorer. The top level of folders are:

audio/

USB drive path: SD Card (drive letter)/audio/

This folder is for user sound files, which can be played by the 'Play track' Special Function. Refer to the Model / Special Functions section. The format should be 16kHz or 32kHz PCM linear 16 bits or alaw (EU) 8 bits or mulaw (US) 8bits.

audio/en/system

USB drive path: SD Card (drive letter)/audio/en/system

This folder is for system sound files, e.g.

hello.wav	The 'Welcome to Ethos' greeting
bye.wav	This is not provided yet by Ethos, but you can add your own goodbye WAV file.

Tap on the [audio] folder to view the folder contents.

File Manager	ETH	DS		()
/audio/en/system				
[]	1.WA	v		
0.WAV	Play		· ·	
1-minute-left.wav	Сору			
1-minute.wav	Move			
1.WAV	Delete			
10.WAV			VAV	
100.WAV		ile size: 42.5 .ast modifica	KB ition: 2021-03-2	29

Tap on a WAV file, and select the Play option to listen to it.

The files may also be copied, moved or deleted.

bitmaps/

user/

This folder is for user model images. Image size for the main X20 screen is 300x280 and 180x166 for the X10.

USB drive path: SD Card (drive letter)/bitmaps/user/

Firmware

Firmware updates for the X20 Internal TD-ISRM RF module, external modules and other devices like receivers etc. are stored here. They can then be flashed from here via external S.Port or OTA (Over The Air). The new firmware must be copied to the Firmware folder after placing the X20 in boot-loader mode and connecting to a PC via USB.

< File Manager	ETH	05		2.46
/Firmware				
[]	TD-ISRM_2.1.2	_202103frsk		
TD-ISRM_2.1.2_202103	Flash Internal I	Module		
	Сору			
	Move			
	Delete			
		File name: TD File size: 216.0 Last modifica	-ISRM_2.1.2_ 0KB Ition: 2021-03	2021frsk 3-15

Tap on the Firmware folder to view the firmware files that have been copied to this folder. Then tap on the Flash option in the popup dialog.

The files may also be copied, moved or deleted.

Logs

Data logs are stored here.

USB drive path: SD Card (drive letter)/Logs/

models/

The radio stores model files here. These files cannot be edited by the user, but may be backed up or shared from here.

USB drive path: SD Card (drive letter)/models/

screenshots/

Screenshots created by the Screenshot Special Function are stored here. Refer to the Model / Special Functions section.

USB drive path: SD Card (drive letter)/screenshots/

System Volume Information

For system use only.

radio.bin

This file is created by the X20 system when first used and stores system settings. It should be backed up together with the models folder above before updating the firmware, to allow downgrading to the earlier version if required.

The firmware update file firmware.bin should be saved here in the root folder of the SD card when doing an update. After saving the new firmware.bin file, the update will automatically be flashed into the radio when it is disconnected from the PC.

USB drive path: SD Card (drive letter)/radio.bin USB drive path: SD Card (drive letter)/firmware.bin

Alerts

< sy	ystem		ETH	05		
	File Manager	Alerts ((ب))		Date & Time	Displa - Ç	y -
	Sound & Vibr.	Battery		Hardware	Stick	s 2
1	* 	F	田	\$	14	:16:48
< sy	ystem Alerts		ETH	05	²⁴⁶	
Silent N	/lode Check				OF	F ON
Main Ba	attery Check				OF	F ON
RTC Ba	ittery Check			OFF	ON	2.5V
Inactiv	ity					10m

The System Alerts are:

Silent Mode Check

A Silent Mode Alert will be given at startup when Silent Mode Check is ON and the Audio Mode has been set to Silent in System / Sound & Vibr.

Main Battery Check

A speech 'Radio Battery is Low' Alert will be given when Main Battery Check is ON and the main radio battery is below the threshold set in the 'Low voltage' parameter in System / Battery.

RTC Battery Check

A speech 'RTC Battery is Low' Alert will be given when RTC Battery Check is ON and the RTC coin battery is below the threshold set in the 'RTC voltage' parameter in System / Battery. The default is 2.9V.

Inactivity

A speech 'No Activity for a Long Time' Alert will be given when the radio has not been used for longer than the 'Inactivity' time. The default is 10 minutes.

Date and Time



The Date and Time settings are:

24 Hour time

The clock displays in 24 hour format when enabled.

Display seconds

The clock will display seconds when enabled.

Date

Should to the current date. This is used in the logs.

Time

Should to the current time. This is used in the logs.

Time Zone

Allows configuration of the user's time zone.

Auto Adjust from GPS

When enabled, the time and date will be automatically set from GPS data.

Display

< s	< System ETHOS							
			•	•				
	File Manager	Alert	s	Date	e & Time		Display	
	P	ψĻ))	:			-``@-	
	Sound & Vibr.	Batter	ry	Hai	⁻ dware		Sticks	
	ژ		þ		١٩ ١			
1	斧 │	★	⊞		ŝ		14:16:	54
	ionless		CTL				⊜ 0.₀0.₀,	
	ispiay			05				,∟,
Brightr	ness		-}	<u>ب</u>		-•		
Wake	ир				Key	rs, Stie	cks, Switch	es 🔻
Sleep								30s
Shutdown LCD during sleep					No 🔵	Yes		
Style						Y	ellow / Bla	ck 🔻
Langua	ige						Engli	sh 🔻
Тор Тс	olbar							>

The LCD Display attributes can be configured here:

Brightness

Use the slider to control the screen brightness, from left to right to set brightness from dark to bright. Long press [ENT] brings up options to use a source, or set it to minimum or maximum.

Pot Option

< Display	ETHOS	246
Brightness	×.	•
Wake up	Brightness	Auto 🔻
Sleep	Set to maximum	30s
Shutdown LCD during sl	Set to minimum	No 🔵 Yes
Style	Use a source	Yellow / Black 🔻
Language		English 🔻

Long press on [ENT] when the bar is selected to bring up a dialog to set brightness to maximum or minimum, or to select a pot to use as brightness control.

Oisplay	ETHOS	6 0 dB 0 d
Brightness	-	Pot1 🔻 🖣 🔆 —————————————————————————————————
Wake up		Keys, Sticks, Switches 🔻
Sleep		30s
Shutdown LCD during sleep		No 🔵 Yes
Style		Yellow / Black 🔻
Language		English 🔻
Top Toolbar		>

The above example shows brightness being controlled via Pot 1.

Wake u

< Display	ETHOS		
Brightness	×		•
Wake up	Wake up		ys, Sticks, Switches 🔻
Sleep	Always On		30s
	Sticks		
Shutdown LCD during sie	Switches		No Yes
Style	Gyro		Yellow / Black 🔻
Language			English 🔻
Top Toolbar			>

The screen backlight can be woken from the sleep state in accordance with one or more of the following options:

Always On

The backlight stays on permanently.

Sticks

The backlight turns on when sticks or keys are operated.

Switches

The backlight turns on when switches or keys are operated.

Gyro

The backlight turns on when you tilt the radio or when keys are operated.

Note that more than one option may be enabled.

Sleep

The length of inactivity before the backlight is turned off.

Shutdown LCD during sleeping

When enabled the LCD will go totally dark (not visible) during sleep mode, otherwise the LCD will still have some brightness so the display remains visible.

Style

There are currently three menu color themes or styles available:

- Yellow/Black
- Orange/Black
- Black/White

Further themes will be made available with the evolution of ETHOS.

Language

The following languages are supported for the display menus:

- cn
- CZ
- de
- en
- fr

Ensure that you have installed the corresponding voice pack in your SD card to ensure the appropriate voice output.

Top Toolbar

< Display ETHOS	86dB100dB 17.8 ∨ 2.46 990M 7.8 ∨
Sleep	30s
Shutdown LCD during sleep	No 🔵 Yes
Style	Yellow / Black 🔻
Language	English 🔻
Top Toolbar	\sim
Digital Voltage	
Digital RSSI	OFF 💽 ON

Digital Voltage

The battery status in the Top Toolbar may be changed from the default bar display to display the radio battery voltage as a digital value instead.

Digital RSSI

Similarly, the RSSI status may be changed from a bar display to a digital value for both 2.4G and 900M.

Sound & Vibr

< s	< System ETHOS 4.000						
			•	•			
	File Manager	Alerts		Date & Time		Display	
	P_	((Ļ)))			-)	
	Sound & Vibr.	Battery		Hardware		Sticks	
	<u>ر</u> ا»			١٩٩		ן י ן	
1	* /	¥	田	段		13:04:	21
< so	ound & Vibr.		ETH	05		2.46	
Langua	ige					Engli	sh 🔻
Main V	olume		냁		•		
Audio r	node					Defa	ult 🔻
Vibr. st	rength		;;	[•	
Vibr. m	ode					Oft	en 🔻
Vario							\sim
Volum	ie			計 —			•

The Sound & Vibrations settings are:

Language

Supported languages are Chinese, Czech, German, English and French.

Main Volume

Use the slider to control the audio volume. Long press [ENT] allows a pot to be used. Beeps during adjustment assist in judging the volume.

Audio Mode

Sound & Vibr.	ETHOS	246
Main Volume	_⊢ Audio mode	-
Audio mode	Silent	Default 🔻
Vibr. strength	Alarms only	
Vibr. mode	Default	Often 🔻
Vario	Often	~
Volume	Always	
Pitch zero		700Hz

Silent

No audio. Note that there will be an Alert given at startup if the Silent Mode Check in System / Alerts is ON.

Alarms only

Only Alarms will be output on audio.

Default

Sounds are enabled.

Often

There will additionally be error beeps when attempting to exceed the maximum or minimum value on editable numbers.

Always

In addition to the sounds in 'Often', there will also be beeps when the menu is navigated.

Vibr Strength

Use the slider to control the haptic vibration strength.

Vibr. Mode

Sound & Vibr.	ETH <mark>05</mark>	2.46
Main Volume	⊦ Vibr. mode	•
Audio mode	Silent	Default 🔻
Vibr. strength	Alarms only	
Vibr. mode	Default	Often 🔻
Vario	Often	~
	Always	•
Pitch zero		700Hz

Similar to Audio Mode above.

Vario

Sound & Vibr.	ETHOS	246
Vibr. strength	3 0 8	
Vibr. mode		Often 🔻
Vario		\sim
Volume	랴 -	
Pitch zero		700Hz
Pitch max		1700Hz
Repeat		500ms

Volume

The relative volume of the vario tone.

Pitch zero

The tone pitch when the climb rate is zero.

Pitch max

The tone pitch at maximum climb rate.

Repeat

The delay between beeps at pitch zero.

< s	ystem	ETH	-05	4.0	
		•	•		
	File Manager	Alerts	Date & Time	Display	
	P_	((Ĵ))		-``@	
	Sound & Vibr.	Battery	Hardware	Sticks	
	⊲ »		۹۹		
1	* *		翰	14:16:57	7
< Ba	attery	ETH	05	0 dB 0 dB	
K Ba	attery oltage	ETH	-05	0 dB 0 dB ◀ 0 2.46 900M ◀ 0	.3V
Aain ve	attery oltage oltage	ETH	-05	0 dB 0 dB € €	.3V .2V
A Ba Main v Low vo Display	attery oltage oltage v voltage range	ETH	-05	0 _{dB} 0 _{dB} € 2.46 999M 8. 7. 6.4V - 8.	.3V .2V 4V
A Bandaria	attery oltage oltage v voltage range oltage	ETH	-05	0 dB 0 dB € € € 246 990M € 8. 7. 6.4V - 8. 2	.3V .2V .4V
K Bain vo Low vo Display RTC vo	attery oltage oltage v voltage range oltage	ETI-	-05	0 _{dB} 0 _{dB} € 8. 7. 6.4V - 8. 2	.3∨ .2∨ 4∨ .9V
Kain vo Low vo Display RTC vo	attery oltage vltage voltage range oltage	ETH		0 dB 0 dB € € 0 246 900M € 8 7. 6.4V - 8. 2	.3V .2V .9V
Aain vo Low vo Display RTC vo	attery oltage vltage voltage range	ETH		0 dB 0 dB € 0 2.46 900M € 8. 7. 6.4V - 8. 2	.3V 2V 4V .9V

Battery

The Battery section is for calibrating the radio batteries and setting the alarm thresholds.

Main Voltage

This is the nominal battery voltage. The default is 8.4V for a charged 2 cell lithium battery.

Low Voltage

This is the alarm threshold voltage. The default is 7.2V.

A speech 'Radio Battery is Low' Alert will be given when Main Battery Check is ON in System / Alerts and the main radio battery is below the threshold set here.

Display voltage range

These settings set the range of the graphical battery display in the top right of the screen. The default range limits for the built-in Li-Ion battery are 6.4 and 8.4V. Many pilots increase the bottom sensing voltage to trigger the low TX voltage alert earlier and prevent over discharging their TX battery.

If the battery is changed to a different type, then the limits must be set appropriately.

RTC voltage

Shows the voltage of RTC (Real Time Clock) battery in the radio. The voltage is 3.0v for a new battery. If the voltage is below 2.7v please replace the battery inside the radio to ensure the clock runs properly.

Hardware



The Hardware section is used to test all inputs, perform analog and gyro calibration, and set switch types.

< Hardware	ETHOS	0 dB 📢 🛄
Hardware check	Analogs calibration	on Gyro calibration
Analogs filter		OFF 💽 ON
Pots/Sliders Settings	>	
Switches Settings		>
Home Keymap		>
Function Switches		6-Pos 🔻
Persistent		OFF 🔵 ON

Hardware check



The Hardware check allows all the inputs to be checked for operation.

Analogs calibration



Analogs calibration is be performed so that the radio knows exactly where the centers and limits of each gimbal, pot, and slider are. It is automatically run at initial startup or after a firmware upgrade. It should be repeated after replacement of a gimbal, pot or slider.

Gyro calibration



Gyro calibration can be performed so that the gyro sensor outputs respond correctly to tilting the radio. For example, the radio 'level' position would be the angle at which you normally hold the radio.

Analogs Filter

The Analog to Digital Converter filter can be turned on/off with this setting. The default value is ON. This may improve jitter around stick centre.

Pots/Sliders Settings

Kardware	ETHOS	0 _{dB}
Pots/Sliders Settings		\sim
Pot1		Potl 📝
Pot2		Pot2 🕞
Pot3		Pot3 🕞
Slider left		Slider left 📑
Slider right		Slider right 🗃
Switches Settings		>

The pots and sliders can be given custom names here.

Switches Settings

Kardware	ETHOS		0 _{dB}
Switches Settings			~
Switch middle detect delay			0mS
Switch 1		sa 📝	3-POS 🔻
Switch 2		SB 🖃	3-POS 🔻
Switch 3		sc 🖃	3-POS 🔻
Switch 4		SD 📝	3-POS 🔻
Switch 5		SE 📝	3-POS 🔻

< Hardware	ETHOS	₽ 0 dB
Switch 4	SD 🗃	3-POS 🔻
Switch 5	SE 🖃	3-POS 🔻
Switch 6	SF 🕞	2-POS 🔻
Switch 7	sg 🛃	3-POS 🔻
Switch 8	SH 🕞	Toggle 🔻
Switch 9	SI 🛃	Toggle 🔻
Switch 10	sj 🛃	Toggle 🔻

Switch middle detect delay

This setting ensures that the switch middle position on three way switches is not detected when the switch is flipped from the up to the down position in one movement, and vice versa. It should only be detected when the switch stops in the middle position. The default has been changed to 0ms to suit the FrSky stabilized receivers when detecting 'Self Check' on CH12.

< Hardware	ETHOS	2.40
Switch middle detect d	elay	100ms
Switch A	Mode	3-POS 🔻
Switch B	None	3-POS 🔻
Switch C	Toggle	3-POS
	2-POS	J F03 ↓
Switch D	3-POS	3-POS ▼
Switch E		3-POS 🔻
Switch F		2-POS 🔻

Switches SA to SJ may be defined as:

- None
- Toggle (momentary)
- 2 POS
- 3 POS

This allows for switches to be swapped over, for example the toggle switch SH could be swapped over with the 2 position switch SF. Note that it may no be possible to replace a toggle or 2 position with a 3 position switch if the radio wiring does not allow for it.

Switches may also be renamed from the default names SA through SJ to custom names. Note that these names will be global across all models.

Ноте Кеутар

Kernel Kardware Kernel	0 dB 1
Home Keymap	~
DISP Short	Configure Screens 🔻
DISP Long	Outputs 🔻
MDL Long	Model Select 🔻
SYS Long	🔻
Function Switches	6-Pos 🔻
Persistent	OFF ON

The [SYS], [MDL] and [DISP] (TELE on older models) home keys can be re-assigned to suit the user. For the [SYS] and [MDL] keys only the long-press options may be re-assigned, but for the [DISP] key both may be reassigned to one of the following options:

< Hardware	ETHOS	
Hardware check		Gyro calibration
Switches Settings		>
Pots/Sliders Settings	Outputs	>
Ноте Кеутар	Model Select	~
DISP Short	Configure Screens	Configure Screens 🔻
DISP Long		Outputs 🔻
MDL Long		Model Select 🔻

Function Switches

< Hardware	ETHOS	
Analogs filter		OFF ON
Pots/Sliders Settings	6-Pos with OFF	
	6-Pos	/
Switches Settings	2 x 3-Pos	>
Ноте Кеутар	6 x 2-Pos	>
Function Switches	Toggle	6-Pos 🔻
Persistent		OFF 🔵 ON
		ADC value inspector

The six Function Switches are available wherever 'Active Condition' parameters are found. They may be configured as follows:

6-Pos with OFF

Pressing any function switch will latch that switch ON. However, pressing a switch that is already ON a second time will turn it off, leaving all six function switches OFF.

6-POS

Pressing any function switch will latch that switch ON until a different function switch is pressed to latch the newly pressed switch ON.

2 x 3-Pos

Breaks the 6 function switches into two groups of 3. Each group can have one switch ON.

6 x 2-Pos

Breaks the 6 function switches into 6 latching switches. Each switch can be ON or OFF.

Toggle

Breaks the 6 function switches into 6 toggle (i.e. momentary) switches. Each switch is ON while depressed.

ADC value inspector

ADC value inspector ET	-05	6 0 dB 0 dB () 2.46 900M
1. 2211	2. 2179	
3. 573	4. 1971	
5. 1057	6. 2053	
7. 1836	8. 4090	
9. 1227		

Shows the analog to digital conversion (ADC) values for the analog inputs read by the CPU.

- 1. Left stick horizontal
- 2. Left stick vertical
- 3. Right stick vertical
- 4. Right stick horizontal 5. Pot 1
- 6. Pot 2
- 7. Middle slider
- 8. Left slider
- 9. Right slider

Sticks

< System ETHOS File Manager Date & Time Display 9 (ڤ) Ē -Ò Sound & Vibr. Battery Hardware Sticks [.] **\$** ()) (m)⊞ ঠ্য 14:17:01 Sticks ETHOS Sticks Mode 1 🔻 Elevator 🖃 Throttle 🖃 Rudder 🖃 Aileron 🖃 Channel order AETR 🔻

Select your preferred stick mode. Mode 1 has throttle and aileron on the right stick, and elevator and rudder on the left. Mode 2 has throttle and rudder on the left stick, and aileron and elevator on the right.

By default the sticks are named as listed above for the industry standard stick modes. They may be renamed as desired.

Channel Order

The Channel Order defines the order in which the four stick inputs are inserted into the mixer when a new model is created by the wizards. The default order is AETR. If there are more than one of each type of surface, they will be grouped unless the first four channels are fixed, see below. For example, for 2 ailerons the channel order will be AAETR.

rev18

First four channels fixed



When this option is enabled, then channel grouping will not occur on the first four channels. If the channel order is AETR, then the wizard will create a model suited to the SRx stabilized receivers. For example, a model with 2 Ailerons, 1 Elevator, 1 Motor, 1 Rudder and 2 Flaps will be created with a channel order of AETRAFF. If this option is not enabled, the channel order would be AAETRFF.

Wireless

< System	ETHOS	
Wireless	Info	
*	★ @	☞ 13:04:27
 Wireless 	ETH <mark>05</mark>	7.9V
Bluetooth Mode		OFF 🔻

Touch Bluetooth Mode to bring up a dialog listing the Bluetooth options.

Bluetooth Mode



The X20 Bluetooth module can work in either Telemetry or Trainer modes, while the X20S has an additional Audio mode for relaying the audio to a Bluetooth device like a headset.

Telemetry

In Telemetry Mode the radio can work with the FrSky FreeLink App to display telemetry data on your mobile phone. The App can also be used to configure FrSky devices like the stabilized receivers.

 Wireless 	ETHOS	6 0 dB 0 dB 1 1
Bluetooth Mode		Telemetry 🔻
Local Name		FrSkyBT 🕞
Local Address		04EE03D65991
Dist Address		Disconnect
		Search Devices

Trainer

In Trainer Mode, the radio can be operated in Master or Slave mode to achieve the trainer function wirelessly. Refer to the Model / Wireless section to configure the radio as Master or Slave for the currently selected model.

K Wireless	ETHOS	0 dB 0 dB
Bluetooth Mode		Trainer 🔻
Local Name		FrSkyBT 🛃
Local Address		04EE03D65991
Dist Address		Disconnect
		Search Devices

Local Name

This is the local BT name that will be displayed in devices being connected. The default name is FrSkyBT, but may be edited here.

Local Address

This is the local Bluetooth address of the radio.

Dist Address

Once a Bluetooth device has been found and linked, the remote device's Bluetooth address is displayed here.

Search Devices

The Search Devices button will be available if the Trainer Mode is Master (refer to the Model / Trainer section).

< Wireless	ETHOS		2.46
Mode			Trainer 🔻
Local Address			04EE03D65991
Dist Address	8 Search Devices		806FB0963467
Local Name	Waiting for devices		FrSkyBT 🖃
		Sear	ch Devices

Tap on 'Search Devices' to put the radio into BT search mode.

< Wireless	ETHOS	2.46
Mode		Trainer 🔻
Local Address	Select device	04EE03D65991
Dist Address	806FB0963467	806FB0963467
Local Name	2C41A19766C9	FrSkyBT 📝
	F4FEFB4198BF	Search Devices

Found devices are listed in a popup dialog with a request to select a device. Select the BT address that matches the radio to be used as training mate.

Audio (X20S and X20HD models only)

 Wireless 	ETHOS	²⁴⁶ 7.9V
Bluetooth Mode		Audio 🔻
Speaker mute		OFF 🔵 ON
Dist Address		Disconnect
		Search Devices

Touch 'Search Devices'.

< Wireless	ETHOS	246 7 .9V
Bluetooth Mode		Audio 🔻
Speaker mute		OFF 🌒 ON
Dist Address	8 Search Devices	Disconnect
	Waiting for devices	ch Devices

Waiting for devices displays. Turn on your Bluetooth device and place it into pairing mode.

< Wireless	ETHOS	246 4 7.9V
Bluetooth Mode		Audio 🔻
Speaker mute		OFF 🌒 ON
Dist Address	Select device	Disconnect
	LC-B41	Search Devices

After the Bluetooth device is found, its name will be displayed. Touch it to select the device.

< Wireless	ETHOS	2.46 (7.9V
Bluetooth Mode		Audio 🔻
Speaker mute		OFF 🌒 ON
Dist Address	8 Connecting	AF Disconnect
	Waiting for connection	ch Devices

'Waiting for connection' displays.
< Wireless	ETHOS		246 4 7.9V
Bluetooth Mode			Audio 🔻
Speaker mute	() Connecting		OFF 🌒 on
Dist Address	Bluetooth Device connected	341	Disconnect
	ок	ch D	Devices

When the radio and device are paired, 'Bluetooth Device connected' displays. Touch OK.

K Wireless	ETHOS	2 46 7.9V
Bluetooth Mode		Audio 🔻
Speaker mute		OFF 🔵 ON
Dist Address		LC-B41 Disconnect
		Search Devices

The Bluetooth screen will display again.

Speaker Mute

To mute the system speaker turn the mute to ON.

< Wireless	ETH	(D	
Bluetooth Mode			Audio 🔻
Speaker mute			SA† 🔻
Dist Address	Category Always On	Member SJ↓	Disconnect
	Switch positions	SA↑	ch Devices
	Function switches	SA-	

The mute function can also be assigned to a switch.

The X20S/X20HD system remembers the Bluetooth device. For normal operation power on the X20S/X20HD and then the Bluetooth device. The Bluetooth device will connect, taking a few seconds for the speaker mute to activate again.

Info



The Info page displays system firmware information, gimbals type, internal module firmware version, ACCESS receiver firmware and external module information.

< Info	ETHOS	О dв О dв 📢 🛄
Firmware		Ethos - X20
Firmware Version		1.0.11, FCC #8bd25e73
Date		Sep 14 2021, 11:18:52
Sticks		ADC
Internal Module		TD-ISRM
		HW: 1.4.0 FW: 2.1.9 (FCC)
External Module		OFF

Firmware

Ethos firmware, and radio type (X20).

Firmware Version

Current firmware version and type, e.g. FCC, LBT, or Flex.

Date

The firmware version date and time.

Sticks

The gimbal Hall sensor version installed. ADC is for analog.

Internal Module

Details of the internal RF module, including hardware and firmware versions.

Internal Module	TD-ISRM
	HW: 1.4.0 FW: 2.1.7 (FCC)
Receiver1	Archer-X
	HW: 1.3.0 FW: 2.1.7
External Module	OFF
 Internal Module	TD-ISRM
Internal Module	TD-ISRM HW: 1.4.0 FW: 2.1.2 (FCC)
Internal Module Receiver1	TD-ISRM HW: 1.4.0 FW: 2.1.2 (FCC) R9-MINI-OTA
Internal Module Receiver1	TD-ISRM HW: 1.4.0 FW: 2.1.2 (FCC) R9-MINI-OTA HW: 1.1.1 FW: 1.3.1

Receiver

Bound receiver details are shown after the Internal Module. Redundant receiver details will alternate with the main receiver. The example above shows an Archer SR10 Pro and it's redundant R9MM-OTA shown against Receiver1 details.

External Module

Details of the external RF module (if fitted), including hardware and firmware versions if ACCESS protocol.

Model Setup

The Model setup menu is used to configure each model's specific setup. It is accessed by selecting the Airplane tab along the bottom of the Home screen. Conversely, settings that are common to all models are performed in the System menu, which is accessed by selecting the Gear tab instead (please refer to the System section).

Overview

Model Select

The Model Select option is used to create, select, add, clone, or delete models.

Edit Model

The 'Edit model' option is used to edit the basic parameters for the model as set up by the wizard, and is mainly used to edit the model name or picture.

Flight Modes

Flight modes allow models to be set up for switch selectable specific tasks or flight behavior. For example, gliders may be set up to have flight modes such as Launch, Cruise, Speed and Thermal. Power planes may have flight modes for Normal flying, Take Off and Landing. Helicopters have modes such as Normal for spool up and take off/landing, Idle Up 1 for aerobatic flying, and Idle Up 2 for perhaps 3D.

Mixer

The Mixer section is where the model's control functions are configured. It allows any of the many sources of input to be combined as desired and mapped to any of the output channels.

This section also allows the source to be conditioned by defining weights/rates and offsets, adding curves (eg Expo). The mix can be made subject to a switch and/or flight modes, and a slow function to be added.

Outputs

The Outputs section is the interface between the setup "logic" and the real world with servos, linkages and control surfaces as well as actuators and transducers. In the Mixer we have set up what we want our different controls to do. This section allows these pure logical outputs to be adapted to the mechanical characteristics of the model. This is where we configure minimum and maximum throws, servo or channel reverse, and adjust the servo or channel center point or add an offset using subtrim. We can also define a curve to correct any real world response issues. For example, a curve can be used to ensure that left and right flaps track accurately.

Timers

The Timers section is used to configure the three available timers.

Trims

The Trims section allows you to configure the Trim Mode, disable trims, or enable Extended Trims or Independent Trims for each of the 4 control sticks.

The Trim Mode configures the granularity of the trim switch steps, from Fine to Coarse to Exponential, or to disable trims. The normal trims range is +/-25%, but Extended Trims enables the full range. If you are using Flight Modes, then Independent Trims enables the relevant trim to be independent for each flight mode, instead of being common across flight modes.

RF System

This section is used to configure the Owner Registration ID, and the internal and/or external RF modules.

The Owner Registration ID is an 8 character ID that contains a unique random code, which can be changed if desired. This ID becomes the Owner Registration ID when registering a receiver. Enter the same code in the Owner ID field of your other transmitters you want to use the Smart Share feature with them. This must be done before creating the model you want to use it on.

Telemetry

Telemetry is used for passing information from the model back to the RC pilot. This information can be quite extensive, and includes RSSI (receiver signal strength) and Link Quality, various voltages and currents, and any other sensor outputs such as GPS position, altitude, etc.

Note that the telemetry screens are set up as main views in the Configure Screens section.

Checklist

The Checklist section is used to define startup alerts for things like initial throttle position, whether failsafe is configured, pot and slider positions, and initial switch positions.

Logic Switches

Logic switches are user programmed virtual switches. They aren't physical switches that you flip from one position to another, however they can be used as program triggers in the same way as any physical switch. They are turned on and off by evaluating the conditions of the programming. They may use a variety of inputs such as physical switches, other logical switches, and other sources such as telemetry values, channel values, timer values, or Global Variables. They can even use values returned by a LUA model script.

Special Functions

This is where switches can be used to trigger special functions such as trainer mode, soundtrack playback, speech output of variables, data logging etc. Special Functions are used to configure model specific functions.

Curves

Custom curves can be used in input formatting, in the mixers or in the outputs. There are 100 curves available, and can be of several types (between 2 and 21 point, with either fixed or user-definable x-coordinates).

In the Mixer a typical application is using an Expo curve to soften the response around midstick. A curve may also be used to smooth a flap to elevator compensation mix so that the aircraft does not 'balloon up' when flaps are applied.

In the Outputs a balancing curve may be used to ensure accurate tracking of the left and right flaps.

Trainer

The Trainer section is used to set the radio as a Master or Slave in a trainer setup. The trainer link can be via Bluetooth or a cable.

Device Config

Device Config contains tools for configuring devices like sensors, receivers, the gas suite, servos and video transmitters.

Model Select



The Model Select option is accessed by selecting 'Model select' from the System menu. It is used to Select the Current Model, Add a New Model, or Clone or Delete it.

Adding a New Model



The first time you tap on Model Select (or at first startup) you are advised that there are no models, and the Model Creation Wizard is started automatically. Choose the category of model you wish to create, and follow the prompts.

There are wizards for:

- Airplane
- Glider
- Helicopter
- Multirotor
- Other

Created models will be shown in groups based on the model categories, and will be sorted alphabetically within each group.

Example: Airplane Wizard

The Airplane wizard assists you with the basic setup for a fixed wing model. It takes you through a number of steps to configure the basic setup of the model, allowing you to choose the number of motors/engines, ailerons, flaps, type of tail (e.g. traditional with elevator and rudder. Finally is asks you to name your model and optionally link an image of it.

Selecting a Model

Tap on 'Model select' to bring up a list of your models. Detailed info of the model is shown below the icon: the model type, name, model file size and the last modification time stamp.



Tap on a model to select it, then tap on it again to bring up the model management menu.

Model Select	ETHOS	
	Airplane	
Model1	Model1	
	Set current model	
	Clone	
	Delete model	
Model type: Airplane File name: model02.bin File size: 1.8K8 Last modification: 2020-04-15 13::		

Model Management Menu

The model management menu allows you to make the selected model the current model.

You can also Clone the model, which will duplicate the model. Alternatively, you can Delete the model. Note that the Delete option only appears if the selected model is not the current model.

Edit model



The 'Edit model' option is used to edit the basic parameters for the model as set up by the wizard.

Edit Model	ETHOS	€
Name		A 🛃
Picture		🔻
Model Type		Airplane 🔻
Ailerons		2 channels 🔻
T ail		Traditional 🔻
Elevators		1 channel 🔻
Rudders		1 channel 🔻

The model can be renamed, or the picture assigned or changed. However, changing the model type, tail type, or heli swash plate will cause all mixers to be reset. Enabling 'Reset All Mixers' will also reset everything.

Flight Modes



Flight modes bring incredible flexibility to a model setup, because they allow models to be set up for switch selectable specific tasks or flight behavior. For example, gliders may be set up to have switch selectable modes such as Launch, Cruise, Speed and Thermal. Power planes may have flight modes for Normal precision flying, Take Off, and Landing with either half or full flaps deployed. Helicopters have modes such as Normal for spool up and take off/landing, Idle Up 1 for aerobatic flying, and Idle Up 2 for perhaps 3D.

Flight modes remove much of the switching and trimming burden from the pilot. The great power of flight modes is that they support independent trims and mixer Variables, and can also be used to enable Mixer lines. Together, these features allow for great flexibility. Please refer to the Tutorial section to see examples of these features applied.

< Flight Modes	ETHOS	4.
		on
Default Flight Mode		
	Default Flight Mode	
	Edit	
	Add	

There are no default flight modes defined. Tap on the default flight mode, and select Edit if you wish to rename it, otherwise select Add to define a new flight mode.

< Default Flight Mode	ETHOS	🗟 0 dB 0 dB 📢 🏢
Name		Normal 🛃
Trims		\checkmark
Trim Rudder		0
Trim Elevator		0
Trim Throttle		0
Trim Aileron		

You can name each flight mode, and define its active condition, which can be a switch or button position, a function or logic switch, a system event such as throttle cut or hold, or a trim position. Note that the default flight mode does not have an active condition parameter, because this is the flight mode that is always active when no other flight mode is active. The first flight mode that has its switch ON is the active one.

Flight Modes	ETHOS	2.46
Name	Active condition	
Flaps Half	SE-	
Flaps Full	SE↑	

Once programed the flight mode selections are displayed in the mixers. Up to 100 flight modes can be programmed. Like most functions in ETHOS the user can program descriptive text Flight Mode names such as Cruise, Speed, Thermal or Normal, Take Off, Landing.

Flight Mode Management

Flight Modes	ETHOS	50 0 dB 0 dB
	A ative condition	
Flaps Half	Edit	
Flans Full	Copy Trims	
	Add	
	Move	
	Delete	

Tap on a flight mode to bring up a menu which allows you to edit, copy trims, add a new flight mode or delete flight modes.



You can use the 'Move' option to change the priority of a flight mode. The priority of flight modes is in ascending order, and the first one that has its switch ON is the active one.

Mixer



The Mixer function forms the heart of the radio. This is where the model's control functions are configured. The Mixer section allows any of the many sources of input to be combined as desired and mapped to any of the output channels. Ethos has 100 mixer channels available for programming your model. Normally the lowest numbered channels will be assigned to the servos, because the channel numbers map directly to the channels in the receiver. The X20 Internal RF (Radio Frequency) module has up to 24 output channels available.

The upper mixer channels can be used as 'virtual channels' in more advanced programming, or as real channels using multiple RF modules (Internal + External) and SBus. The channel order is a matter of personal preference or convention, or it may be dictated by the receiver. We will use AETR for our example.

The source or input to a mix can be chosen from analog inputs such as the sticks, pots and sliders; the toggle switches or buttons; any defined logic switches; the trim switches; any defined channels; a gyro axis; a trainer channel; a timer; a telemetry sensor; a system value such as the main radio voltage or RTC battery voltage; or a 'special' value such as 'minimum', 'maximum' or 0.

This section also allows the source to be conditioned by defining weights/rates and offsets, and adding curves (eg Expo). The mix can be made subject to a switch and/or flight modes, and a slow function to be added. (Note that Delays are implemented in the Logic Switches because they are related to switches.) The mixer includes contextual help text that dynamically changes as mixer options are touched. Up to 100 mixer lines may be defined.

< Mixer		ETHOS	
Name	Source	Channels	Active condition
Ailerons	Aileron	1, 2	Always On
Elevators	Elevator	3	Curve
Throttle	Throttle	4	
Rudders	Rudder	5	035
			-100%
			Flight Mode
			D 1 2

If your model was created using one of the model creation wizards in the 'Model select' function in the System menu, the base mixer lines will be shown when you tap on the 'Mixer'.

In addition, the most common predefined mixes can be added as well as free mixes that are user configurable.

< Mixer		ETHOS		
		Channala	Active	condition
Ailerons	Ailero	Ailerons		Always On
Elevators	Elevat	Edit	urve	
	Throt	Add Mix		
	Rudde	↓ Move down		
		Clone		
		Delete	- liaht N	1ode
				D 1 2

There is one mix line for each control/mix and a graphic display for that mix. To edit a mixer line, touch the mixer and touch again for the popup menu, then select Edit.

Please note that inactive mixer lines are shown greyed out, to assist in debugging.

The radio asks for confirmation before deleting a mix, in case of inadvertent selection.

Aileron, Elevator, Rudder Mixer

We will use the Ailerons as an example, but the Elevator and Rudder mixes are very similar.



Name

Ailerons has been filled in as the default name, but it can be changed.

Active Condition

The default active condition is 'Always On', which is appropriate for Ailerons. It may be made conditional by choosing from switch or button positions, function switches, logic switches, a system event such as throttle cut or hold, or trim positions.

Flight Modes

If any flight modes have been defined, the mix can be made conditional to one or more flight modes. Click on 'Edit' and check the boxes for the flight modes in which this mixer line must be active.

Curve

A standard curve option is Expo, which by default has a value of 0, which means the response is linear (i.e. no curve). A positive value will soften the response around 0, while a negative value will sharpen the response.

Any previously defined curve may also be selected. The mixer output will then modified by this curve. Alternatively, a new curve may be added.

Weight / Rates

Multiple rates can be defined, subject to a switch position, function switch, logic switch, trim position or flight mode. A line is added for each rate. The default rate (i.e. first rates line) is active when none of the other rates are active. There is a small cross inside an arrow on the left of defined rates that can be used to delete a rates line. In the example above three rates have been set up on switch SB.

< Elevators	ETHOS	
Name	Elevators 🗃	100%
Active condition	Always On 🔻	
Flight Modes	D 1 2 Edit	0%
Curve	🔻	
	+ Add a new curve	-100%
Weight / Rates	■ Pot1 ▼ ■ 65%	0
	+ Add a new weight	
Differential	0%	

In this example a long press on Enter brought up the dialog to select a source instead of the default fixed value, in this case Pot1 was selected. The graph on the right shows that the pot is at 65%, so this would be the weight for the Aileron Rates, but adjustable in flight.

Differential

Ailerons	E	THOS		(,)
	+ Add a	new weight		100%
Differential	-	50%		
Channels count		2		0%
Output1	CH1	. (Aileron1) 🔻		
CH1 (Mixer: 0% I	-100%	
Output2	CH2	2 (Aileron2) 🔻	Select the chann affected by this	
СН2	Channel: 0% (1502us)	Mixer: 0% I		

On Ailerons differential (typically more up aileron travel than down) is utilized to reduce adverse yaw and to improve turning/ handling characteristics. A positive value will result in the ailerons having less downward travel, as can be seen in the graph above. (Default = 0. Range -100 to +100). On Elevator differential may be used for planes wanting less down than up elevator, typically in racing situations.

Channels Count

Channel count defines how many Output channels are allocated. In this example two ailerons were configured in the model creation wizard.

Output1, Output2

The model creation wizard assigned channels 1 and 2 to the ailerons, because the default channel order in the System – Sticks menu was set to AETR, i.e. ailerons, elevator, throttle, rudder.

The default can be altered if required, but care must be exercised to assess any other impacts to making a change here.

Throttle Mixer

The Throttle mixer has parameters for managing Throttle Cut and Throttle Hold. Throttle Cut features a throttle input safety interlock, while Throttle Hold has a simple on/off function.

< Throttle	ETHOS	Ĺ ₀ G, 0db 0db 🗳 🎹
Name	Throttle 🖃	100%
Input	■ Throttle ▼	
Throttle Cut	\sim	0%
Active condition	■ SB↓ ▼	
Sticky	OFF ON	-100%
Trigger value	-85%	
Idle Output Value	-100%	

Input

The source for the Throttle mix can be selected here. It defaults to the Throttle stick, but can be changed to an analog, switch, trim, channel, gyro axis, trainer channel, timer or special value.

Throttle Cut

Throttle Cut features a throttle input safety interlock. When used with Low Position Trim (see below), it can be used for managing the throttle and idle settings on glow or gas powered models.

Active Condition

The active condition may be chosen from switch or button positions, function switches, logic switches or trim positions.

Sticky

When Sticky is in the ON position, the throttle channel output will be switched to the Idle Output Value (default -100%) as soon as Throttle Cut becomes active.

When Sticky is in the OFF position, once Throttle Cut becomes active, the throttle channel output will be switched to the Idle Output Value (default -100%) as soon as the throttle stick goes below the Trigger value (default -85%).

Trigger Value

The Trigger Value determines the value below which the throttle input triggers the throttle safety interlock.

For safety, once Throttle Cut becomes inactive, the throttle channel output will only leave the Idle Output Value if the throttle input has been below the Trigger Value. This ensures that the engine or motor only starts from a low throttle input value.

< Throttle	E	HOS		
Throttle Hold		\sim		100%
Active condition	-	SAI 🔻		
Value		-100%		0%
Flight Modes	D 1 2	Edit	-100%	
Curve		🔻	0	
	+ Add a n	ew curve		
Weight / Rates	-	100%		

Throttle Hold

Throttle Hold provides a simple throttle hold function without the throttle input safety interlock of Throttle Cut above.

Active Condition

The active condition may be chosen from switch or button positions, function switches, logic switches or trim positions.

Value

Once the throttle hold function goes active, the Value setting will be output on the throttle channel. On electric powered models, the throttle hold value is normally (-100%).

Flight Modes

If any flight modes have been defined, the mix can be made conditional to one or more flight modes. Click on 'Edit' and check the boxes for the flight modes in which this mixer line must be active.

Curve

A curve may be defined to modify the throttle channel output. Any previously defined curve may also be selected.

Weight / Rates

Multiple rates can be defined, subject to a switch position, function switch, logic switch, trim position or flight mode. A line is added for each rate. The default rate (i.e. first rates line) is active when none of the other rates are active. There is a small cross inside an arrow on the left of defined rates that can be used to delete a rates line. In the example above three rates have been set up on switch SB.

Low Position Trim



For glow and gas engines 'Low position trim' is used to adjust the idle speed. The idle speed can vary depending on the weather, etc., so having a way to adjust the idle speed without impacting the full throttle position is important.

If 'Low position trim' is enabled, the throttle channel goes to an idle position of -75% when the throttle stick is at the low position (please refer to the channel bar display at the bottom of the screenshot above). The throttle trim lever can then be used to adjust the idle speed between -100% and -50%. Throttle Cut can then be configured to cut the engine with a switch.

Predefined Mixes

< Mixer Library ETH		-05	
Free Mix	Var	Trim	Ailerons
Elevators	Rudders	Flaps	Throttle
Ail => Flaps	Ail => Rud	Airbrake	Camber
Flaps => Ele	Ele => Camber	Rud => Ail	Rud => Ele
Snap Roll	Thr => Ele	Thr => Rud	Test Mix

Free Mix

The Mixer function can best be described by making use of a Free Mix, which we will add to the above mixes for illustration purposes. Tap on any Mixer line, and select 'Add Mix' from the popup menu to add a new mixer line.

Select Free Mix from the list of available predefined mixes in the Mixer Library.

< Mixer Librar	y ETHOS	◀,
	Add After	
	First position	Throttle
	Ailerons	
Flaps => Ele	Throttle Ele	
Snan Boll	Rudders	Test Miv
Shap Koli		

Next the position for the new mixer line must be chosen, in this example after 'Rudders'.

< Mixer		ETHOS	
Name	Source	Channels	Active condition
Ailerons	Aileron	1, 2	Always On
Elevators	Elevator	3	100%
Throttle	Throttle	4	0%
Rudders	Rudder	5	
Free Mix		None	Flight Mode
			D 1 2

Tap on 'Free Mix' to bring up the edit sub-menu.

< Mixer		ETHOS		
Name	Source	Chappele	Active	condition
Ailerons	Ailero	Free Mix		Always On
Elevators	Elevat	Edit		
Throttle	Throt	Add Mix		
Rudders	Rudde	Move		
Free Mix		Clone		
		Delete	light N	/lode D 1 2

Select Edit to open a new screen showing the detailed parameters for the 'Free Mix'. The graph display on the right will display the mixer output, and the effect of any setting changes that are made.

Free Mix	ETHOS	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Name	Free Mix 🗃	100%
Active condition	Always On 🔻	
Flight Modes	D 1 2 Edit	0%
Source	🔻	
Function Type	Addition 🔻	-200%
Curve	🔻	ଡ
	+ Add a new curve	
Offect	• ^0⁄	

Name

A descriptive name can be entered for the Free Mix.

Active Condition

The default active condition is 'Always On'. It may be made conditional by choosing from switch or button positions, function switches, logic switches, a system event such as throttle cut or hold, or trim positions.

Flight Modes

If any flight modes have been defined, the mix can be made conditional to one or more flight modes. Click on 'Edit' and check the boxes for the flight modes in which this mixer line must be active.

Source

The source or input to this mix can be chosen from:

- a) analog inputs such as the sticks, pots and sliders
- b) the toggle switches or buttons
- c) any defined logic switches
- d) the trim switches
- e) any defined channels
- f) a gyro axis
- g) a trainer channel
- h) a timer
- i) a telemetry sensor
- j) a system value (e.g. main radio voltage or RTC battery voltage)

k) a 'special' value, i.e. minimum, maximum or 0

The mixer line will take the value of the source at any instant as its input.

Function Type

The Function Type defines how the current mixer line interacts with the others on the same channel. There are three function types:

Addition

The output of this mixer line will be added to any other mixer lines on the same output channel.

Multiply

The output of this mixer line will be multiplied with the result of any other mixer lines on the same output channel.

Replace

The output of this mixer line will replace the result of any other mixer lines on the same output channel.

Lock

A channel which is "locked" will never be changed by any other mix while the locked mixer line is active. (This is a good alternative to the Override function of OpenTX.)

The combination of these operations allows the creation of complex mathematical operations.

Curve

A standard curve option is Expo, which by default has a value of 0, which means the response is linear (i.e. no curve). A positive value will soften the response around 0, while a negative value will sharpen the response.

Any previously defined curve may also be selected. The mixer output will then modified by this curve. Alternatively, a new curve may be added.

Offset

Offset will shift the mixer output up or down by the offset value entered here. Negative values are allowed.

Free Mix	ETHOS		
Weight Up	100%		100%
Weight Down	100%		
Slow Up	0.0s		0%
Slow Down	0.0s	-200%	
Channels count	1	0	
Reverse	OFF 🔵 ON		
Output	🔻		

Weight Up

The mixer output in the positive direction will be scaled by the weight value entered here. Negative values are allowed.

Weight Down

Similarly, the mixer output in the negative direction will be scaled by the weight value entered here.

Slow Up/Down

Response of the output can be slowed down with regard to the input change. Slow could for example be used to slow retracts that are actuated by a normal proportional servo. The value is time in seconds that the output will take to cover the -100 to +100% range.

Channels Count

Channel count defines how many Output channels are allocated.

Reverse

The output of this mixer line can be reversed or inverted by enabling this option. Please note that servo reversal should be done under Outputs. This option is for getting the logic of the mixing right.

Output

Any channel can be selected to receive the output from this mixer line. If the Channels Count above is greater than one, then a channel must be configured for each Output.

Other Pre-defined Mixes

<< this section to be added >>

Outputs



The Outputs section is the interface between the setup "logic" and the real world with servos, linkages and control surfaces as well as actuators and transducers. In the Mixer we have set up what we want our different controls to do. This section allows these pure logical outputs to be adapted to the mechanical characteristics of the model. This is where we configure minimum and maximum throws, servo or channel reverse, and adjust the servo or channel center point or add an offset using subtrim. We can also define a curve to correct any real world response issues. For example, a curve can be used to ensure that left and right flaps track accurately. The various channels are outputs, for example CH1 corresponds to servo plug #1 on your receiver (with the default protocol settings).

< Outputs	ET	-05	0 _{dB}
	• • • •		
CH1 Aileron1		CH2 Aileron2	
		Channel	0%
		Mixer	0%
CH3 Elevators		CH4 Throttle	
Channel	0%	Channel	100%
Mixer	0%	Mixer	100%
CH5 Rudders		СН6	
Channel	0%	Channel	0%
Mixer	0%	Mixer	0%
СН7		СН8	
		Channel	0%
Mixer	0%	Mixer	0%

The Outputs screen shows two bar graphs for each channel. The lower (green) bar shows the value of the mixer for the channel, while the upper (orange) bar shows the actual value (in both % and μ S terms) of the Output after the Outputs processing, which is what is sent to the receiver. In the example above you can see that both the mixer and output values for CH4 Throttle are at 100%.

The channels that are not being output to the RF module are shown with a darker background. In the example above, all eight channels are being transmitted, so they have a lighter grey background.

Note: For quick access to this monitor screen, a long press of the enter key from the Mixer screen and Flight Modes screens will jump to the Outputs.

Outputs Setup

Tap on the Output channel to be edited or reviewed.

< Channel3	ETHOS	85 _{db} 100 _{db}
Name		Throttle 🖃
Invert		Normal 🕖 Inverted
Min		-100.0%
Max		100.0%
Center/Subtrim		0.0%
Curve		🔻
Slow Up		0.0S

Name

The name can be edited.

Invert

Will Invert the channel output, typically to reverse servo direction.

Min/Max

The Channel min and max settings are 'hard' limits, i.e. they will never be overridden. They should be set to avoid mechanical binding. Note that they serve as gain or 'end point' settings, so reducing these limits will reduce throw rather than induce clipping. Note that the limits default to +/-100.0%, but may be increased here to +/-150.0%.

Center/Subtrim

Used to introduce an offset on the output, typically used to center a servo arm.

Curve

Allows you to select an Expo or custom curve to condition the output. The popup allows to to either select an existing curve, or to add a new curve. After configuring the curve, an Edit button is added so that you can edit the curve easily.

Curves are a quicker and more flexible way of configuring the center and min/max limits of the outputs, and you get a nice graphic. Use a 3-point curve for most outputs, but use a 5-point curve for things such as the second aileron and flap, so you can synchronize the travel at 5 points. When using a curve it is good practice to leave Min, Max and Subtrim at their 'pass thru' values of -100, 100 and 0 respectively (or -150, 150 and 0 if using extended limits).

Slow Up/Down

Response of the output can be slowed down with regard to the input change. Slow could for example be used to slow retracts that are actuated by a normal proportional servo. The value is time in seconds that the output will take to cover the -100 to +100% range.

Delay

Please note that a delay function is available under Logic Switches.

	odel		ETH	-05		
	Model Selec		edit Model	• Flight Modes	Mixer	
			<u> </u>	s f f f	ት ት	
	Outputs		Timers	Trims	RF System	
ጽ	\	*	@	\$ \$	14:17:1	L5
I < Tin	ners		ETI	-05		
< Tin Name	ners M	lode	ETI Value	Active conditio	n Reset	
〈 Tin Name Timer1	ners M U	lode p	ET! V alue 00:00:00	Active conditio	n Reset	
<pre>< Tin Name Timer1 Timer2</pre>	mers M U U	lode p p	Value 00:00:00 00:00:00	Active conditio	n Reset 	
C Tin Name Timer1 Timer2 Timer3	mers M ບ ບ	lode p p	Value 00:00:00 00:00:00 00:00:00	Active conditio	n Reset 	

Timers

There are 3 fully programmable timers that can count either up or down.

< Timers			ETHOS		€ ,∰
Name	Mode	Malua	Active condit	ion	
Timer1	Up	Deret	i iiier 1		
Timer2		Reset			
Timer3		Edit			
		Add			
		Move			
		Сору			

Touching any timer line brings up a popup with options to reset or edit that timer, add a new timer, or to move or copy/paste the timer.

< Timer edit E	
Name	BattTimer 🖃
Mode	Down 🔻
Start Value	00:03:00 🖃
Countdown Mode	Speech 🔻
Haptic	OFF ON
Countdown Start	00:02:00 🖃
Countdown Step	30s

Name

Allows the timer to be named.

Mode

The timer can count Up or Down.

Alarm/Start Value

If the timer has been set to count Up, the Start Value parameter sets the Alarm Value at which the timer triggers the configured alerts.

If the timer has been set to count Down, the Alarm Value parameter sets the Start Value from which the timer counts down. When it reaches zero, it triggers the configured alerts.

Countdown Mode

This setting determines whether the countdown alert is mute, or a beep or spoken value.

Haptic

Enables haptic feedback to signal that the timer has elapsed.

Countdown Start

The timer value from which the countdown alerts start.

Countdown Step

The interval at which countdown alerts are made.



Active Condition

The active condition parameter which determines when the timer is running has the following options:

Always On

Always On counts all the time.

Throttle Absolute

The timer runs whenever the throttle stick isn't at idle.

Throttle Percentage

The timer counts up/down as a percentage of the full stick range.

Throttle Trigger

Throttle Trigger starts the timer the first time throttle is advanced.

Switch Positions

The timer may also be enabled by a switch position.

Logic Switch Positions

The timer may also be enabled by a logic switch.

Reset

The timer can be reset by switch positions, function switches, logic switches or trim switch positions. Not that the timer will be held in reset while the Reset condition is valid.

Persistent

Turning Persistent to On allows storing the timer value in memory when the radio is powered off or the model is changed, and will be reloaded next time the model is used.

Trims



The Trims section allows you to configure the Trim Mode (i.e. trim step size), enable Extended Trims or Independent Trims for each of the 4 control sticks. It also allows Cross Trims to be configured.

< Trims	ETHOS	
Trim Rudder		\sim
Trim Mode		Fine 🔻
Extended trims		OFF 🔵 ON
Independent Trim per Flig	ht Mode	OFF 🔵 ON
Trim Elevator		\sim
Trim Mode		Fine 🔻
Extended trims		OFF 🔵 ON

There are four sets of Trims settings, one set for each stick. For example, you can have independent elevator trims per flight mode, while leaving the aileron and rudder trims as common or combined.

Trim Mode

< Trims	ETHOS	
Left Horizontal	Trim Mode	\sim
Trim Mode	Disable	Fine 🔻
Extended trims	Extra Fine	OFF 🌒 ON
One value per flight mo	Fine	OFF 🌒 ON
Left Vertical	Medium	~
Trim Mode	Coarse	Fine 🔻
Extended trims		OFF ON

The Trim Mode allows trims to be disabled, or to configure the granularity of the trim switch steps, from Extra Fine through Medium to Coarse, or Exponential. The Exponential setting gives fine steps near the center, and coarse steps further out. Custom allows the trim step to be specified.

Extended Trims

Extended trims allows trims to cover the full stick range instead of +/-25%. Care must be taken with this option, as holding the trim tabs for too long might add so much trim as to make your model unflyable.

Independent Trim per Flight Mode

If you are using Flight Modes, then this setting enables the relevant trim to be independent for each flight mode, instead of being common to all flight modes.

Cross Trim

< Trims	ETHOS	
Extended trims		OFF 🔵 ON
Independent Trim per Flight	Mode	OFF ON
Cross Trim		\checkmark
Stick Rudder		Trim Rudder 🔻
Stick Elevator		Trim Elevator 🔻
Stick Throttle		Trim Throttle 🔻
Stick Aileron		Trim Aileron 🔻

Cross trims can be set up for each trim stick, so you can nominate which trim switch to use for each stick.

RF System



This section is used to configure the Owner Registration ID, and the internal and/or external RF modules.

<pre>< RF System</pre>	ETHOS	
Owner Registration ID		kVkVbDfH 🕞
Internal Module		>
External Module		>

Owner Registration ID

The Owner Registration ID is an 8 character ID that contains a unique random code, which can be changed if desired. This ID becomes the Owner Registration ID when registering a receiver (see below). Enter the same code in the Owner ID field of your other transmitters you want to use the Smart Share feature with them. This must be done before creating the model you want to use it on.

Internal Module

Overview

The X20 TD-ISRM internal RF module is a new design that provides tandem 2.4GHz and 900MHz RF paths. It can operate in 3 modes, i.e. ACCESS, ACCST D16 (see below) or TD MODE (see further below).

ACCESS Mode

In ACCESS mode the 2.4G and 900M RF paths work in tandem with one set of ACCESS controls. There can be three 2.4G receivers registered and bound or three 900M receivers registered and bound or a combination of 2.4G and 900M for a total of three receivers.

In ACCESS mode with a combination of 2.4G and 900M receivers the telemetry for the 2.4G and 900M RF links are active at the same time. The sensors are identified in telemetry as 2.4G or 900M.

There is a new ETHOS telemetry receiver source feature named RX. RX provides the receiver number of the active receiver sending telemetry. RX is available in telemetry like any other sensor for real time display, Logic Switches, Special Functions and data logging.

ACCST D16 Mode

In ACCST D16 the TD-ISRM becomes a single 2.4G RF path.

TD Mode

In TD Mode the TD-ISRM is in a low latency long range mode using the 2.4G and 900M RF links in Tandem to work with the new Tandem receivers. At the time of writing Tandem receivers are not available yet.

Please see the following sections for configuration details.

<pre>< RF System</pre>	ETHOS	
Internal Module		\sim
State		OFF 🔵 ON
Туре		ACCESS 🔻
2.4G		OFF ON
Antenna		Internal 🔻
900M		OFF 🔵 ON
Model ID		0

State

The Internal Module can be On or Off.

Туре

Transmission mode of the internal RF module. The X20/X20S models operate on the 2.4GHz and/or the 900MHz band. The ACCESS and TD (Tandem) modes can operate on both the 2.4GHz and/or the 900MHz band simultaneously (or individually), while the ACCST D16 operates only on the 2.4GHz band. The Mode must match the type supported by the receiver or the model will not bind! After a Mode change, carefully check model operation (especially Failsafe!) and fully verify that all receiver channels are functioning as intended.

KF System	ETHOS		
Туре			ACCESS 🔻
2.4G			OFF 💽 ON
Antenna			Internal 🔻
900M			OFF 🔵 ON
Model ID			0
Channel Range			CH1 - CH8
Set		Register	Range Check

Type: ACCESS

ACCESS changes the way receivers are bound and connected with the transmitter. The process is broken into two phases. The first phase is registering the receiver to the radio or radios it is to be used with. Registration only needs to be performed once between each receiver / transmitter pair. Once registered, a receiver can be bound and re-bound wirelessly with any of the radios it is registered with, without using the bind button on the receiver.

Having selected the ACCESS mode, the following parameters must be set up:

2.4G

Enable or disable the 2.4G RF module.

Select Internal or External (on ANT1 connector) Antenna. Although the RF stage has built-in protection, it is good practice to ensure that an external antenna has been fitted before selecting the External antenna.

900M

Enable or disable the 900M RF module.

Antenna: Select Internal or External (on ANT2 connector) Antenna. Although the RF stage has built-in protection, it is good practice to ensure that an external antenna has been fitted before selecting the External antenna.

Power: Select the RF Power desired between 10, 25, 100, 200, 500mW.

In ACCESS mode the 2.4g and 900m RF paths work in tandem with one set of ACCESS controls. There can be three 2.4G receivers registered and bound or three 900M receivers registered and bound or a combination of 2.4G and 900M for a total of three receivers.

Model ID

When you create a new model, the Model ID is automatically allocated. The Model ID must be a unique number because the Smart Match function ensures that only the correct Model ID will be bound to. This number is sent to the receiver during binding, so that it will then only respond to the number it was bound to. The Model ID can be changed manually. Note also that the Model ID is changed when the model is cloned.

Channel Range:

Since ACCESS supports 24 channels, you normally choose Ch1-8, Ch1-16, Ch9-16 or Ch17-24 for the receiver being set up. Note that Ch1-16 is the default.

Phase One: Registration

Set:

1. Initiate the registration process by selecting [Register].

< Register	ETHOS	2.46
	Waiting for receiv	er
Registration ID		
RX Name		
UID		0
		Register

A message box with 'Waiting....' will pop up with a repeating 'Register' voice alert.

2. While holding down the bind button, power up the receiver, and wait for the red & green LEDs to become active.

Kegister	ETHOS	2.46
	Receiver connect	ed
Registration ID		URqrqxyw 🕞
RX Name		SR10 🛃
UID		0
		Register

The 'Waiting...' message changes to 'Receiver Connected', and Rx Name field will be filled in automatically.

- 3. At this stage the Reg. ID and UID can be set:
 - Reg. ID: The Registration ID is at owner or transmitter level. This should be a unique code for your X20/X20S and transmitters to be used with Smart Share. It defaults to the value in the Owner Registration ID setting described above at the start of this section, but can be edited here. If two radios have the same ID you can move receivers (with the same Receiver No for a given model) between them by simply using the power on bind process.
 - RX Name: Filled in automatically, but the name can be changed if desired. This can be useful if you are using more than one receiver and need to remember for example that RX4R1 is for Ch1-8 or RX4R2 is for Ch9-16 or RX4R3 is for Ch17-24 when rebinding later. A name for the receiver can be entered here.
 - The UID is used to distinguish between multiple receivers used simultaneously in a single model. It can be left at the default of 0 for a single receiver. When more than one receiver is to be used in the same model, the UID should be changed, normally 0 for Ch1-8, 1 for Ch9-16, and 2 for Ch17-24. Please note that this UID cannot be read back from the receiver, so it is a good idea to label the receiver.

4. Press [Register] to complete. A dialog box pops up with 'Registration ok'. Press [OK] to continue.

KF System	ETHOS		2.46
Туре			ACCESS 🔻
	Registration		OFF ON
Antenna	- Registration OK		Internal 🔻
900M		ОК	OFF 🔵 ON
Model ID			
Channel Range			
Set			Range Check

5. Turn the receiver off. It is now ready for binding.

Range

KF System				
				0mw 🔻
Model ID				
Channel Range	Range Check 2.4G RX : 1 2.4G VFR : 98% 2.4G RSSI : 42dB900M RX : 1 900M VFR : 100%			
Set			Range Check	
RX1 SR10		:1		
RX2	900M RSSI:62dB			
RX3				

A range check should be done at the field when the model is ready to fly.

Range check is activated by selecting 'Range Check'. A voice alert will announce 'Range Check' every few seconds to confirm that you are in range check mode. A popup will display the Receiver Number, and the VFR% and RSSI values to evaluate how reception quality is behaving. When the Range Check is active, it reduces transmitter power, which in turn reduces the range for range testing. Under ideal conditions, with both the radio and receiver at 1m above the ground, you should only get a critical alarm at about 30m apart.

Currently ACCESS in range check mode provides range check data for one receiver at a time on the 2.4G link and one receiver at a time on the 900M link. If you have three 2.4G receivers registered and bound as Receiver 1, 2 and 3, one of the receivers will be the active telemetry receiver and its number will be displayed by the RX sensor as 0, 1, or 2. That will be the receiver that is sending the RSSI and VFR data. If you turn that receiver off the next receiver will become the active telemetry receiver in a priority of 0, 1, and then 2. Each of the three receivers can be range checked by turning off the other receivers.

RX sensor 0 = Receiver 1 RX sensor 1 = Receiver 2 RX sensor 2 = Receiver 3

Please also refer to the Telemetry section for a discussion on VFR and RSSI values.

<pre>< RF System</pre>	ETHOS	246		
Model ID				1
Channel Range			CH1	- CH8
Set		Register Range Check		e Check
RX1		Bind	Set	Reset
RX2		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			No	ot Set 🔻

At this point the receiver is registered, but it still needs to be bound to the transmitter to be used.
Phase Two – Binding, and Module Options

Receiver binding enables a registered receiver to be bound to one of the transmitters it has been registered with in phase 1, and will then respond to that transmitter until re-bound to another transmitter. Be certain to perform a range check before flying the model.

Receiver No: Confirm the receiver number the model is to operate under. Receiver matching is still as important as it was before ACCESS. The receiver number defines the behavior of the Smart Match function. This number is sent to the receiver during binding, which will then only respond to the number it was bound to. The Model ID can be changed manually.

Bind

Warning – Very Important

Do not perform the binding operation with an electric motor connected or an internal combustion engine running.

- 1. Turn the receiver power off.
- 2. Confirm that you are in ACCESS mode.

3. Receiver 1 [Bind]: Initiate the binding process by selecting [Bind]. A voice alert will announce 'Bind' every few seconds to confirm that you are in bind mode. A popup will display 'Waiting for receiver....'.

RF System	ETHOS			
Model ID				
Channel Range			CH1	
Set	8 Bind		Rang	
RX1	Waiting for receiver			
RX2		Bind		
RX3				
Failsafe				ot Set 🔻

4. Power up the receiver without touching the F/S bind button. A message box will pop up 'Select device' and the name of the receiver you have just powered on.

< RF System	ETHOS MIN			
Model ID				
Channel Range				
Set	Select device	ister	Rang	
RX1	SR10	Bind		
RX2				
RX3				
Failsafe			No	ot Set 🔻

5. Scroll to the receiver name and select it. A message box will pop up indicating that binding was successful.

KF System		ETHOS	^{2,6} 11 √ .□		
Model ID					
Channel Range	Bind				
Set	Bind	Pind OV		Rang	
RX1 SR10			OK		
RX2					
RX3					
Failsafe				Nc	ot Set 🔻

6. Turn off both the transmitter and the receiver.

7. Turn the transmitter on and then the receiver. If the Green LED on the receiver is on, and the Red LED is off, the receiver is linked to the transmitter. The receiver/transmitter module binding will not have to be repeated, unless one of the two is replaced.

The receiver will only be controlled (without being affected by other transmitters) by the transmitter it is bound to.

RF System	FSystem ETHOS			
Model ID				1
Channel Range			CH1	- CH8
Set		Register	Range	Check
RX1 SR10		Bind	Set	Reset
RX2		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			No	t Set 🔻

The receiver selected will now show for RX1 the name next to it:

The receiver is now ready for use.

Repeat for Receiver 2 and 3 if applicable.

Refer also to the Telemetry section for a discussion on RSSI.

Adding a Redundant Receiver

A second receiver may be bound to an unused slot, e.g. either RX2 or RX3 to provide redundancy in case of reception problems. Either a 2.4G or 900M receiver may be the backup for redundancy. Our example below shows a 900M receiver being added.

1. Connect the SBUS Out port of the redundant receiver to the SBUS IN port of the main receiver.

2. Power up the receivers (the redundant receiver can be powered via the SBUS cable.

Kegister	ETHOS	\$2.46 \$2.46 \$10000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$100
	Receiver connect	ed
Registration ID		d9l8g7n6 🗃
RX Name		R9MINI-O 🕞
UID		3
		Register

- 3. Register the new receiver.
- 4. Switch off the receivers.

RF System ETHOS 98.80.8 98.40.8 2.4 90.4 98		dв ()		
Model ID				1
Channel Range			CH1	- CH16
Set		Register	Range	e Check
RX1 SR10		Bind	Set	Reset
RX2		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			No	t Set 🔻

- 5. Tap 'Bind' on either the RX2 or RX3 line.
- 6. Power up the receivers.

RF System	ETHOS		2.46 S	
				.0mw 🔻
Model ID				
	Select device			
Channel Range	SR10		CHI	- CH8
Set	R9MINI-O	ister	Rang	
RX1 SR10		Bind		
RX2				
RX3				

7. Select the R9 redundant receiver.

<pre>< RF System</pre>	ETH <mark>OS</mark>		S	
				l0mw 🔻
Model ID	1 Bind			
Channel Range	Bind OK		CH1	
Set		ОК	Rang	
RX1 SR10		Bind		
RX2 R9MINI-O				
RX3				

8. Tap on OK. Ensure that the Green LED on the redundant receiver is ON. The redundant receiver is now bound.

< RF System	ETHOS		94 _{dB} 99d 2.46 9001	" (]
Model ID				1
Channel Range			CH1 -	CH16
Set		Register	Range	Check
RX1 SR10		Bind	Set	Reset
RX2 R9MINI-O		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			Not	Set 🔻

9. The redundant receiver will now be listed.

Note: Although it is possible to bind both the main and redundant receivers to the same UID by powering them up individually, you will not have access to the Rx Options while both are powered up.

Set – Receiver Options

	RF System ETHOS		²⁴⁶ ∎¶¶.Ш	
Model ID				1
Channel Range			CH1	- CH8
Set		Register	Range	e Check
RX1 SR10		Bind	Set	Reset
RX2		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			No	t Set 🔻

Tap the Set button next to Receiver 1, 2 or 3, and to bring up Receiver Options:

KF System	ETHOS		2.4	
Model ID				
Channel Range	Set			
Set	Options	ister	Rang	
RX1 SR10	Share	Bind		
RX2	Reset bind	Bind		
RX3				
Failsafe			No	ot Set 🔻

Tap on Options:

<pre>< RX Settings</pre> ET	
Telemetry 25mW	OFF 🔵 ON
High PWM Speed	OFF 🔵 ON
PORT	S.Port 🔻
Pin1	CH1 (Aileron1) 🔻
Pin2	CH2 (Aileron2) 🔻
Pin3	CH3 (Elevators) 🔻
Pin4	CH4 (Rudders) 🔻

Options

Telemetry 25mW: Checkbox to limit telemetry power to 25mW (normally 100mW), possibly required if for example servos experience interference from RF being sent close to them.

High PWM Speed: Checkbox to enable a 7ms PWM update rate (vs 20ms standard). Ensure that your servos can handle this update rate.

KX Settings	ETHOS	²⁴⁶ 1 ◀
Telemetry 25mW		OFF 🔵 ON
High PWM Speed		OFF ON
PORT	S.Port	S.Port 🔻
Pin1	F.Port	CH1 (Aileron1) 🔻
Pin2	F.Port2	CH2 (Aileron2) 🔻
		CH3 (Elevators) 🔻
		CH4 (Rudders) 🔻

Port: Allows selection of the SmartPort on the receiver to use either S.Port, F.Port or the F.Port2(FBUS) protocol. The F.Port protocol was developed with the Betaflight team to integrate the separate SBUS and S.Port signals. F.Port2(FBUS) also enables one Host device to communicate with several Slave devices on the same line. For more information about the port protocol, please refer to the protocol explanation on the official FrSky website.

The receiver Options dialog also gives the ability to Remap channels to the receiver pins.

Share

The Share feature provides the ability to move the receiver to another ACCESS radio having a different Owner Registration ID. When the Share option is tapped, the receiver green LED turns off.

On target radio B, navigate to the RF System section and Receiver(n) and select Bind. Note that the Share process skips the Registration step on Radio B, because the Owner Registration ID is transferred from radio A. The receiver name from the source radio pops up. Select the name, the receiver will bind and its LED will go green.

A 'Bind successful' message will pop up.

Tap on OK. Radio B now controls the receiver. The receiver will remain bound to this radio until you choose to change it.

Press the EXIT button on Radio A to stop the Share process.

The receiver can be moved back to radio A by rebinding it to radio A.

Note: You do not need to use 'Share' if all your radios are using the same Owner ID / registration number. You can simply put the radio you want to use in bind mode, turn on the receiver, select the receiver in the radio and it will bind with that radio. You can switch to another radio the same way. It is best to keep the model receiver numbers the same when copying the models.

Reset bind

If you change your mind about sharing a model, select 'Reset bind' to clean up and restore your bind. Power cycle the receiver, and it will be bound to your transmitter.

Reset – Receiver

Tap on the Reset button to Reset the receiver back to factory settings and clear the UID. The receiver is unregistered with X20.

Set Failsafe

	ETHOS		2.4	il4 .00
Model ID				1
Channel Range			CH1	- CH8
Set		Register	Rang	e Check
RX1 SR10		Bind	Set	Reset
RX2		Bind	Set	Reset
RX3		Bind	Set	Reset
Failsafe			Nc	ot Set 🔻

The Failsafe mode determines what happens at the receiver when the transmitter signal is lost.

Tap on the drop-down box to see the failsafe options:

KF System	ETHOS		2.4	i l4 .©
Model ID	Set failsafe			
Channel Range	Not Set			
Set	Hold	ister	Rang	
RX1 SR10	Custom	Bind		
RX2	No Pulses	Bind		
RX3	Receiver	Bind		
Failsafe			No	t Set 🔻

Hold

Hold will maintain the last received positions.

Set failsafe	ETHOS		2.46
CH1 (Aileron1)			Not Set 🔻
CH2 (Aileron2)			Not Set 🔻
CH3 (Elevators)		Custom 🔻	-10% 🕝
CH3 (Elevators)	Channel: -10%		Failsafe: -10%
CH4 (Throttle)			Not Set 🔻
CH5 (Rudders)			Not Set 🔻
CH6 (Flap1)			Not Set 🔻

Custom

Custom allows moving the servos to custom predefined positions. The position for each channel can be defined separately. Each channel has the options of Not Set, Hold, Custom or No Pulses. If Custom is selected, the channel value is displayed. If the set icon with an arrow is tapped, the current value of the channel is used. Alternatively, a fixed value for that channel can be entered by tapping on the value.

No Pulses

No Pulses turns off pulses (for use with flight controllers having return-to-home GPS on loss of signal).

Receiver

Choosing "Receiver" on X series or later receivers allows failsafe to be set in the receiver.

Warning: Be sure to test the chosen Failsafe settings carefully.

Type: ACCST D16

<pre>< RF System</pre>	TH <mark>os</mark> "I
Internal Module	\sim
State	OFF 💽 ON
Туре	ACCST D16 🔻
2.4G	OFF 💽 ON
Antenna	Internal 🔻
Model ID	0
Channel Range	CH1 - CH8

Mode ACCST D16 is for the ACCST 16ch two-way full duplex transmission, also known as the "X"-mode. For use with the legacy "X" series receivers.

2.4G

ACCST D16 operates on 2.4G, so the 2.4G RF section is on by default.

Antenna

Select Internal or External (on ANT1 connector) Antenna. Although the RF stage has built-in protection, it is good practice to ensure that an external antenna has been fitted before selecting the External antenna.

Model ID

When you create a new model, the Model ID is automatically allocated. The Model ID must be a unique number because the Model Match function ensures that only the correct Model ID will be bound to. This number is sent to the receiver during binding, so that it will then only respond to the number it was bound to. The Model ID can be changed manually.

Channel Range

Choice of which of the radio's internal channels are actually transmitted over the air. In D16 mode you can choose between 8 channels with data sent every 9ms, and 16 channels with data sent every 18ms.

RF System	ETHOS	()
2.4G		OFF 📃 ON
Antenna		Internal 🔻
Model ID		0
Channel Range		CH1 ⁻ CH8
Set		Bind Range Check
Failsafe		Not Set 🔻
External Module		>

Bind

1. Initiate the binding process by selecting [Bind]. A voice alert will announce 'Bind' every few seconds to confirm that you are in bind mode. In D16 mode a pop-up menu will open during bind to allow selection of the operation mode of the receiver. The options refer to the PWM outputs, and apply to receivers that support choosing between these 4 options using jumpers. Ensure that the receiver and RF module firmware support this option. If they do not, it is necessary to do a regular bind with the F/S button (please refer to the receiver manual).

KF System	ETHOS		
Туре			ACCST D16 🔻
2.4G	Bind		OFF ON
	CH1-8 Telem ON		Testa en al 🗮
Antenna 	CH1-8 Telem OFF	_	Internal 🔻
Model ID	CH9-16 Telem ON		
Channel Range	CH9-16 Telem OFF		CH1 ⁻ CH16
Set		Bind	Range Check
Failsafe			Not Set 🔻

There are 4 modes with the combinations of Telemetry on/off and channel 1-8 or 9-16. This is useful when using two receivers for redundancy or to connect more than 8 servos using two receivers.

KF System		ETHOS		
2.4G				OFF ON
Antenna	Bind			Internal 🔻
Model ID	• • • • •	Binding		
Channel Range		2 man gin	ОК	CH1 ⁻ CH8
Set			Bina	Range Check
Failsafe				Not Set 🔻
External Module				>

2. Power up the receiver, putting it into bind mode as per the receiver instructions. (Generally done by holding down the Failsafe button on the receiver during power up.)

3. The Red and Green LEDs will come on. The Green LED will go off, and the Red LED will flash when the binding process is completed.

4. Tap OK on the transmitter to end the Bind process, and power cycle the receiver.

5. If the Green LED on the receiver is on, and the Red LED is off, the receiver is linked to the transmitter. The receiver/transmitter module binding will not have to be repeated, unless one of the two is replaced. The receiver will only be controlled (without being affected by other transmitters) by the transmitter it is bound to.

Warnings – Very Important

Do not perform the binding operation with an electric motor connected or an internal combustion engine running.

KF System	ETHOS	·····
		OFF ON
Antenna		Internal 🔻
Model ID	8 Range Check	0
Channel Range	RX : 1 VFR · 0%	CH1 - CH16
Set	RSSI : 76dB	Range Check
Failsafe		Not Set 🔻
External Module		>

Range

A range check should be done at the field when the model is ready to fly.

Range check is activated by selecting 'Range'. A voice alert will announce 'Range Check' every few seconds to confirm that you are in range check mode. A popup will display the Receiver Number, and the VFR% and RSSI values to evaluate how reception quality is behaving. When the Range Check is active, it reduces transmitter power, which in turn reduces the range for range testing. Under ideal conditions, with both the radio and receiver at 1m above the ground, you should only get a critical alarm at about 30m apart.

Please refer to the Telemetry section for a discussion on VFR and RSSI values.

RF System	ETHOS		(
2.4G			OFF ON
Antenna			Internal 🔻
Model ID			0
Channel Range			CH1 ⁻ CH8
Set		Bind	Range Check
Failsafe			Not Set 🔻
External Module			>

Set Failsafe

The Failsafe mode determines what happens at the receiver when the transmitter signal is lost.

Tap on the drop-down box to see the failsafe options:

RF System	ETHOS	²⁴⁶ 11 ¶,∭
	Set failsafe	OFF ON
Antenna	Not Set	Internal 🔻
Model ID	Hold	0
Channel Range	Custom	CH1 - CH16
Set	No Pulses	Bind Range Check
Failsafe	Receiver	Not Set 🔻
External Module		>

Hold

Hold will maintain the last received positions.

Custom

Custom allows moving the servos to custom predefined positions. The position for each channel can be defined separately. Each channel has the options of Not Set, Hold, Custom or No Pulses. If Custom is selected, the channel value is displayed. If the set icon with an arrow is tapped, the current value of the channel is used. Alternatively, a fixed value for that channel can be entered by tapping on the value.

No Pulses

No Pulses turns off pulses (for use with flight controllers having return-to-home GPS on loss of signal).

Receiver

Choosing "Receiver" on X series or later receivers allows failsafe to be set in the receiver.

Warning: Be sure to test the chosen Failsafe settings carefully.

Type: TD Mode

<< to be completed when Tandem receivers are ready >>

External Module

Currently the following external modules are supported: XJT Lite, R9M Lite, R9M Lite Access, R9M Lite Pro Access and PPM.

The External module can operate in 3 modes, i.e. ACCESS, ACCST D16 or TD MODE. Please see the following sections for configuration details.

KF System	ETHOS		
External Module			\sim
State			OFF ON
Туре	XJT Lite	•	D16 🔻
Model ID			0
Channel Range			CH1 CH8
Set		Bind	Range Check
Failsafe			Not Set 🔻

State

The External Module can be On or Off.

Туре

XJT Lite

Protocol

KF System	ETHOS	
External Module		~
State	Protocol	OFF ON
Туре	D16	D16 🔻
Model ID	D8	0
Channel Range	LR12	CH1 - CH8
Set		Bind Range Check
		Not Set 🔻

The XJT Lite can operate in D16 (up to 16 channels), D8 (up to 8 channels) or LR12 (up to 12 channels) modes.

Туре

R9M Lite

KF System	ETH <mark>OS</mark>	
External Module		\sim
State		OFF 💽 ON
Туре	R9M Lite 🔻	FCC 🔻
Power		100mW 🔻
Model ID		0
Channel Range		CH1 - CH8
Set	Bind	Range Check

0

KF System	ETHOS	
External Module		\sim
State	Protocol	OFF ON
	FCC	FCC V
Туре	EU	FCC V
	FLEX 868MHz	100mW 🔻
Model ID	FLEX 915MHz	
Channel Range		CH1 - CH8
Set		Range Check

Protocol

The R9M Lite can operate in the following modes:

Mode	RF Operating Frequency	RF Power
FCC	915MHz	100mW (with telemetry)
EU	868MHz	25mW (with telemetry) / 100mW (without telemetry)
FLEX 868MHz	Adjustable	100mW (with telemetry)
FLEX 915MHz	Adjustable	100mW (with telemetry)

Туре

R9M Lite ACCESS

Protocol

The R9M Lite ACCESS operates in ACCESS mode.

Туре

R9M Lite Pro ACCESS

<pre>< RF System</pre>	ETHOS		
External Module			~
State			OFF ON
Туре	R9M Lite Ac	cess 🔻	ACCESS 🔻
Options			Set
Options Model ID			Set 0
Options Model ID Channel Range			Set 0 CH1 - CH8

Protocol

The R9M Lite Pro ACCESS operates in ACCESS mode.

Mode	RF Operating Frequency	RF Power
FCC	915MHz	10mW / 100mW / 500mW / 100mW~1W (Self-adaptive)
EU	868MHz	Telemetry mode (25mW) / Non-Telemetry mode (200mW / 500mW)

Туре

PPM

KF System	ETHOS		
Owner Registration ID			kVkVbDfH 🛃
Internal Module			>
External Module			\sim
State			OFF 💽 ON
Туре		PPM 🔻	🔻
Channel Range			CH1 - CH8

The External RF Module can operate in PPM mode.

Channels Range

Bind/Range

Set Failsafe

Please refer to the relevant module manuals for configuration details.

Telemetry



FrSky offers a very comprehensive telemetry system. The power of telemetry has lifted the RC hobby to a whole new level, and allows much more sophistication and a much richer modeling experience.

Smart Port telemetry

FrSky's series of sensors are a hub-less design. Smart Port (S.Port) telemetry devices are daisy chained together in any sequence and plugged into the Smart Port connection on compatible X and S and later series receivers. The receiver can achieve full duplex (2-way) high speed communication with many compatible devices through this connection with little or no manual set up. This results in less clutter and gives you the freedom to design the system you need, not what a hub will allow.

Key features:

Each value received via telemetry is treated as a separate sensor, that has its own properties such as

- the sensor value
- the S.Port Data ID and Physical ID number
- the name of the sensor (editable)
- the unit of measurement
- the decimal precision
- option to log to the SD card

The sensor also keeps track of its min/max value.

More than one of the same sensor type can be connected, but the Physical ID must be changed (using the FrSky Airlink App or SBUS servo changer SCC) to ensure that each sensor in the smart port chain has a unique ID. Examples are a sensor for each cell in a 2 x 6S Lipo, or monitoring individual motor currents in a multi-motor model.

The same sensor can be duplicated, for example with different units, or for use in calculations such as absolute altitude, altitude above starting point, distance, etc.

Each sensor can be individually reset with a special function, so for example you can reset your altitude offset to your starting point without losing all the other min/max values.

With FrSky sensors, once set up, they are auto-discovered whenever the complete system is powered up. However, when initially installed, they must be manually 'discovered' in order for the system to recognize them.

Telemetry Sensors can be

- played in voice announcements
- used in logical switches
- used in Inputs for proportional actions
- displayed in custom telemetry screens
- seen directly on the telemetry setup page without having to configure a custom telemetry screen

Displays are updated as data is received, and loss of sensor communication is detected.

ACCESS Telemetry

Single receiver telemetry with ACCESS works in the same way as before.

Multi receiver telemetry

ACCESS offers TrioControl[™], which allows one transmitter to control the channels and/or telemetry for up to 3 receivers per model. You no longer need to use the STK tools for setup, and Smart Port also allows the use of third-party input/output devices with pass-through mode.

ACCESS will automatically switch to the next receiver if the RF link to a receiver is lost. The switching order is Receiver 1, then 2, then 3.

The most common application would be using S.Port, by daisy chaining the S.Port sensor chain to all 3 receivers, which should be sharing a common power supply.

- Register and bind the receivers (refer to Model Setup).
- Connect the sensor and receiver Smart Ports in a daisy chain fashion.
- Discover new sensors (refer to Telemetry Setup), and test carefully that Smart Port switching is working correctly.

Note that on the transmitter there will only be one telemetry entry for RSSI and RxBat, but these values will dynamically come from the receiver that is currently handling the telemetry.

Simultaneous telemetry from three receivers will come later. Further developments are expected in this area.

Sensor Types:

1. Internal Sensors

FrSky radios and receivers have built-in telemetry functions to monitor the strength of the signal being received by the model.

RSSI

Receiver Signal Strength Indicator (RSSI): A value transmitted by the receiver in your model to your transmitter that indicates how strong the signal is that is being received by the model. Warnings can be set up to warn you when it drops below a minimum value, indicating that you're in danger of flying out of range. Factors affecting the signal quality include external interference, excessive distance, badly oriented or damaged antennas etc.

ACCESS

The default alarms for ACCESS are 35 for 'RSSI Low' and 32 for 'RSSI Critical'. Loss of control will happen when the RSSI drops to around 28.

ACCST

The default alarms for ACCESS are 35 for 'RSSI Low' and 32 for 'RSSI Critical', while for ACCST they are 45 and 42 respectively. Loss of control will happen when the RSSI drops to around 28 for ACCESS and 38 for ACCST.

The warning for when telemetry is lost completely is announced as 'Telemetry Lost'. Be aware that further alarms will NOT sound, because the telemetry link has failed, and the radio can no longer warn you of an RSSI or any other alarm condition. In this situation it is wise to turn back to investigate the problem.

Note that when the radio and receiver are too close (less than 1m) the receiver may be swamped causing spurious alarms, resulting in an annoying "Telemetry Lost" - "Telemetry Recovered" alarm loop.

VFR%

Prior to ACCESS V2.1, RSSI was based on a combination of received signal strength and lost frame rate. Lost frames have now been removed from the RSSI calculation, and added as a new sensor VFR% (Valid Frame Rate) to provide a measure of Link Quality. At this stage there is no built in alert for VFR%, but you can easily set one up as follows:

a) Set a Logical Switch to become True when VFR drops below say 80% (please refer to the Logic Switches section):

< LSW1	ETHOS	2.46
Name		VFR 🛃
Function	Normal 🔵 Inverted	A < X ▼
Source (A)		VFR 🔻
Value (X)		80%
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

b) Then create a Special Function to play the VFR value when the Logical Switch is True (please refer to the Special Functions section):

< SF2	ETHOS	244
Action		Play value 🔻
State		Disable 📃 Enable
Switch		LSW1 🔻
Value		VFR 🔻
Repeat		5s
		55

RxBatt

Another standard internal sensor is the receiver battery voltage.

ADC2

Some receivers support a second analog voltage input, which is available in telemetry as sensor ADC2.

2. 'External' Sensors

The current FrSky telemetry system makes use of FrSky Smart Port sensors. The X and S and later series of telemetry enabled receivers have the Smart Port interface. Multiple Smart Port sensors can be daisy chained together, making the system easy to implement. Most receivers also have either one or both A1/A2 analog input ports, which are useful for monitoring battery voltages, etc.

Telemetry Settings

Discover and edit sensor options including data logging. When the sensors are discovered they have an individual description for 2.4G or 900M so the sensor values can be used throughout the system. Up to 100 sensors are supported.

Calculated sensors may be added, including Consumption, Distance and Trip.

K Telemetry	ETHOS	0 dB 0 dB 1
Discover new sensors		OFF ON Delete all
		Create calculated sensor
Name	Value	Source

Sensors

Telemetry	ET	HOS 84 dB 0 dB 1
Discover new sensors		OFF 🔵 ON Delete all
Create DIY Se	ensor	Create calculated sensor
Name	Value	Source
• RxBatt 2.4G	4.94V	Internal Module 2.4G
• RSSI 2.4G	84dB	Internal Module 2.4G
• RX 2.4G	0	Internal Module 2.4G
ADC2 2.4G	0.00V	Internal Module 2.4G
VFR 2.4G	100%	Internal Module 2.4G

Discover new sensors:

Once the sensors have been connected, and the radio and receiver have been bound and are powered up, enable 'Discover new sensors' to discover new sensors available. A flashing dot in the left column indicates sensor data being received, or the value shows in red if no data is being received. Up to 100 sensors are supported.

During discovery the screen will be automatically populated with all the sensors found.

The above example screen shows an SR10 Pro receiver's 'internal' and external sensors, which are:

- 1 RSSI (Receiver Signal Strength Indicator) on line 1,
- 2 RX: There is a new ETHOS telemetry receiver source feature named RX. RX provides the receiver number of the active receiver sending telemetry. RX is available in telemetry like any other sensor for real time display, Logic Switches, Special Functions and data logging.
- 3 RxBatt, the receiver battery voltage measurement on line 3,
- 4 ADC2, the receiver analog voltage input on line 4, and
- 5 VFR, the Valid Frame Rate percentage on line 4.

< Teleme	try	ETHOS	²⁴⁶ ∎€∎
Name	Value	Source	
• RSSI	83dB	Internal module 2.4G	
• RX	0	Internal module 2.4G	
● RxBatt	5.04V	Internal module 2.4G	
ADC2	0.0V	Internal module 2.4G	
VFR	100%	Internal module 2.4G	
VSpeed	1.02m/s	Internal module 2.4G	
Altitude	1.58m	Internal module 2.4G	

- 6 VSpeed, the Vertical Speed from a FrSky High Precision Vario (FVAS-02H) on line 6, and
- 7 Altitude, and Altitude from the same sensor.

Note that the minimum and maximum values are also defined for each parameter, even though they are not displayed on the sensor list. For example, when Altitude is defined, Altitude- and Altitude+ for the minimum and maximum altitude also become available.

Sensor discovery must be done for every model.

Stop Discovery:

Move the 'Discover new sensors' switch to Off to stop discovery once the sensors have been discovered.

Delete all sensors:

This option will delete all sensors so you can start again.

Create DIY Sensor

OIY Sensor	ETHOS	84dB 0dB
Value		
Name		DIY Sensor 🗃
		Auto Detect
Physical ID		00
Application ID		0000
Module		INT 💽 EXT
Band		2.4G 🔵 900M

This option allows you to add a DIY or 3rd party sensor.

Value

Sensor value being received.

Name

The sensor name, which may be edited.

Auto Detect

Auto Detect will list all sensors detected on the S.Port/F.Port connection to the receiver. Select your DIY sensor from the list.

< DIY Sensor	ETH <mark>05</mark>	93dB 100dB
Value		
Name	Select Sensor	DIY Sensor 🖃
	0300 (LiPo)	to Detect
	F101 (RSSI)	
Physical ID	F104 (RxBatt)	00
Application ID	F010 (VFR)	0000
Module		INT EXT
Band		2.4G 900M

Physical ID

Two character physical ID of the sensor. This will be populated by Auto Detect if selected.

Application ID

Four character Application ID of the sensor. This will be populated by Auto Detect if selected.

Module

Allows Internal or External RF module to be selected. This will be populated by Auto Detect if selected.

Band

Allows 2.4G or 900M to be selected. This will be populated by Auto Detect if selected.

RX

Allows RX1, RX2 or RX3 to be selected. This will be populated by Auto Detect if selected.

Protocol Precision / Unit

Allows the precision for the incoming protocol to be set, from 0 to 3 decimals. It also allows the measurement units to be selected.

Display Precision / Unit

Allows the precision to be displayed to be set, from 0 to 3 decimals. It also allows the display measurement units to be selected.

Range

The low and high limits of a range can be set as a fixed value for scaling. This is mostly used when using a telemetry value as a source for a channel. This allows the Range to set to the desired scale.

Ratio

The default 100% ratio may be changed to correct readings being received.

Offset

The default offset of 0 may be changed to correct readings being received.

Write Logs

When enabled, the sensor data will be logged to the SD card. Logs are enabled by default.

Sensor lost warning

Will suppress the sensor lost warning when disabled. It is enabled by default.

Create Calculated Sensor				
Calculated Sens	or ETHOS			97dBOdB
Formula			Cor	sumption 🔻
Name	Formula			sumption 🖃
Unit	Consumption			mAh 🔻
Decimals	Distance			
Range	Trip	_	0mAh -	10000mAh
Write Logs				off ON
Source				🔻

Calculated sensors may be added, including Consumption, Distance and Trip.

Consumption Sensor

Calculated Sensor	ETHOS	90 dB 100 dB
Formula		Consumption $igstar{}$
Name		Consumption 🕞
Unit		mAh 🔻
Decimals		0
Range		0mAh - 10000mAh
Write Logs		OFF ON
Source		🔻

The Consumption sensor allows the energy consumed by your motor to be calculated from a current sensor such as the FAS series.

Name

The sensor name, which may be edited.

Unit

The measurement may be in mAh or Ah.

Decimals

The display may be to 0, 1, 2 or 3 decimals.

Range

The range may be from 0 up to a maximum of 1000Ah.

Write Logs

Logs will be written to the SD card in the Logs folder if enabled.

Source

After discovering sensors, select your current sensor.

Persistent

Persistent allows storing the sensor value in memory when the radio is powered off or model is changed, and will be reloaded next time the model is used.

Reset

Allows the sensor to be reset.

Distance sensor

Calculated Sensor	ETHOS	96dB100dB
Formula		Distance 🔻
Name		Distance 🗃
Unit		m 🔻
Decimals		0
Range		0m ⁻ 10000m
Write Logs		
Source		🔻

The Distance sensor allows the distance traveled to be calculated from a GPS sensor.

Name

The sensor name, which may be edited.

Unit

The measurement may be in cm, meters or feet.

Decimals

The display may be to 0, 1, 2 or 3 decimals.

Range

The range may be from 0 up to a maximum of 10km.

Write Logs

Logs will be written to the SD card in the Logs folder if enabled.

Source

After discovering sensors, select your GPS sensor.

Persistent

Persistent allows storing the sensor value in memory when the radio is powered off or model is changed, and will be reloaded next time the model is used.

Reset

Allows the sensor to be reset.

Trip Sensor 96 dB 100 dB ETHOS Calculated Sensor Formula Name Trip 🖃 Unit Decimals 0 0m 10000m Range Write Logs ON ON Source

The Trip sensor allows the accumulated distance between GPS coordinates to be calculated from a GPS sensor.

Name

The sensor name, which may be edited.

Unit

The measurement may be in cm, meters or feet.

Decimals

The display may be to 0, 1, 2 or 3 decimals.

Range

The range may be from 0 up to a maximum of 10km.

Write Logs

Logs will be written to the SD card in the Logs folder if enabled.

Source

After discovering sensors, select your GPS sensor.

Persistent

Persistent allows storing the sensor value in memory when the radio is powered off or model is changed, and will be reloaded next time the model is used.

Reset

Allows the sensor to be reset.

Editing and Configuring Sensors

< Telemetry	ETHOS	246 9000
RSSI		Internal Module 2.4G
	RSSI	
	Edit	nal Module 2.4G
	↓ Move down	nal Module 2.4G
	Delete	nal Module 2.4G
		Internal Module 2.4G
SBEC V		

Tap on a sensor, then select 'Edit' from the popup dialog to edit the sensor settings. Alternatively select 'Move Down' to reorder sensors, or 'Delete' to remove it.

Control Telemetry sensor Control Telemetry sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Sensor	ETHOS	2	
Value			
ID		18 F1(01 (ISRM Rx0)
Name			rssi 🛃
Unit			dB 🔻
Decimals			0
Range		0dB -	100dB
Write Logs		(DFF ON

Value

Displays the current sensor reading.

ID

The ID is the sensor ID. The sending receiver ID is also shown.

Name

The sensor name, which may be edited.

Unit

The unit of measurement (dB in this example).

Decimals

The decimal precision.

Range

The low and high limits of a range can be set as a fixed value for scaling. This is mostly used when using a telemetry value as a source for a channel. This allows the Range to set to the desired scale.

Write Logs

When enabled, the sensor data will be logged to the SD card.

Control Con	ETHOS		0 dB 0 dB
Value			
Range		OdB -	100dB
Write Logs			OFF 🔵 ON
Sensor lost warning			OFF 🔵 ON
Reset			🔻
Critical value			32
Low value warning			35

Sensor Lost Warning

Will suppress the sensor lost warning when disabled.

Reset

A source can be configured to reset the sensor.

Sensor Specific Warnings

The edit menu may vary for depending on the sensors, for example:

Critical value

Some sensors such as RSSI have built-in alerts, this being the critical value threshold setting. Please refer to the Access Telemetry section for a discussion of the RSSI alerts.

Low value warning

The RSSI low value threshold setting.

Checklist



The Checklist function provides for a set of Preflight Checks. This is a group of safety features that take effect when powering up the radio and/or loading a model from the model list.

A Preflight Checks Ch	THOS	5 0 dB 0 dB () ШО 2.46 900М
	Throttle Check	< 🕶 -95%
	Failsafe Check	OFF ON
	Pots Check	>
	Switch Check	>
Load all pots positions		
Load all switches positions		

Throttle Check

When enabled, it will warn you if the throttle stick is above the value set in it's parameter.

Failsafe Check

When enabled, it will warn you if Failsafe has not been set for the current model. It is highly advisable to leave this enabled!

Pots Check

A Preflight Checks A	ETHOS	60 dB 0 dB	ав 📢 🋄
	Pots Check		~
	Pot1	< 🔻	-97%
	Pot2	No check 🔻	0%
	Pot3	No check 🔻	17%
$\bigcirc \bigcirc \bigcirc$	Slider left	No check 🔻	0%
Load all pots positions	Slider right	No check 🔻	0%
Load all switches positions	Switch Check		\sim

Defines whether the radio requests the pots and sliders to be in predefined positions at startup. The desired pot values can be entered for each pot.

Switch Check

Switch Check	~
Switch A	Down 🔻
Switch B	Middle 🔻
Switch C	Up 🔽
Switch D	Up 🔽
Switch E	Up 🔽
ns Switch F	Down 🔻
ETH <mark>OS</mark>	246
ETHOS	246
ETHOS Switch A	244 Vp
Switch A Check	₩ ↓ Up ▼ Up ▼
Switch A Check	246 () Vp () Vp () Vp ()
Switch A Check	²⁴ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
Switch A Check ddle	244 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
	Switch Check Switch A Switch B Switch C Switch D Switch E Switch F

For each switch, you can define whether the radio requests that switches to be in the desired predefined positions. The options are shown above.

Logic Switches



Logical switches are user programmed virtual switches. They aren't physical switches that you flip from one position to another, however they can be used as program triggers in the same way as any physical switch. They are turned on and off (in logical terms they become True or False) by evaluating the input conditions against the programming for the logical switch. They may use a variety of inputs such as physical controls and switches, other logical switches, and other sources such as telemetry values, mixer values, timer values, gyro and trainer channels. They can even use values returned by a LUA model script (to be supported).

Up to 100 Logic Switches are supported.



There are no default Logic Switches. Tap on the '+' button to add a Logic Switch.

< Log	jic Switch	ETHOS	
		Description	
		Edit	
LSW2	VFRlow	Add	
LSW3	Edge	Move	0s and 1s
		Сору	
		Clone	

Once Logic Switches have been defined, tapping on one will bring up the above popup menu, allowing you to edit, add, move, copy/paste, clone or delete that switch.

< Log	jic Switch	ETH <mark>OS</mark>	8 0 dB 0 dB
	Name	Description	
LSW2	VFRlow	< 8(🔨	
LSW3	Edge	1↓Pulse of SA1 between 0s and	d 1s
		Sticky 💙 3 / SIl	

Selecting 'Move' will bring up arrow keys allowing the logic switch to be moved up or down.

∠ LSW1 [↑]	ETHOS	2.46
Name		🖻
Function	Normal 🔵 Inverted	A ~ X 🔻
Source (A)		Rudder 🔻
Value (X)		0
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

Adding Logic Switches

Name

Allows the Logic Switch to be named.

Function

The functions available are listed below. Please note that all functions may have normal or inverted outputs. Please also refer to the shared parameters section following the function descriptions below.

$A \sim X$

The condition is True if the value of the selected source 'A' is approximately equal (within about 10%) to 'X', a user defined value.

In most cases, it is better to use the approximately equals function rather than the 'exactly' equals function.

A = X

The condition is True if the value of the selected source 'A' is 'exactly' equal to 'X', a user defined value.

Care must be taken when using the 'exactly' equals function. For example, when testing if a voltage is equal to a setting of 8.4V, the actual telemetry reading may jump from 8.5V to 8.35V, so the condition is never met and the Logical Switch will never turn on.

A > X

The condition is True if the value of the selected source 'A' is greater than 'X', a user defined value.

A < X

The condition is True if the value of the selected source 'A' is less than 'X', a user defined value.

|A| > X

The condition is True if the absolute value of the selected source 'A' is greater than 'X', a user defined value. (Absolute means disregarding whether 'A' is positive or negative, and just using the value.)

|A| < X

The condition is True if the absolute value of the selected source 'A' is less than 'X', a user defined value. (Absolute means disregarding whether 'A' is positive or negative, and just using the value.)

$\Delta > X$		
< LSW3	ETHOS	О dB О dB () 2.46 900М
Name		delta 200mA 🕞
Function	Normal 🕖 Inverted	∆ > X ▼
Source (A)	•	Consumption $igstar{}$
Value (X)		200.0mAh
Check interval		
Active condition		Always On 🔻
Delay before active		0.05

The condition is True if the change in value 'd' (i.e. delta) of the selected source 'A' is greater than or equal to the user defined value 'X', within the 'Check interval'. If the 'Check interval' is set to '---', then the check interval becomes infinite.

$|\Delta| > X$

The condition is True if the absolute value of the change |d|' in the selected source 'A' is greater than or equal to the user defined value 'X'. (Absolute means disregarding whether 'A' is positive or negative.). again, if the 'Check interval' is set to '---', then the check interval becomes infinite.

Range		
✓ LSW1↑	ETHOS	2.46
Function	Normal 🔵 Inverted	Range 🔻
Source		Rudder 🔻
Range	0 -	0
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s
Min duration		0.0s

The condition is True if the value of the selected source 'A' is within the range specified.

AND

< LSW1↑	ETHOS	2.46
Function	Normal 🔵 Inverted	AND 🔻
Value 1		SA-Up 🔻
Value 2		SA-Up 🔻
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s
Min duration		0.0s

The condition is True if both the sources selected in Value 1 and Value 2 are true (i.e. ON).

OR

< LSW1↑	ETHOS	246
Function	Normal 🌖 Inverted	or 🔻
Value 1		SA-Up 🔻
Value 2		SA-Up 🔻
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s
Min duration		0.0s

The condition is True if either of the sources selected in Value 1 and Value 2 is true (i.e. ON).

XOR (Exclusive OR)

< LSW1	ETHOS	246
Name		🖻
Function	Normal 🔵 Inverted	XOR 🔻
Value 1		SA-Up 🔻
Value 2		SA-Up 🔻
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

The condition is True if either the Value 1 source or the Value 2 source is true (i.e. ON) but not both.

< LSW1 ↑	ETHOS	
Name		🖻
Function	Normal 🔵 Inverted	Timer Generator 🔻
Duration active		1.0s
Duration inactive		1.0s
Active condition		Always On 🔻

Timer Generator

The Logical Switch toggles on and off continuously. It switches on for time 'Duration Active', and off for time 'Duration Inactive'.

Sticky

∠ LSW1 [↑]	ETHOS	
Name		🖻
Function	Normal O Inverted	Sticky 🔻
Trigger ON condition		SA-Up 🔻
Trigger OFF condition		SA-Up 🔻
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

The Sticky function is latched on (i.e becomes True) when the Trigger ON condition' switches from False to True, and holds its value until it is forced to False when the 'Trigger OFF condition' switches from False to True. This can be gated by the optional 'Active Condition' parameter. This means that if the 'Active Condition' is True, then the Logical Switch output follows the Sticky function's condition. However, if the 'Active Condition' is False, then the Logical Switch output is also held False.

Note that the Sticky function continues to operate, even if its output is gated by the 'Active Condition' switch. As soon as the 'Active Condition' switch condition becomes True again, the Sticky function's condition is switched through to the Logic Switch output.

Edge

< LSW1	ETH <mark>OS</mark>	246
Name		🛃
Function	Normal 🌒 Inverted	Edge 🔻
Active condition		SA-Up 🔻
During	0.0s -	0.0s
Active condition		Always On 🔻
Min duration		0.0s

Edge is a momentary switch that becomes True for the period specified in 'Duration' when its edge trigger conditions are satisfied.

Rising Edge option

< LSW1	ETHOS	
Name		Egl 🛃
Function	Normal O Inverted	Edge 🔻
Trigger ON condition		SA† 🔻
During	0.0s	- Rising Edge
Active condition		Always On 🔻
Duration		0.3s

During = '0.0s'

During is in two parts [t1:t2]. With t1 of During = 0.0s and t2= 'Rising Edge', the logic switch becomes True (for the period specified in 'Duration') the instant the 'Trigger On Condition' transitions from False to True.
< LSW2	ETHOS	
Name		Eg2 🛃
Function	Normal 🌒 Inverted	Edge 🔻
Trigger ON condition		sat 🔻
During	5.0s	- Rising Edge
Active condition		Always On 🔻
Duration		0.3s

During >= '0.0s

During is in two parts [t1:t2]. With t1 of During a positive value (say 5.0s) and t2= 'Rising Edge', the logic switch becomes True (for the period specified in 'Duration') 5 seconds after the 'Trigger On Condition' transitions from False to True. Any additional 'spikes' during the t1 period are ignored.

Falling Edge option

< LSW3	ETHOS	0 dB 1
Name		🖻
Function	Normal 💽 Inverted	Edge 🔻
Trigger ON condition	•	SA† 🗸
During	0.0S ⁻	
Active condition		Always On 🔻
Duration		0.55

During = '0.0s'

During is in two parts [t1:t2]. With During t1=0.0s and t2= '---' (Falling Edge), the logic switch becomes True (for the period specified in 'Duration') the instant the 'Trigger On Condition' transitions from True to False.

< LSW3	ETHOS	0 dB 1
Name		🛃
Function	Normal O Inverted	Edge 🔻
Trigger ON condition	•	SA† 🗸
During	3.0S ⁻	
Active condition		Always On 🔻
Duration		0.55

During >= '0.0s

During is in two parts [t1:t2]. With t1 of During a positive value (say 3.0s) and t2= '---' (Falling Edge), the logic switch becomes True (for the period specified in 'Duration') when the 'Trigger On Condition' transitions from True to False, having been True for at least 3 seconds.

Pulse option

During is in two parts [t1:t2]; if values are entered for both t1 and t2, then a pulse is needed to trigger the logic switch.

< LSW41	ETH <mark>OS</mark>	
Name		Eg4 🗃
Function	Normal 💽 Inverted	Edge 🔻
Trigger ON condition		SA† 🔻
During	2.0s ⁻	5.0s
Active condition		Always On 🔻
Duration		0.3s

In the example above the logic switch will become True for the 'Duration' period if the 'Trigger On Condition' goes from False to True, and then goes from True to False after at least 2 seconds but no later than 5 seconds.

Logic Switches – Shared Parameters

The Logic Switches all have a number of shared parameters:

Active Condition

The Logic Switches can be gated by the optional 'Active Condition' parameter. This means that if the 'Active Condition' is True, then the Logical Switch output follows the Function's condition. However, if the 'Active Condition' is False, then the Logical Switch output is also held False.

Note that the Sticky function continues to operate, even if its output is gated by the 'Active Condition' switch. As soon as the 'Active Condition' switch condition becomes True again, the Function's condition is switched through to the Logic Switch output.

Delay before active

This value determines the time for which the Logic Switch conditions have to be True before the Logic Switch output becomes True. (Not relevant to Timer Generator and Edge.)

Delay before inactive

Similarly, this value determines the time for which the Logic Switch conditions have to be False before the Logic Switch output becomes False. (Not relevant to Timer Generator and Edge.)

Min Duration

Once the Logic Switch becomes True, it will remain True for the duration specified. If the duration is the default 0.0s, the logic switch will only become True for one mixer processing cycle, which is too short to see, so the LSW line will not go bold.

Logic Switches – Use with Telemetry

If the source of a logic switch is a telemetry sensor, if your sensor is active => Logic Switch will be active

Special Functions



Special Functions can be configured to play values, play sounds, etc. Up to 100 Special Functions supported.



There are no default Special Functions. Tap on the '+' button to add a Logic Switch.

Once Special Functions have been defined, tapping on one will bring up the above popup menu, allowing you to edit, add, move, copy/paste, clone or delete that switch.

Selecting 'Move' will bring up arrow keys allowing the special function to be moved up or down.

Special Functions

Currently the following Special Functions are supported:

- Reset
- Screenshot
- Set failsafe
- Play track
- Play value
- Haptic
- Write logs

Action: Reset

< SF7	ETHOS	0 db 0 db 🖤 🎹
Action		Reset 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
Reset		🔻

State

Enable or disable this Special Function.

Active Condition

The Special Function may be Always On, or activated by switch positions, function switches, logic switches, trim positions or flight modes.

To select the inverse of for example switch SG-up, if you long press Enter on the switch name and select the Negative check box in the popup the switch value will changes to !SG-up. This means the Special Function will be active when switch SG is not in the up position.

Reset

The following categories may be reset:

- Flight data: resets both telemetry and timers
- All timers: resets all 3 timers
- Whole telemetry: resets all telemetry values.

Action: Screenshot

< SF7	ETHOS	0 dB 0 dB 🔮 🛄
Action		Screenshot 🔻
State		Disable 📃 Enable
Active condition		Always On 🔻

Will save a screenshot into the location: SD Card (drive letter)/screenshots/

Action: Set failsafe

< SF7	ETHOS	0db 0db 🖤 🋄
Action		Set Failsafe 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
Reset		Internal Module 🔻

At the time of writing, this Special Function is still under construction.

Action: Play track

< SF7	ETHOS	0 dB 0 dB 🔮 🎹
Action		Play Track 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
File		🔻
Repeat		Once
Skip on startup		OFF 🔵 ON

State

Enable or disable this Special Function.

Active Condition

The Special Function may be Always On, or activated by switch positions, function switches, logic switches, trim positions or flight modes.

File

Select the wav file to be played. The file should be located in:

SD Card (drive letter)/audio/

Note that the standard audio files are generated by the Google Text-to-Speech tools.

Repeat

The value may be played once, or repeated at the frequency entered here.

Skip on startup

If enabled, the file will not be played on startup.

Action: Play value

< SF7	ETHOS	0 dB 0 dB 🔮 🎹
Action		Play Value 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
Value		🔻
Repeat		Once

State

Enable or disable this Special Function.

Active Condition

The Special Function may be Always On, or activated by switch positions, function switches, logic switches, trim positions or flight modes.

Value

Select the source whose value is to be played. The source may be from any of the following:

- Analogs, i.e. sticks, pots or sliders
- Switches
- Logic Switches
- Trims
- Channels
- Gyro
- Trainer
- Timers
- Telemetry

Repeat

The value may be played once, or repeated at the frequency entered here.

Action: Haptic

< SF7	ETHOS	0 dB 0 dB 🖤 🎹
Action		Haptic 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
Duration		10
Strength		Default
Repeat		Once

This Special Function assigns haptic vibration

State

Enable or disable this Special Function.

Active Condition

The Special Function may be Always On, or activated by switch positions, function switches, logic switches, trim positions or flight modes.

Duration

Sets the duration in seconds.

Strength

Select the strength of the haptic vibration, between 1 and 10. The default is 5.

Repeat

The haptic may be executed once, or repeated at the frequency entered here.

Action: Write Logs

< SF7	ETHOS	ℾL ։ G」 0 dB 0 dB ♥ ∭)
Action		Write Logs 🔻
State		Disable 🔵 Enable
Active condition		Always On 🔻
Write interval		250ms
Sticks / Pots / Sliders		OFF ON
Switches		OFF ON
Logic Switches		OFF ON

State

Enable or disable this Special Function.

Active Condition

The Special Function may be Always On, or activated by switch positions, function switches, logic switches, trim positions or flight modes.

Write Interval

The logs write interval is user adjustable between 100 and 500ms.

Sticks/Pots/Sliders

Enables logging of Sticks/Pots/Sliders.

Switches

Enables logging of Switches.

Logic Switches

Enables logging of Logic Switches.

Curves



Curves may be used to modify the control response in the Mixers or Outputs. While the standard Expo curve is available directly in those sections, this section is used to define any custom curves that may be required. The 'Add curve' function may also be reached from the Mixer and Outputs edit screens directly.

There are 100 curves available.



There are no default curves (except Expo which is built in). Tap on the `+' button to add a new curve. Tapping on a list of curves brings up a dialog allowing you to Edit, Move, Copy, Clone or Delete the highlighted curve. You can also add another curve.



The initial screen allows you to name your curve, and to select the curve type.

< Curve1	ETH05	2.46
	^{100%} Name	CV1 📝
	Туре	🔻
	Ехро	
	Function	
	Custom	

The available curve types are:

Ехро

The default exponential curve has value of 40.

< Curve1	ET		
	100%	Name	CV1 🛃
		Туре	Ехро 🔻
		Weight	100
	0%	Offset	0
		Ехро	40
/100%			

A positive value will soften the response around 0, while a negative value will sharpen the response around 0. Softening the response around mid stick helps to avoid over controlling the model, especially for beginners.

Function



The following mathematical function curves are available:



If the source value is positive, then the curve output follows the source. If the source value is negative, then the curve output is 0.



If the source value is negative, then the curve output follows the source. If the source value is positive, then the curve output is 0.



The curve output follows the source, but is always positive (also called 'absolute value').

115

f > 0			
< Curve1	ET	HOS	
	100%	Name	CV1 🛃
		Туре	Function $igslash$
		Function Type	f > 0 🔻
	0%		
-100%			

If the source value is negative, then the curve output is 0. If the source value is positive, then the curve output is 100%.



If the source value is negative, then the curve output is -100%. If the source value is positive, then the curve output is 0.



If the source value is negative, then the curve output is -100%. If the source value is positive, then the curve output is +100%.

Custom

< Curve1	ET	2.46	
	100%	Name	CV1 📝
		Туре	Custom 🔻
		Points Count	5points
•	0%	Smooth	
		Easy Mode	
		Points Config	>
-100%			

Points Count

The default custom curve has 5 points. You may have up to 21 points on your curve.

Smooth

If enabled a smooth curve is created through all points.

< Curve1	ET	HOS				4 00
	100%	Easy Mod	e			
		Points Co	nfig			\sim
		Point1	x		у	-70%
• 0%	0%	Point2	x	-50%	у	-20%
		Point3	x	0%	у	15%
		Point4	x	50%	у	25%
-100%		Point5	x	100%	у	15%

Easy Mode = On

Easy mode has equidistant fixed values on the X axis, and only allows the Y coordinates for the curve to be programmed.

Points Config

With Easy Mode On, the Y coordinates may be configured (see example above).

< Curve1	ET	HOS				
	100%	Easy Mode	e			
		Points Cor	nfig			\sim
	, → →	Point1	х	-100%	у	-100%
	0%	Point2	х	-80%	у	-100%
	Point3	x	40%	у	15%	
		Point4	x	50%	у	15%
-100%		Point5	x	100%	у	0%

Easy Mode = Off

Easy mode has equidistant fixed values on the X axis, and only allows the Y coordinates for the curve to be programmed.

Points Config

With Easy Mode Off, both the X and Y coordinates may be configured, (see example above). Note that the -100% and +100% X coordinates for the curve end-points cannot be edited, because the curve must cover the full signal range.

Trainer



The Trainer function is off by default.

Trainer Mode = Master

Trainer	ETHOS	
Trainer Mode		Master 🔻
Wireless		OFF ON
Local Name		FrSkyBT 🛃
Local Address		04EE03D65991
Dist Address		Disconnect
		Search Devices
Active condition		SDI 🗸

Link Mode (Wireless Off/On)

The trainer link can be either via cable or wireless (Bluetooth). The cable should be a 3.5mm mono audio lead.

Local Name

This is the local BT name that will be displayed in devices being connected. The default name is FrSkyBT, but may be edited here.

Local Address

This is the local Bluetooth address of the radio.

Dist Address

Once a Bluetooth device has been found and linked, the remote device's Bluetooth address is displayed here.

Search Devices

The Search Devices button will be available if the Trainer Mode is Master.



Tap on 'Search Devices' to put the radio into BT search mode.

< Wireless	ETHOS	2.46
Mode		Trainer 🔻
Local Address	Select device	04EE03D65991
Dist Address	806FB0963467	806FB0963467
Local Name	2C41A19766C9	FrSkyBT 📝
	F4FEFB4198BF	Search Devices

Found devices are listed in a popup dialog with a request to select a device. Select the BT address that matches the radio to be used as training mate.

Active Condition

Control of the model can be transferred to the student radio by a switch or button, a function switch, logic switch, trim position, or flight mode.

Trainer Channels

Up to 16 controls may be transferred from the student radio to the master radio when the 'Active Condition' set above is active.

Trainer	ET	ETHOS	
Active condition		•	SDI 🔻
CH1 Replace Rudder	Trainee Channel: 0%	CH2 Replace Elevator	Trainee Channel: 0%
CH3 Replace Throttle	Trainee Channel: 0%	CH4 Replace Aileron	Trainee Channel: 0%
CH5 No destination		CH6 No destination	Trainee Channel: 0%
CH7 No destination		CH8 No destination	Trainee Channel: 0%
CH9 No destination		CH10 No destination	

Tap on each channel to configure it individually:

Slave CH1	ETHOS	0 dB 0 dB 1
Mode		Replace 🔻
Percent		100%
Destination		Rudder 🔻

Mode

OFF: disables the channel for trainer use.

Add: selects additive mode, where both master and slave signals are added so both teacher and student can act upon the function.

Replace: replaces the master radio's control with the student's, so the student has full control while the 'Active Condition' is active. This is the normal mode of use.

Percent

Normally set to 100%, but can be used to scale the Slave input.

Destination

Maps the slave radio's channel to the corresponding function.

Trainer Mode = Slave

Trainer	ETHOS	€ 0 dB 0 dB 1 10 0 dB 1 10 0 dB 1 10 0 dB 1 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Trainer Mode		Slave 🔻
Wireless		OFF ON
Local Name		FrSkyBT 🗃
Local Address		04EE03D65991
Dist Address		Disconnect
Channel Range		CH1 - CH8

Link Mode (Wireless Off/On)

The trainer link can be either via cable or wireless (BT). The cable should be a 3.5mm mono audio lead.

Local Name

This is the local BT name that will be displayed in devices being connected. The default name is FrSkyBT, but may be edited here.

Local Address

This is the local Bluetooth address of the radio.

Dist Address

Once a Bluetooth device has been found and linked, the remote device's Bluetooth address is displayed here.

Channels Range

Selects which channel range is transferred to the master radio.

Device Config



Device Config contains tools for configuring devices like sensors, receivers, the gas suite, servos and video transmitters.

Contraction Contractica Con	fig ET	-05	2.46 9000
Air Speed	Current	Gas Suite	GPS
Lipo Voltage	RB 10/20	RB 30/40	RPM
SBEC / ESC	SxR	SxR Calibration	Variometer
V\$600	XAct		

The following devices are currently supported:

- Airspeed
- Current
- Esc
- Gas Suite
- GPS
- Lipo Voltage
- RB 10/20
- RB 30/40
- RPM
- SBEC/ESC
- SxR
- SxR Calibration
- Variometer
- VS600 video transmitter
- XAct servos

Please refer to the device's manual for further details.

Programming Tutorials

This section describes some programming examples for a number of models, preceded by a basic radio setup section covering the basic settings needed for any model.

- Initial radio setup example
- Basic Power Model example
- Simple 4ch Glider example
- Basic Wing example

Although these examples may appear to be for specific model types, they are merely a vehicle for explaining the Ethos way of programming. It would be useful to actually program these models on the radio, and observe the outputs on the monitor screen as the inputs are manipulated. Once these concepts and the process are understood, you should be able to adapt these examples to your model.

Initial radio setup example

This introductory section describes the initial steps in setting up the radio itself, before programming any specific models. Once completed, any of the programming examples in the following sections can be followed.

Note: These examples are not 'cookbook' in nature. They assume that the user has a basic understanding of the vocabulary of radio control models, and is familiar with navigating the Ethos menu structure. If, at any time, you are confused, please review previous sections of this manual for a refresher. In particular, please refer to the Menu Navigation section to familiarize yourself with the radio's user interface, so that you can find the setup page you need easily.

Step 1. Charge the radio and flight batteries.

Please refer to the battery charging section and charge the radio battery using those guidelines. Also charge the flight battery(ies) to be used, using a charger suitable for the battery type(s), observing all safety precautions, especially when using Lithium batteries.

Step 2. Calibrate the hardware.

Ensure that you have performed the hardware calibration during initial startup of the radio, to confirm that the radio knows exactly where the centers and limits of each gimbal, pot, and slider are. It should also be re-done whenever the firmware is upgraded. Please refer to the System $\$ Hardware $\$ Calibration section of this manual for instructions on doing this.

Step 3. Perform the Radio System setup.

The radio System Setup is used to configure those parts of the radio system's hardware that are common to all models. It differs from the 'Model Setup' functions which configure the model specific settings for each model.

Please read the System Setup section to familiarize yourself with all the settings in this section.

Many settings can (at least initially) be left at their defaults, but the following should be reviewed:

Date & Time

Set the current time and date.

Sticks

Sticks Mode

Select your preferred stick mode. Mode 1 has throttle and aileron on the right stick, and elevator and rudder on the left. Mode 2 has throttle and rudder on the left stick, and aileron and elevator on the right.

Note: Mode 2 is the default.

Warning: If you upgrade the firmware, check that the Sticks Mode is as expected! If you fly a different mode to Mode 2, previous model profiles do not work as expected. This is the first setting to check! CAUTION! If a model is configured for Mode 2 and the TX for Mode 1, it is possible to have the motor for electric models start when the receiver is turned on.

Channel Order

The default channel order for Ethos is AETR (i.e. Aileron, Elevator, Throttle, Rudder). You may prefer to set the default channel order to the order you are accustomed to. TAER is the default for Spektrum/JR, and AETR is the default for Futaba/Hitec. This setting defines the order in which the four stick inputs are inserted when a new model is created. They can of course be changed later.

Note that AETR is the required order if you want to use any of the FrSky stabilized receivers.

Battery

Review your radio battery's specification and configure the 'Main voltage', 'Low voltage' and 'Display voltage range' as described in the System / Battery section of this manual.

Owner Registration ID

The Owner Registration ID is used with ACCESS systems. This ID becomes the Registration ID when registering a receiver. Enter the same code in the Owner Registration ID field of your other transmitters you want to use the SmartShare[™] feature with. Refer to the Model Setup / RF System section of this manual (although it is configured in the Model Setup section, the Owner Registration ID will be used for each new model and can be considered a System setting. Please note also that the Owner Registration ID can be changed for a particular receiver during the registration process).

Units

Please note that in Ethos telemetry units are configured on a per sensor basis. There is no global Metric or Imperial setting.

Basic Fixed Wing Airplane example

This simple fixed wing airplane example covers the configuration of a model having a motor, 2 ailerons (and optionally retracts and 2 flaps) and has a servo for each surface.

Step 1. Confirm System settings

Begin by following the 'Initial radio setup example' above, which is used to configure those parts of the radio system's hardware that are common to all models. For this example we are using the default AETR (Aileron, Elevator, Throttle, Rudder) channel order.

Use the RF System function to register (if your receiver is ACCESS) and bind your receiver in preparation for configuring the model.

Step 2. Identify the servos/channels required

The Mixer function forms the heart of the radio. It allows any of the many sources of input to be combined as desired and mapped to any of the output channels. Ethos has 100 mixer channels available for programming your model. Normally the lowest numbered channels will be assigned to the servos, because the channel numbers map directly to the channels in the receiver. The X20 Internal RF (Radio Frequency) module has up to 24 output channels available.

The upper mixer channels can be used as 'virtual channels' in more advanced programming, or as real channels using multiple RF modules (Internal + External) and SBus. The channel order is a matter of personal preference or convention, or it may be dictated by the receiver. We will use AETR for our example.

Our airplane example has the following servos/channels:

- 1 motor
- 2 ailerons
- 2 flaps
- 1 Elevator
- 1 Rudder

We will also add retracts later.

Step 3. Create a new model.

Refer to the Model Setup / Model Select section to create your new model. Also refer to the Menu Navigation section to familiarize yourself with the radio's user interface, so that you can find the functions you need easily.

For this example we will assume that you are using an FrSky stabilized receiver. Please refer to the System / Sticks section and enable the 'First four channels fixed' setting after confirming the Channel Order as AETR, to ensure that the channel order created by the wizard will suit the receiver.

Tap on the Model tab (Airplane Icon), and select the Model Select function. Then tap on the '+' symbol, which will present you with a choice of model creation wizards, i.e. Airplane, Glider, Heli, Multirotor or Other. The wizard takes your selections and creates the Mixer lines needed to implement the functionality required.



For our example, tap on the Airplane icon to start the model creation wizard.



Accept the default of 1 channel for the motor.

Create Model	ETHOS		
Ailerons		Flaps	
2 channels		2 channels	
4 channels		4 channels	
-			

Accept the default 2 channels for Ailerons, and select 2 channels for Flaps.



Accept the default Traditional Tail (which has Elevator and Rudder).



Accept the default 1 channel for Elevator and 1 channel for Rudder.

< Create Model	ETHOS	
Name	FWexample 🛃	
Picture		
+		\rightarrow

We will name the model 'FWexample', and follow the wizard to the end which results in the 'FWexample' model being created in the Airplane group. It will also be made the active model, so we can continue to configure its features.

Step 4. Review and configure the mixes



Tap on the Mixer icon to review the mixes created by the Airplane wizard.

< Mixer	E	THOS		
Name	Source	Channels	Active condi	tion
Ailerons	Aileron	1, 5		
Elevators	Elevator	2		100%
Throttle	Throttle	3		
Rudders	Rudder	4		0%
Flaps		6, 7		
			-100%	

The wizard has created two Ailerons on channels 1 and 2, followed by the Elevator, Throttle, Rudder and Flaps channels.



Ailerons

To review the Aileron mix, tap on the Ailerons line and select Edit from the popup menu.



Weight/Rates

It is a good idea to set up Rates on your model, especially if you have not flown it before. Rates set the ratio of the stick movement to channel movement. For example, for sport flying you normally want fairly modest throws on the control surfaces, so you may want to reduce the travel to say 30%. On the other hand, for 3D flying you want as much travel as you can get, i.e. 100%. In the screenshot above a Rate of 60% has been set for switch SB in the mid position. The vertical axis in the graph on the right shows that only 60% of throw is available.



Click on 'Add a new weight', and set up a 30% Rate for switch SB in the down position. The vertical axis in the graph on the right now shows that only 30% of throw is available in this switch position.



Ехро

In the Rates examples above you can see that the output response is linear. To avoid the response being too twitchy at the stick centers, you can use an Expo curve to reduce the control surface movement at center stick and to increase it as the stick moves further from center. For this example we have set three Expo rates to 60%, 40% and 25% on the corresponding SB switch positions, and the graph now shows a curved response which is flatter at stick center.

Ailerons	ETHOS		
	+ Add a new weight		100%
Differential	- 50%		
Channels count	2		0%
Output1	CH1 (Aileron1) 🔻		
CH1 Char		-100%	
Output2	CH5 (Aileron2) 🔻	Select the amour movement for cl	
CH5 Char			

For Ailerons there is another special setting called Differential. If the left and right ailerons move up or down by the same amount, the downward moving aileron will cause more drag than the upward moving aileron, causing the wing to yaw in the opposite direction to the turn. This is known as adverse yaw. To reduce this a positive value in the Differential setting will result in less downward aileron movement, as can be seen in the graph. This will reduce adverse yaw and improve turning/ handling characteristics. A common aileron differential setting is 50%.

Ailerons	ETHOS			
	+ Add a new weigl			
Differential	Differential			
Channels count	Set to maximum			
Output1	Set to minimum			
CH1	Use a source	_	-100%	
Output2	CH5 (Aileron2	2) 🔻		
CH5				

However, you can assign the differential to a pot, allowing your to optimize the value in flight. Long press Enter to bring up the Options dialog, and select 'Use a source'.

Ailerons	ETH <mark>OS</mark>	ETH <mark>OS</mark>				
	+ Add a new weight		100%			
Differential	Pot1 ▼ 5 0%					
Channels count	2		0%			
Output1	CH1 (Aileron1) 🔽					
CH1 (Channel: 0% (1500us) Mixer: 0%	100%				
-	· ·					
Output2	CH5 (Aileron2) 🔻					
СН5 (Channel: 0% (1500us) Mixer: 0%					

Choose Pot1 from the sources list. You can see the effect of Pot1 in the graph on the right.

< Ailerons	ETHOS		(
	+ Add a new weight		
Differential	Differential		
Channels count	Set to maximum		
	Set to minimum		
CH1 Channe	Convert to value	-100%	
	Options	2	
Output2	CH5 (Aileron2) 🔻		
CH5 Channe			

After optimizing aileron differential in flight, you can easily make the pot value your permanent setting. Long press Enter to bring up the Options dialog, and select 'Convert to value'.

Elevator and Rudder



In a similar way to the Ailerons, we can set up triple rates and expo for the Elevator and Rudder on switch SC.

Throttle < Throttle ETHOS 4i@ Throttle 🛃 Name Throttle Input > Throttle Cut > Throttle Hold Curve + Add a new curve Weight / Rates 100% Add a new weight

For the throttle we will leave the Input on the throttle stick. We do not need rates or expo, but we do need a safety switch so that the motor will not start unexpectedly. This is extremely important, because model engines and motors can cause serious injury or death.



Throttle Cut provides a throttle safety latching mechanism. Once the Active Condition has been satisfied in our example with switch SA in the down position, the throttle output will be held at -100% once the throttle value falls below -85%. (Compare the first graph above with the second.)

However, if the 'Sticky' is enabled, then the throttle will be cut the instant switch SA goes down.

Once the Active Condition has been removed (i.e. switch SA not in the down position), the throttle stick or control must be brought down below -85% before it can be increased. This avoids the motor unexpectedly starting at a high throttle position when Throttle Cut on switch SA is released.

Low Position Trim

For glow and gas we use 'Low position trim' to adjust the idle speed. The idle speed can vary depending on the weather, etc., so having a way to adjust the idle speed without impacting the full throttle position is important.

If 'Low position trim' is enabled, the throttle channel goes to an idle position of -75% when the throttle stick is at the low position. The throttle trim lever can then be used

Throttle Cut

to adjust the idle speed between -100% and -50%. Throttle Cut can then be configured to cut the engine with a switch.



< Throttle	ETHOS		2.46
Active condition	SAI 🔻		100%
Trigger value	-85%		
Idle Output Value	-100%		0%
Throttle Hold	~	-100%	
Active condition	SAJ 🔻	0	
Value	-100%		
Weight / Rates	100%		

Throttle Hold is used to cut the motor in an emergency from any throttle position. When the Throttle Hold Active condition is met, the throttle output is instantly reduced to -100% (or the value entered). As can be seen in the graph above, the throttle output has been cut to -100% even though the throttle stick is above the half way mark.)

K Flaps	ETHOS	•
Name	Flaps 🛃	100%
Active condition	Always On 🔻	
Input	SE 🕶	0%
Curve	🔻	
	+ Add a new curve	-100%
Channels count	2	? Edit name for the mixer
Weight	100%	
Output	CH6 (Flan1) 🔻	

Flaps

In this example we assign the flaps to switch SE, and increase both output channel weights to 100%.

Step 5. Configure the Outputs

The Outputs section is the interface between the setup "logic" and the real world with servos, linkages and control surfaces, and motors or engines. So far we have set up the logic for what we want each control to do. Now, we can adapt that to the mechanical characteristics of the model. The various channels are outputs, for example CH1 corresponds to servo plug #1 on your receiver.



Tap on the Outputs icon to configure the Outputs.

< Outputs		ETH	-05			
	• •		• • •	•		
CH1 Aileron1			CH2 Elevators			
Channel	0%			Channel	0%	
Mixer	0%			Mixer	0%	
CH3 Throttle			CH4 Rudders			
Channel	-100%			Channel	0%	
Mixer	-100%			Mixer	0%	
CH5 Aileron2			CH6 Flap1			2012us
Channel	0%			Channel	100%	
Mixer	0%			Mixer	100%	
CH7 Flap2		2012us	СН8			
Channel	100%			Channel	0%	
Mixer	100%			Mixer	0%	

Tap on an Output channel to configure it.

Example 1: Aileron1

Channel1	ETHOS		
Name		Aile	ron1 🛃
Invert		Normal	Inverted
Min			-100%
Max			100%
Center/Subtrim			0.0%
Curve		Ail1Lim 🔻	Edit
Slow Up			0.0s

The servo or channel limits can be configured with the Min and Max settings, but an easy way is to use a curve. In this example we have defined a curve 'Ail1Lim' and assigned it to the Aileron1 (left aileron) channel.

< Curve1	ET	HOS				.
	100%	Points Count	t			3points
		Smooth				
		Easy Mode				
	0%	Points Confi	g			\sim
		Point1	x	-100%	у	-30%
		Point2	x	0%	у	0%
-100%		Point3	x	100%	у	30%

It is a good idea to use +/- 30% initially, and then adjust the curve to suit the servo and linkages with the model powered up. This ensures that the servo will not be driven beyond its mechanical limits, which would overload the servo and lead to failure. The curve midpoint is edited to achieve the surface neutral position.

Example 2: Flap1

Channel6	ETHOS		
Name		FI	apl 📝
Invert		Normal 🔵 I	nverted
Min			-100%
Max			100%
Center/Subtrim			0.0%
Curve		Flap1Lim 🔻	Edit
Slow Up			0.0s

In a similar way the Flap1 channel can have a 'Flap1Lim' curve assigned to it. In addition, Slow Up and Slow Down could be set to 1 second, so that the flaps move to the new position slowly.

Note that Flaps normally require a large amount of down deflection for effective braking. To achieve this large downward deflection, you can sacrifice some of the upward deflection when making the linkages. This means that the Flaps will be in a half down position at servo center. The three points of the curve are adjusted to achieve the desired flap up, flap half, and flap full positions.

Step 6. Introduction to Flight Modes

Flight Modes are a great way to configure a model for different tasks. For example, a glider may have flight modes for tasks such as Cruise, Speed, Thermal, Launch and Land. Each flight mode can remember its own trim settings, so once you have trimmed the glider to fly well in each mode, you no longer have to keep changing your trims during flight as you change tasks. The flight mode switch becomes a bit like changing gears in a car. Flight modes are sometimes called 'Conditions' in other firmware.

For simplicity, this example only shows setting up flight modes for Normal, Flaps Half and Flaps Full.

There are 100 flight modes including the default mode available for use. The first flight mode that has its Active Condition ON is the active one. When none has its Active Condition ON, the default mode is active. This explains why the default mode does not have a switch selection option.

Flight Modes	ETHOS	2.46
Name	Active condition	
Flaps Half	SE-	
Flaps Full	SE↑	

For our example we have configured the default flight mode as Normal, and added two additional flight modes named Flaps Half (switch SE-mid) and Flaps Full (switch SE-Up).

C Trims	ETHOS	.
Trim Elevator		~
Trim Mode		Fine 🔻
Extended trims		OFF 🔵 ON
Independent Trim per Flight N	lode	OFF 🔵 ON
Trim Throttle		\sim
Trim Mode		Fine 🔻
Extended trims		OFF 🔵 ON

Next we go the Trims section, and change the Elevator stick to have Independent Trims per Flight Mode. This then allows you to have independent elevator compensation for the two flap settings. The Elevator Trim Switch will automatically switching between the settings as you operate the flaps on switch SE.

Step 7. Add a VFR alert

The Valid Frame Rate sensor has been introduced with ACCESS, and provides a measure of Link Quality, where 100% is perfect. At this stage there is no built in alert for VFR%, but you can easily set one up as follows:

K Telemetry	ETHOS	94 dB 100 dB 1
Discover new sensors		OFF 🔵 ON Delete all
		Create calculated sensor
Name	Value	Source
• RxBatt 2.4G	5.05V	Internal Module 2.4G
• RxBatt 900M	4.92V	Internal Module 900M
• RSSI 2.4G	95dB	Internal Module 2.4G
• RX 2.4G	0	Internal Module 2.4G
• RSSI 900M	100dB	Internal Module 900M

a) Enable the 'Discover new sensors' option in Model / Telemetry. You should see sensors similar to the example above, including VFR.

< LSW1↓	ETHOS	96dB 97dB
Name		VFRlow 🗃
Function	Normal 🕖 Inverted	A < X 🔻
Source (A)	•	VFR 2.4G 🔻
Value (X)		80%
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

b) Tap on the '+' in Model / Logical Switches to add a Logical Switch.

c) Configure the Logical Switch to become True when VFR drops below say 80%.

< Log	ic Switch	ETHOS	0 dB 0 dB
	Name	Description	
LSW1	VFRlow	VFR 2.4G < 80%	

d) The completed Logical Switch is shown above.



e) Tap on the '+' in Model / Special Functions to add a Special Function to speak the value of VFR% every 5 seconds when its value drops below the threshold of 80% set up in the logical switch above.
Step 8. Set up a LiPo battery timer

Timer edit	ETHOS	О dв О dв (1) 2.46 900м
Name		BattTimer 🕞
Mode		Down 🔻
Start Value		00:05:00 🖃
Sound		Speech 🔻
Haptic		OFF ON
Countdown Start		00:02:00 📝
Countdown Step		30s

Tap on Timer 1 in the Model / Timers section, and select Edit. In this example we are configuring a Down counting timer, with a Start Value of 5 minutes. The countdown will start at 2 minutes, and will be called out via speech at 30 second intervals and then every second from 10 seconds remaining. The timer will run whenever the throttle is not idle (throttle absolute option), provided it is not being held in reset.

< Timer edit	ETHOS	0 dB 0 dB 📢 🛄
Sound		Speech 🔻
Haptic		
Countdown Start		00:02:00 🖃
Countdown Step		30s
Active condition		Throttle absolute 🔻
Reset		SAJ 🔻
Persistent		OFF 🔵 ON

In the example the timer is reset by switch SA-down, which is our throttle hold switch. It is not persistent, so it will also be reset at power on.

This setup can be used to warn you when it is time to land, with the start value chosen so that approximately 30% of battery capacity remains. LiPo type batteries do not tolerate being over-discharged.

Step 9. Add a mix for retracts

K Mixer Librar	y ETH	-IOS	()
Free Mix	Var	Trim	Ailerons
Elevators	Rudders	Flaps	Throttle
Ail To Flap	Ail To Rud	Airbrake	Camber
Cmbflap To Ele	Ele To Camber	Rud To Ail	Rud To Ele
Snap Roll	Thr To Ele	Thr To Rud	Test Mix
Ail To Flap Cmbflap To Ele Snap Roll	Ail To Rud Ele To Camber Thr To Ele	Airbrake Rud To Ail Thr To Rud	Cambe Rud To E Test Mi

Tap on a mixer line and select 'Add Mix' from the popup menu. This will open the Mixer Library. Select 'Free Mix'.

Free Mix	ETHOS	0 dв 0 dв 📢 🛄
Name	Retracts 🗃	100%
Active condition	Always On 🔻	
Flight Modes	D 1 2 Edit	0%
Source	SF 🔻	
Function Type	Addition 🔻	.200%
Curve	🔻	🤨 Edit name for the mixer
	+ Add a new curve	
Offect	■ ∩%	

For this example name the Free Mix as 'Retracts'. The mix can always be on, and the Source can be switch SF.

Free Mix		E	rhos		0	dB O dB
Weight Down			100	%		100%
Slow Up			0.0	0s		
Slow Down			0.0	0s		0%
Channels count				1	-100%	
Reverse			OFF 🔵 C	N	2 Colact the chann	el vou want to be
Output		CH8	(Retracts)	•		
СН8	Channel: -1	L00% (988us)	Mixer: -10	0%		

The lower half of the Free Mix settings shows that channel 8 has been allocated to the retracts.

'How To' section

1. How to set up a low battery voltage warning

In this age of telemetry, a better battery management approach is to monitor the battery voltage under load, and raise an alert when the voltage drops below the chosen threshold. For this a battery voltage sensor such as the FrSky FLVSS can be used.

< Telemetry	ETHOS	97dB99dB
• RSSI 900M	100dB	Internal Module 900M
• RX 900M	0	Internal Module 900M
• RxBatt 2.4G	5.04V	Internal Module 2.4G
• RxBatt 900M	4.94V	Internal Module 900M
VFR 900M	100%	Internal Module 900M
VFR 2.4G	100%	Internal Module 2.4G
ADC2 2.4G	0.00V	Internal Module 2.4G
• LiPo 2.4G	23.01V	Internal Module 2.4G

Connect the FLVSS to your receiver via an S.Port cable, and enable the 'Discover new sensors' option in Model / Telemetry. The additional LiPo sensor is shown in the example above.

< LSW2	ETHOS	0 dB 0 dB 1
Name		BattLow 🗃
Function	Normal 🕖 Inverted	A < X ▼
Source (A)	•	LiPo 2.4G 🔻
Value (X)		0.00V
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

Add a new Logical Switch and select the Lipo sensor as the Source.

< LSW2	ETH05	0 dB 0 dB 📢
	Options	BattLow 🛃
Function	Min 🗖	A < X 🔻
Source (A)	Max 🗖	LiPo 2.4G Lowest 🔻
Value (X)	Lowest 🛛	0.00V
Active condition	Highest 🗌	Always On 🔻
Delay before active	Count	0.0s
Delay before inactive		

<pre>< LSW2</pre>	ETHOS	0 dB 0 dB 4
Name	Options	BattLow 🖃
Function	Min 🗖	A < X 💌
Source (A)	Max 🔳	LiPo 2.4G Lowest 🔻
Value (X)	Lowest 🔽	0.00V
Active condition	Highest 🗌	Always On 🔻
Delay before active	Count 📃	0.0s
Delay before inactive		
< LSW6	ETHOS	83dB 99dB 4
Function	Options	A ~ X 💌
Source (A)	Cell1	LiPo 2.4G 🔻
Value (X)	Cell2	0.00V
Active condition	Cell3	Always On 🔻
Delay before active	Cell4	0.05
Delay before inactive	Cell5	0.0S

With the Lipo sensor highlighted, long-press the [ENT] key to bring up an options dialog. Select the Lowest from the list of Lipo sensor options, which include Min pack voltage, Max pack voltage, Lowest cell voltage, Highest cell voltage, cell Count and the individual cell voltages.

< LSW2↓	ETHOS	0 dB 0 dB 📢 🏢
Name		BattLow 🗃
Function	Normal 🕖 Inverted	A < X ▼
Source (A)	•	LiPo 2.4G Lowest 🔻
Value (X)		3.40V
Active condition		Always On 🔻
Delay before active		4.0s
Delay before inactive		0.0s

Set the Value to something like 3.4V, and 'Delay before active' to 4 seconds. The Logical Switch will become True/Active when the lowest cell voltage remains below 3.4 per cell for 4 seconds or more. A threshold of 3.4V under load will recover to around 3.7V when no longer under load.

< Log	jic Switch	ETHOS	
	Name	Description	
LSW1	VFRlow	< 80%	
LSW2	BattLow	LiPo 2.4G Lowest < 3.40V	

The completed Logical Switch for battery low is shown above.

< SF3	ETHOS	О dв О dв (] ()) 2.46 999М
Action		Play value 🔻
State		Disable 💽 Enable
Active condition		LSW2 🗸
Value		LiPo 2.4G 🔻
Repeat		5s

Add a Special Function to speak the value of the LiPo total voltage every 5 seconds when its value drops below the threshold of 3.4V per cell for 4 seconds as set up in the logical switch above.

2. How to set up a battery capacity warning using a Neuron ESC

The best method of monitoring battery usage is to measure the energy or mAh consumed, so that the remaining battery capacity can be calculated. The FrSky Neuron series of ESCs offer this capability. If your ESC does not have this capability, an ammeter may be used with a calculated Consumption sensor, please refer to the next example.

Contract	ETHOS	
VFR	100%	Internal Module 2.4G
SBEC V	4.932V	Internal Module 2.4G
SBEC A	0.206A	Internal Module 2.4G
ESC Temp	38°C	Internal Module 2.4G
ESC Voltage	16.56V	Internal Module 2.4G
ESC Current	0.00A	Internal Module 2.4G
ESC RPM	0	Internal Module 2.4G
ESC Consumption	0mAh	Internal Module 2.4G

Connect the telemetry port of the Neuron ESC to your receiver via an S.Port cable, and enable the 'Discover new sensors' option in Model / Telemetry. The additional sensors are shown in the example above. The sensor of interest is 'ESC Consumption'.

< LSW2	ETHOS	2.46
Name		BattCons 📝
Function	Normal 🕖 Inverted	A > X ▼
Source (A)		ESC Consumption 🔻
Value (X)		900mAh
Active condition		Always On 🔻
Delay before active		0.0s
Delay before inactive		0.0s

Add a new Logical Switch to monitor the 'ESC Consumption', and become True/Active when the consumption exceeds say 900mAh, or approximately 60% of the battery capacity, allowing sufficient capacity to land and still have about 30% left.

< SF3	ETHOS	.111 4 1000
Action		Play value 🔻
State		Disable 💽 Enable
Switch		LSW2 🔻
Value		ESC Consumption 🔻
Repeat		5s

Add a Special Function to speak the value of 'ESC Consumption', i.e. the total mAh consumed, which will be just over 900 mAh in our example. As an additional safeguard, we can also set up an alert for battery voltage using the Neuron 'ESC Voltage' sensor.

< LSW3	ETHOS	²⁴⁶ ∎◀iⅢ
Name		BattLow 🗃
Function	Normal Inverted	A < X 🔻
Source (A)		ESC Voltage 🔻
Value (X)		13.60V
Active condition		Always On 🔻
Delay before active		4.0s
Delay before inactive		0.0s

Add a new Logical Switch to monitor the 'ESC Voltage', and to become True/Active when the 'ESC Voltage' voltage remains below 3.4 per cell for 4 seconds. In the example a 4S LiPo is being monitored, so the threshold is set to $3.4 \times 4 = 13.6$ V. A threshold of 3.4V under load will recover to around 3.7V when no longer under load.

< SF4	ETHOS	246 • 1 1 1 4 1 (111)
Action		Play value 🔻
State		Disable 💽 Enable
Switch		LSW3 🔻
Value		ESC Voltage 🔻
Repeat		5s

Now add a Special Function to speak the value of 'ESC Voltage' every 5 seconds when its value drops below the threshold of 3.4V per cell for 4 seconds as set up in the logical switch above.

3. How to set up a battery capacity warning using a calculated sensor

This is another example of monitoring battery usage by measuring the energy or mAh consumed, so that the remaining battery capacity can be calculated. If your ESC does not have this capability, a current sensor such as the FrSky FASxxx series may be used with a calculated Consumption sensor.

Telemetry	ETHOS	98 _{dB} 100 _{dB}
• RSSI 900M	100dB	Internal Module 900M
• RX 900M	0	Internal Module 900M
VFAS 2.4G	0.02V	Internal Module 2.4G
Temp 2 2.4G	-26°C	Internal Module 2.4G
• RxBatt 900M	5.28V	Internal Module 900M
Current 2.4G	0.0A	Internal Module 2.4G
VFR 2.4G	100%	Internal Module 2.4G
• Consumption	1.0mAh	Consumption Current 2

Connect the telemetry port of the FASxxx current sensor to your receiver via an S.Port cable, and enable the 'Discover new sensors' option in Model / Telemetry. The additional sensors are shown in the example above. (The Consumption calculated sensor is added below).

Control Telemetry sensor Control Telemetry sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Control Telemetry Sensor Sensor	ETHOS	98	
Value			0.2A
Name		Cu	rrent 2.4G 🗃
Unit			А 🕶
Decimals			1
Range		0.0A ⁻	100.0A
Write Logs			OFF 🔵 ON
Sensor lost warning			OFF ON

In this example a FAS100 was used, so the Range is set to 0-100A.

Calculated Sense	or ETHOS	97dB 0dB
Formula		Consumption 🔻
	Formula	Consumption 🖃
Unit	Consumption	mAh 🔻
Decimals	Distance	0
Range	Trip	0mAh ⁻ 10000mAh
Write Logs		OFF ON
Source		🔻

In Telemetry click on 'Create Calculated Sensor' and select 'Consumption' from the popup dialog.

Calculated Sensor ETHOS	
Formula	Consumption 🔻
Name	Consumption 🖃
Unit	mAh 🔻
Decimals	1
Range	0.0mAh - 2200.0mAh
Write Logs	
Source	Current 2.4G 🔻

Configure the Consumption sensor to use 'mAh' units, and set the range to suit your Lipo. Select the source as 'Current2.4g'.

< LSW3	ETHOS	0 db 0 db 📢 🛄
Name		delta 200m A 🖃
Function	Normal 🕖 Inverted	∆ > X ▼
Source (A)	•	Consumption $igstar{}$
Value (X)		200.0mAh
Check interval		
Active condition		Always On 🔻
Delay before active		0.05

Add a new Logical Switch using the Delta (d>X) function to monitor the Consumption sensor, and become True/Active every time the consumption reaches say 200mAh, or a convenient fraction of the battery capacity.

✓ SF3	ETHOS	0 dB 0 dB 📢 🛄
Action		Play value 🔻
State		Disable 🚺 Enable
Active condition		LSW3 🗸
Value		Consumption 🔻
Repeat		Once

Add a Special Function to speak the total value of 'Consumption', i.e. the total mAh consumed, every time 200mAh has been consumed.

< LSW4↓	ETHOS	0 dB 0 dB 1
Name		BattLow 🕞
Function	Normal 🕖 Inverted	A > X ▼
Source (A)	•	Consumption $igvee$
Value (X)		1000.0mAh
Active condition		Always On 🔻
Delay before active		0.0S
Delay before inactive		0.0S

Finally, you can set up a logic switch to trigger a call out of Consumption every 10 seconds once a threshold has been reached. In our example, a threshold of 1000mAh has been set for a 1200mAh LiPo.

< SF5	ETHOS	0 dB 0 dB 📢 🛄
Action		Play value 🔻
State		Disable 💽 Enable
Active condition		LSW4 🔻
Value		Consumption 🔻
Repeat		105

Set up a special function to play the value of Consumption every 10 seconds once LSW4 triggers when the 1000mAh threshold has been reached.

4. How to create a model for SR8/SR10

The wizards use the channel order as defined in System / Sticks, by default AETR. However, for models with more than one surface for ailerons, elevator, rudder, flaps etc the wizard will normally group these surfaces, so for example you would get AAETR if using 2 Aileron channels.

The SRx receivers expect a channel order of AETRA, so the wizard can be told (in System / Sticks) to keep the 'First four channels fixed':

1. Confirm the default channel order

In System / Sticks, confirm that the default channel order is AETR.

2. Enable 'First four channels fixed'

In System / Sticks, enable the 'First four channels fixed' setting. This will ensure that the wizard does not group similar channels (within the first four) and keep for example both Aileron channels together.

2. Create the model using the wizard

Run the new model creation wizard by clicking on the [+] in Model / Select Model, and tell the wizard all the channels your are using. The first 5 channels will be AETRA.

5. How to reorder channels e.g. for SR8/SR10

You may wish to convert an existing model for use with an FrSky stabilized receiver. This might involve re-ordering the channels.



Your current model may have a channel order of AAETRFF.

CH1 Aileron1 (Right)
CH2 Aileron2 (Left)
CH3 Elevator
CH4 Throttle
CH5 Rudder
CH6 Flap1 (Right)
CH7 Flap2 (Left)
CH8 Retracts.

The FrSky stabilized receivers have a defined channel order AETRAE as follows:

- CH1 Aileron (Left)
- CH2 Elevator
- CH3 Throttle
- CH4 Rudder
- CH5 Aileron2 (Right)
- CH6 Elevator2

< Ailerons	ETH	105		^{300M}	
	Char	nel			
Differential					
Channels count	CH1 (Aileron1)				
Output1	CH2 (Aileron2)				
CH1	Channel: CH3 (Elevators	;)	-100%		
Output2	CH4 (Throttle)	iici onz)			
CH2					

1. Change CH1 (Aileron1) to CH9

First we move CH1 (Aileron1) out of the way.

- a) Go to Model / Mixers, and tap on CH1 (Aileron1) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output1, and tap on CH1, then select CH9.

< Ailerons	ETHOS	2.46
	+ Add a new weight	
Differential ? Confirm	F00/	
Channels cc Do you want	t to swap CH1 and CH9 chann	els settings?
CH1 CH1	Yes No	Cancel
	CH2 (Ailaran2)	
CH2 Channel: (0% (1500us) Mixer: 0%	

- d) Say Yes to swap CH1 and CH9 channels settings.
- e) You will now have Aileron1 on CH9.

2. Change CH2 (Aileron2) to CH1

- a) Tap on CH2 (Aileron2) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output2, and tap on CH2, then select CH1 (Aileron1).
- d) Say Yes to swap CH2 and CH1 channels settings.
- e) You will now have Aileron2 on CH1.

3. Swap CH3 (Elevators) and CH2

- a) Go to Model / Mixers, and tap on CH3 (Elevators) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output1, and tap on CH3, then select CH2.
- d) Say Yes to swap CH3 and CH2 channels settings.
- e) You will now have Elevator on CH2.

4. Change CH4 (Throttle) to CH3

- a) Tap on CH4 (Throttle) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output1, and tap on CH4, then select CH3.
- d) Say Yes to swap CH4 and CH3 channels settings.
- e) You will now have Throttle on CH3.

5. Swap CH5 (Rudders) and CH4

- a) Tap on CH5 (Rudders) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output1, and tap on CH5, then select CH4.
- d) Say Yes to swap CH4 and CH3 channels settings.
- e) You will now have Rudder on CH4.

6. Change CH9 (Aileron1) to CH5

- a) Go to Model / Mixers, and tap on CH9 (Aileron1) to highlight it.
- b) Tap again, and select Edit from the popup dialog.
- c) Scroll down to Output1, and tap on CH9, then select CH5.
- d) Say Yes to swap CH9 and CH5 channels settings.
- e) You will now have Aileron1 on CH5.

4. Confirm new channel order

As can be seen in the above example, the channels are now in the correct order for FrSky stabilized receivers:

- CH1 Aileron (Left)
- CH2 Elevator
- CH3 Throttle
- CH4 Rudder

CH5 Aileron2 (Right)CH6 Flap1 (Left)CH7 Flap2 (Right)CH8 Retracts.

6.How to configure a Butterfly mix

For this example it will be assumed that a Butterfly mix is to be added to a glider, which typically uses the throttle stick for braking. You may want to configure the mix so that no butterfly is added with the throttle up, and progressively butterfly increases as the stick is moved down. You probably also want elevator compensation using a curve because the response is non-linear.

1. Use a curve to convert the slider to a -100 to 0 range

To do this a curve may be used to convert the -100 to +100 range coming from the slider

< Curve1	ET		
	100%	Name	-100to0 🖃
		Туре	Custom 🔻
		Points Count	2points
	0%	Smooth	
		Easy Mode	
		Points Config	>
-100%			

Name the curve -100to0.

< Curve1	ET	.				
	100%	Туре	Custom 🔻			
		Points Count	2points			
		Smooth				
	0%	Easy Mode				
		Points Config	\sim			
		Point1 x	-100% y -100%			
-100%		Point2 x	100% y 0%			

We need a 2 point custom curve with endpoints of (-100%, -100%) and (+100%, 0%).

2. Add the Butterfly mix

< Butterfly	ETHOS	
Name	Butterfly 🛃	100%
Active condition	Always On 🔻	
Input	Slider right 🔻	0%
Curve	-100to0 🔻 Edit	
	+ Add a new curve	-100%
Channels count	5	Operation of the second sec
Weight	-10%	will be calculated before the param weight
Output	CH1 (Aileron1) 🔻	

Set the Input to your desired butterfly control, e.g. Slider right. Select the newly created curve '-100to0'.

< Butterfly		ETHC	S		
Weight	•		-10%		100%
Output		CH1 (Ailer	on1) 🔻		
CH1			Mixer: 0%		0%
Weight	-		-10%		
Output		CH2 (Ailer	on2) 🔻	-100%	
CH2	Channel: 0% (15(01us)	Mixer: 0%	? The multiplier in 9	
Weight	•		100%		
Output		CH6 (FI	an1) 🔻		

Normally for butterfly or crow braking, the ailerons are set to go up a modest amount, say -10%, while the flaps go down a large amount. This combination creates a lot of drag, and is very effective for braking.



Flaps are unusual in that a very large downward deflection is needed, with very little or no upward movement. This may be achieved by sacrificing some upward travel in favor of downward travel. In practice the flap servo horns may be offset from neutral by say 20 or 30 degrees.

In this situation the flaps will be half down at servo neutral, which means an offset mix will be need to bring the flaps up to their neutral position for normal flight.

3. Add a 'Flaps Neutral' offset mix

FlapsNeut	ETHOS	
Name	FlapsNeut 🗃	100%
Active condition	Always On 🔻	
Source	Maximum 🔻	0%
Function Type	Addition 🔻	
Curve	🔻	-100%
	+ Add a new curve	0
Offset	0%	

Add a Free Mix and set the source to Maximum. In the current version of Ethos, this mix must be inserted before any other mixes that act on the flaps channels.

FlapsNeut	ETHOS	
Source	Maximum 🔻	100%
Function Type	Addition 🔻	
Curve	🔻	0%
	+ Add a new curve	
Offset	0%	-100%
Weight Up	60%	 Select the control source of this mixer
Weight Down	60%	

Set the Weights so that the flaps are brought up to their neutral position with the Butterfly mix off, i.e. the throttle stick up. In this example they are set to an indicative 60%.

FlapsNeut		E	ETHC	S		()
						100%
Channels count				2		
Reverse			OFF	ON		
Output			CH6 (Fl	ap1) 🔻		
СН6		9% (1804us)				
					-100%	
Reverse			OFF	ON	0	
Output			CH7 (Fl	ap2) 🔻	Select the chanr affected by this	
СН7	Channel: 59	9% (1804us)		Mixer: 59%		

Finally, set the 'Channels count' to 2, and the Outputs to your flaps channels. In this example the flaps are on channels 6 and 7.

4. Add the Elevator compensation curve and mix

To add elevator compensation to the butterfly mix. the Weight parameter for the Elevator must be changed to a mix which in turn calls up a compensation curve.

く Curve2	ET	HOS	₽
	100%	Name	EleComp 🖃
		Туре	Custom 🔻
		Points Count	5points
• • • • • • • • • • • • • • • • • • •	\$	Smooth	
		Easy Mode	
		Points Config	>
-100%			

Define a curve EleComp as a custom 5 point curve.

< Curve2	ETH <mark>05</mark>						
	100%	Easy Moc					
		Points Co	Points Config				
		Point1	x	-100%	у	-12%	
• • • • • • • • • • • •		Point2	х	-50%	у	-10%	
		Point3	х	0%	у	-8%	
		Point4	х		у	-5%	
-100%		Point5	x	100%	у	0%	

In this example EleComp has initial values of -12%, -10%, -8%, -5% and 0%. If your aircraft does not have an elevator compensation curve specified, these points will need to be determined empirically.

< EleCompx	ETHC	5			()
Name	EleCo	mpx 🛃			100%
Active condition	Alway	rs On 🔻			
Source	Thr	ottle 🔻	0%		-0%
Function Type	Addition 🔻				
Curve	EleComp 🔻	Edit	-100%		
	+ Add a new curve		U		
Offset	-	0%			

Next we define a high mix which will convert our compensation curve into a variable value suitable as a weight in the Butterfly mix. Use a Free Mix, with throttle as source and attach the curve EleComp.

< EleCompx	ETHOS		
Weight Down	100%		100%
Slow Up	0.0s		
Slow Down	0.0s		0%
Channels count	1	-100%	
Reverse	OFF 🔵 ON	0	ļJ
Output	CH30 (EleCompx) 🔻	Select th affected	
CH30 Channel: -1	0% (1449us) Mixer: -10% I		

Finally assign the EleCompx mix output to a high channel such as CH30.

	Member				
	CH27				
	CH28				
	CH29		1)		
	CH30 (EleCompx)		2)		
	СН31		2		
	-5% (1477us) M	lixer: -5%			

Now go back to the Butterfly mix, and long-press [ENT] on the Weight for the Elevator Output, then select 'Use a source', and navigate to CH30 (EleCompx).

< Butterfly	ETHOS	
СН6	Channel: -15% (1422us) Mixer: -15%	100%
Weight	100%	
Output	CH7 (Flap2) 🔻	0%
СН7	Channel: -15% (1422us) Mixer: -15%	-100%
Weight) (EleCompx) 🔽 📍 -10%	0
Output	CH3 (Elevators) 🔻	
СН3	Channel: 8% (1538us) Mixer: 8%	

The Butterfly mix is now configured.