



PowerBox Systems®

World Leaders in RC
Power Supply Systems

Manual
V1.6



Dear PowerBox pilot,

Many thanks for placing your trust in us, and purchasing our **PowerBox CORE**. You have chosen an extremely unusual radio control system: the **CORE** has great presence and allure, which you cannot fail to appreciate when you pick up the transmitter for the first time. The **CORE** fits perfectly in your hands, and is the perfect tool for controlling your valuable models with precision.

30 months have passed between the initial idea and the start of series production: in this time we have developed everything from the ground up: electronics, mechanical systems, choice of components and suppliers, external appearance, technical design, mould construction, software architecture, basic operating philosophy and endless details.

Development started late, and the system had to be completely re-designed, but over time we realised that this offered one great advantage: compatibility with old systems developed in the past did not have to be considered in any way. This is a very important benefit, since there have been significant technical advances in the field of 2.4 GHz systems since the start of the current era.

A single example will suffice to underline this advantage: the highly developed radio link, offering a range of more than 9 km. This is unique, and provides unrivalled system reserves. Further advances are evident in our new bi-directional **P²BUS** which operates as the telemetry interface, and is capable of transferring data at unprecedented speed. The most important advance as far as the pilot is concerned is the user interface, which is controlled using the transmitter's integral touch-screen: the entire menu system is accessed from here, and the self-explanatory menus are completely logical in their structure. The internal high-performance Linux computer provides unlimited future expansion potential.

We are confident that we can guarantee our customers durability and quality at the very highest level, because we exclusively use components of the highest possible industrial quality, produced by top manufacturers.

The entire production process - starting with circuit board assembly and extending right through to final assembly in our own premises - takes place in Germany. Each **CORE** is hand-made, and represents an example of German craftsmanship at its best! All our staff are united in their shared aim: perfection!

We wish you many hours of pleasure and countless successful flights with your new **PowerBox CORE**!

CONTENT

1. Connections, controls	3	20. Service Note.....	34
2. Initial steps	4	21. Guarantee conditions.....	34
3. Function menu.....	8	22. Liability exclusion.....	34
4. Binding a receiver.....	12	23. FCC.....	34
5. Mixer	13	24. IC.....	35
6. Virtual switches.....	14	25. RF exposure statement (portable devices)	35
7. Servo Cut-Off.....	16		
8. Flight modes	18		
9. Speech output.....	20		
10. File Manager	21		
11. Telemetry, timers, servo display and quick-select buttons.....	22		
12. Update.....	27		
13. Charging the transmitter	28		
14. Connections.....	28		
15. Mechanical transmitter adjustments.....	29		
16. Calibrating the transmitter controls	31		
17. Specification	31		
18. Set contents.....	31		
19. CORE Accessories	32		

1. CONNECTIONS, CONTROLS



Quick-select buttons



Screen
unlock



User-
defined
menu



Servo
monitor



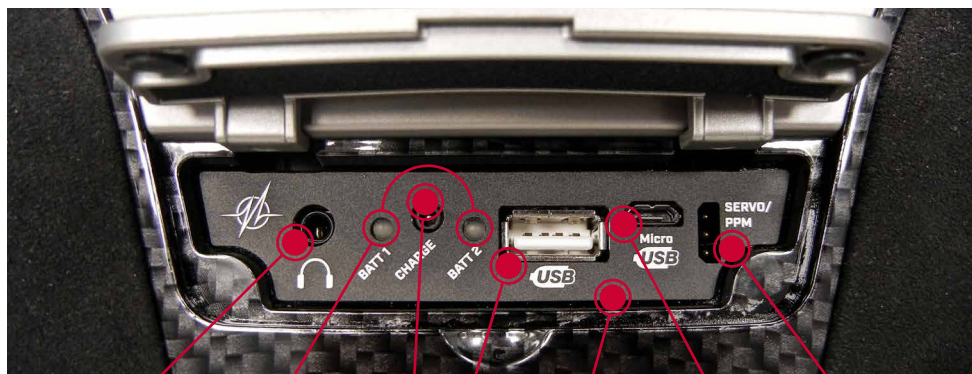
History
back



Home screen




History
forward



Headphone socket Charge status LED Charge socket (10-16V) USB-A socket Microphone input Micro USB socket Servo tester/ PPM output

2. INITIAL STEPS

a) Switching on

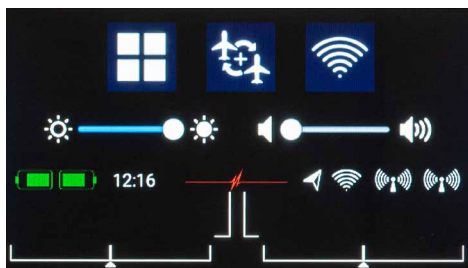
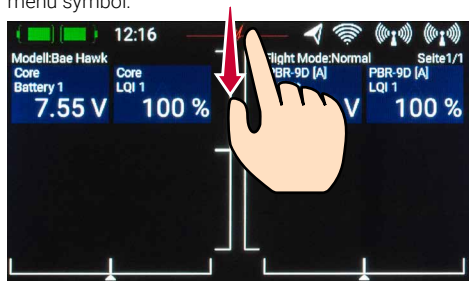
The **CORE** is switched on by holding the -button pressed in until it lights up red. Release the button briefly, then confirm the power-on process by briefly pressing the button a second time. The transmitter is switched off in exactly the same way. The button changes to green when the Linux system has booted; this process takes about 25 seconds.

Once the **CORE** is running, you will see the Home display on the screen: this shows fields containing telemetry values, timers, servo positions or quick-select buttons for menus. These fields are known as widgets.

Note: the **CORE** is fitted with a fully redundant power supply system, which is deliberately kept separate from the Linux computer and the other processors. This means that any malfunctions in the complex Linux system cannot possibly result in the transmitter switching itself off. The two real-time processors also function completely independently of the Linux computer. The model remains fully controllable even if the Linux computer is pulled out when the system is running!

b) Entering the menu

The main menu is accessed by swiping a finger downwards from the top edge. You can now touch the left-hand menu symbol:



There is no need to press firmly, as the capacitive touch-screen simply responds to touch, like all modern smart-phones.

The symbols in the Main menu are arranged in order of importance.

Note: you can transfer any menu point to your own personal menu. This is accomplished simply by holding your finger on the appropriate menu for a few seconds. When the "Person symbol" appears, the menu point is transferred into your personal menu, which you can access conveniently using the quick-select button at the bottom of the screen. If you wish to remove a menu point again, use the same procedure: keep your finger on the menu symbol in question, and that entry is duly erased.

Menu



Functions

- Function overview
- Create or erase functions



Servos

- Servo overview
- Create or erase functions



Servo monitor



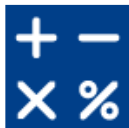
Flight modes



Virtual switches



File manager



Mixers



Servo Cut-off



Model

- Model overview
- Load, copy or erase models



Receiver

- Receiver overview
- Bind or remove receiver
- Range check



Speech output

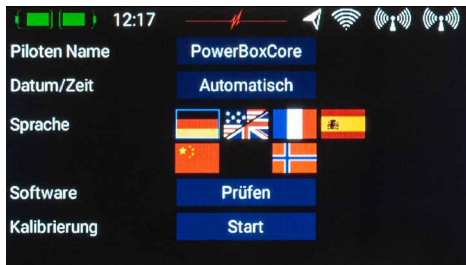


Settings

- System
- Screen

c) Settings

This menu point is used to set your personal preferences.



The **System** sub-menu is used to enter your name, set the time display format, select your preferred language, display the software version and update the software when necessary. Another important point is the Calibration menu; this is described in full at a later stage.

In the **Screen** sub-menu you can select the background colour and icon colour. The brightness control should be set to a value which enables you to see the screen content clearly and distinctly.

Note: the ultra-bright TFT screen allows you to see everything clearly even in bright sunshine. However, the screen brightness does have a perceptible effect on battery duration!

The **Dimmer** time setting determines the point at which the screen is automatically darkened. The **automatic screen lock** can be released again using the **Q**-button (quick-select button, bottom left).

d) Creating a model

Select the **Model** button in the Main menu, and you will see an overview of all models stored in the transmitter.



To create a new model, briefly touch the **+** button at the bottom of the screen. Assign a name to your model, and confirm your choice with **OK**. You will now see the Select screen for the model type.

At this point you can select the appropriate model type, with the additional options of delta wing and V-tail.



On the next screen you select one of the ranges on the right-hand side, e.g. Wing. The screen now shows a diagram of a wing corresponding to your chosen type. If your configuration is more specialised, that presents no problems: at a later stage you can very easily program individual functions manually.



Here you will see the name of the function (e.g. Aileron L), a transmitter control and a **+** symbol, which is used to assign the appropriate number of servos. These individual Select points are inter-connected; the method used for this will become self-evident in the course of the set-up procedure.



Now you select a transmitter control which is to control the left aileron; this will be the left or right primary stick, depending on the transmitter mode you prefer.

Note: the software of the **CORE** has no modes – it is only the mechanical settings of the transmitter sticks which determines the stick mode.

If you now leave the Select screen again, you will see that the same transmitter control has also been assigned automatically to the right aileron.

The next step is to select the servo outputs to which you intend to connect the aileron servos; this is accomplished by pressing **+**. Note that you can assign up to eight servos to a single function.



If your model is an aerobatic aircraft, you would naturally select two or three servos at this point, if you have multiple servos mechanically connected to a single control surface. At a later stage you will be able to set the travel, direction of rotation and centre position for each servo separately.

If these parameters are too coarse for your application, you can set an individual curve with up to 33 points for each servo.

Back in the Assignment screen it is also possible to rename the functions to suit your own preference.

If you decide to assign the wing flaps at this point, you will learn to appreciate one of the truly unique features of the **CORE**. As with the ailerons, you again assign a transmitter control to the flaps. If each flap is operated by a separate servo, you won't notice anything unusual: you simply assign the flaps to your preferred servo outputs. However, if you also want the ailerons to double as flaps, or want the ailerons to be mixed in to the flaps, you also assign the aileron outputs to the flap function. These functions are now superimposed, i.e. the mixing is accomplished simply by assigning the servos.

At a later stage you can adjust the servos individually, both for the Aileron function and the Flap function. Servo travel, centre and direction can be set separately for both functions!

An even clearer example of this exceptional feature relates to models with a delta wing. If you select a delta using the Assistant, the correct functions are assigned automatically. To clarify this, the manual method would be as follows:

As an example servos 1 and 5 are assigned to Aileron. Servos 1 and 5 are also assigned to Elevator. Since the servos are installed in a mirror-image arrangement, it is logical that the servos always operate as ailerons, regardless of whether the pilot moves the elevator stick or the aileron stick. Now we switch to the Elevator function and reverse the direction of rotation of one servo. The elevator function now works correctly, but the "reversed" elevator function has no effect on the servo direction when an aileron command is applied, i.e. the ailerons still work correctly. That's all there is to setting up a "delta mixer".

Back to our Wing screen: when all the assignments are complete, press the ↩-button amongst the quick-select buttons at the bottom in order to return to the overview.

You can now continue assigning transmitter controls and servos to all the remaining functions. When everything is finished, touch **Continue** at bottom right. The functions and servo assignments are complete.

3. FUNCTION MENU

You now arrive at the most important screen display: the **Function Overview**. In principle, the set-up of the whole model is carried out from this starting point. The display is arranged logically from left to right:

Function → Transmitter control → Trim → Setup → Failsafe → Servo(s)



The individual points in detail:

A. Function

Each function always contains a transmitter control, the associated trim, the settings for the transmitter control - such as Expo and Travel, Failsafe or Hold - and the assigned servos.

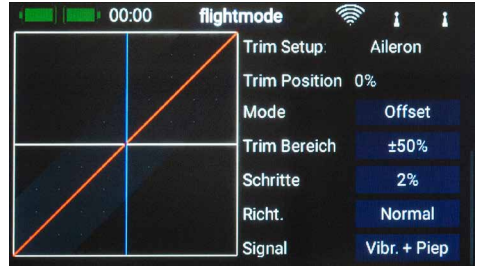
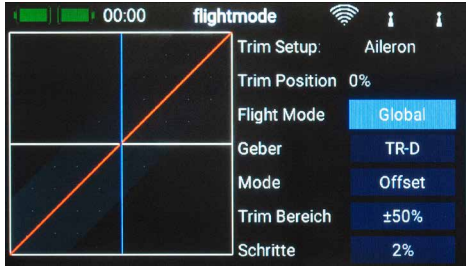
Each function can also be renamed just as you wish at this screen: simply touch the Function name.

B. Transmitter control

At this point you can assign a transmitter control or a fixed value to the function. A transmitter control may be a primary stick, a proportional control, a switch or a push-button.



C. Trim



a) Flight mode

Here you can select whether the effect of any trim adjustment is to be **Global** – i.e. the trim value should be the same in all flight modes – or **Single** – i.e. the trim value should be variable separately in each flight mode. The method of using flight modes is discussed later.

b) Trim control

It is necessary to assign a trim control as the first step here. This can be one of the four trims located adjacent to the primary sticks, or two of the four rubberised push-buttons. If you select the push-buttons, the buttons always work together left and right as the trim.

c) Trim mode

You can choose any of four different trim modes. The standard one is **Offset** mode: In this mode a trim adjustment affects the entire range of stick travel, i.e. including the end-points.

Alternative trim modes are **Left** and **Right**; typically these are intended for idle adjustment in the case of engines and turbines.

In the **Centre** trim mode any adjustment only affects the centre range, i.e. the end-points remain unchanged.

d) Trim range

At this point you can limit the permissible trim range. The percentage value indicates the maximum trim travel in each direction.

e) Steps

Here you can set the number of trim steps or increments; not the size of the step.

Note: if you change the **Min.** / **Max.** values but leave the number of steps the same, the step size changes accordingly.

f) Direction

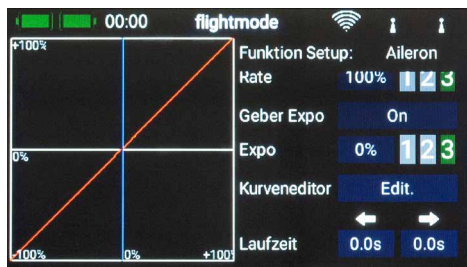
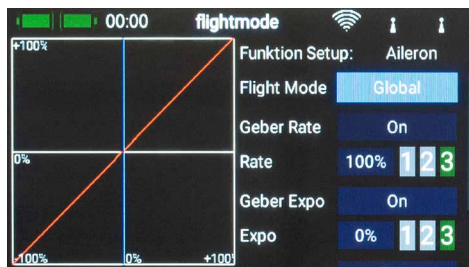
Here you can set the direction of the trim control; for example, you may need this function in connection with the trim buttons.

g) Signal

At this point you can set whether the trims are to generate an audio signal when they are adjusted, or when they pass through the centre point. A vibration signal is also available.

D. Setup

At this point you can adjust the transmitter control input, Expo, transit time and curves.



a) Flight mode (flight phase)

If you want the adjustments you make to affect all flight modes, set this menu point to Global. If you set this point to Single, you can carry out individual adjustments for each flight mode separately. This tool is extremely powerful, but if you wish to make use of it you must first create flight modes – more on this later.

Once you have set up the flight modes, all you need to do is activate them, then enter your preferred adjustments for the transmitter control concerned. The transmitter control settings (travel, curve, etc.) which you enter for, say, the "Landing" flight mode, will then have no effect in the "Thermal" flight mode.

b) Transmitter control rate

Here you can select a transmitter control which switches the rate on and off, or sets it to linear. The transmitter control can be any of the primary sticks, proportional controls or switches.

c) Rate

The purpose of the **Rate** button is to adjust the travel of the transmitter control. If you select nothing for **Transmitter control rate**, the value is fixed. If you assign a transmitter control to **Transmitter control rate**, you can set different values on three levels. The level initially selected with the transmitter control you have selected is shown in green. If you select a proportional control as transmitter control, the values are applied in a linear fashion within the three levels.

d) Transmitter control expo

At this point you can select a transmitter control which is used to switch an Expo characteristic, or set it to linear. You can choose any transmitter control from the primary sticks, proportional controls or switches.

e) Expo

The purpose of the **Expo** button is to adjust the exponential factor. If you select nothing for **Transmitter control expo**, the value is fixed. If you assign a transmitter control to **Transmitter control expo**, you can use it to set different values on three levels. The level initially selected using the transmitter control you have selected is shown in green. If you select a proportional control as transmitter control, the values are applied in a linear fashion within the three levels.

f) Curve editor

The curve editor is used to set up special curves.

- The first step is to select the number of points: up to 33 can be specified.
- Use the arrow buttons to select the point which you wish to move; the selected point changes colour to green.
- Adjust the percentage value to shift the point up or down.
- The **Smooth** option can be used to even out the curve, and thereby avoid jerks in the servo's response.
- **Raw** removes the effect of the curve smoothing.
- **Reset** curve resets the curve to linear travel.



g) Transit time

At this point you can set two transit times: one determines the servo transit time to the left, the other to the right. The time in seconds determines how long the servo takes to move from one end-point to the other.

E. Hold /Failsafe

If you want a servo to take up a pre-determined position in case of radio signal loss, you should select Failsafe here. The **Learn** button now appears, enabling you to store the current position in the receiver.

Note: the receiver or receivers do not need to be bound at this point. The Failsafe positions are repeatedly transmitted to the receivers at regular intervals.



F. Servo

Here you will find the assigned servos again. Up to eight servos can be assigned to each function. As already mentioned in the Assistant, the travel and end-points of each servo can be adjusted separately here. Any adjustments you make to a servo at this point have no influence on the settings of the same servo if it is also assigned to another function. This provides a simple means of mixing in aircraft with multi-flap wings, delta wings and V-tails.



- **Servo number:** indicates the receiver output at which this servo signal is present.
- **Servo name:** the servo name can be changed individually. Hold your finger on it to open up the keypad.
- **Limit:** works like a mechanical stop – the servo does not move beyond the set point.
- **Travel:** adjusts the servo travel.
- **Centre:** offsets the servo centre position. Acts like a “mechanical” centre offset – it also affects the end-points.
- **Direction:** reverses the direction of rotation of the servo.
- **Curve editor:** each servo can be adjusted very precisely to match the model's mechanical arrangement by means of a curve consisting of up to 33 points. This function will be implemented in a future version.

If you wish to adjust a servo's travel or centre position, the first step is to touch the appropriate button; you can now adjust the value. As soon as you move the associated stick, the Select button shifts to the corresponding position. This means that you do not need to select Left, Right and Centre when adjusting the control surface; instead you select each point very conveniently using the transmitter stick, altering the position of the control surface using the arrow buttons at the bottom of the screen. At the same time you can observe the effect of any change directly on the servo.

4. BINDING A RECEIVER

Select the **Receiver** button from the Main menu. As you will now see, up to four receivers can be bound to the **CORE** simultaneously.

It is even possible to use different types of receiver; for example, one **PBR-9D** and one **PBR-5S** can be bound. All four receivers are of “equal value”, i.e. there is no Master / Slave assignment, and no restrictions in terms of telemetry. Telemetry sensors can be connected to all four receivers, all of which send data to the **CORE** on an equal footing.



The receivers are identified by the four capital letters **A** to **D**. The same letters appear in the telemetry data sent from the receivers, helping to differentiate between them.

a) Binding

There are two methods of binding receivers:

1. Connect a power supply to the receiver, and it will respond by flashing green at high frequency for ten seconds. Press the **Bind** button on your **CORE** transmitter, and the receiver now binds to it; the LED lights a continuous green.
If you do not press the Bind button within the ten-second period, the LED switches to flashing slowly red – at this point the receiver can no longer be bound to the transmitter. You can only re-start the process if you first disconnect the power supply.
2. Press the **Bind** button on your **CORE**, then connect the receiver to a power supply. The LED switches to continuous green once the receiver is bound.

Technical information: during the binding procedure the **PowerBox CORE** generates a random sequence from a total of more than 32 million numbers; this is then used as the basis for calculating the hopping sequence and encoding the signals. The likelihood that two identical codes could be generated is therefore very close to zero.

b) Remove

The **Remove** button has an important function: if you wish to uninstall a receiver from a model, it is essential to remove that receiver from the model memory beforehand using this button. If you simply uninstall the receiver without first removing it at the transmitter, then the other bound receivers will not work when you next switch the system on. This is an important safety feature, as it ensures that all the bound receivers are working when you switch the system on, i.e. before you take off!

c) Range check

The **range check** function reduces the transmitter's output power, thereby simulating a large distance between transmitter and model. This enables you to determine any possible weaknesses in reception in the receivers. In range check mode all the controls should work perfectly at a range of at least 50m. The range check switches itself off automatically after 120 seconds.

Note: settings which apply to the receiver, such as channel reassignment, framerate or data output, are entered in the Telemetry menu in the Widgets on the home screen.

5. MIXER

The free servo mixers represent an additional method of mixing functions with each other. Servo mixing by servo assignment has already been described in the Function menu, but this option also enables you to mix functions with each other with a response curve.

You can create a new mixer by selecting the Mixer menu and pressing **+**. You can also immediately rename the **Mixer** to your own choice by touching the **Mixer** button.



Press the Setup button on the right in order to program the mixer. The following display appears:



a) Flight mode

As is the case with the transmitter controls and trims, the mixers also include the option of programming mixed functions from one transmitter control to another separately for each flight mode. If you select the **Global** setting, the mixer will be identical in all flight modes, and also if you are not using flight modes. Select **Single** if you wish the mixer to be effective only in particular flight modes.

b) From / To

The first step is to select the source function under **From**, and the target function under **To**.

c) Transmitter control

At this point you should select a switch, stick or proportional control. You can then use it to activate the mixer, switch the input to the three available levels (1-2-3), or set it to linear response. The default entry here is **On**, which means that a fixed mixer input is set.

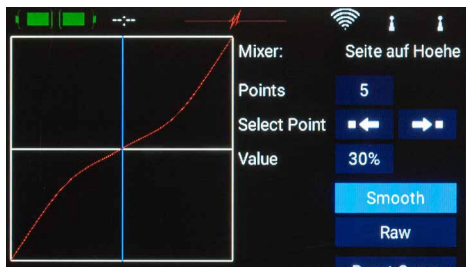
d) Input

The **Input** button is used to set the magnitude of the mixer. Selecting **On** at **Transmitter control** sets a fixed value. If you assign a switch or proportional control at **Transmitter control**, you can set different values on three levels; the level selected by the transmitter control is shown in green. If you select a proportional control as transmitter control, the values are applied in a linear fashion between the three levels.

e) Curve editor

The curve editor enables you to set up special mixing curves.

- The first step is to select the number of points: up to 33 points can be specified.
- Use the arrow buttons to select the point which you wish to move; the selected point changes colour to green.
- Adjust the percentage value to shift the point up or down.
- The **Smooth** option can be used to even out the curve, and thereby avoid jerks in the servo's response.
- **Raw** removes the effect of the curve smoothing.
- **Reset** curve resets the curve to linear travel.



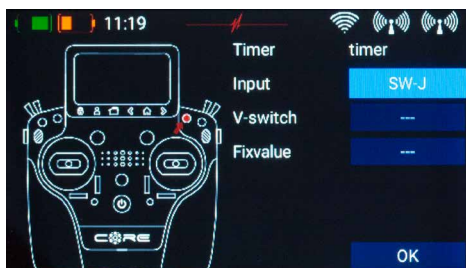
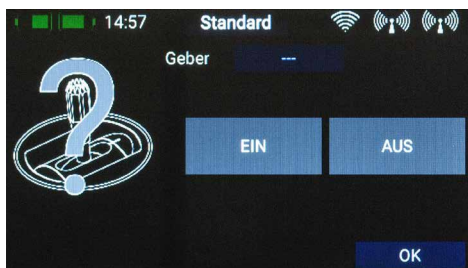
6. VIRTUAL SWITCHES

The virtual switches can be used to „digitise“ linear transmitter controls by setting up a switching threshold to generate a switched state. It is also possible to set up a logical link between two or more switches or linear controls. This facility can be used as a very easy method of implementing functions such as safety switches for electric power systems.

Select the **Virtual Switch** button in the menu, then press **+** to set up a new virtual switch:



First select a transmitter control by briefly pressing the blank field (three dashes) under Control; press Control again at the next screen:



You can now select a switch or linear control as transmitter control by operating it.

A further alternative is to define a fixed value - **On** or **Off**. This is necessary, for example, if you only wish to assign a switching threshold to one linear control. In this case select one transmitter control as fixed value, and define a linear control for the other transmitter control.

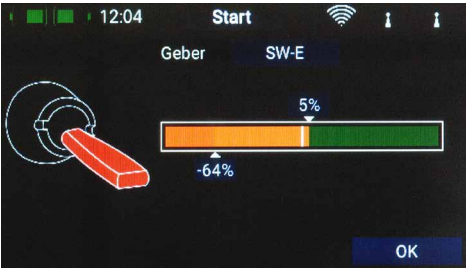
Yet another option is to use the output of a previously defined logical switch in turn as a transmitter control input. In this way you can set up a logical link between three or more switches.

In the following section you will see your transmitter control on the left, and a bar display on the right showing two switching points.

The two switching points can now be placed in any position you like by moving them with your finger. The red area indicates the "Off state"; the green area the "On state". The orange area indicates "hysteresis", i.e. the area in which no switching takes place. You can very easily reverse the "Off state" and the "On state" by moving one of the two switching point sliders in front of or behind the other.

This adaptability provides maximum flexibility and simplicity, and you can immediately check the effect of your settings by moving the switch or linear control. The transmitter control symbol on the left changes colour to indicate the switched state.

If you wish to use a switch, you can very easily set the desired switch position to **ON**. If you select a 3-position switch it is also possible to set two **ON** positions.



Press **OK** once you have completed your settings.

You are now returned to the virtual switch overview, and you can define the second input using exactly the same procedure as the first.

Once you have finished you can check how your settings behave.

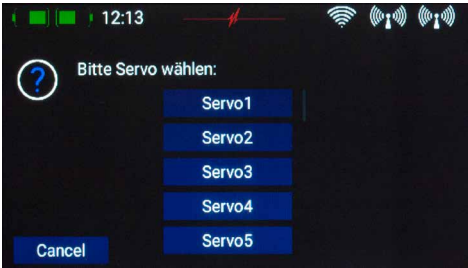
Selecting **AND** or **OR** logic defines the switching characteristics you wish to use.



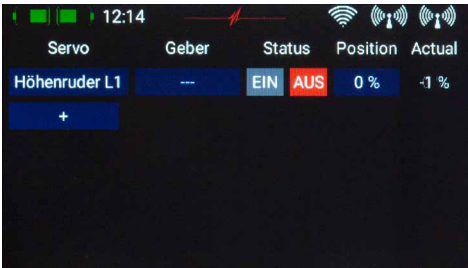
7. SERVO CUT-OFF

This feature provides a very easy means of switching a servo output to a fixed, previously defined value. An example of this might be a motor arming switch, or a fixed, pre-defined nosewheel position when the undercarriage is retracted.

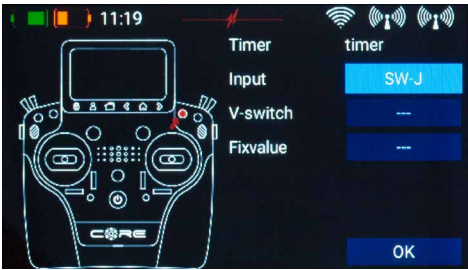
Select the Servo Cut-Off menu, then press **+** in order to create a new cut-off function:



At this point select the servo which you wish to move to a fixed, pre-defined position, then press **OK**.

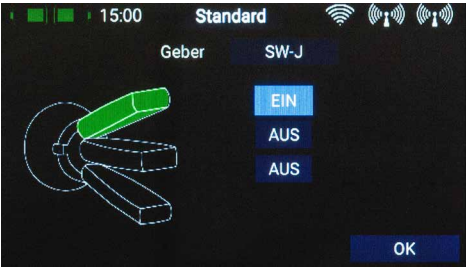


First select a transmitter control by briefly pressing the blank field (three dashes) under Control; press Control again at the next screen:



You can now select a switch or linear control as transmitter control by operating it. Yet another option is to use the output of a previously defined logical switch in turn as a transmitter control input. Press **OK** when you have made your selection.

In the following section you will see your transmitter control on the left, and a bar display on the right showing two switching points.



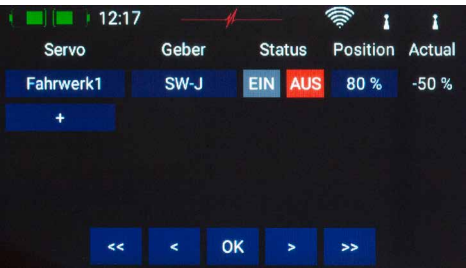
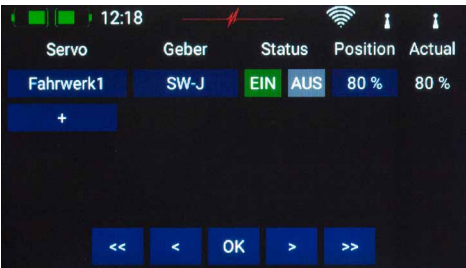
The two switching points can now be placed in any position you like by moving them with your finger. The red area indicates the "Off state"; the green area the "On state". The orange area indicates "hysteresis", i.e. the area in which no switching takes place. You can very easily reverse the "Off state" and the "On state" by moving one of the two switching point sliders in front of or behind the other.

This adaptability provides maximum flexibility and simplicity, and you can immediately check the effect of your settings by using the linear control. The transmitter control symbol on the left changes colour to indicate the switched state.

If you wish to use a switch, you can very easily set the desired switch position to **ON**. If you select a 3-position switch it is also possible to set two **ON** positions.

Press **OK** once you have completed your settings.

You are now returned to the Cut-Off function overview. Under Position set the servo position to which the servo is to move when the transmitter control is operated.

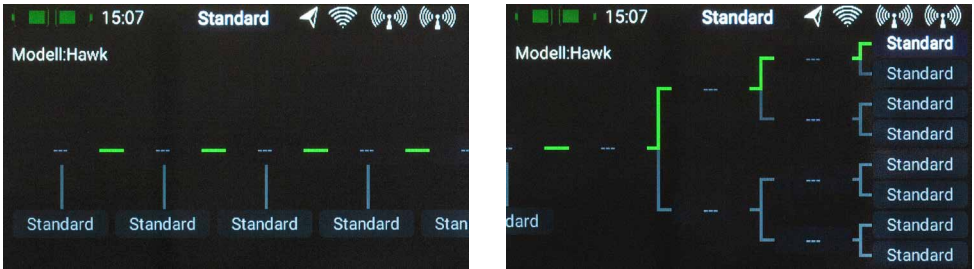


If the assigned transmitter control is set to off, the servo output works as previously defined for that function. As soon as the transmitter control is moved to the **ON** position, the servo moves to the previously defined position; you can read off the current value at far right.

8. FLIGHT MODES

Flight modes, also known as flight phases, are one of the **CORE**'s most powerful features, but they are still easy to use! You can imagine a flight mode as a copy of a particular model memory, but one with slightly altered settings. A switch can be used to select different modes when the model is flying. In the simplest case this might simply be a different landing flap position and the appropriate elevator trim for that position. The practical advantage of this feature is that you can adjust the trim when the landing flaps are lowered, without altering the trim in the normal "flight mode".

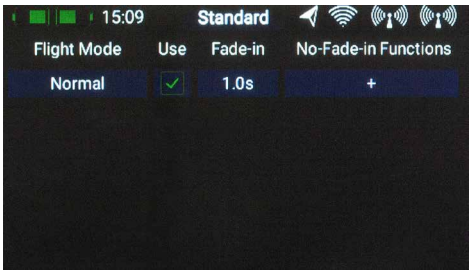
When you select the Flight Mode menu you will see a graphic representation of the Flight Mode tree structure.



The most important point to know at this point is that the **CORE** prioritises the flight modes. Priority runs from left to right, i.e. the flight modes in the left-hand tree diagram have the highest priority, and those on the right the lowest priority. Even when the flight mode structure is complex, this means that you can, for example, overrule all other switch positions with a single switch, returning you very quickly to "normal" flight mode.

Before you set up flight modes it is worthwhile considering which flight modes are important, and which are of secondary importance.

To create a flight mode, press briefly on one of the boxes labelled "Standard", and you will see the following screen display:



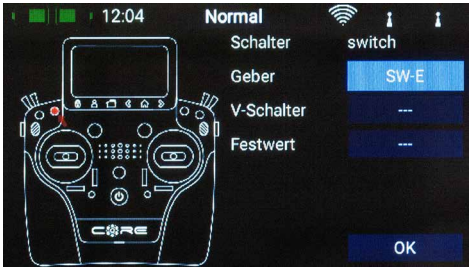
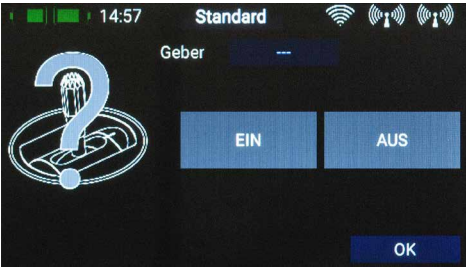
You can immediately assign an informative name to the new flight mode by briefly pressing the left-hand field. Bear in mind that you should not use abbreviations here if you intend the flight mode names to be used for speech output later, as the TTS systems reads the text exactly as you have entered it!

In the field below **Fade-in** you can set how fast the settings for the new flight mode are to affect the servos. For example, if you lower the landing flaps by selecting the appropriate flight mode, it makes sense to set a delay at this point.

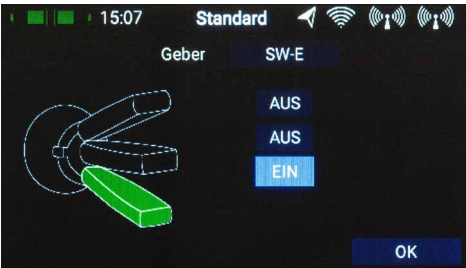
In contrast, selecting **No-Fade-in Functions** enables you explicitly to remove transmitter control functions from the delay.

Once you have entered all the settings, press the ↵-button to return to the Flight Mode tree diagram.

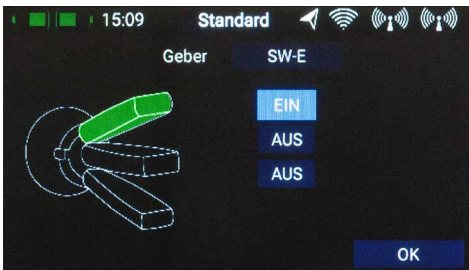
Now press the field with the three dashes --- above the Flight Mode to select the transmitter control which you want to use to activate this flight mode. In the next screen display press briefly on Transmitter Control again.



At this point you can select the appropriate transmitter control. If you select a switch, you can activate one or two switch positions. If you choose a linear control, you can set the switching threshold and hysteresis here. If you have already set up virtual switches, please note that you can also use these for selecting the flight mode.



Exactly the same procedure is used to set up additional flight modes. The picture below shows a switch which is used to select three flight modes; FM Normal has the highest priority.



When you have set up multiple flight modes, you will see green dashes in the Flight Mode tree which indicate which flight mode is currently active. You can now select various settings for the different flight modes in the Transmitter Control, Trim and Mixer menus after selecting the **Single** setting at Flight Mode.



9. SPEECH OUTPUT

The speech output function of the **CORE** is based on the latest TTS (Text to Speech) technology. Each transmitter possesses a licence for the Accapella@ speech module. For optimum speech quality we have implemented what is probably the most highly developed TTS system available; the licence is a chargeable item which is included in the **CORE** as standard. For each language several male and female voices are available. Due to the file size these are gradually loaded into the transmitter by means of updates. As of Version 1.60 one male and one female voice are available for each language. This means that the recording of speech files, and copying from WAV or MP3 files, can now be consigned to the past.

There is one important point to bear in mind regarding speech output: a German text will not be reproduced correctly using an English voice, and vice versa. It is therefore essential to assign German names to, say, flight modes if the transmitter is set to the German language. However, that is the only point you need to note; in every other respect the TTS system will give you loads of fun!

When you open the Speech Output menu, the following screen display appears:



The only speech output implemented as standard is the statement of Flight Modes. All other speech outputs can be set up in the usual way using the + character. To select a new speech output, just press the + button.

a) Source

At this point you select the source which provides the text to be spoken. Version 1.6 offers speech output for flight modes, free text and telemetry values. The next version will also enable the statement of telemetry and timer alarms.

b) Value

If you want the system to speak free text or a telemetry value, at this point you should select the sensor value which is to act as data source. In the case of free text you can enter up to 64 characters here.



c) Activation

Here you can select a transmitter control, or permanent ON/OFF.

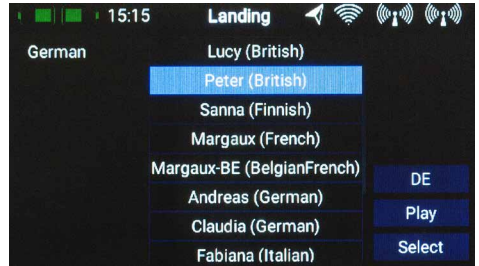
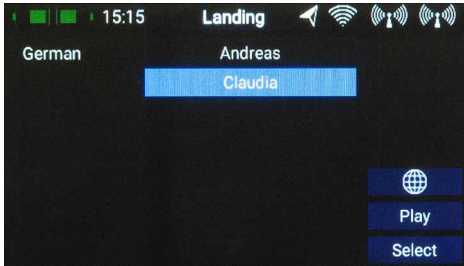
d) Replay

In this menu you can activate single and repeated statements, or a statement in response to a change in a value. Depending on your choice, you have the option of setting the interval period or the extent to which the selected telemetry value must change in order to activate speech output.

e) Test

This button has two functions:

- When pressed briefly the parameters entered on the left are played back once.
- If you keep the button pressed, you can change the voice in this menu. First you will see the voices which are available for your set language. Pressing on the globe at bottom right displays all the voices together with the associated language. This enables you, for example, to have English expressions spoken using an English voice, even though the **CORE** is set to German.



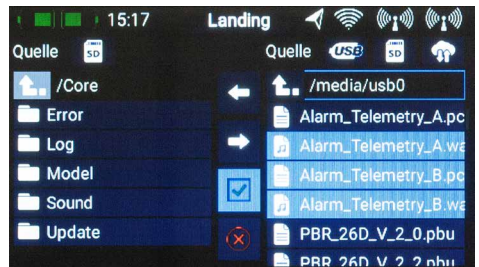
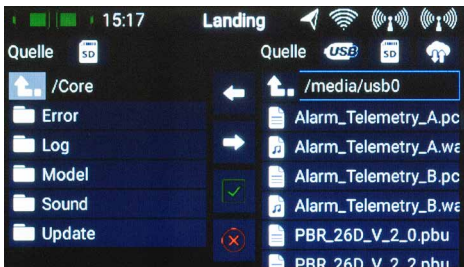
10. FILE MANAGER

The File Manager enables you to exchange files on the SD card in the **CORE** transmitter with files stored on a USB memory stick. File types include model data, log files and also audio files for audible signals.

We have kept the structure and operation of this function simple. On the left-hand side you will see the content of the **CORE** transmitter's internal SD card. At top right you will see the selected source. As of Version 1.60 it is possible to access the **CORE**'s USB port; in a later version file exchange with a **PowerBox Cloud** will also be possible. When you plug a USB stick into the **CORE** transmitter, you can display the content of the memory stick by briefly pressing the USB symbol on the right-hand side.

You now have the opportunity to copy files: navigate to the folder which contains the files you wish to copy, then briefly press the green tick in the centre. Now select one or more files which you wish to copy. Once you have selected your files, press on one of the two arrow buttons in the centre – depending on the direction in which you want to copy the files.

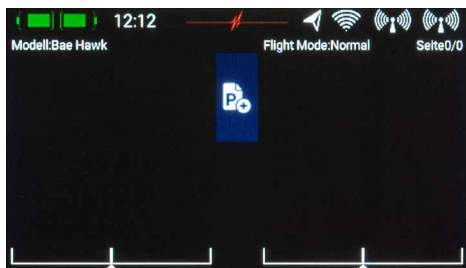
It is also possible to erase files – **but caution:** if you wish, for example, to erase a sound file for a telemetry alarm, then that alarm will no longer function! Even though you can quickly copy the files back into the transmitter, you may well find yourself wasting a lot of time searching for the cause of the error.



11. TELEMETRY, TIMERS, SERVO DISPLAY AND QUICK-SELECT BUTTONS

Once you have created a new model and bound one or more receivers, you can display important information on the main screen using the telemetry widgets.

To create a widget, touch an empty area of the main screen, and you will see the following display:



You will now see twelve grey fields, together with a **P+** button and a **P-** button. The **P+** button can be used to create additional pages, so that more telemetry widgets can be displayed. You can move to and from between the pages by swiping with your finger. The **P-** button is used to erase empty pages.

Touch one of the grey fields, and this screen display appears:

You can select any of four different types of widget:

- Telemetry
- Servo values
- Timer
- Quick-select menu



a) Telemetry

This can be used to display all the sensors connected to the **P²BUS**, and show the data they generate. This information also includes the receiver and transmitter data.

Technical information: the **PowerBox CORE** telemetry system and the **P²BUS** are designed in such a way that each sensor supplies its own information, including sensor name, unit, number of sensor values, decimal point, priority and other data. A new sensor designed for use with the **P²BUS** can be connected to the system at any time without updating the transmitter.

The advantage of the system is that all the text information relating to the sensor values is collected only when the system is switched on, i.e. when the system is booting.

Once the system is running, only the pure sensor values are transferred; this permits very fast data transmission with maximum flexibility, and ensures a thoroughly user-friendly system.

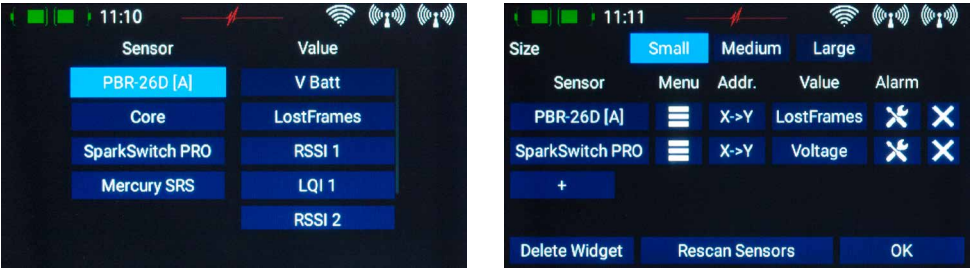
If you select the **Telemetry** widget type, this screen display appears:



At this screen you can adjust the size of the widgets using the Small, Medium and Large buttons. The **Delete widget** function can be found at bottom left.

Rescan sensors is required if you wish to plug in new sensors when the system is running; this action causes all sensor information to be re-collected on the **P²BUS**. Basically all sensor information is automatically collected when the system is switched on.

At this point you can select sensor values using the **+** button:



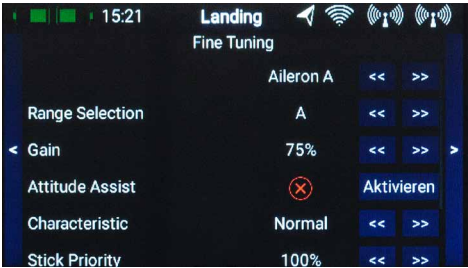
The left-hand column shows all the connected sensors, while the right-hand column shows all the values which these sensors supply. The **P²BUS** is an in-house development, and is capable of transmitting up to 255 sensors each with 32 individual values – and at a speed of up to 800 values per second!

It is possible to set up each widget to display multiple sensor values, even from different sensors; these values are then displayed in turn by the widget. This is accomplished by selecting one or more sensor values which you want your widget to display, then confirming your choice with **OK**.

A list of the selected sensor values is displayed.

The Telemetry menu is an important function, since it enables you to configure and set up sensors and other devices which are connected to the **P²BUS**. An example of this is the **iGyro Sat**, which can be connected to PBR receivers.

Pressing the Menu button at the appropriate sensor calls up the associated menu:



The arrow buttons at top left and right can be used to navigate through any sub-menus which the sensor offers. Briefly pressing the arrow buttons to the right of the sensor values allows you to alter the sensor values. A longer press on the arrow buttons causes larger values to change more rapidly. To leave the menu press the **⏪**-button at the bottom of the touch-screen.

The Addr. button is important if you wish to connect several sensors of the same type, e.g. if you are setting up an electric-powered model fitted with two telemetry-enabled ESCs. This is the procedure:

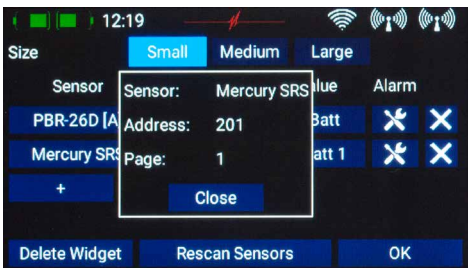
Connect one of the sensors, and carry out a rescan. Press **+** in order to select one or more telemetry values for this sensor; the sensor now appears in the list. In the example below this is the **Mercury SRS**.



A long press on the sensor name now displays the current address. This is purely for information purposes - address management is carried out automatically by the **CORE**.



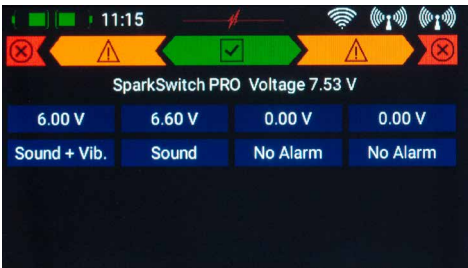
Press the **X->Y** button in order to change the address. Another long press on the sensor name will show you that the address is now different from the previous one:



The next sensor can now be connected. Repeat the procedure outlined above if you wish to connect more sensors.


Behind the individual sensor values you will find the **Alarm** button. The Alarm menu allows you to set four alarm thresholds: one yellow alarm and one red alarm for each direction. This enables you to select different thresholds coupled to different sounds, text, or vibration modes.

For example, you might set up battery capacity alarms for an electric model: a yellow audible alarm when there is just sufficient energy remaining for one minute of flight; a red audible alarm with vibration for twenty seconds.



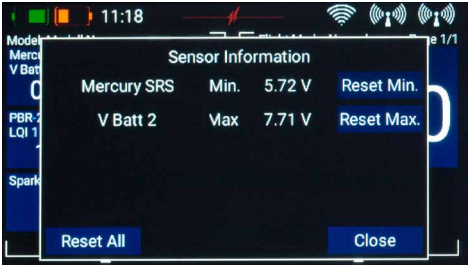
Pressing the Back button returns you to the sensor overview. The last button (cross symbol) is used to delete individual telemetry values from the widget.

Press **OK** at the bottom once you have completed all your settings.

The widget now appears at the point where you began. Note that widgets can be moved to any position: hold your finger on the screen until the widgets begin to flicker; they can now be moved around on the screen. Wait a few seconds, or press the -button, to lock the widgets in place again.

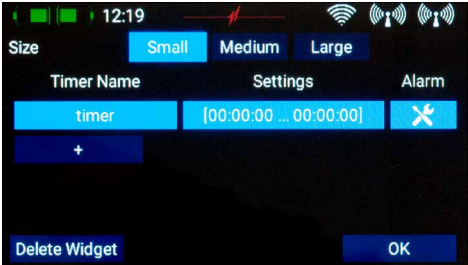


Another important feature relating to telemetry data: the **CORE** automatically records the maximum and minimum values for the incoming data. You can display these values very easily simply by double-pressing the widget:



b) Timer

The **CORE** allows you to set up eight separate, independent timers. If you select the **Timer** widget type, you will see the screen shown below, where you can adjust the timer settings and set alarms, and add further timers by pressing the **+** button. If you have set up several timers, the widget only displays the timer which has a light blue background:



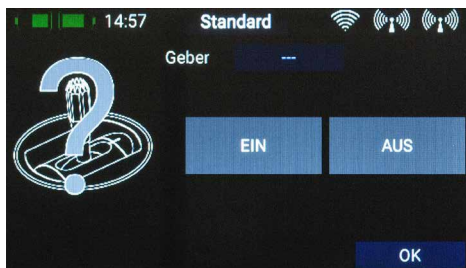
Press the field below Settings to configure the timer, and the following screen now appears:



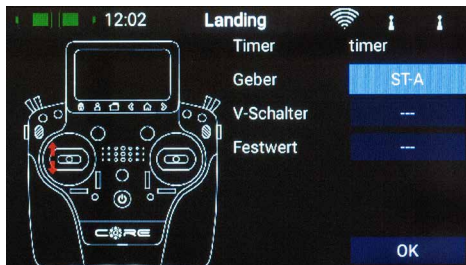
You can change the Timer Name to any name you wish.

At this point you can set the Start and Stop times: if the Start time is greater than the Stop time, then the timer counts down; if the Stop time is greater than the Start time, it counts up.

In the Control field you can select the transmitter control which is to start, stop or reset the timer. For Start press the button with the three dashes, and you will see the following screen.



Locate Input at the top, and again press the field with the three dashes.



Now you can select a transmitter control by operating it; this can be a switch or a linear control. Your chosen transmitter control now appears on the left, together with a bar display containing two switching points.



The two switching points can now be placed in any position you like by moving them with your finger. The red area indicates the "Off state", the green area the "On state". The orange area indicates "hysteresis", i.e. the area in which no switching takes place. You can very easily reverse the "Off state" and the "On state" by moving one of the two switching point sliders in front of or behind the other.

This adaptability provides maximum flexibility and simplicity, and you can immediately check the effect of your settings by moving the switch or linear control. The transmitter control symbol on the left changes colour to indicate the switched state.

Press **OK** when you have completed the settings.

The procedure for the Stop and Reset control is identical.

Note: if you wish the timer to start once, and continue running until it is reset, then you do not need to assign a Stop control. If you wish the same transmitter control to start and stop the timer alternately, simply assign the same control to Stop as for Start, and reverse the switching points.

c + d) Servo values, Quick-Select menu and notes

Widgets for individual servo outputs, quick-select for menu entries and also simply notes can be created in the same way as telemetry values. The procedure is the same as for telemetry or timer widgets: keep your finger on a free space on the main screen display, and make your selection as you wish.

12. UPDATE

a) CORE

The **CORE** transmitter can be updated by means of a USB memory stick (1GB - 32GB) - later a WiFi download will also be an option.

If you wish to update the transmitter, the first step is to download the **PowerBox Terminal program** from our website, and install the program on your PC or laptop. Start the program and select **CORE Update** at top left. Insert a USB stick in your PC, and follow the on-screen instructions. The USB stick will now be formatted, and all the essential data copied onto it. Once that is finished, switch your **CORE** transmitter on and wait until it has booted up. Now insert the USB stick in the **CORE** transmitter, move to the **Settings** → **System** → **Software** → **Check menu**, and briefly press **Update**. Depending on which version is currently loaded in your **CORE** transmitter, it is absolutely essential to observe the following procedure, otherwise the Linux system may crash, and you will need to return the transmitter to our Service department. This problem has been cured with Version 1.6.

- Update from Versions 1.0 and 1.4 to Version 1.6 or higher:

Pressing Update opens a window, and the transmitter invites you to carry out a restart. **Do not switch the transmitter off immediately!! It is essential to wait for about twenty seconds, as the files must first be copied.** When this period has elapsed you can restart the transmitter, and the update will be completed automatically.

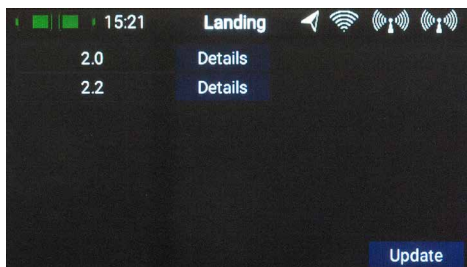
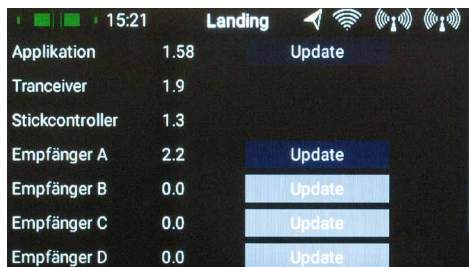
- Update from Version 1.5 to Version 1.6 or higher:

Nothing happens when you press Update. Do not press Update a second time – the transmitter is already working, and copying the files. Simply wait until the transmitter displays the message that you need to restart the transmitter. You can then restart the transmitter, and the update will be completed automatically.

As of Version 1.6 a Status message relating to the copy process appears immediately, followed by a Complete message when the copy process is finished.

b) Receiver

Version 1.6 introduces a feature which is unique in the entire RC market: from this version all PBR receivers (except the PBR-8E) can be updated from the transmitter, provided that they are already bound to it. For this to work you must first switch on the model, i.e. the bound receiver. Now navigate to the **Settings** → **System** → **Software** → **Check menu**



Briefly press **Update** for one of the bound receivers. The following screen displays the software version which is currently in the transmitter's memory. Select the latest version, and wait until the update is complete. If multiple receivers are bound to the transmitter, repeat the procedure with each one.

Note: don't hold the transmitter too close to the receiver, as transmission is very poor at a range of less than 50cm. The transmitter and receiver are designed to operate at long range, and at very close range the input amplifiers may be overloaded. At a range of 1m to 9km the update process functions without any delay!

13. CHARGING THE TRANSMITTER

If you wish to charge the **CORE**, the first step is to open the front cover. Locate the two plugs attached to the mains PSU, and insert either one into the charge socket. If the battery symbol is displayed large and flashing on the screen, this means that you have a reserve for about 20 - 30 minutes. You must charge your **CORE** at this point, if not sooner. For safety reasons the **CORE** does not feature a battery cut-off. Never allow the transmitter to become deep-discharged!

The LEDs light up red when the batteries are on charge, and green when the charge process is complete. The charger can be left connected to the **CORE** after charging without causing damage, as the internal charge control circuits regulate the charge process completely automatically.

The battery charge process takes about 3.5 hours from the fully discharged state.

The **CORE** can also be recharged while it is switched on, e.g. for protracted programming work.

Note: in addition to the bar display at top left on the screen, you can also set up the transmitter to display its own exact battery voltage on the main screen in the form of a telemetry widget, and set a corresponding alarm. The transmitter is fitted with two internal 7.2V Li-Ion batteries of 3400 mAh capacity. Sensible alarm values would be 6.8V for an orange alarm, and 6.6V for a red alarm.

Note: the mains PSU is the same type used for **PowerBox Batteries** and **PowerPaks**, and can also be used to recharge these batteries.

14. CONNECTIONS

Under the front cover you will find additional sockets (see illustration on page 4):

- **Headphone socket:** stereo headphones can be plugged in here for spoken vario or telemetry messages.
- **USB-A socket:** this accepts a USB stick, which can be used to update the radio control system. Data from the **CORE** can also be copied onto the USB stick.
- **Micro USB socket:** for direct exchange of data with a PC.
- **Servo/PPM:** servos plugged into this socket respond directly to the movements of the primary sticks. This can be extremely useful for centring servos accurately before installation, or for subjecting them to a brief function test. This output is protected with a 1A fuse, and is therefore not suitable for load-testing servos!

It is also possible to switch this socket to PPM output for use with flight simulators or Trainer (buddy-box) systems.

Note: In the initial production run these functions are not yet implemented in full!

15. MECHANICAL TRANSMITTER ADJUSTMENTS

a) Removing the handrests

The handrests fitted to the **CORE** can be removed quickly and easily: simply undo the four socket-head screws in the feet, and the handrests can be slid down and off.

Note: Alcantara is not, as often supposed, natural leather, but a micro-fibre material. Alcantara is incredibly tough and durable, and is very easy to maintain. If your handrests become soiled, simply rinse them clean using warm water and ordinary washing-up liquid.

Caution: if you clean the handrests, it is essential to allow them to dry out completely before re-attaching them to the transmitter, otherwise damp could enter the transmitter and cause corrosion damage!

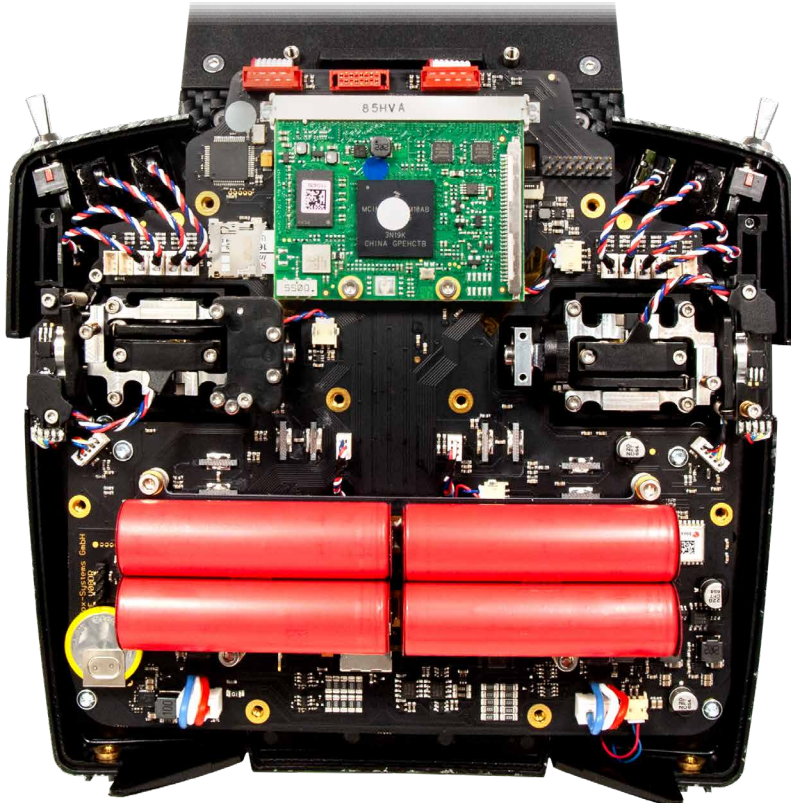
b) Opening the transmitter

As standard the **CORE** is supplied in the correct mode, as specified by the customer, but some users may find that the centring spring tension or the ratchet function needs to be adjusted to meet their personal preferences.

The first step is to remove the handrests. Lay the **CORE** on a soft surface – ideally a thick layer of foam. Now undo and remove all ten socket-head screws holding the back cover. Don't remove the back cover yet, as the cables for the switches and proportional controls in the cover must first be disconnected.

This is the procedure: raise one side of the back cover slightly, and loosen the connectors by moving them to left and right whilst pulling gently, then repeat the process on the other side.

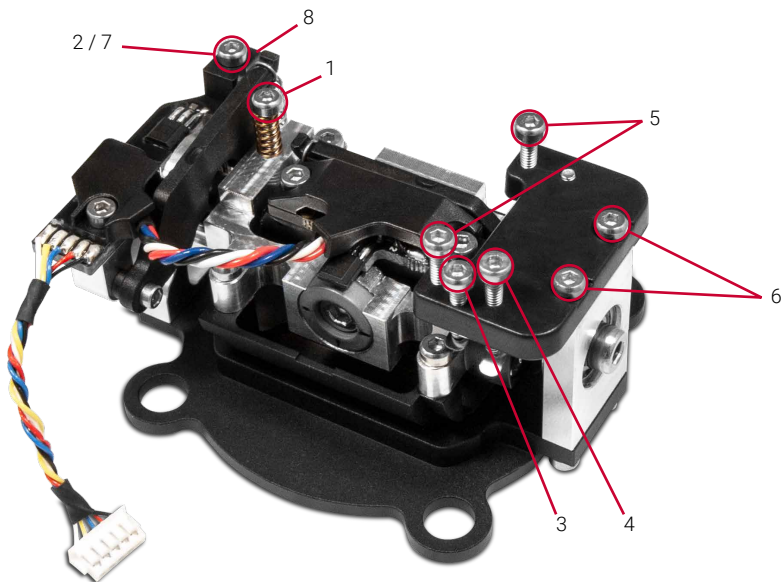
The back cover is now free, and can be lifted off. You will see the transmitter's internal features:



c) Adjusting the tension of the primary stick centring springs

On the screws 1 and 2, the centring spring tension can be adjusted for the respective axis. Tightening the screw further increases the spring tension. If you find it impossible to set your preferred spring tension, we can supply a range of stronger springs.

Note: if you tighten the screw too far, you may find that the lower spring tensioner partially moves out of its guide. You can correct this by moving the stick fully to one side, at the same time pressing the spring tensioner back into its guide using a small screwdriver.



d) Adjusting the throttle ratchet and brake

The hardness of the throttle ratchet can be adjusted using screw 3. Screw 4 adjusts the friction brake.

e) Adjusting the throttle travel

The travel of the throttle stick on the **CORE** is adjustable. This is useful for 3D pilots in particular, as it enables them to set a mechanical limit on throttle travel. Adjustment is carried out by tightening screws 5. The throttle travel can also be set up asymmetrically. Once you have set the travel of the throttle stick to meet your requirements, it is essential to re-calibrate that function.

f) Switching modes

As already mentioned, the software has no modes, but naturally the hardware must correspond to your preferred mode.

If you wish to change the factory default mode, first undo screws 6 from the ratchet plate, then install the ratchet plate on the other primary stick unit, as an exact mirror-image of the original installation. Tighten the retaining screws, pressing the plate towards the centre of the transmitter.

The next step is to re-install the spring blocker (8): remove screw 7. The screw with the spring can immediately be installed again on the other side.

To re-install the spring blocker, move the stick fully to its end-point, fit the spring blocker pin under the spring lever, then tighten the spring blocker screw.

16. CALIBRATING THE TRANSMITTER CONTROLS

Naturally the **PowerBox CORE** is supplied with all functions correctly calibrated. However, if you wish to swap a switch or replace a broken switch, we recommend that you re-calibrate the new switch. Re-calibration is also necessary if, for example, you limit the throttle stick travel, or change the transmitter mode mechanically.

Move to the Calibration menu by this route: **Settings** → **System** → **Calibration**. Move the transmitter control you wish to calibrate in order to select it. The information relating to this transmitter control is now superimposed on the right.

For example, if you wish to change from a 3-position switch to a 2-position switch, select the appropriate switch type in the **Type** field. Once you have done this, touch **Calibration** at the bottom, then move the control to both end-points. The **Continue** field now appears. If you have installed a proportional control or a 3-position switch, you also need to move the transmitter control to the centre. Touch **Finished** to complete the process.

The **Direct** button can be used to reverse the transmitter control's direction of operation.

Caution: this has the same effect as installing the switch the other way round, i.e. this change affects **all** models!



17. SPECIFICATION

Power supply	Li-Ion
Channels	26
Servo signal resolution	4096 Bit
Screen	TFT - Touch
Weight	Handheld version: 1190g Tray version: 1330g
Temperature range	-30°C to +85°C

18. SET CONTENTS

- **PowerBox CORE**
- **1x PBR-9D**
- **2x PBR-8E** (limited Early bird edition only)
- Case
- padded neck strap
- main adapter
- conversion tool
- sticker set
- screen cleaning cloth
- exclusive Shirt „CORE“, navy
- Instruction manual in german and english

19. CORE ACCESSORIES

Receiver



PBR-9D

Order No. 8210

This is a nine-channel receiver with two redundant receiver circuits. The unit features a P²BUS interface for servo and telemetry data, and an auxiliary output which can be configured either as SRXL bus or as channel 10.



PBR-7S

Order No. 8220

This is a seven-channel receiver with a single receiver circuit. The unit features a P²BUS interface for servo and telemetry data, and an auxiliary output which can be configured either as SRXL bus or as channel 8.



PBR-5S

Order No. 8230

This is a five-channel receiver with a single receiver circuit. The unit features a P²BUS interface for servo and telemetry data, while its minuscule size makes it the natural choice for small models.



PBR-26D

Order No. 8240

This is a satellite receiver featuring two redundant receiver circuits. The unit features a P²BUS interface for servo and telemetry data, and an auxiliary output which can be configured either as SRXL bus or S-BUS. This unit is designed to be connected to our **PowerBox** power supply systems or a flybarless system.



PBR-8E

Order No. 8250

This is a eight-channel receiver with two redundant receiver circuits. The unit features 8 PWM servo outputs and telemetry data for battery voltage and RF-data.

Sensors



PBS-RPM

Order No. 6623

The **PBS-RPM** is a rotational speed (rev-count) sensor which is easy to install. It is designed to work with the **PowerBox CORE**, but is also suitable for use with other telemetry systems!

PBS-P16

Order No. 6622

The **PBS-P16** is an ultra-precise pressure sensor for up to 16 Bar. It is designed to work with the **PowerBox CORE**, but is also suitable for use with other telemetry systems.

PBS-T250

Order No. 6621

The **PBS-T250** is a five-way temperature sensor for measuring cylinder head temperatures. It is designed to work with the **PowerBox CORE**, but is also suitable for use with other telemetry systems.

GPS II

Order No. 3520

The GPS sensor was originally introduced to provide a means of speed-dependent gain adjustment for our **iGyro**, but the **GPS II** is an entirely new development, and can now be used with all current telemetry systems.

PBS-V60

Order No. 6620

The **PBS-V60** is a small, lightweight voltage sensor which we have developed for use with the **PowerBox CORE**, but is also suitable for use with other telemetry systems currently on the market.

20. SERVICE NOTE

We are anxious to offer good service to our customers, and to this end we have set up a Support Forum which deals with all queries concerning our products. This relieves us of a great deal of work, as it eliminates the need to answer frequently asked questions time and again. At the same time it gives you the opportunity to obtain help quickly - all round the clock and even at weekends. All the answers are provided by the **PowerBox** team, which guarantees that the information is correct.

Please use the Support Forum before you telephone us.

You can find the forum at the following address:

www.forum.powerbox-systems.com

21. GUARANTEE CONDITIONS

At **PowerBox-Systems** we insist on the highest possible quality standards in the development and manufacture of our products. They are guaranteed "Made in Germany"!

That is why we are able to guarantee the **PowerBox CORE** for a period of 36 months from the initial date of purchase. The guarantee covers proven material faults, which will be corrected by us at no charge to you. As a precautionary measure, we are obliged to point out that we reserve the right to replace the unit if we deem the repair to be economically unviable.

Repairs which our Service department carries out for you do not extend the original guarantee period.

The guarantee does not cover damage caused by incorrect usage, e.g. reverse polarity, excessive vibration, excessive voltage, damp, fuel, short-circuits, etc. The same applies to defects due to very severe wear. We accept no liability for further claims, e.g. consequential damage.

We also deny liability arising from the equipment or the use of the same.

We accept no liability for transit damage or loss of your shipment. If you wish to make a claim under guarantee, please send the equipment to our Service department address, together with proof of purchase and a description of the defect.

22. LIABILITY EXCLUSION

We are not in a position to ensure that you observe our instructions regarding installation of the **PowerBox CORE**, fulfil the recommended conditions when using the set, or maintain the entire radio control system competently.

For this reason we accept no liability for loss, damage or costs which arise due to the use or operation of the **PowerBox CORE**, or which are connected with such use in any way. Regardless of the legal arguments employed, our obligation to pay compensation is limited to the invoice total of our products which were involved in the event, insofar as this is deemed legally permissible.

23. FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Information to user:

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

24. IC

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Appareils radio exempts de licence (ISDE) L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

25. RF EXPOSURE STATEMENT (PORTABLE DEVICES)

This device complies with the RF exposure requirements for portable devices. The device is intended for hand-held use, with the transmitter antennas kept more than 60mm from the hands and more than 20cm from the body in normal use.

We wish you every success with your new **PowerBox CORE!**



Donauwoerth, January 2020



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