Instruction Manual

PowerBox Systems®

World Leaders in RC
Power Supply Systems

PowerBox Cockpit SRS

Dear customer,

We are delighted that you have decided to purchase the **PowerBox Cockpit SRS** from our range.
We hope you have many hours of pleasure and great success with your **PowerBox Cockpit SRS.**

1. Product description

The **PowerBox Cockpit SRS** is the latest innovation from the **PowerBox Systems** stable. This **PowerBox** is a modern power supply system containing all the electronic components needed to meet the requirements of modern receivers, servos and models. All the essential components for a secure power supply voltage - ICs, micro-controllers and electronic circuits - are **duplicated.** The outstanding features of this High-End power supply unit are a raft of the latest in-novations, such as **serial receiver input**, **full receiver redundancy**, **unrestricted channel assignment** (channel-mapping) at the outputs, integral **high-resolution graphic OLED screen**, multi-tasking door sequencer, four match-channels and the facility to bind to the downlink channels of various manu-facturers.

Features:

- **SRS – Serial Receiver System** provides the ability to use receivers with a serial interface, such as those made by Spektrum, Multiplex, Futaba and Jeti.
- Unrestricted channel assignment of the **PowerBox** outputs
- Integral high-resolution graphic OLED screen with 128 x 64 pixels
- Particularly user-friendly menu-based programming using the **SensorSwitch**
- Twelve channels including one channel for the door sequencer
- Signal amplification and interference suppression for all 12 channels and 21 servos
- **Synchronised** servo output for totally synchronous servo response
- Flight recorder: records Lost Frames and Fail-Safe periods for all receivers con-nected to the backer
- Variable frame rate, range 12 ms – 21 ms
- 16-bit processor for fast, high-resolution signal processing
- Multi-tasking **door sequencer**
- Four match-channels, each for two servos. Accurate adjustment of all eight servos
- **Double** regulated output voltage for receivers and servos
- Can be connected to S**pektrum** and Multiplex **MSB** downlink channel bus systems

- Direct transmission of battery voltages and capacities to the transmitter
- Separate voltage and capacity displays for each battery
- Software-selectable servo voltage: 5.9 V or 7.4 V
- **Minimum value memory** displays any voltage collapses
- Large-area heat-sinks for high regulator power
- Regulator monitor, regulator malfunction indicator
- Support for three battery types: **LiPo, NiMH / NiCd, LiFePo**
- Suppresses any servo feedback currents which might develop

These functions make the **PowerBox Cockpit SRS** the ideal choice for model aircraft with wingspans up to 3.0 m, including jets and scale models weighing over 25 kg.

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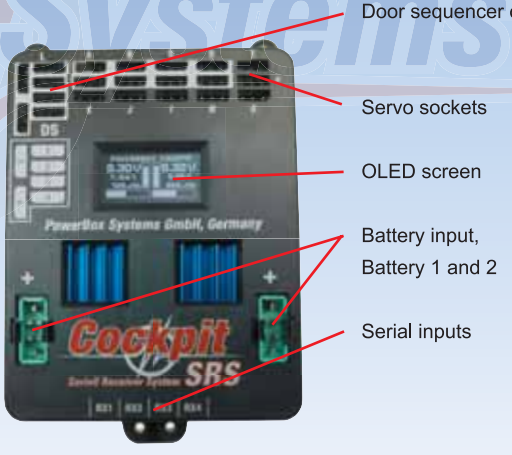
2. Connections, controls

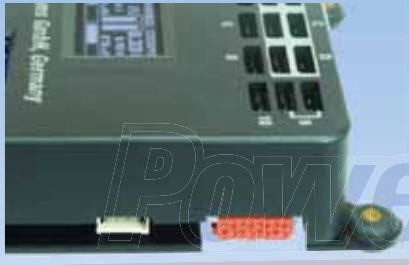
The following illustrations show the essential sockets and controls:



Button for activating switch and setting battery type

Power-on status LEDs

Switch buttons for Battery I and II



Left: Socket for **Spektrum** telemetry
Right: **SensorSwitch** button

Socket for Multiplex **MSB** telemetry

3. First steps before using the unit:

3.1. Connections

Plug the batteries into the MPX connectors on the backer with **correct polarity**. We recommend **PowerBox Batteries** of **1500mAh**, **2800mAh**, **3200 mAh** or **4000mAh** capacity. If you prefer to use other makes of battery, or packs you have assem-bled yourself, please take particular care over polarity - it is always better to check twice rather than make a mistake. If you connect a battery to the backer incorrectly, this will immediately ruin the associated regulator. The unit does not feature reverse polarity protection, as this minimises power losses between battery and backer. The + markings are printed clearly on the case cover.

Connect the **SensorSwitch** to the appropriate red socket. Note that the ribbon cable must run upwards. In models subject to powerful vibration we recommend that you secure the ribbon cable at a minimum of one point in order to prevent the connector working loose and falling out. Although this would have no effect on the switched state of the backer, it would prevent you switching it off.

Do not connect the receiver yet! Please read Point **3.5.** to establish the essen-tial initial settings

3.2. The procedure for switching on and off

The method of switching the unit on and off is very simple, and the process effectively eliminates the possibility of changing the backer's status accidentally. This is the procedure

Locate the SET button on the **SensorSwitch** and hold it pressed in until the central LED glows red. Now press buttons I and II in turn to switch the backer on.
Repeat the procedure to switch off: hold the SET button pressed in, wait until the central LED glows red, then confirm by pressing buttons I and II in turn.
Your **PowerBox** stores the last switched state (on or off). That means: if the backer is switched off using the **SensorSwitch**, it stays switched off.
Once switched on, the backer can only be turned off again using the switch unit. Intermittent contacts or interruptions in the power supply cannot cause the backer to be switched off.

3.3. Basic settings

The **PowerBox Cockpit SRS** feature a new kind of graphic OLED screen, intended to do away with old-fashioned programming methods based on flashing LED codes, morse code beeps or obsolete mechanical jumpers. The screen provides the basis for an extremely user-friendly control system, and eliminates the need for a supplementary set-up unit or programming device. The **SensorSwitch** is employed as a convenient means of entering settings within the menu system, and since the **SensorSwitch** is always used as the main ON / OFF switch, it is always installed in the model, so you cannot forget it. Wherever possible the screen provides full information in English; few abbreviations are used. The overall result is an intuitive method of programming which is a great advantage at the flying field, as you will rarely need to consult the operating instructions.

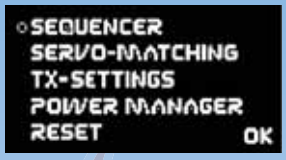
This is the basic rule in programming: buttons **I** and **II** are used to move the cursor or **change** values, while the **SET** button is used to select or confirm your inputs.

The breadth of functions offered by the **PowerBox Cockpit SRS** is enormous, but the unit is by no means difficult to operate. To provide a clear idea of the sequence required in order to use the backer, we have drawn up a brief list of operations

Battery settings

These settings should always be entered first, so that you have an accurate view of the state of the battery while you carry out further adjustments. In the screen-shot below you will see the default settings of the **PowerBox Cockpit SRS.** If you wish to change them, this is the procedure:

- Switch both batteries on.
- Press the SET button and **hold it pressed** in until the following display appears:



- Press button **II** until the **cursor** (**hollow** circular ring) lines up with **"Power Manager"**, then press the SET button. The following display now appears:

- If you wish to change one of the settings, use buttons **I** and **II** to move the cursor to the appropriate menu point, then press the SET button to select it (cursor changes to a solid disc). You can now alter the value using buttons **I** and **II**. Once you have selected the desired value, press the SET button to confirm it; this saves (stores) the new value. Select the menu point **OK** to return to the main menu.

NOTE: the presence of a solid disc (instead of a ring) indicates that you are in a menu point.

It is possible to alter a value more quickly by holding one of the two buttons **I** or **II** pressed in; the value then starts to change slowly in the corresponding direction, and the rate of change accelerates with time.

Key to the individual menu points:

- **Chemistry:** this is where you set the battery type. Three different types of battery are available:

• Two-cell LiPo
• Five-cell NiMH
• Two-cell LiFe

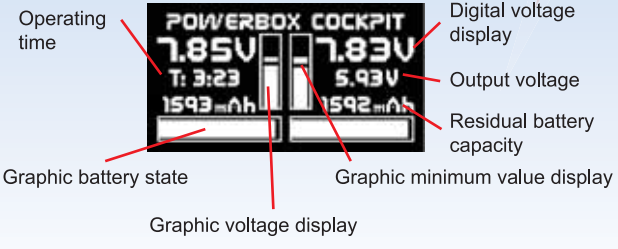
- **Capacity:** you can enter the nominal capacity of your batteries at this point.

- **Output voltage:**

CAUTION: if you intend to select the 7.4 V output voltage, please ensure **before** you make the change that **all** the consumer units connected to the unit, i.e. all servos, receivers and gyros, are compatible with a 7.4 V supply. Information on this subject can be found in the instructions for these components supplied by the manufacturers.
Compared with a direct, unregulated voltage of 8.4 V, the advantage of a stabilised 7.4 V supply is that the voltage is always constant. This means that the servos in your model always run at the same speed and with the same torque, regardless of the manoeuvres you fly. For example, if you were to operate the servos on the unregulated voltage of LiPo batteries, their running characteristics would alter as the freshly charged batteries steadily discharged during the flight. Another major advantage of a regulated 7.4 V voltage is that it completely eliminates damaging voltage peaks (spikes); this extends the useful life of the servos substantially.

3.4. Main screen display

When switched on, the unit's integral screen shows this display:



Key to the individual display points:

- Digital voltage display:
This extremely accurate display allows you to read off the voltage of the battery directly, i.e. the voltage which is present at the **input** of the **PowerBox.**

- Graphic voltage display:
A brief glance into the model provides you with information about the batteries' state of charge. This display is always correct for the type of battery you have selected. This means that the bar will extend right to the top of the box if the connected battery is fully charged - assuming that you have set the correct battery type. If the bar only fills the bottom third of the box, then the corresponding battery is almost flat. This indicator is supplemented by the residual capacity display.

- Residual battery capacity:
This display shows the momentary capacity value of the battery - again, assuming that you have previously set the battery type correctly. This display is capable of providing very accurate information about the remaining battery capacity, although ageing effects or defective batteries may falsify the value. In practice this means that you should always take both values into account: if the remaining capacity appears to be high, but the voltage has already fallen to a low level, you should consider it an urgent necessity to check the battery more closely.

- Graphic indicator of battery charge state:
This display is set to match the capacity you previously entered for the batteries connected to the backer. Assuming that the battery is of good quality, this means: if the bar only reaches the half-way point, then the battery is still half-full.

- Operating time:
This figure shows the elapsed time since the last RESET. It is important always to carry out a RESET after each battery charge process.

- Output voltage:
This value displays the backer's exact output voltage. The voltage fed to the servos and receiver is the exact value displayed here.

Note:
The residual capacity of the two batteries as displayed on the screen is likely to drift apart as the packs are discharged; this is due to minor differences in the rate of discharge of the batteries through the **PowerBox.** This by no means indicates a fault in the **PowerBox**; in fact

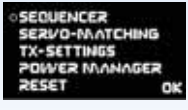
it proves that the **system** features **genuine redundancy.** Here at **PowerBox Systems** we take great trouble to compensate for manufacturing tolerances between the two regulators, but it is never possible to produce a system which is completely devoid of tolerances. The only method of discharging two batteries at 100% identical rates is to use a system fitted with only one regulator. However, such systems cannot be claimed to offer redundancy!

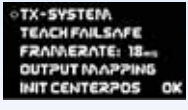
3.5. Setting the receiver system

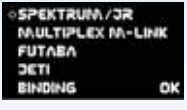
Caution:
Please ensure that you have set the correct receiver type **before** connecting the receivers. This is important, because the Spektrum system operates on only **3.3V**, whereas all other receivers work on 5.9 V or 7.4 V. For example, if you set the receiver system to Futaba and connect a Spektrum Remote Receiver, the Spektrum Remote Receivers will be ruined!

This is the procedure:

- Switch on the **Cockpit SRS**, as **described** in Point 3.2, and wait until the Battery display appears.
- Hold the “SET” button pressed in until the Main Menu appears.
- Use buttons “I” and “II” to move the cursor to the menu point **“TX-SETTINGS”**, and press the “SET” button.
- In the following menu move the cursor to “TX-SYSTEM” and press the “SET” button.
- You can select your radio control system in this sub-menu. When you do this, the screen displays a security query - except in the case of “Spektrum”. Check that your selection is correct, then confirm with “YES”.
- If you are using a Spektrum system and have selected that option, you can now connect your satellite receivers, and bind your RC system to the backer using the “Binding” menu point; the binding plug is not required. This process can be repeated at any time if required. All other receiver systems should be bound as recommended by the manufacturer.







TIP: if you are using a Multiplex system, telemetry must be disabled on one receiver. If you are using a Jeti system, one receiver must be bound as “Master”, one as “Slave”.

The method of connecting the receivers varies according to the radio control system you are using:

• **Spektrum:** connect at least three satellite (remote) receivers. It is up to you to decide which satellites are connected to which ports (RX1 – RX4); the cables are supplied with the satellites. **The system will not start if fewer than three satellites are connected.** Once started, the **PowerBox Cockpit SRS** continues to operate even with only one satellite.

• **Futaba:** if you intend to use only **one** receiver, connect the R6108SB to ports **RX1 or RX4** using one of the patch-leads supplied in the set. Use the output marked “S-BUS” on the receiver for this. If you are using **two** receivers, they should be connected to **RX1 and RX4.**

• **Multiplex:** if you intend to use only **one** receiver, connect the output marked **B/D** on the receiver to port **RX1 or RX4** using one of the patch-leads supplied in the set. If you are using **two** receivers, these should be connected to **RX1 and RX4.** Ensure that the receiver’s software version offers a serial output. If you are unsure of this, the Multiplex support staff will help you.

• **Jeti:** a special patch-lead (optional accessory) is needed for the Jeti sys-tem. If you intend to use only **one** receiver, connect the output of the **“R-SAT”** to ports **RX1 or RX4** using the appropriate patch-lead. If you are using **two** receivers, they should be connected to **RX1 and RX4.** The receive sensitivity of the “R-SAT” satellites is not quite as high as a primary Jeti receiver, and for this reason we **expressly** recommend the use of **two** “R-SAT” receivers.

3.6. Output Mapping

The “output mapping” function allows the channels to be assigned in any sequence you like. This makes it possible to connect the servos to the sockets which best match the wiring arrangement in your model. The only outputs which have a fixed assignment are those for the door sequencer. By default the outputs have a standard assignment.

Caution:

Disconnect the mechanical linkages from the **unmatched** servos before connecting them to the backer, noting the set-up information under **Point 5**.

The “Output Mapping” menu is located in the “TX settings” menu. The screen display varies according to the RC system you have already set:

The right-hand display appears if you have selected Spektrum/JR, and the left-hand display for Multiplex, Futaba and Jeti.
In the case of certain Futaba RC systems it is also possible to output the two switched channels DG1 and DG2. In the standard assignment DG1 controls the door sequencer.
The letters to the left of the colon (:) indicate the channel outputs, as printed on the case of the **PowerBox Cockpit SRS.** The abbreviations or numbers to the right of the colon are the channels as generated by the transmitter. You can now quite simply place the cursor in front of one letter, press the “SET” button, and then assign a different input channel to the selected output using buttons I and II.
This new assignment is automatically saved when you press the “SET” button again.

3.7. Setting the centre positions of the match-channels, and the switching points for the door sequencer

Once you have selected the radio control system and assigned the channels, **it is essential** to carry out the “INIT CENTERPOS” (initialise centre position) function **once**. This is necessary to ensure that the match-channels operate accurately and reliably. The switching points for the door sequencer are set at the same time. The switch positions at the transmitter must be set up symmetrically relative to the centre position.

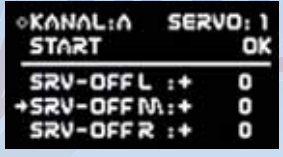
For example:
“Extended” position: -100%
“Retracted” position: +100%

To carry out the initialisation process, move the cursor to the “INIT CENTERPOS” menu point. Check that all transmitter sticks are at centre, and that the retract switch is at the **“Extended”** position. Now press the “SET” button. This action sets and saves the centre positions for servo-matching, and the switch positions.

Note: this function can be repeated at any time, perhaps if you wish to make a slight change to the switching point of the undercarriage. If you alter the centre positions of the match-channels at the transmitter, you should carry out this function again in order to ensure that servo-matching operates accurately.

4. Setting up the match-channels

Select the point **“Servo matching”** from the main menu, and you will see the following screen display:



It is important to start by initialising the match-channels which you wish to use, as described in point **3.7.** We recommend that you carry out a mechanical adjustment of servo 1 for the channel in question, so that the control surface is exactly at neutral when the servo is at centre. We also advise that you set up the maximum travel and Expo functions correctly before matching the servos. The method of programming is once again extremely simple; a step-by-step account follows:

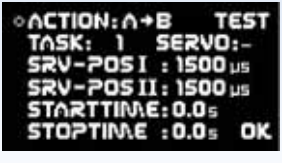
- **Disconnect** the control surface linkages from the servos to avoid high forces acting upon the as yet unmatched servos.
- Select the channel you wish to match in the menu point **CHANNEL.**
- Now select the servo you wish to adjust; both servos can be adjusted or reversed independently of each other.

- Move the cursor to “START”, but **do not** press the SET button at this stage.
- If you now move the corresponding transmitter stick, the arrow at the bottom of the screen indicates which OFFSET you are adjusting. This is not relevant to the adjustment process, but does inform you whether you are altering the end-point or the centre position.
- Move the stick in the direction you wish to adjust, then press the SET button.
- You can now release the stick, as the **PowerBox** retains the position. This means that you have both hands free, so that you can use one hand to adjust the position accurately using buttons **I** and **II**, and the other to check that the disconnected ball-link lines up correctly with the linkage point.
- Press the SET button again to conclude the set-up process.
- Do not re-connect the linkage until you have adjusted the centre position and both end-points perfectly
- To carry out further adjustments at the opposite end-point or the centre position, move the transmitter stick in the desired direction once more, and press the **SET** button again to start the process.
- If you wish to reverse the direction of rotation of a servo, move the control surface to one end-point and select the menu point **START**. Now press button **I** or **II** constantly until the control surface moves in the opposite direction. Repeat the procedure for the other end-point of travel.

TIP:
In the case of large ailerons in particular, it can be advantageous **not to** match the servos with 100% accuracy. If the servos are precisely matched, gearbox play may allow aileron flutter to develop. You can eliminate this danger as follows: first match the servos exactly to each other, and then offset them against each other slightly by pressing the **I** or **II** button two or three times..

5. Setting up the door sequencer

Select the point **“SEQUENCER”** in the main menu. The following display will now appear:



Right at the outset we must point out that the **PowerBox** door sequencer which we have developed provides totally new solutions and unprecedented facilities for programming the movement of undercarriage wheel doors.

For example, many door sequencers only offer the pilot fixed, pre-set vectors for retracting and extending the undercarriage, but our system does **not.** Most of today's door sequencers only provide two modes, which can be used - for example - to open the wheel doors, extend the wheels, then close the doors again. When the undercarriage is retracted, the procedure and the timing of the actions are the same.

The **PowerBox door sequencer** offers virtually unlimited flexibility, because the operator is able to define each element of travel himself, **together** with the time over which each part of the process occurs. For example, it is possible for all the wheel doors to open or close at entirely different rates, and even multiple extension / retraction processes are possible. If your scale prototype features a 'jerk' in the motion when the locking mechanism engages, this can also be simulated. The opening and closing processes can be set up individually, as they are completely independent of each other.

In spite of the wide-ranging facilities, operating the door sequencer is simple and user-friendly thanks to the integral screen and the menu-based control system. Additional programming aids are included in the software. Once you have understood the basic principle, you will find it very straightforward to program the system, even **without recourse to the manual.**

This is the principle:

The basis of all the settings is what we term the **"TASK"**: each **task** represents a **single** action. **Twelve** tasks are available for the retraction process, and a further **twelve** tasks for the extension process, i.e. it is possible to program a sequence consisting of **24** different movement processes.

One task contains the following information:

Value	Range
Task number	1 - 12
Extend or retract undercarriage	ACTION **A** or **B**
Servo number	1 - 6
Servo position START	700 µs - 2300 µs
Servo position STOP	700 µs - 2300 µs
Start time	0 - 9.9s
Stop time	0 - 9.9s

A brief reminder of the method of setting the values: as in the other menus, buttons **I** and **II** on the **SensorSwitch** are always used to move the cursor and adjust the selected value. The **"Set"** button is used to select the menu point or confirm the entered value.
Holding buttons **I** or **II** pressed in causes the selected value to change automatically in the appropriate direction; the rate of change is initially slow, and then accelerates steadily.
The servo position alters in **real time**, which makes it very much easier for you to adjust the wheel doors accurately to suit the **"OPEN"** or **"CLOSED"** positions.

Intelligent programming aid:

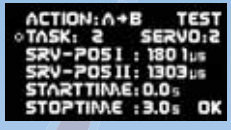
If you wish to set up multiple tasks in order to move the wheel doors to several positions, you will soon discover that the initial position value and start time for the new task are always assumed to be the same as the last set position of the selected servo. This speeds up programming, as you do not need to note down the servo's last position and stop time. The system is analogous when you are setting up the retract process (A » B). When you subsequently set up the extend process (B » A), you will find that the position values for Start and Stop for that servo are already entered at Stop and Start.

You will also find the **TEST** function helpful when programming particular **tasks**, as it carries out the specific task which is displayed on the screen at that time. This is always useful if you wish to check whether the servo reaches the same end-point from its rotational movement as it did in the previous stage of programming. It is also helpful for testing the switching points of an electronic valve.

The following sequential example covers a complete retraction / extension process. Naturally the values for the various positions will vary according to your linkages, and you must set them up individually to suit your model. **It is vital that the wheel door positions should not mechanically stall (obstruct) the servos.** You will also need to adjust the timing shown in the example to suit the requirements of your model. The processes do not need to be timed exactly as shown in tasks 3 and 4. Our example shows a typical set-up for opening one wheel door, extending the wheel, and closing the wheel door again.

Sequence for retracting the undercarriage

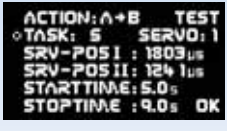
TASK 1 is used to open the main wheel door immediately when the transmitter switch is moved **from position A to position B.** The selected stop time of three seconds causes the door to open slowly.



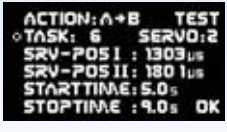
TASK 2 controls the secondary wheel door. In our example the servo for this function is installed in the reverse orientation, as can be seen from the position values. Reversing the servo is very easy with the sequencer.

TASK 3 is responsible for operating the nosewheel door, which is open when the wheel is extended. After a period of 3.5 seconds (set in Task 4) the undercarriage is extended, and after a brief pause this wheel door closes again.

TASK 4 controls an electronic pneumatic valve for the retractable undercarriage in our example. The valve will open after a delay of half a second once the wheel doors have reached their position; at this moment it feeds compressed air into the air cylinders. The switching points are programmed on the valve itself **after** the door sequencer has been programmed.

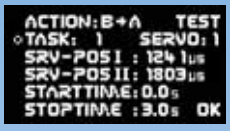


TASK 5 - the wheel door which opened in Task 1 closes again 1.5 seconds after the undercarriage is extended. In our example it closes even more slowly than when opened.

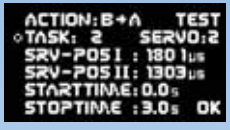


TASK 6 - the secondary wheel door of the main undercarriage closes again.

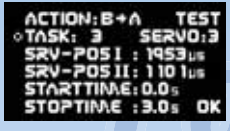
Sequence for extending the undercarriage



TASK 1 - the same times have been selected as for retracting the undercarriage. The only change that needs to be made is the direction: B » A must be selected at the **ACTION** point. The software automatically copies the values for positions I and II as soon as you select servo 1.

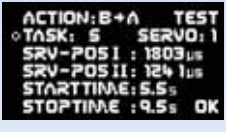


TASK 2 - the main undercarriage door opens immediately when the retract switch is moved from position “B” to “A”.

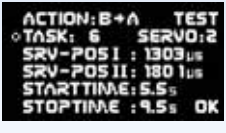


TASK 3 immediately starts to open the nosewheel door when the transmitter switch is operated, but opens it slowly.

TASK 4 operates the electronic valve again, and the undercarriage is extended.



TASK 5 - the main wheel doors close again slowly.



TASK 6 closes the secondary main wheel door after the undercarriage is extended, with a delay of 1.5 seconds.

Our example clearly shows how a complex function is put together. It is also possible to insert additional movements or intermediate stops at any time when opening or closing the wheel doors: you can simply use the remaining tasks 7 to 12 for this. Using the facilities of the sequencer system there is no reason why the model's undercarriage should not retract and extend exactly as the original. The only limit to what can be achieved is your own imagination.

6. Reading out the flight recorder

The flight recorder records lost data frames, receiver holds and fail-safe episodes according to the system in use. The various systems supply different information via the serial bus, which the **PowerBox Cockpit SRS** analyses and saves at one-second intervals. **Even if the batteries are disconnected from the backer, e.g. as the result of a crash, the receiver data can still be read out.** The data are read out by briefly pressing buttons "I" and "II" simultaneously. The **PowerBox Cockpit SRS** switches to the relevant flight recorder screen display. The meaning of the individual items of data is described below.

Caution: the data are reset to 0 when you quit this screen display. It is not pos-sible to read out previous data again.

- **Spektrum:**

Meaning of the individual values:

• **AERIAL FADES:** the backer counts individual lost data frames for every "remote receiver". This means: if receiver 1 loses the signal for 20 ms, the value for RX1 is incremented once. When this happens, the other satellites supply the signal. The lost frames value may run to several hundred. If the score for one satellite is significantly different from the others, you should check this receiver, or change its installed position.

• **LOST FRAMES:** this value is incremented when all the satellites lose the signal simultaneously for a period of at least 20 ms. The value continues to increment for as long as the signal loss persists, i.e. a value of 5 indicates a signal loss lasting 100 ms.
• **HOLDS:** this value is incremented when all four satellites lose the signal for a period of more than 60 ms; the count only increases once for each loss of signal, i.e. a signal loss lasting 200 ms would generate a value of 1. If a "HOLD" event occurs, the servos run to the pre-defined Fail-Safe position. You can read about the various Fail-Safe options available under Point 7.

- **Multiplex / Futaba:**

Meaning of the individual values:

• **LOST FRAMES:** this value is incremented when the associated receiver registers a Lost Frame, or when this receiver supplies no signal for a period longer than 25 ms. The value continues to be counted until such time as a valid signal is again present, i.e. until no more LOSTFRAMES are registered.
• **HOLDS:** this value is incremented when the receiver registers a Fail-Safe event, or when no signal is present for longer than 25 ms. The value only increases once per Fail-Safe phase, i.e. a signal loss lasting 200 ms would generate a value of 1. In conjunction with the "LOST FRAMES" value it is possible to assess whether individual brief fail-safe events have occurred, or a small number of protracted fail-safe periods.
• **FAILSAFE:** this value is incremented when one of two receivers register a fail-safe event, or when no signal is present for a period longer than 100 ms. This value is counted once per fail-safe episode. At this time the servos run to the pre-programmed positions. You can read about the various Fail-Safe options available under point **7.**

- Jeti / analogue systems:

Meaning of the individual values:

• **LOST FRAMES:** this value cannot be assessed with the Jeti system.
• **HOLDS:** this value is counted when the system switches from one receiver to the other. If the signal is absent at the active receiver for longer than 20 ms (1 frame), the system switches to the second receiver.
• **FAILSAFE:** this value is incremented when neither receiver delivers a signal. The value only increases once per fail-safe event. At this time the servos run to the pre-programmed positions. You can read about the various Fail-Safe options available under Point **7.**

7. Fail-Safe settings

The Fail-Safe settings vary from system to system, but each system offers several options:

- Spektrum/JR:
As with the original receivers, the **PowerBox Cockpit SRS** offers a choice between two types of fail-safe:

• **Smart Fail-Safe:** during the binding process only the throttle position is saved as a fixed value. All the control surfaces remain in the Hold position. When carrying out the binding process, as described under 3.1, ensure that your throttle stick is at the Idle position. You must repeat the binding procedure if you make any changes to the throttle function, to ensure that the motor is switched off / engine returns to idle if a fail-safe event occurs.
• **Preset Fail-Safe:** in this type of fail-safe all the control surfaces move to pre-programmed positions. These positions are very easy to program in the TX Settings menu: move all the control surfaces to the desired

position using the transmitter. The backer's cursor must be moved to the "Teach Failsafe" menu point. Now press the "SET" button to save the control surface positions. If the signal is lost at all the remote receivers, the servos will move to these stored positions.

- **Multiplex / Futaba / Jeti:**

Once again the **PowerBox Cockpit SRS** offers two possible methods of fail-safe programming: in the first the servos remain at the last valid position; in the second the control surfaces move to previously programmed positions.

• **Hold:** the "Hold" option is automatically activated when you select your receiver system in the TX-SYSTEM menu, i.e. the control surfaces of your model remain in the last position recognised as valid.

The Futaba system offers a special feature here: the S-Bus signals are passed on to the backer, which means that you can program the fail-safe positions for individual channels or all channels at the transmitter. If a fail-safe event occurs, the control surfaces move to the positions programmed at the transmitter. If a fault occurs in the lead between receiver and backer, the control surfaces remain in the last valid position.

• **Failsafe:** if you wish to program fixed, pre-programmed positions for the con-trol surfaces of your model, select the "TX Settings" menu, and move the cursor to the "Teach Failsafe" menu point. Use the transmitter to set all the model's control surfaces to the positions which you wish them to take up if signal loss occurs. Finally press the "SET" button in order to save all the positions. You can check the settings simply by switching the transmitter off: the control surfaces must now run to the previously programmed positions.

8. Frame rate:

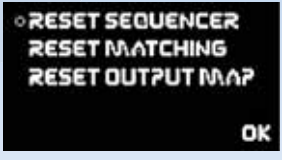
What does **'frame rate'** mean?

This value indicates the time interval at which the servo signal is refreshed. Modern digital servos are unlikely to encounter problems with the 12 ms setting, but older analogue servos may require a longer setting of 21 ms. For more information on servo compatibility please contact the manufacturer of your servos. A faster refresh rate causes the servos to respond more swiftly, and they will offer greater effective torque because they are capable of counteracting the forces acting upon them more quickly.

Caution:
The **Frame-Rate** setting should only be changed if you are certain that your servos are designed for the **Frame-Rate** you wish to use. In the extreme case please note that the servo may lose its triggering, and become "soft".

9. Resetting the door sequencer, match-channels or output mappings

Select the **"RESET"** point in the main menu, and you will see this display:



This menu point allows you to reset the door sequencer settings, or the match-channels, or the output mappings to the factory default values.

Caution: when you answer the security query with **"YES"**, the values are reset permanently, i.e. you cannot retrieve the earlier settings.

10. Connections for radio control systems with downlink facilities

The **PowerBox Cockpit SRS** includes one entirely new feature: you can connect various radio control systems to them in order to transmit all battery data directly to the screen of your radio control transmitter. The system supports the Multiplex **"MSB"** system and **Spektrum** telemetry. All that is required is to connect the receiver or the downlink transmitter to the appropriate port of the **PowerBox Cockpit SRS** battery backer before switching the system on. There is nothing to configure, and the system automatically adopts the correct settings and calibration values. However, if you are using an **MSB** connection it is essential to check that other sensors connected to the "bus" do not share the addresses used by the **PowerBox.** The table below contains a summary of the addresses used. The voltage and residual capacity of **both** batteries is passed out, and alarms are triggered at the transmitter if the values fall below a specific threshold, regardless of battery type. An alarm is also triggered at the transmitter if the residual capacity falls below 20%.

Addresses of the **PowerBox Cockpit SRS** for the MSB system (Multiplex):

Address	Function
3	Battery voltage 1
4	Battery voltage 2
6	Capacity 1
7	Capacity 2

11. Regulator error message

The **PowerBox Cockpit SRS** constantly checks both voltage regulators independently of each other. If a fault should occur in one of these regulators, this warning will appear on the screen:

There are three possible causes for this warning:

- One or both regulators is generating insufficient output voltage or none at all. This could mean that you are flying with only one regulator functioning, and for reasons of safety this is not permissible.

- One or both regulators is not functioning, and is passing through the full battery voltage. This means that the servos and receiver are being operated on an excessive voltage, which could lead to failures in the longer term. This malfunction usually occurs after a reversed polarity connection.

- One battery is plugged in but not switched on. The second battery is plugged in and switched on. The screen displays the message "regulator malfunction". This **does not indicate a fault**! The message is a warning, and is intended to remind the user to switch on both regulator circuits.

In the first two cases please send the device to our Service Department at the address below, with the completed repair form which you can download from our website.

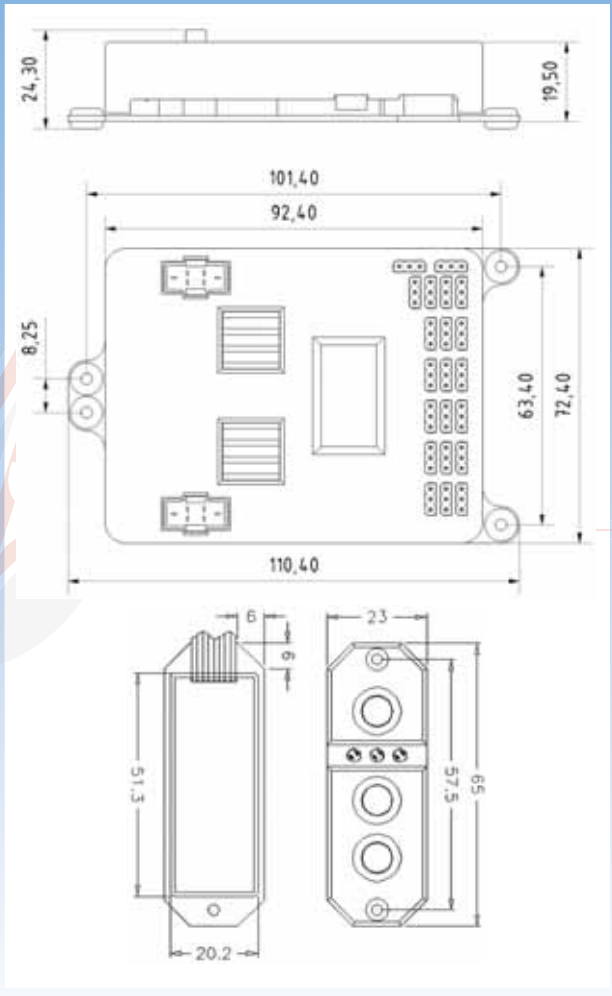
12. Specification

Operating voltage:	4.0 Volt to 9.0 Volt
Power supply:	2 x two-cell LiPo battery, 7.4 Volt 2 x five-cell NiCd / NiMH batteries, 2 x two-cell LiFePo batteries (A123)
Current drain:	switched on - approx. 125 mA switched off - approx. 33 µA
Dropout voltage:	approx. 0.25 V
Max. receiver and servo current:	2 x 10 A (stabilised) according to cooling Peak 2 x 20 A
Servo signal resolution:	0.5 µs
Signal repeat rate: (frame rate)	12 ms, 15 ms, 18 ms, 21 ms
Screen:	OLED 128 x 64 pixels, graphic
Servo sockets:	21 sockets, 12 channels
Temperature range:	-30°C to +75°C
Weight:	115 g
SensorSwitch:	15 g
EMV approval:	EN 55014-1:2006
CE approval:	2004/108/EG
WEEE Reg. No.	DE 639 766 11

This battery backer fulfils the EMV protective requirements, EN 55014-1:2006 with certificate dated 10 February 2009. EMC approval 2004/108/EG.

The unit must not be connected to a mains PSU!
The **PowerBox Cockpit SRS** is intended exclusively for use in modelling applications. It is prohibited to use it for any purpose other than in radio-controlled models.

Dimensions:



13. Set contents

- **PowerBox Cockpit SRS**
- 2 patch-leads
- **SensorSwitch**
- 4 rubber grommets and brass spacer sleeves, factory-fitted
- 4 retaining screws
- Operating instructions

14. Guarantee conditions

We take the maintenance of the highest quality standards very seriously, and that is why **PowerBox Systems GmbH** is currently the only RC electronics manufacturer which has been awarded certification to the **DIN ISO 9001:2008** industrial norm.
Our stringent quality management, which applies both to development and production, is the reason why we are able to grant a **36 month** guarantee on our products, valid from the initial date of purchase. The guarantee covers proven material faults, which will be corrected by us at no charge to you.
Any repairs carried out during the guarantee period do not extend that period. Claims under guarantee are invalid if damage is due to mishandling or incorrect use, e.g. reversed polarity, excessive voltage or damp. The same applies to defects caused by heavy wear or excessive vibration. Any further claims, e.g. for con-sequent damages, will not be entertained.

Liability exclusion:

We are not in a position to ensure that you install and operate this battery backer correctly, nor that you maintain the entire radio control system properly.

Regardless of the legal argument employed, our obligation to pay compensation is limited to the invoice price for those of our products which are involved in the event, unless this restriction is deemed unlawful.

For this reason we are unable to accept liability for loss, damages or costs which result from the use of the device, or are connected with its use in any way!

We wish you every success using your new power supply from **PowerBox Systems!**

Donauwörth, January 2011

PowerBox-Systems GmbH

certificated according to DIN EN ISO 9001:2008

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