Instruction Manual

PowerBox Systems®

World Leaders in RC
Power Supply Systems

PowerBox CHAMPION SRS

Dear customer,

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

Product description

Here at **PowerBox Systems** we have developed a new High-End product designed to provide supreme functionality and security for the demanding pilot.

Present-day requirements obliged us to adopt many new ideas during the development period: these include our new **PowerBUS** technology, which is destined to usher in fundamental changes in the electronic layout of large-scale models as a whole.

In other respects we have retained proven concepts in further developed form. For example, the new **Champion SRS** is fully programmable using a menu system, controlled with the **SensorSwitch** and a blue backlit LCD screen; as usual, all battery-specific and flight-relevant data can be displayed on-screen after each flight.

The door sequencer function features an integral set-up assistant which makes it possible to complete the essential set-up procedure in very short order.

Over the last two years developments in serial receiver bus systems have brought them to the forefront of modern technology, and the new **Champion SRS** features these inputs.

The **Champion SRS** features no fewer than four high-performance voltage regulators, allowing the use of both HV servos and conventional 6 V types. With dual security in mind, each pair of regulators can be set to an output voltage of 5.9 V or 7.4 V.

The Servo-Match and Fail-Safe functions have also been expanded: the software now provides adjustment facilities for all 24 outputs individually, covering servo centre, travels, fail-safe and hold-mode. Servo reverse is available with a single button-press.

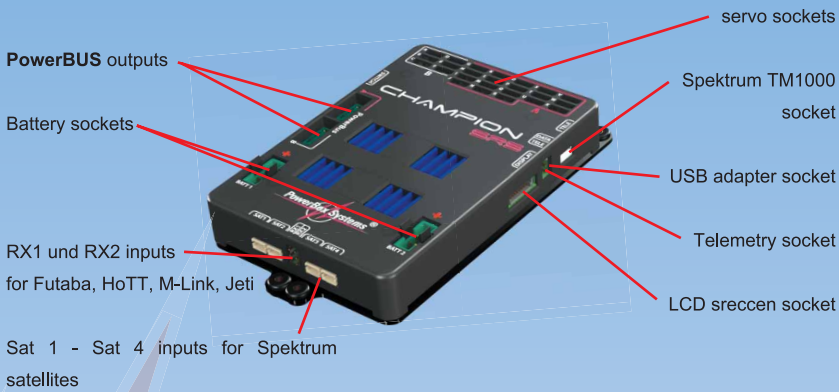
Five different radio control systems - Spektrum, Futaba, Multiplex, HoTT and Jeti - can be bound to the **Champion SRS**, some providing telemetry output of battery-relevant data. More systems are in preparation.

Features:

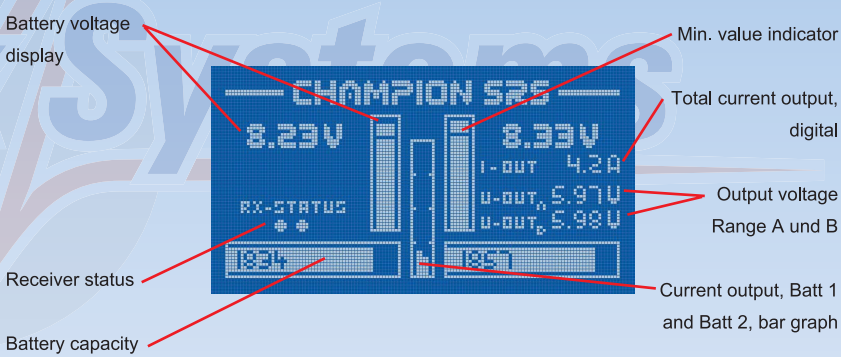
- Door sequencer: six freely programmable outputs with set-up assistant
- **PowerBUS**: 2 outputs, 16 + 2 channels, compatible with other servo bus systems
- Servo-Match function: servo centre, end-points and reverse for all 24 servo outputs
- **SRS**: **S**erial **R**eceiver **S**ystem provides the facility to use receivers with serial interface: Spektrum DSM2 and DSMX, Multiplex M-Link, Futaba S-Bus, HoTT and Jeti R-SAT2
- Unrestricted channel assignment for all 24 **PowerBox** outputs
- Graphic LCD screen with 128 x 64 pixels
- Extremely user-friendly menu-based programming using the **SensorSwitch**
- Up to 18 channels - depending on the radio control system in use
- Signal amplification and interference suppression for all 24 outputs
- Flight recorder, recording of lost frames, fail-safe events and all battery data
- Variable frame rate, range 12 ms - 21 ms
- Two 16-bit processors for fast, high-resolution signal processing
- 2 x double-regulated output voltages for receivers and servos
- 2 regulated voltage ranges with independent selection facility, 5.9 V or 7.4 V
- Connection facilities for Spektrum, HoTT and Multiplex MSB downlink bus systems
- Direct transmission of battery voltage and capacity to the transmitter
- Separate voltage and capacity display for each battery
- Minimum value memory alerts the user to voltage collapses
- Large-area heat-sinks for high regulator performance
- Regulator monitoring, regulator error indicator
- Support for three battery types: LiPo, NiMH / NiCd, LiFePo
- Suppression of any servo feedback currents which may occur

Contents:

1. Layout, connections



2. Main screen, data logger

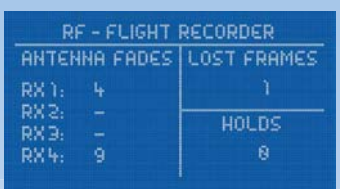


Key:

- **Battery voltage indicator:** Shows the exact battery voltage for both batteries, digitally and as bar graph
- **Receiver status:** This item shows which receivers are delivering a signal. Jeti and HoTT are exceptions: this item shows which receiver is currently active.

- **Battery capacity:** Shows the residual capacity of the batteries in digital and bar graph form.
- **Minimum value indicator:** The row of white pixels in the bar display represent the lowest voltage which occurred during the flight. If the minimum value is significantly lower than the actual voltage, this may indicate unsuitable or defective batteries.
- **Total current output:** Displays your model's actual current drain.
- **Output voltage:** Voltage display for both power circuits A and B.
- **Current output, Batt. 1and Batt. 2:** Current output of the two batteries in bar graph form.

The ***RF-Flight Recorder*** display is accessed by briefly and simultaneously pressing **buttons I and II** on the **SensorSwitch**:



Antenna Fades:

- Spektrum, Futaba, M-Link:
  This item displays the lost data packets for the individual receivers.

- HoTT and Jeti:
  This item displays the number of switching events between the receivers.

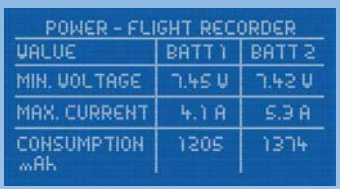
Lost Frames:

This value shows how many occasions none of the connected receivers was able to supply a valid data packet.

Holds:

This value is incremented when none of the connected receivers is able to supply a valid signal for a period longer than 250 ms. When this occurs, the servos move to the Hold or Fail-Safe positions stored in the backer.

The ***Power-Flight Recorder*** display can be accessed by briefly and simultaneously pressing **buttons I and II** on the **SensorSwitch** a second time:



This Flight Recorder enables you to monitor all data relating to current and batteries.

- Min. Voltage: This is the lowest value to which your battery voltage fell during the flight.
- Max. Current: The highest current which was drawn from each battery during the flight.
- Consumption: This item shows the energy consumed since the system was last switched on. The value is erased when you switch the system off.

Note: it is extremely rare for the maximum current and / or energy consumption of both batteries to be identical. In fact, the discrepancy is proof that the backer exhibits **"genuine redundancy"**, i.e. it contains two systems which work entirely independently of each other. Although we go to great lengths to match the integral regulators accurately to each other, there are always minor manufacturing tolerances in the components, hence the difference. Only non-redundant systems drain the batteries equally.

3. Initial steps

a) Installation notes

The four mounting holes in the base plate of the **PowerBox Champion SRS** are fitted with rubber grommets as standard. The **Champion SRS** should be mounted on a surface which is not subject to serious vibration, using the retaining screws supplied in the set. Although all **PowerBox** products are designed to be highly resistant to vibration, you should still avoid attaching the backer to thin GRP or CFRP surfaces.

The internal card packaging can be used as a template for installing the **SensorSwitch**. The **SensorSwitch** should also be installed at a point where vibration is low. The GRP fuselage sides of a powered model aircraft are not suitable for this, as they suffer from severe vibration. The appropriate area should be stiffened with a piece of plywood 2 to 3 mm thick; 20 to 40 mm of wood round the switch is generally sufficient to stiffen the GRP fuselage side. Gluing the plate to the GRP material helps to absorb the vibration, and also provides plenty of “meat” for the switch retaining screws.

The **Info Display** should also be installed at a point where vibration is low – and ideally in a position where it can be seen clearly. The **Info Display** does not need to be left permanently in the model, as the **Champion SRS** also functions when the unit is not connected. The only point to note is that the **Info Display** can only be plugged in again when the main screen is displayed - not the menu. All you have to do is ensure that it can be plugged into the main unit when you are using the system.

Connect the **SensorSwitch**, the **Info Display** and your batteries to the **PowerBox**. The **Champion SRS** features unrestricted output mapping. This means that you can assign any function to any of the output. For this reason you should not connect the servos until later - see point 3d.

b) Switching the PowerBox on, the menu system

The method of switching on and off is very simple, and effectively prevents the system being switched on or off accidentally. This is the procedure: locate the **SET button** on the **SensorSwitch** and hold it pressed in until the centre LED lights up red. Now press the two **buttons I and II** in turn: the backer is now switched on. The procedure for switching off is exactly the same: hold the **SET button** pressed in, wait until the centre LED lights up red, then switch off by pressing **buttons I and II** in turn.

Your **PowerBox** stores the last switched state. This means that the backer stays off if it is switched off using the **SensorSwitch**. Once switched on, the unit can only be switched off again using the **SensorSwitch**. Any intermittent contacts or interruptions in the power supply circuit cannot cause the backer to be switched off.

The menu system for all **PowerBox** devices is as simple as possible, and generally self-explanatory:

- Hold the **SET button** pressed in for a few seconds to access the menu system.
- Use the **SET button** to select the menu point you wish to use.
- **Buttons I and II** are now used to move the cursor up or down, and to change values once a menu point has been selected.
- Pressing the **SET button** again leaves the menu point.

c) Setting the receiving system to be used

The first requirement is to define the receiving system. If this setting is not selected, the subsequent functions, settings and assistants only work in a restricted manner.
Switch the **PowerBox** on as described above. Hold the **Set button** pressed in for a few seconds, and the menu system appears. Select the ***RX/TX SETTINGS*** point; the first point in the ***TX-SYSTEM*** menu enables you to select your radio control system:

Spektrum DSM2 and DSMX:

If you select Spektrum DSM2 or DSMX, the additional menu point ***BIND*** now appears. Whether you select the DSM2 or DSMX option depends on your transmitter type - not on the satellites connected to the system. For example, if your transmitter operates on DSM2, but the satellites are DSMX types, select DSM2 at this point (for example, this applies to all Spektrum modules fitted to MC-24 transmitters).
Now connect your satellites, and select the ***BIND*** menu point; at least three satellites must be connected. Even if two of three satellites were to fail in flight, **SRS technology** allows the **PowerBox** to continue to function correctly with just a single satellite.
All satellites connected to the system now flash, and can be bound to the transmitter.

The following systems are connected to inputs RX1 and RX2 using the three-core patch-leads supplied in the set:

Futaba S-BUS:

Set the receiver or receivers to “Normal Mode” - not “High-Speed Mode”.
If you are using the R7008SB receiver it is particularly important to set Output 8 to S-Bus, and to use this output. Do not use the S-Bus2 output! Naturally the receiver’s S-Bus2 socket can be used for Futaba telemetry accessories.

Multiplex M-Link:

The MPX receiver or receivers must be set to “Digital Output”. This can be selected using the Multi-Mate device or a USB adapter (Multiplex or **PowerBox USB interface**) and a PC. The software required for this is called “Multiplex Launcher”, and is available as a free download from the Multiplex website. You should also set the fail-safe time to 0s; this is important if you wish to use two receivers, as it ensures a fast switch-over if signal loss occurs.

SJ HoTT:

If you wish to use a HoTT receiving system, the SUMD signal must be activated at the receiver. Use the SmartBox or the transmitter’s Telemetry menu to set ***“CH OUT TYPE: SUMD OF 16”***.
“OF” means that the receiver switches the SUMD signal off if signal loss occurs. The SRS system detects this within a few milliseconds, and switches over to the second receiver. If you intend to use only one receiver, you can also set FS or HD.

Jeti Duplex:

Connect two R-Sat2 satellites directly to RX1 and RX2. One satellite is operated as “Clone”, the other as “Normal”. The following settings have proved effective in practice:

- Output Mode: Computed
- Signal Fault: off
- Signal Fault Delay: 0.5s
- Output period: 24ms (if you are using 12 to 16 channels, set this to 28ms)
- PPM 8, 9, 12, 16, according to your transmitter / transmitter module

d) Setting the battery type

It is essential to set both the battery type and the capacity of the batteries you intend to use, otherwise accurate battery monitoring will not be possible. You will find this set-up point in the ***POWER/TELEMETRY*** menu:

- CHEMISTRY: Select one of the three battery types: LiPo, NiMH or LiFePo

- CAPACITY: Select the capacity of your batteries at this point. The backer is reset to this value when you carry out a Reset after recharging the batteries.

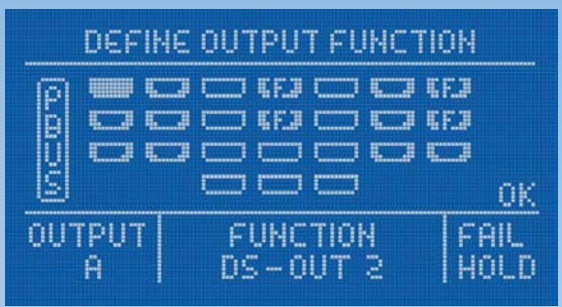
e) Setting the output voltage

The **Champion SRS** is fitted with a total of **four** independent **high-performance voltage regulators**. In order to guarantee 100% redundancy, these are linked together in pairs. You can select the output voltage of each of these regulator pairs ***A and B***. For example, it is possible to set an output voltage of 7.4 V for regulator pair ***A***, and 5.9 V for regulator pair ***B***. This feature makes it possible to connect a mixture of HV servos and normal servos to the **PowerBox Champion SRS**. The markings ***A*** (red) and ***B*** (black) on the case cover indicate which outputs are assigned to range A, and which to range B. The **Output Mapping** function provides a comprehensive means of assigning the appropriate output voltage to particular functions.

Note: the **PowerBUS** outputs are also assigned to voltage range ***A*** and voltage range ***B***.

f) Channel assignment, output side

As already mentioned, the outputs of the **PowerBox Champion SRS** can be assigned in any way, without restriction. This means that particular functions or channels can be assigned to any of the 24 outputs. The menu point where this is carried out is entitled ***OUTPUT MAPPING***:



This menu displays a graphic image of the outputs. You can use the cursor to move through the outputs in order to select the one you wish to assign. Pressing the **SET button** at a selected output highlights the ***FUNCTION*** field, where you can select the signal to be assigned to this output. Pressing the **SET button** again highlights the ***FAIL*** field, and pressing the **SET button** a third time causes the cursor to move back to the Outputs field.

Key to the different displays for the outputs:

Cursor, or selected output

Free output, not yet assigned

Assigned channel, output switches to Hold when fail-safe is triggered

Assigned channel, output switches to saved fail-safe position when fail-safe is triggered

Note: ***Output Mapping*** provides enormous scope for individual arrangements. By default most of the outputs are pre-defined, as this minimises the amount of set-up work that has to be carried out. You will find a list of pre-defined outputs on the next page.

The following set-up facilities are provided:

- FUNCTION:

- ***DIRECT 1 … 18:***
  Depending on your radio control system, you can output channels 1 – 18 (Futaba) directly, i.e. as they arrive from the transmitter.
  Example: the right-hand landing flap is programmed to channel 9 at your transmitter, and you want to connect the landing flap servo to output ***D***. Move the cursor to the ***OUTPUT D*** field, and confirm your choice with the **SET button**. Set ***DIRECT 9*** under ***FUNCTION***. The servo connected to output ***D*** now outputs channel 9 from your transmitter 1 : 1 - unless Servo Matching has been carried out on this channel.

- ***DS-OUT 1 … 6:***
  If you select one of these functions, the output is linked to the door sequencer. You can select which wheel door or which valve is controlled by which door sequencer output without any restriction, but we always recommend that you make use of the **Door Sequencer Assistant**, which determines the output assignment as shown below.

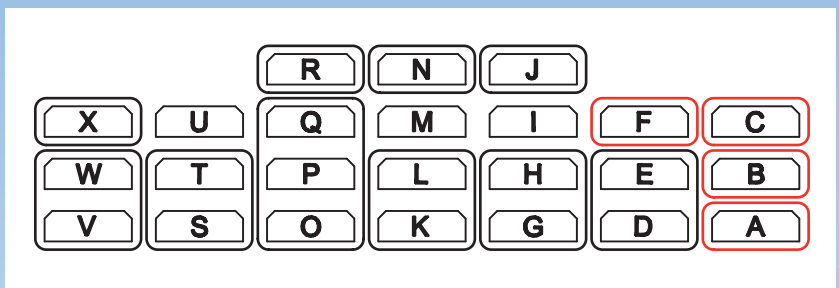
- FAIL:

- ***FS:***
  If there is a complete loss of signal at all receivers connected to the system, this output runs to a previously determined position. See Point 6. for information on defining this position.

- ***HOLD:***
  If there is a complete loss of signal at all receivers connected to the system, this output remains in the last known valid position.

By default, or after you have ***RESET the OUTPUT MAPPING***, certain outputs are pre-defined in order to reduce the amount of set-up work the user is required to carry out. The door sequencer functions are assigned to the outputs listed below, but only if the door sequencer Assistant has been invoked.
If you wish to re-assign an output after setting up the door sequencer, this generally presents no problems, as the changes do not affect the door sequencer settings.

Default output assignments:



Note:

- After a Reset the fields outlined in black are assigned as shown below:
- Fields outlined in red are assigned as shown below, but only if the **Sequencer Assistant** has been used:

M	free
N	Direct 10
O	Direct 4
P	Direct 4
Q	Direct 4
R	Direct 11
S	Direct 7
T	Direct 7
U	free
V	Direct 6
W	Direct 6
X	Direct 1

A	Direct 5 / VALVE sequencer
B	R.H. wheel door
C	L.H. wheel door
D	Direct 8
E	Direct 8
F	Nosewheel door
G	Direct 2
H	Direct 2
I	free
J	Direct 9
K	Direct 3
L	Direct 3

g) Using the Door Sequencer Assistant

The **Setup Assistant** significantly simplifies the set-up procedure for the door sequencer function. The **Setup Assistant** is not a second door sequencer; instead its purpose is to define the **Tasks** in the door sequencer to match your requirements, i.e. the information you enter. Because of this it is also possible at any time to expand or alter the retract or wheel door functions **after** you have completed the **Setup Assistant** procedure.
The **Setup Assistant** guides you through the settings: on-screen instructions describe everything that you have to do. These instructions simply provide supplementary information which cannot be supplied by the **PowerBox** itself simply due to the size of the screen.

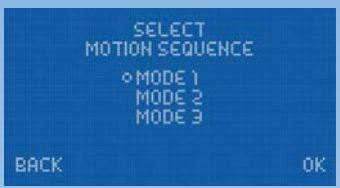
Preparation:

- The radio control system is set up correctly, and all the other control surfaces move properly.
- **Do not connect** any servos or valves to the door sequencer at this point.
- Assign a transmitter switch to a vacant channel, and set up servo travel for that channel to the standard range of -100% to +100%. If you are using a Futaba system, it is also possible to use DG1 or DG2.
- If you intend to use pneumatic valves, please ensure that there is adequate pressure in the system throughout the programming procedure to avoid interruptions and other problems.

Access the **PowerBox**'s Door Sequencer menu, and select the ***SETUP ASSISTANT*** point. You will now see the following screen display:

At this point the **Champion SRS** learns which switch is to be used: the unit automatically detects the appropriate channel when you operate the transmitter switch you have assigned for the retractable undercarriage. The double arrow on the screen should move from the ***UP*** line to the ***DOWN*** line. If your retract switch operates in the wrong "sense", change it by reversing that output at the transmitter.

Press the **SET button** in order to continue with the Assistant; the next screen display now appears:



The purpose of this menu is to set up the way the door sequencer operates. The following basic sequences are available:

Mode 1:

Extend undercarriage:
Wheel doors open → Undercarriage extends

Retract undercarriage:
Undercarriage retracts → Wheel doors close

Mode 2:

Extend undercarriage:
Nosewheel doors open → Nosewheel extends
Main wheel doors open → Main undercarriage extends → Main wheel doors close

Retract undercarriage:
Nosewheel doors open → Nosewheel retracts
Main wheel doors open → Main undercarriage retracts → Main wheel doors close

Mode 3:

Extend undercarriage:
Nosewheel doors open → Nosewheel extends → Nosewheel doors close
Main wheel doors open → Main undercarriage extends → Main wheel doors close

Retract undercarriage:
Nosewheel doors open → Nosewheel retracts → Nosewheel doors close
Main wheel doors open → Main undercarriage retracts → Main wheel doors close

Move the cursor to the appropriate mode, and confirm your choice by pressing the **SET button**. Use button II to move the cursor to ***OK***, then press the **SET button**; the following display now appears:

Connect your retract system valve to output ***A***. One of the following will now occur, depending on the way your valve is programmed:

Valve is triggered, and the undercarriage retracts. Press button II on your SensorSwitch, and hold it pressed in until the undercarriage extends again.

Valve is not triggered, and the undercarriage remains in the extended state.

Press the **SET button** to move to the next screen display:

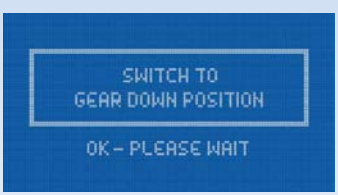
The undercarriage should now retract. If not, hold **button I** pressed in until the valve is triggered, and the undercarriage retracts. Press the **SET button** to move on to the next stage of the procedure.

Connect the nosewheel door servo to output ***F***. Press the **SET button** to close the nosewheel door; repeat the procedure in the next set-up screen to open the door.

The succeeding steps are used to set up the rear wheel doors; the procedure is identical to that described for the nosewheel door. The servo for the right-hand wheel door is connected to output ***B***, that for the left-hand wheel door to output ***C***.

Note: if you are only using **one** valve for all the wheel doors, you can by-pass the last four points by selecting ***OK***.

All the settings are now complete, and you will see one final safety query:



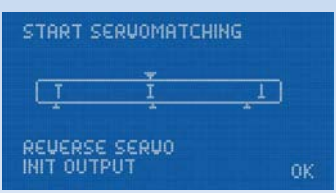
Move your transmitter switch to the “gear down” position. It will now take a few moments for the Assistant to create the necessary tasks, and move the doors to the correct position without any fouling or jamming.
The tasks created by the Assistant are described in detail under Point 7. If the timing (pauses, opening times and closing times) is not exactly as you wish, you can change the settings manually at any time.

4. Servo-Match function

The Servo-Match function provides the facility for adjusting the centre position and end-points of the servos connected to the backer. If you have a model aircraft with more than one servo per control surface, this makes it possible to set up multiple servos to move to identical positions at identical times. Since this ensures that the servos do not work against each other, their effective life is increased, and more power is available to move the control surfaces; matched servos also draw lower current.
It is also possible to reverse the direction of rotation of individual servos. This function is useful if you wish to employ fewer channels at the transmitter. For example, the right and left elevators, or the right and left landing flaps, can be controlled using only one radio channel. In models such as jets and warbirds, which by their nature have a large number of working systems, this feature can be very important, but it can also make transmitter programming much easier with other types of model.

Select ***SERVO-MATCHING*** in the Main menu, and the following screen display appears:

The screen displays a graphic representation of the block of output sockets, the identifying letter for each output, and the function assigned to that output. Initialised outputs are marked by an ***I***; channels which have already been matched by an ***M***.
Select the channel to be matched using **buttons I and II**, then confirm your choice with the **SET button**. The following display now appears:



To ensure accurate servo matching, the output to be adjusted must first be initialised. Leave the associated transmitter stick at centre. Move the cursor to ***INIT OUTPUT*** and press the **SET button**. Now move the transmitter stick to both end-points.
The graphic display shows the movement of the upper arrow, which indicates the input signal. The bar inside the box shows the movement of the output. The three lower arrows indicate the centre and end-point positions which are 'learned' in this process.

Note: if the channel has not yet been initialised, it is not possible to select the ***START SERVOMATCHING*** and ***REVERSE SERVO*** points.

The following examples illustrate the correct procedure for the Servo-Match function:

a) Fine-tuning multiple servos to operate on a single control surface; in this case the aileron of the right-hand wing.

- Disconnect the linkages to the - as yet unmatched - servos, to avoid them being subjected to severe forces during the adjustment procedure.
- Assign multiple outputs to the appropriate socket in the ***OUTPUT MAPPING*** menu.
- In this example: ***output G*** and ***output H - DIRECT 2***. If the model features a third pair of aileron servos, ***output I*** should also be assigned to ***DIRECT 2***.
- Set up one servo (generally the inboard one – ***output G***) in mechanical terms, using the transmitter if necessary; continue adjusting until the centre point and the **maximum** end-points are exactly as required.
- Now access the Servo-Matching menu and select the servo to be matched. In our example this would be ***output H***.
- Initialise ***output H*** as described above.
- Move the cursor to ***START SERVOMATCHING*** → but do **not** press the **SET button** at this stage!
- At the transmitter, move the aileron stick to the position to be adjusted, then press the **SET button**.
- You can now release the aileron stick: the **PowerBox** maintains this position. You now have both hands free, and can adjust the position accurately with one hand, using **buttons I and II**, whilst checking the length (matching) of the disconnected ball-link at the horn with the other hand.
- Press the **SET button** again to conclude this adjustment.
- Complete the set-up procedure for the centre position and both end-points before re-connecting the servo linkage.
- If you need to carry out further adjustments to another end-point or centre position, move the aileron stick in the desired direction again, and press the **SET button** again to start the procedure.
- Repeat the procedure with all the servos connected to the same control surface.

Note: if your model is fitted with very large ailerons, 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 risk as follows: first match the servos exactly to each other, and then press buttons I or II two or three times to reduce the effect of lost motion in the servo gears to a **controlled** extent.

b) Reversing an output when servos are installed in a "mirror-image" arrangement: in this case left and right landing flaps.

- Disconnect the linkage to the left-hand landing flap, to avoid the servo being subjected to severe forces during the adjustment procedure.
- Assign multiple outputs to the appropriate socket in the ***OUTPUT MAPPING*** menu. In our example: right landing flap to ***output D*** and left landing flap to ***output E***.
- First set up the right-hand landing flap servo in mechanical terms, using the transmitter if necessary; continue adjusting until the centre point and the **maximum** end-points are exactly as required.
- Now access the Servo-Matching menu and select the servo to be matched (left landing flap ***E***).
- Move the landing flap switch to the **centre position - not one end-point!**
- Now select: ***INIT OUTPUT***
- The output is initialised by moving the switch on your transmitter to both end-points. If you have set up a delay at the transmitter, wait until the end-point has been reached.
- Use the **SET button** to select ***REVERSE SERVO***. A tick appears after the function, and the left-hand landing flap servo now operates in the correct direction.
- Move the cursor to ***START SERVOMATCHING*** and press the **SET button**.
- Use **button I or II** to adjust the centre position of the left-hand landing flap to the exact position required, then press the **SET button**.
- Move the transmitter switch to the "flaps extended" position, then press the **SET button** again.
- Now set the appropriate end-point using button I or II before concluding the procedure with the **SET button**.
- Move the transmitter switch to the "retracted" position, then press the **SET button** again.
- Now set the corresponding end-point with button I or II, and conclude the procedure by pressing the **SET button**.
- Both landing flaps will now move synchronously.

5. Channel assignment, input side

Modern SRS bus technology makes it possible to assign any channel to any function without restriction. The Input Mapping function is only required if you wish to set up the **door sequencer** manually, i.e. without recourse to the ***Setup Assistants***.

The ***INPUT MAPPING*** menu point can be used to assign a channel to the following functions:

1 x Door sequencer switch

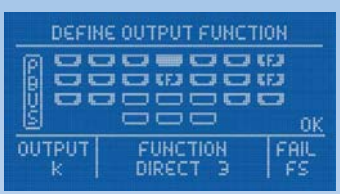
To assign a channel, use the **SET button** to select the appropriate function, then move the transmitter stick, rotary knob or switch which is to be assigned. Obviously the transmitter control concerned must already be assigned to a channel at the transmitter.

Note: Alternatively you can use **buttons I and II** to assign the channel.

s) Failsafe and Hold function

The integral Fail-Safe and Hold function makes it possible to program fail-safe or hold mode in the **Champion SRS** without recourse to the transmitter or receiver. Each output can be set up individually. Example: it would be possible to assign fail-safe to throttle if complete signal loss occurs, while all other outputs maintain the last known valid position.

It is important to be aware of this point: if you program fail-safe on one output, all other outputs which have the same input channel will also be set to fail-safe. This avoids mechanical problems if one control surface is operated by multiple servos, because these are assigned to the same input.
The example shown below shows: output ***K*** and output ***L*** are linked to ***DIRECT 3***. Output ***K*** is set to fail-safe, output ***L*** is therefore also programmed to fail-safe automatically.



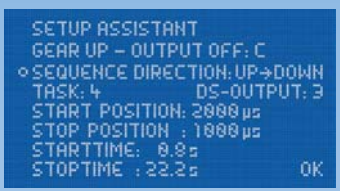
Procedure for setting up the Fail-Safe function: access the ***OUTPUT MAPPING*** menu and set the appropriate outputs to fail-safe as shown above. Now leave the ***OUTPUT MAPPING*** menu and select the ***RX/TX Settings*** menu, where you will find the ***TEACH FAILSAFE POSITIONS*** menu point.

Use the transmitter to move all the model's control surfaces, the undercarriage and the throttle to the positions which you want them to take up if a fail-safe situation should occur, then press the **SET button**: this action stores your selected positions. Check the settings by moving all the functions to any "non fail-safe position" at the transmitter - e.g. move throttle to "full-throttle" - then switch the transmitter off. All the outputs which are marked ***FS*** in the ***OUTPUT MAPPING*** menu should now move to the previously set positions, whereas all outputs not marked ***FS*** remain in the last known position.

Note: thanks to the backer's integral SRS system, and the facility to operate two receivers simultaneously, the chances of complete transmission failure are virtually zero. This claim is based on our three years of experience with existing SRS products.

7. Manual door sequencer installation

Select the ***DOORSEQUENCER*** point in the Main menu, and you will see this screen display:



The **PowerBox door sequencer** is an in-house development which offers unprecedented facilities for the programmed movement of wheel doors. Right at the outset it is important to understand that the system opens up entirely new possibilities.

For example, the sequencer does not constrain you to use pre-set modes, forcing you to adopt fixed, pre-determined vectors for retracting and extending the undercarriage.

The **PowerBox door sequencer** offers innumerable options, because the modeller has the freedom to define each step in terms of travel, sequence and timing. For example, all the wheel doors can be set to open or close at entirely different speeds. It is also possible to set up multiple forward-and-back sequences. If the full-size aircraft features a “jerk” when the legs lock, that can also be simulated. The opening and closing processes can be set up entirely individually and independently of one another.

In spite of the vast scope of these facilities, the sequencer is simple and user-friendly to set up, as the screen and menu system guide you through the procedure. The sequencer software also features supplementary programming aids. Once you understand the principle, the system can easily be programmed without recourse to the manual.

We always recommend that you start the set-up procedure using the **Setup Assistant**. This incremental set-up aid creates the tasks required, automatically detects the retract switch channel, and assigns the door sequencer outputs in the ***OUTPUT MAPPING*** menu. If you use the Assistant, but find it necessary or desirable to alter the settings subsequently - perhaps to fine-tune the timing - then this can be carried out using the menu points outlined below. To help you arrive quickly at a satisfactory result, the following section lists the door sequencer functions in detail:

The primary component of the procedure is the ***TASK***, which is self-explanatory: a **task** refers to the movement of a servo from its starting point to its stop point with a defined start and stop time. Twelve tasks are available for the retraction process, and a further twelve for extension. In total 24 different movement sequences can be programmed.

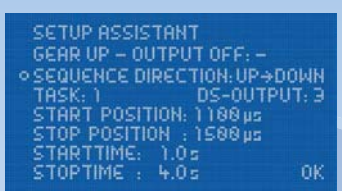
A **Task** contains the following information:

Value	Range
Task number	1 - 12
Extend or retract undercarriage	***UP » DOWN / DOWN » UP***
Servo number	1 - 6
Servo START position	700µs - 2300µs
Servo STOP position	700µs - 2300µs
Start time	0 - 25.0s
Stop time	0 - 25.0s

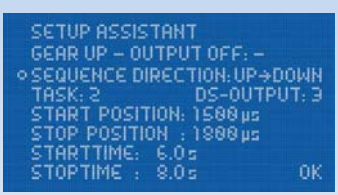
Intelligent programming aid:

If you wish to set up multiple tasks in order to move the wheel doors to several positions, it should be obvious that the new task's initial positional value and start time are determined by the previous position and time for the servo concerned. This is carried out automatically, helping to speed up the programming procedure, and eliminates the need for you to note down the servo's previous position and stop time.
A similar situation applies when you set the retract process ***DOWN » UP***. When you set up the extend process ***UP » DOWN***, the positional values for Start and Stop for that servo are already entered as Stop and Start.

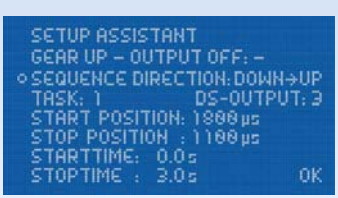
The following example demonstrates how one wheel door opens half-way when the transmitter switch is operated, pauses for a while, then runs to its end-point. When the switch is reversed, the door returns to its original position in a single movement lasting three seconds.



UP » DOWN means undercarriage extension. Output 3 of the door sequencer has been selected. The servo runs from its initial value of 1100 µs (right servo end-point) to the stop value of 1500 µs (servo centre).
The servo only starts moving 1.0 seconds after the switch is operated, and the period is 3.0 seconds (4.0 s – 1.0 s).
Task 1 has now completed its course.



After a pause lasting 2.0 seconds at servo centre, the servo starts moving in the direction of 1800 µs (left servo end-point). The movement period is 2.0 seconds (8.0 s – 6.0 s).
Task 2 has completed its course.

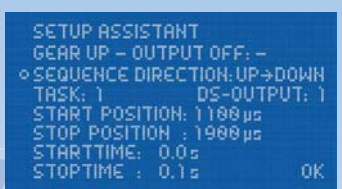


DOWN » UP means undercarriage retraction. In this example, when the switch is operated, the servo immediately starts running slowly from the left to the right servo end-point (Start time 0.0 s).

The positional values vary according to your linkages, and must be adjusted to suit your individual model. Clearly it is important to avoid your wheel doors jamming (striking their mechanical end-stops). The timing values shown here should also be set to suit your requirements. The task numbering does not need to coincide with the timed sequence; for example, ***Task 5*** could be set to run before ***Task 2***.

Our example clearly shows how the function is built up. Additional movements or intermediate stops when the doors open or close can be added at any time; all you need is to set up a new free task. Viewed overall, there is now no reason at all why the retraction and extension of the undercarriage in the model should not exactly emulate that of the full-size aircraft. In other words: you can give free rein to your imagination.

Note: if you wish simply to switch servos or valves on or off, you must always enter a time difference in the sequence, as the door sequencer needs a small amount of time to carry out its calculations. The following is an example for a retract valve:



The time lag of 0.1 s is sufficient, and is virtually unnoticeable in practice.

Important: the first ***START POSITION*** at ***UP » DOWN*** must always coincide exactly with the last ***STOP POSITION*** of ***DOWN » UP***. This simply means that the last task must cause the servo to return to its starting value, regardless of any individual intermediate steps you create! If the wheel door servos carry out unusual or unexpected movements when you try out the programmed sequence, please check your tasks!

8. Channel lock when undercarriage is retracted

The **PowerBox Champion**'s **door sequencer** also features one last unique function: it is now possible to switch a channel off when the undercarriage is retracted. The purpose of this feature is to prevent the retracted nosewheel moving inside the fuselage when the pilot gives a rudder command, as this may cause the mechanical system to jam. The function can be found under ***GEAR UP - OUTPUT OFF*** in the Door Sequencer menu. Simply use the **SensorSwitch** to select the output which you wish to disable when the undercarriage is retracted. Select the output, and confirm your choice with the **SET button**; at the same time the system stores the position of the nosewheel servo at which it is to remain.

9. PowerBUS

PowerBUS consists of three wires which supply current and signal to the servos connected to the unit. At first glance this is nothing unusual, but the big difference lies in the signal wire. When conventional servo signals are transferred, the signal wire always carries the information for one individual servo only - this is a PWM (Pulse Width Modulated) signal. In a servo bus system the positional information for multiple servos is transferred in digital form. The information for individual servos carries address data, and since each servo is assigned its own individual address, it can read out “its” information from the data stream, and convert it into a movement of the control surface.
The advantage is perfectly obvious: all you need is one three-core lead in order to supply the essential information to several servos. The wiring is much simpler, and there is also a significant weight reduction.
However, until now there has always been one drawback: if a short-circuit occurs in one servo, this blocks the bus lead, and all the servos connected to it stop working. Here at **PowerBox Systems** we have now completely eliminated this former disadvantage:
The servo distributors which we have developed are protected against short-circuits in the power supply wires and the signal wire! This means that if one output is shorted out at a servo distributor, that output is switched off within a few micro-seconds, and the bus lead remains active.
This supplementary feature is very important to flight safety, since a servo bus without it is not suitable for use in valuable model aircraft!
Another important point relating to servo bus systems must be taken into account: the more servos connected to the servo bus, the higher the current that flows, and the more severe the demands on the wiring system. The **PowerBUS system** is Plug-n-Play: our range of products includes special leads of different lengths, fitted with connectors encapsulated using the HotMelt process.
The **PowerBUS** system does not necessarily require bus-enabled servos. If you wish to use conventional PWM servos with the **PowerBUS**, you can use a **PowerBUS** distributor which converts the digital bus signal into PWM signals.

Three different types of distributor are available:

- **Order No. 9200 - PowerBUS one-2-four PWM**
  Four-way distributor, integral BUS / PWM converter
- **Order No. 9210 - PowerBUS one-2-four BUS**
  Four-way distributor for bus-enabled servos
- **Order No. 9220 - PowerBUS one-2-two**
  Splitter, for expanding one PowerBus lead into two
- **Order No. 9126/30, 60, 90, 120, 200 - PowerBUS cable**
  three-core connection lead, different lenghts, further lenghts available on request

10. Telemetry

The **Champion SRS** makes battery data available as telemetry information which can be exploited by various makes of radio control system. The unit supports the following makes of equipment, and other systems will gradually be introduced as updates become available:

- **Multiplex MSB**
  Connect the backer's TELE output to the receiver's Sensor input using a standard commercial Uni patch-lead. The voltage and residual capacity of both batteries are now available at the transmitter.

- **Spektrum**
  Connect the four-pin Spektrum Telemetry output to the TM1000, and at the same time bind the TM1000 and the connected satellites to the transmitter. Activate the **PowerBox** Telemetry display at your transmitter. The voltage and residual capacity of both batteries are now available at the transmitter.

  The matching X-Bus lead for this can be obtained in various lengths from Horizon Hobby:

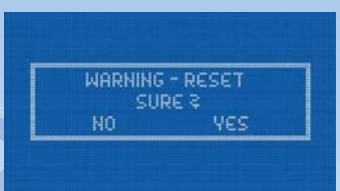
  SPMA9579 X-Bus extension 150 mm
  SPMA9580 X-Bus extension 300 mm
  SPMA9581 X-Bus extension 600 mm

- **HoTT**
  Connect the backer's ***TELE*** output to the receiver's Sensor input using a standard commercial Uni patch-lead. Select the "Electric Air Module" in your transmitter's Telemetry menu. The voltage of both batteries, and the residual capacity of the weaker battery, can now be viewed on the transmitter's screen.

11. Reset, Update, Save and Restore

The **Champion SRS** offers numerous facilities for resetting individual ranges without affecting other settings. For example, it is possible to reset **Output Mapping** without affecting the **Doorsequencer's** settings.
All the Reset options can be found in the ***RESET/UPDATE*** menu:

In the interests of safety, the software generates a confirmation query when you select one of the Reset options; the intention is to avoid accidental erasure of data. If you confirm this query, the settings are permanently erased, and cannot be restored.



The lowest line in the menu **- *PC-CONTROL* -** has several functions: selecting this point enables you to update the software in conjunction with the **PowerBox Terminal** PC program, save the backer's internal settings on a PC, or restore saved settings from a PC.

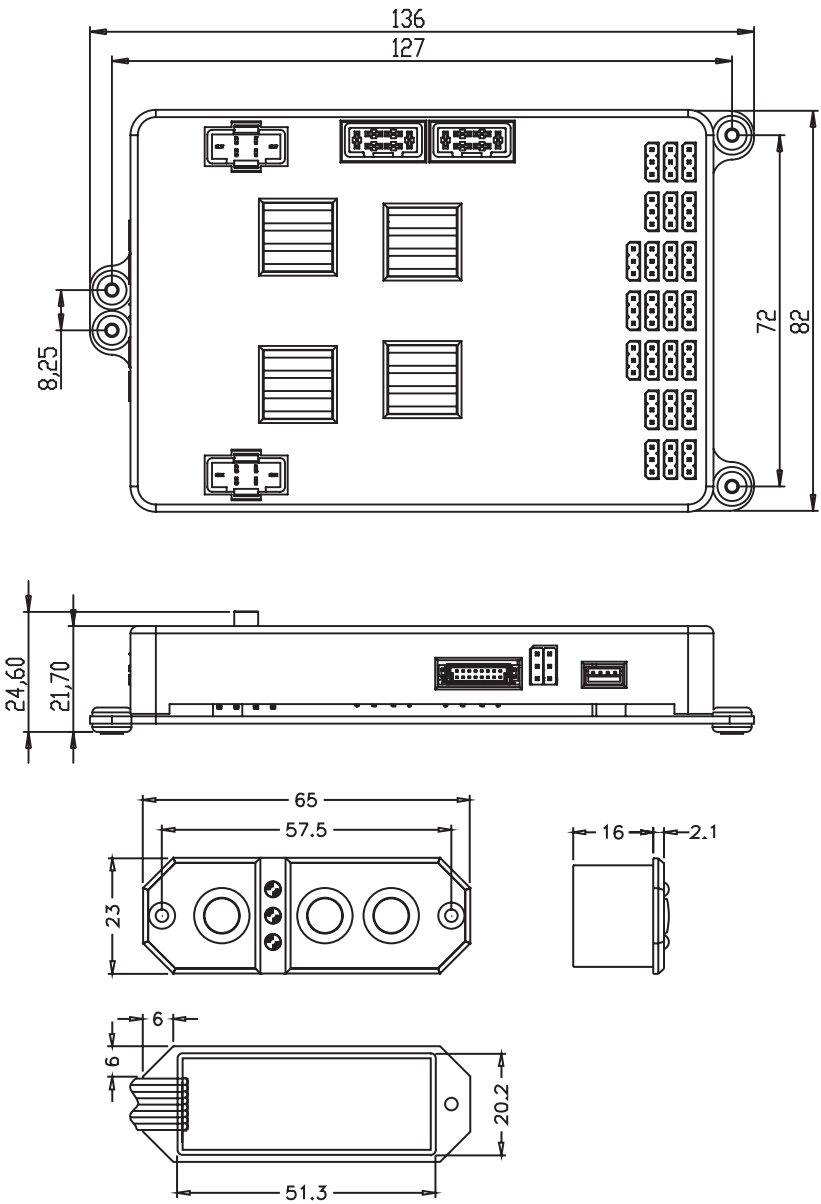
These options require the installation of **PowerBox Terminal** on your home computer. The PC program is available as a free download from our website, together with installation instructions.

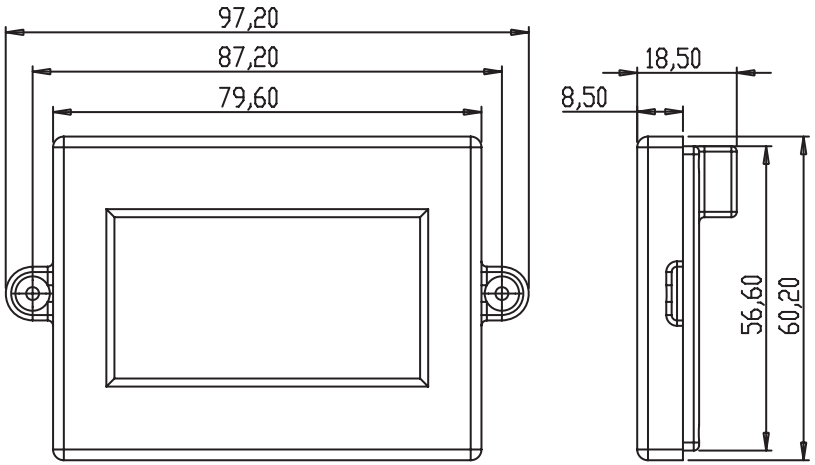
Start the **PowerBox Terminal** program, and look for ***UPDATE*** and ***SAVE/RESTORE*** in the top row of tabs. Make your selection, connect the **PowerBox USB Interface** to the ***DATA*** socket on the **Champion SRS** and select the ***PC- CONTROL*** point in the menu.
From this point on simply follow the instructions on the screen.

12. Specification

Operating voltage:	4.0 V - 9.0 V
Power supply:	2 x 5S NiMH / NiCd, 2S LiPo, 2S LiFePo
Current drain:	When operating: approx. 185 mA
Idle current:	approx. 30 µA
Output voltage:	5.9 V and / or 7.4 V stabilised
Current load:	Peak 4 x 20 A
Dropout voltage:	0.3 V
Servo signal resolution:	0.5 µs
Variable frame-rate:	9ms, 12ms, 15ms, 18ms, 21ms
Screen:	LCD, 128 x 64 pixels, graphic
Servo sockets:	24 sockets
Channels:	max. 18
Telemetry:	Spektrum, HoTT, M-Link, others to follow
Dimensions:	136 x 83 x 20 mm
Weight incl. screen and switch:	250 g
Temperature range:	-30°C to +75°C
EMV approval:	EN 55014-1:2006
CE approval:	2004/108/EG

13. Dimensions





14. Set contents

- **PowerBox Champion SRS**
- **LCD screen**
- **SensorSwitch**
- 2 three-core patch-leads, 180 mm
- 4 retaining screws
- 4 rubber grommets / brass spacer sleeves, fitted
- Operating instructions in German and English

15. 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 it gives you the opportunity to obtain help quickly all round the clock - even at weekends. All the answers are provided by the **PowerBox Team**, guaranteeing 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

16. 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 grant a **36 month** guarantee on our **PowerBox Champion SRS** 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, and short-circuits. The same applies to defects due to severe wear.

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

Service Address:

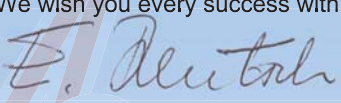
PowerBox-Systems GmbH
Ludwig-Auer-Straße 5
D-86609 Donauwörth
Germany

17. Liability exclusion

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

For this reason we deny liability for loss, damage or costs which arise due to the use or operation of the **PowerBox Champion SRS**, 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.

We wish you every success with your new **Champion SRS!**



Donauwörth, Mai 2013

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