



# PowerBox Systems®

World Leaders in RC  
Power Supply Systems



# MERCURY SRS

**Dear customer,**

We are delighted that you have decided to purchase the **PowerBox Mercury SRS** power supply from our range.

We hope you have many hours of pleasure and great success with your **PowerBox Mercury SRS**.

## **Product description**

The **PowerBox Mercury SRS** is a new power management system which combines all the experience and findings we have gained over the last few years, together with customer requests, in a single compact unit. Never before has so much functionality been crammed into such a small space! The **Mercury SRS** is ideal for any application requiring an airborne system which provides an uncompromising level of high performance. Integral **iGyro**, dual battery, dual receiving system, telemetry, door sequencer and servo matching are just a few of the highlights which this small, lightweight device provides.

## **Introduction**

These instructions explain how to install the **Mercury SRS** in the model and set it up with the help of the Assistants. Working through the individual steps in the Assistants completes most of the programming for the model; all that remains is to set up the auxiliary functions and fine-tune the servos using the servo-match function. Naturally it is also possible to set up all the functions of the **Mercury SRS** manually, i.e. without using the Setup Assistant. All the menu points are explained individually in the latter part of these instructions.

## **1. USING THE UNIT FOR THE FIRST TIME**

Any pilot who has experience using a **PowerBox** will immediately feel 'at home' with the method of operating the **Mercury SRS**. The device is operated in the usual way with the help of a menu system displayed on the OLED screen, and the ON / OFF switch.

## 1.1. Installing the Mercury SRS in the model

The **Mercury SRS** must be screwed to a hard surface in the model, otherwise it is possible that the integral **iGyro** will not work properly. If the mounting plate is large, it must be stiffened by the addition of cross-struts. Please note that the **Mercury SRS** must always be installed in the model at right-angles to the fuselage centreline. The actual orientation of the **Mercury SRS** is unimportant: it can be installed in any location which is at 90° to the direction of flight. The actual installed position is automatically detected later when the Assistant is invoked.

The switch is mounted on the fuselage side. As is usual, the inside of the switch opening should be stiffened by adding a hardwood doubler to prevent serious vibration from reaching the switch; this is particularly important if the fuselage is made of GRP. In the case of scale models it is often undesirable to have an exposed switch on the outside, and for such applications we offer the **MagSensor** or the **Magic Jeti Switch** (only Jeti TX) as alternative methods of switching. Please note, however: the **SensorSwitch** is essential for programming the unit, and should always be accessible.

The OLED screen can be installed in any location where it is clearly visible. If the standard cable (50 cm) is not long enough, we can supply extension leads.

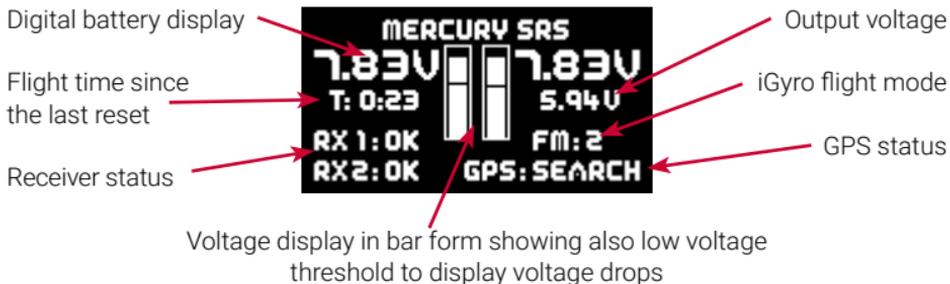
## 1.2. Connections

The first step in operating the **PowerBox** is to connect two batteries to it; the two packs should be of the same type and capacity. Connect the switch, the screen, both receivers (Spektrum system: four satellites) and the optional **GPS II** sensor using the patch-leads supplied in the set. The batteries can be either 2S LiPo, 2S LiIon, 2S LiFePo or 5S NiMH types. We recommend the use of **PowerPaks**, which include integral electronic charge circuitry. If you intend to make up your own battery packs, please note that correct polarity is vital, as the unit does not include reverse polarity protection in order to avoid power losses.

**Connecting a battery with reversed polarity - no matter how briefly - will instantly destroy the voltage regulators in the PowerBox.**

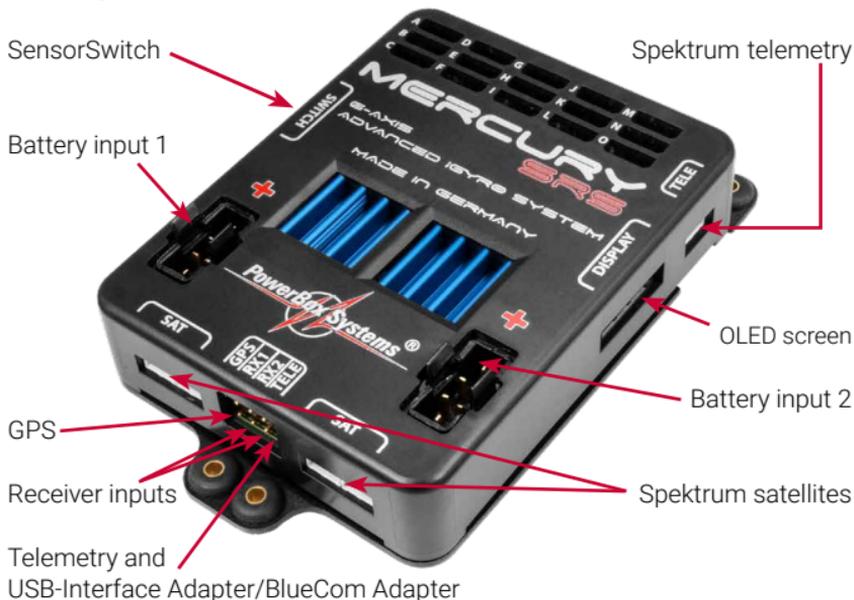
### 1.3. Switching on

This is the procedure for switching the **PowerBox** on: hold the SET button pressed in, and wait until the orange LED on the switch lights up. Continue to hold the SET button pressed in while you briefly press buttons I and II; this completes the switching process. The OLED screen now displays the following:



## 2. CONNECTIONS, CONTROLS

The following illustration shows the essential sockets and controls:



### 3. MENU

Hold the SET button pressed in for two or three seconds to enter the menu system; you can now move the cursor using buttons I and II. Hold the SET button pressed in once you have selected a particular menu point; you can then adjust values and settings using buttons I and II.



### 4. BASIC SETTINGS

#### 4.1. Selecting the radio control system

The **Mercury SRS** must be informed which radio control system you wish to use, as the bus systems of the various manufacturers differ very widely. You only need to enter this information once.

The unit's integral **SRS** system selects one receiver when switched on, and automatically switches over to the second receiver if the signal is lost. Regardless of the type of radio control system employed, the change-over process takes just a few milliseconds, and is not noticeable to the pilot. The **Mercury SRS** can also be operated with a single receiver.

Select the **GENERAL SETTINGS** point at the main menu, then press the SET button; the following screen display appears:



At this point please select the radio control system you wish to use. With most receivers it is necessary to activate the Bus output, and / or set the correct operating mode. Bear in mind the following points:

## - PowerBox P<sup>2</sup>BUS

Connect a receiver to the **P<sup>2</sup>BUS** output on RX1 and RX2.

## - Futaba FASST and FASSTEST

The **Mercury SRS** works with the **S-BUS** signal. Many receivers require one output to be re-assigned to **S-BUS**:

- R7003SB: no adjustment necessary; signal present at "PORT 1".
- R7008SB: output 8 must be set to S-BUS, Mode B or Mode D.
- R6303SB: no adjustment necessary; direct S-BUS output fitted
- R6308SB(T): output 8 must be set to S-BUS, Mode B or Mode D.

Other receivers with an S-BUS output can also be used; please refer to the set-up notes included in the instructions supplied with the receiver.

**Telemetry:** if you wish to use telemetry, you will need the **PowerBox Teleconverter**, which is available as an optional extra. This is used to connect the **TELE** output on the **PowerBox** to the **S-BUS 2** input of your receiver.

## - Spektrum DSM2 and DSMX

If you have a Spektrum system you simply plug in three or four satellites, and all 18 channels are available - without the need for an X-Plus module.

**Telemetry:** if you wish your transmitter to receive telemetry data, you will need the Spektrum TM1000. Connect the three-pin **TELE** output of the **PowerBox** to the **DATA** input of the TM1000. Connect the four-pin **TELE** output of the **PowerBox** to the **X-BUS** input of the TM1000.

## - Jeti

With a Jeti system it is only necessary to set one **SAT** or **EXT** output (depending on the particular receiver) to **UDI 16**. The remaining adjustments are carried out using the transmitter's device manager: Serial output: UDI

### Primary settings:

- Signal speed: 10 ms
- PPM settings: Direct
- Failsafe: Inactive (if two receivers are in use; otherwise any setting)

**Telemetry:** if you wish your transmitter to receive telemetry data, connect the **TELE** output of the **PowerBox** to the **EXT** input of your satellite.

### - Graupner HoTT

When a HoTT system is used, the receivers should first be bound; adjustments can then be carried out in the Telemetry menu. All receivers require the **CH-OUT-TYPE** to be set to **SUMD-OF-16**.

- SUMD-OF-16 is present at Output 8.
- GR32: SUMD-OF-16 is present at Output S.

**Telemetry:** if you wish your transmitter to receive telemetry data, connect the **TELE** output of the **PowerBox** to the **T** input of your receiver.

### - Multiplex M-LINK

If you are using a Multiplex system, the **B/D** output at the receiver must be set to Serial Servo **Data SRXL**. This can be accomplished using the USB lead and the MPX Launcher PC program. If you connect two receivers, the following settings must also be entered: max. hold duration: 0.2 s and max. Failsafe duration: 0.0 s.

**Telemetry:** if you wish your transmitter to receive telemetry data, connect the **TELE** output of the **PowerBox** to the **SENSOR** input of your receiver.

### - JR DMSS

For a JR DMSS system you need receivers with an **X-BUS** output, e.g. **RG731BX**. The receiver or receivers are first bound, then set to **MODE A** at the transmitter. The **X-BUS** output now generates sixteen channels, which are accessible from the **iGyro SRS**.

**Telemetry:** if you wish your transmitter to receive telemetry data, connect the **TELE** output of the **PowerBox** to the **SENSE** input of your receiver.

## 4.2. Framerate

At this point you can set the servo frame rate (signal repeat rate). If you are using modern digital servos, you can set a frame rate of 12 - 15 ms, whereas older analogue servos may only work properly with a setting of 21 ms. If the frame rate is too low, you will notice that the servos jitter, or have no holding power at the centre position.

### 4.3. Battery type

The battery type you wish to use is also determined in the **GENERAL SETTINGS** menu. This setting is important, otherwise the battery display will not be correct.

### 4.4. Output voltage

This is where you set your preferred output voltage: the available options are a regulated output voltage of either **5.9V** or **7.4V**. If you intend to use the **7.4V** option, please ensure that all servos, switches and valves connected to the system are HV types, as the voltage is the same at all outputs.

## 5. SETUP ASSISTANT

Once the basic settings are complete, you can move on immediately to the **Setup Assistant**, which can be found on the second page of the main menu.

Start the **Setup Assistant** and follow the instructions on the screen. When you have concluded the settings on each screen display, press the SET button twice to move on to the next step. A single press of the SET button allows you to select **BACK** and return to the previous screen.

### 5.1. Installed position

You will find the following screen displays in the **SETUP ASSISTANT** and also in the **GENERAL SETTINGS** menu under **SET ORIENTATION**:



1. At the first screen you are requested to raise or lower the model's tail. You can immediately determine whether the correct axis is selected by observing the elevator's response. If the elevator does not deflect, briefly jerk the model's tail up or down once. The PowerBox detects this movement, causing the sensor to switch to the

correct axis. Hold the model's tail at a slight angle, so that the bar deflects fully to the right, and wait until the elevator jumps back to the neutral position. The screen now switches automatically to the next display.

2. At this point you are requested to swing the model's tail to left or right: the rudder should immediately deflect in response to this movement. Here again: if the rudder does not respond, briefly jerk the model's tail once to left or right, so that the sensor switches to the correct axis.

Now hold the model's tail far enough to left or right to cause the bar to move to full deflection, and wait until the rudder jumps back to the neutral position. This concludes the procedure, and the following screen display appears:



You can install the **Mercury SRS** in any position, provided that the case is at right-angles (90°) to the fuselage centreline.

## 5.2. Model type

The next step is to select the model type which is the closest match to your aircraft. The main effect of your choice at this point is the assignment of the outputs. Take a look at the table below and decide which output assignment suits your model best:



**Note:** it is also possible to change the output assignment at any time.

## Explanation of terms:

DS 1 – 5: Door sequencer

VT: Vector thrust: thrust vector control

The two model types **Normal+VT** and **Delta+VT** include a special feature as standard: in both cases the **VT-RUDDER** and **VT-ELEVATOR** outputs are switched off in flight modes 1 and 2. This allows you to control a jet with thrust vector control using only three channels, without having to set up mixers at the transmitter. You only need to set up aileron, elevator and rudder at the transmitter; thrust vector control is then switched on in flight mode 3.

All outputs which are not assigned by the Assistant are marked “-”, indicating that they are free for use with other functions.

Normal				
<input type="checkbox"/> -/DS5 O	<input type="checkbox"/> -/DS4 L	<input type="checkbox"/> -/DS3 I	<input type="checkbox"/> -/DS2 F	<input type="checkbox"/> -/DS1 C
<input type="checkbox"/> - N	<input type="checkbox"/> Flap K	<input type="checkbox"/> Rudder B H	<input type="checkbox"/> Flap E	<input type="checkbox"/> Throttle B
<input type="checkbox"/> Aileron B M	<input type="checkbox"/> Elevator B J	<input type="checkbox"/> Rudder A G	<input type="checkbox"/> Elevator A D	<input type="checkbox"/> Aileron A A
V-Tail				
<input type="checkbox"/> -/DS5 O	<input type="checkbox"/> -/DS4 L	<input type="checkbox"/> -/DS3 I	<input type="checkbox"/> -/DS2 F	<input type="checkbox"/> -/DS1 C
<input type="checkbox"/> - N	<input type="checkbox"/> Flap K	<input type="checkbox"/> Rudder B H	<input type="checkbox"/> Flap E	<input type="checkbox"/> Throttle B
<input type="checkbox"/> Aileron B M	<input type="checkbox"/> - J	<input type="checkbox"/> V-Tail left G	<input type="checkbox"/> V-Tail right D	<input type="checkbox"/> Aileron A A
Delta				
<input type="checkbox"/> -/DS5 O	<input type="checkbox"/> -/DS4 L	<input type="checkbox"/> -/DS3 I	<input type="checkbox"/> -/DS2 F	<input type="checkbox"/> -/DS1 C
<input type="checkbox"/> - N	<input type="checkbox"/> Flap K	<input type="checkbox"/> Rudder B H	<input type="checkbox"/> Flap E	<input type="checkbox"/> Throttle B
<input type="checkbox"/> - M	<input type="checkbox"/> - J	<input type="checkbox"/> Rudder A G	<input type="checkbox"/> Delta left D	<input type="checkbox"/> Delta right A
Normal VT				
<input type="checkbox"/> VT - Rudder O	<input type="checkbox"/> VT-Elevator L	<input type="checkbox"/> -/DS3 I	<input type="checkbox"/> -/DS2 F	<input type="checkbox"/> -/DS1 C
<input type="checkbox"/> - N	<input type="checkbox"/> Flap K	<input type="checkbox"/> - H	<input type="checkbox"/> Flap E	<input type="checkbox"/> Throttle B
<input type="checkbox"/> Aileron B M	<input type="checkbox"/> Elevator A J	<input type="checkbox"/> Rudder A G	<input type="checkbox"/> Elevator A D	<input type="checkbox"/> Aileron A A

Delta VT				
VT - Rudder O	VT-Elevator L	- / DS3 I	- / DS2 F	- / DS1 C
- N	Flap K	- H	Flap E	Throttle B
- M	- J	Rudder A G	Delta left D	Delta right A

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Acro				
Throttle O	- / DS4 L	- / DS3 I	- / DS2 F	- / DS1 C
Aileron B N	Flap K	Rudder A H	Flap E	Aileron A B
Aileron B M	Elevator B J	Rudder A G	Elevator A D	Aileron A A

**Note:** for model types with **VT** (Vector Thrust) it is only possible to engage vector control in Flight Mode 3. If you subsequently decide that the model needs more complex mixers, select a model without VT (**Normal** or **Delta**) and make use of the vector function at the transmitter.

### 5.3. Flight mode switch

Assign a three-position switch of your choice at the transmitter, and check that the travel is set to -100% to 0% to +100%. At a later point this switch will be used to call up the gyro functions you have already set. Move the switch once to all three positions in turn, and the channel will automatically be detected. If the flight modes are not in the arrangement (direction) you prefer, simply reverse that channel at the transmitter.



### 5.4. Gain channel

The gain channel is only required for the test-flight, during which the gyro gain is adjusted to suit your model perfectly while it is in the air. Once the set-up flight is complete, this function is disabled automatically. Assign a rotary knob or slider to a vacant channel at the transmitter, and check that its travel is set to -100% to +100%. Move the rotary knob or slider to both end-points in turn, and the channel will be detected automatically.



## 5.5. Flight mode configuration

The next stage is to define the gyro function required for each flight mode. This setting defines the task which the **iGyro** is to carry out in flight modes 1, 2 and 3. Note that in flight mode 1 the Assistant only permits the functions **OFF** or **RATE MODE**.

Important point concerning the Flight Mode settings which are pre-defined in the Assistant: these can be altered at any time in the **Gyro Settings** menu. For example, if you have defined one flight mode as Rate Mode, and you wish, say, to activate Attitude Assist on the ailerons, you can do this at any time in the **Gyro Settings** menu.

As of Version V07 it is also possible to assign a Gain channel to individual axes, and fine-tune the gain of that axis in flight. You will find more information on this under **Input Mapping**.

The following options are available:

- **OFF:** The **iGyro** is disabled.

- **RATE MODE:** The **iGyro** operates in Normal mode on all control surfaces. The gyro simply compensates for gusts of wind.

- **ATT ASSIST STD:**

Since the English terms "Heading mode" and "Hold mode" are not quite applicable to the way the **iGyro** works, we have decided to adopt the name "**Attitude Assist Mode**" for its unique control characteristics. If the **Attitude Assist Standard** option is selected, the **iGyro** maintains the model's attitude, as last commanded by the pilot, around the roll and pitch axes (aileron and elevator). At the same time the rudder operates in Normal mode, so that turns can be flown in the usual manner. The **Attitude Assist Mode** only operates at the neutral position of the sticks. As soon as the pilot gives a command, the **iGyro** switches to Normal mode. The result is 100% natural handling in the air. This function is recommended for all models, and can be left active for take-off, flying and landing. The control characteristics of the **iGyro** eliminate the need to worry about stalling, which can occur with conventional gyro systems.



#### - **ATT ASSIST ALL:**

This setting is identical to the above option, except that attitude maintenance is also active on rudder. This makes it easy to fly slow rolls, as the rudder automatically maintains the correct attitude. However, this flight mode option must not be used for normal flying, as the rudder would then try to maintain heading through aileron turns, making the model reluctant to turn.

#### - **TORQUE ROLL:**

In this mode the **iGyro** is capable of maintaining a model's attitude once it is brought into the vertical position. When this option is selected, all three gyro axes are turned up to 100%, and Heading mode is active. This flight mode must not be selected unless the model's forward speed is already close to zero. The torque roll is initiated as follows: you approach the manoeuvre by slowing the model down. The model is then rotated to the vertical position, and you activate the **TORQUE ROLL** option using the flight mode switch (usually FM3); you then adjust the throttle to maintain the model's height. The other control functions should be left untouched. If you now wish to rotate the model around the roll axis, you can do that by giving an aileron command, taking care not to touch rudder and elevator at the same time. When you wish to terminate the manoeuvre, remember to disable the **TORQUE ROLL** option using the flight mode switch before opening the throttle.

#### - **VECTOR THRUST:**

This option is specially tailored to suit model jets with thrust vector control. This flight mode option has several aspects:

- All gyro outputs including vector control are set to 100% gain.
- **Attitude Assist** is disabled. This is important with a jet, because there is no pro-wash over the control surfaces.
- The control functions for the assigned vector outputs (these are established later as part of the Assistant procedure) are activated. This means that rudder and elevator mixers must not be set up at the transmitter, as the **Mercury SRS** carries out these functions. When the flight mode option is disabled again, thrust vector control is restored to the neutral position which was detected when the **PowerBox** was first switched on.
- The **Airspeed factor** is set to a value of 5; this provides more time to switch flight modes as the model approaches and leaves the hover, without a tendency for the model to oscillate due to the high gain setting.

The function is set up by accessing the appropriate flight mode using the flight mode switch, and selecting the desired function using buttons I and II on the **SensorSwitch**.

## 5.6. Teaching the aileron, elevator, rudder, landing flap and throttle functions

During the following sequence of queries the Assistant assigns the channels to the appropriate functions as they arrive from the transmitter. The left-hand column shows the detected channel; in the centre is the function; the right-hand column shows the associated output of the **Mercury SRS**. You can immediately plug in your servos and check their operation. The **Mercury** also detects whether you are using, say, one or two channels for aileron or elevator. The outputs are assigned correctly according to the model type you selected earlier.

MOVE AILERON STICK TO TEACH:		
FUNCTION	CH	OUTPUT
AILERON R	16	A+B
AILERON L	6	M+N
BACK		•OK

MOVE THROTTLE STICK TO TEACH:		
FUNCTION	CH	OUTPUT
THROTTLE	3	B
BACK		•OK

## 5.7. Direction of effect of the gyro outputs

In the next two screen displays the gyro sensitivity (gain) is automatically set to maximum. You can now check the direction of effect of the gyro very simply by moving the model, and reverse the directions if necessary. The control surface must always deflect in the direction in which that part of the model is moved.

### Examples:

- If you raise the tailplane, both elevators must deflect up.
- If you raise the right-hand wing, the right-hand aileron must deflect up.
- If you move the fin to the left, the rudder must deflect to the left.

If you need to reverse the direction of gyro effect, move the cursor to the appropriate control surface and press the SET button.

SET GYRO DIRECTION	
○ AILERON R	NORMAL
AILERON L	NORMAL
ELEVAT R	REVERSE
ELEVAT L	NORMAL
BACK	OK

SET GYRO DIRECTION	
○ RUDDER A	NORMAL
RUDDER B	NORMAL
BACK	OK

This completes the Setup Assistant procedure. In the following stage all the remaining functions, such as retract system, brakes and lighting, are assigned and adjusted where necessary using the servo-matching function.

## 6. OUTPUT MAPPING

Since the Setup Assistant does not cover all the functions, Output Mapping is employed to assign additional functions to the outputs; it is also possible to shift existing functions to other outputs.

OUT	FUNCTION	HD/FS
A	GY AILE-A	HD
B	DIRECT - 1	HD
C	DOORS.1	FS
D	GY ELEV-A	FS
E	DIRECT - 6	HD →

As can be seen in the screen-shot above, the left-hand column shows the output letter; the centre lists the assigned function or the transmitter channel; and the right-hand column is used to set each output to Hold or Failsafe if the radio link should fail.

The following set-up facilities are provided for **FUNCTION**:

### - DIRECT 1 to 18:

Depending on your radio control system, channels 1 to 18 can be output directly, as they arrive from the transmitter.

**Example:** at your transmitter the wheel brakes are assigned to channel 9, and you wish to connect the brakes to output **E**. Move the cursor to **E** and confirm your choice by pressing the SET button. Set the following at **E: DIRECT 9**. The servo connected to output **E** now follows commands from channel 9 at your transmitter 1:1 - unless, that is, you have made adjustments using the servo-matching facility.

### - GY AILERON, ELEVATOR, RUDDER:

If you select one of these functions, the output is linked internally with the **iGyro** output. Two outputs are available for each axis: **GY AILE-R**, **GY AILE-L**, **GY ELEV-R**, **GY ELEV-L**, **GY RUDD-A**, **GY RUDD-B**.

Each of these axes is individually variable for gain, direction of effect and gyro function.

### Example:

- The right-hand aileron is connected to **GY AILE-R**, the left-hand aileron to **GY AILE-L**.
- The rudder is connected to **GY RUDD-A**, the steerable nosewheel to **GY RUDD-B**.

### - **DOORS. 1 to 5:**

If you select one of these functions, the appropriate output is linked to the door sequencer. Which wheel door or valve is controlled by which door sequencer output is left entirely up to you, but we recommend using the Door Sequencer Assistant for the set-up process, as this will assign the outputs correctly.

## **HD/FS:**

### - **FS (Failsafe):**

If a complete loss of signal occurs, affecting all receivers connected to the system, this output moves to a previously determined position. If you wish one or more outputs to take up a pre-determined position if the radio link fails, select the **FS** option for that output.

At this point you should leave the **OUTPUT MAPPING** menu and select the **GENERAL SETTINGS** menu, where you will find the **TEACH FAILSAFE POSITIONS** menu point. Now use the transmitter controls to move all the control surfaces, the undercarriage and the throttle to the positions you want them to assume if a failsafe event is triggered, then press the SET button; this action stores the positions. You can test this setting simply by switching the transmitter off: the servos will immediately move to the positions you have just established.

### - **HD (Hold):**

If a complete loss of signal occurs, affecting all receivers connected to the system, this output remains in the last "good" (known) position.

## **7. SERVO MATCHING**

The Servo-Match function provides the facility for adjusting the centreposition 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:



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** and **REVERSE SERVO** points.

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

**a) Fine-tuning multiple servos connected to a single control surface; in this example: right aileron connected to output A and output B**

- Disconnect the linkages from the unmatched servos, as they may exert damaging forces during the adjustment procedure!
- First adjust the mechanical linkage of one servo (generally the inboard one, i.e. closer to the fuselage, connected to **OUTPUT A**), then - if necessary - adjust it at the transmitter, until the centre position and maximum end-points are as you require.
- Now select the channel to be fine-tuned in the servo-matching menu. In this example it is **OUTPUT B**.
- Leave the corresponding transmitter stick at the centre position.
- Now select: **INIT CHANNEL**
- Initialise the output by moving the transmitter stick to both end-points in turn.
- 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, gear-box 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 one output where servos are installed in a mirror-image arrangement; in this example right and left landing flaps, connected to OUT E and OUT K**

- Disconnect the linkage to the left-hand landing flap, to avoid the servo being subjected to severe forces during the adjustment procedure.
- The right-hand landing flap servo is connected to **OUTPUT E**; carry out the mechanical adjustment, then fine-tune it using the transmitter until the centre position and maximum end-points are correct.
- Now select the channel to be matched in the servo-matching menu. In this example it is **OUTPUT K**.
- Move the landing flap switch to the center position - not one end-point!
- Now select: **INIT OUTPUT**
- The output is initialized 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** and press the SET button.
- Use button I or II to adjust the center 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.

## 8. SETTING UP THE DOOR SEQUENCER

Select the **SEQUENCER** point at the main menu; this takes you to the following screen display:



The **SETUP ASSISTANT** helps you to adjust the gears and doors in a few minutes.

The **EXPERT MENU** provides a very powerful programming interface, with which you can program highly individual sequences, or alternatively expand the settings previously entered using the **SETUP ASSISTANT**. More on this later.

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.

The recommended programming procedure is as follows: first enter the basic settings using the **SETUP ASSISTANT**. At this point the system setup will be complete for 90% of all models. If you wish to add more wheel doors or adjust the sequence to cater for other details, this can be carried out in the **EXPERT MENU**.

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



Operate the appropriate transmitter switch, and the **PowerBox** automatically detects it as the switch which you have assigned to the retract system. The on-screen arrows should now be located in front of **UP/DOWN**. If you find that your retract switch works in the wrong "sense" (direction), correct it by reversing that output at the transmitter. Press the SET button again to proceed.

The door sequencer's method of working is determined in the following menu:



The following sequences are available:

### **Mode 1:**

#### **Extend undercarriage:**

Open wheel doors → extend undercarriage

#### **Retract undercarriage:**

Retract undercarriage → close wheel doors

### **Mode 2:**

#### **Extend undercarriage:**

Open nosewheel doors → extend nosewheel

Open main wheel doors → extend main undercarriage → close main wheel doors

### **Retract undercarriage:**

Retract nosewheel → Close nosewheel doors

Open main wheel doors → retract main undercarriage → close main wheel doors

### **Mode 3:**

#### **Extend undercarriage:**

Open nosewheel doors → extend nosewheel → close nosewheel doors

Open main wheel doors → extend main undercarriage → close main wheel doors

#### **Retract undercarriage:**

Open nosewheel doors → retract nosewheel → close nosewheel doors

Open main wheel doors → retract main undercarriage → close main wheel doors

Move the cursor to the appropriate mode, and press the SET button to confirm your choice. Select **OK** to move on to the next screen display:



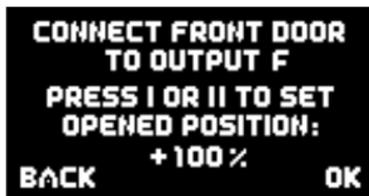
Connect your retract system valve to output **C**. One of the following will now occur, depending on the way your valve is programmed:

- 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 twice 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 servo for the first nosewheel door to output **F**. Use the SET button to close the first nosewheel door, then confirm by pressing the SET button. In the next screen display open the first nosewheel door again.

The next steps are used to set up the second nosewheel door and the two rear wheel doors. The procedure is identical to that described for the nosewheel doors.

**Note:** if you are only using one valve for all the wheel doors, you can skip the doors not required by selecting **OK**.

**Caution:** the Door Sequencer Assistant overwrites the **Output Mapping**! Depending on the number of doors in your system, outputs **C, F, I, L** and **O** will be overwritten with door sequencer functions.

All the settings are now complete, 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 9.4. If the timing (pauses, opening times and closing times) is not exactly as you wish, you can change the settings manually at any time. You will find a range of examples of settings in our **PowerBox Forum** under **FAQ**.

## 9. TEST FLY ASSISTENT

Once you have completed all the points listed above, it is time to carry out test-flights with the **iGyro**. Even though the **Mercury** version of the **iGyro** only requires one rotary knob or slider for the adjustment process, we recommend carrying out the procedure on the ground several times until you are confident that you know how to complete the process. Note that previous settings are overwritten every time you carry out this point. Just to be sure, please check the direction of effect of the gyro functions once more before you fly the model.

From the main menu select the **TEST FLY ASSISTANT** point.



The **Mercury SRS** carries out a self-calibration of the gyro sensors, and resets the maximum permitted control surface travels. In the next screen display you are requested to move all the transmitter sticks to both end-points. When you have done this, confirm by selecting **OK**.

At the next screen you must move the flight mode switch to **FM2**, and set the gain control to 0%.



As soon as you have done this, the **Mercury SRS** skips to the set-up screen display.



Launch the model and fly at half-throttle parallel with the landing strip. Increase gyro gain until the aircraft just starts to oscillate around one axis. At this point reduce gain slightly until the model shows no sign of oscillating in **any** speed range.

**Note:** if you are using the **Mercury SRS** without **GPS II**, it is vital to ensure that the gain you set does not allow the model to oscillate even at full-throttle.

Please take your time to complete this step properly! If the first level pass is too short to enable you to turn up the gain as far as you would like, simply carry out another pass. If you are not confident of doing this, ask a friend to adjust the gyro gain setting for you.

If there is no wind at all when you carry out the set-up flights, it can be helpful to give the gyro a little "work" to do: briefly move the sticks away from centre to check that the model maintains its heading accurately, without any tendency to over-correct.

The ideal test: set the model in the knife-edge attitude and adjust the rudder on its own to maintain a steady height; leave the aileron and elevator sticks alone. The model should now fly exactly straight, without any hint of oscillation.

This final test is by no means essential, but it does provide a very clear demonstration of how effectively the **iGyro** does its job!

When you are sure that gyro gain is set correctly, move the flight mode switch to select **FM1**. This causes the **iGyro** to adopt the previously selected gain setting, and also immediately adjusts your pre-defined **iGyro** flight modes. Once you have done this, you are free to activate the flight mode you wish to use.

**Example:** gain setting established during the set-up flight: 37%. These values are adopted for **flight mode 2**, while **flight mode 1** and **flight mode 3** are automatically adjusted by the Assistant based on your earlier inputs.

**FM1: GYRO OFF**

Aileron:	0%	ATT.ASSIST: off
Elevator:	0%	ATT.ASSIST: off
Rudder:	0%	ATT.ASSIST: off

**FM2: ATTITUDE ASSIST STD**

Aileron:	37%	ATT.ASSIST: on
Elevator:	37%	ATT.ASSIST: on
Rudder:	37%	ATT.ASSIST: off

### FM3: **TORQUE ROLL**

Aileron: 100% ATT.ASSIST: on  
Elevator: 100% ATT.ASSIST: on  
Rudder: 100% ATT.ASSIST: on

The model's set-up is now complete, although manual fine adjustment is still possible at any time: either by manual intervention in Gyro Settings, or by assigning a Gain channel for individual axes. The latter enables you to fine-tune individual axes accurately in the air.

## 10. ADDITIONAL FUNCTIONS AND SET-UP FACILITIES

### 10.1. Flight recorder

You can access the **RF-Flight recorder** display by briefly and simultaneously pressing buttons I and II on the **SensorSwitch**:



RF - FLIGHTRECORDER	
ANT. FADES	LOST
RX 1: 3	FRAMES:
RX 2: 8	0
RX 3:	
RX 4:	HOLDS: 0

**ANT. FADES:** this item displays the lost data packets for the individual receivers or satellites.

**LOST FRAMES:** this value shows the occasions when none of the receivers connected to the system was able to deliver a valid data packet.

**HOLDS:** this value is incremented when none of the receivers connected to the system was able to supply a valid signal for a period longer than 250 ms. In this case the servos move to the Hold or Failsafe positions set in the **PowerBox**.

### 10.2. Flight time reset

The main screen displays the elapsed flight time. You can use this timer to keep track of the power-on time, and reset it every time you recharge the batteries. The time is reset by simultaneously pressing buttons I and II on the **SensorSwitch**; hold both buttons pressed in until the screen displays the message **RESET**.

## 10.3. Gyro Settings

The **Gyro Settings** menu permits you to adjust the gyro values manually. We recommend that you set up the **iGyro** using the **Setup Assistant** and test-fly the model using the **Testfly Assistant**; in the majority of cases it is likely that no further fine-tuning will be required. However, the following section describes the individual points in case you ever need to adopt non-standard settings.



- **AXIS:** at this point you select the axis which is to be adjusted. The **Mercury SRS** offers six axes: **Aileron-R, Aileron-L, Elevator-R, Elevator-L, Rudder-A** and **Rudder-B**.
- **FM:** here you select the flight mode which you intend to alter. The flight mode is selected using the transmitter switch you have already assigned (**Input Mapping**).
- **GAIN:** this point displays the gain setting, which can be adjusted individually for each axis and each flight mode. If you find that gyro gain on one or other of the axes needs to be increased or reduced, you can simply fine-tune the value at this point using buttons I and II on the **SensorSwitch**.
- **ATT. ASSIST:** **Attitude Assist** refers to “Heading” mode or “Hold” mode, as described earlier. It is possible to switch **Attitude Assist** on or off separately for each gyro axis.
- **DIRECTION:** this item refers to the direction of effect of the gyro axis. If you are a newcomer to gyros, please note: the control surface must respond in the same direction as the part of the model which is moved. For example: if you raise the right-hand wing, the right-hand aileron must also deflect up.

**Caution:** please don't confuse this with the direction in which the transmitter controls operate! It is vital to check the direction of gyro effect very carefully every time you make any adjustments to the **iGyro**.

- **AIRSPPEED FACTOR:** after the gyro test-flight the airspeed factor defaults to a value of 3. If you subsequently discover that the model starts to oscillate at high speed, but behaves perfectly at low speed, then you need to increase the **airspeed factor**. The higher the **airspeed factor**, the lower the gyro gain as the model's airspeed increases.

## 10.4. DOORSEQUENZER

The door sequencer in the **Mercury SRS** provides completely unrestricted facilities for implementing control systems for retractable undercarriages and canopies. All sequences are controlled by means of "TASKS".



### - SETUP ASSISTANT

We recommend that you start the adjustment process using the **SETUP ASSISTANT**. This step-by-step guide to setting up the system presents the tasks in the appropriate order, automatically locates the channel for the retract switch, and assigns the door sequencer outputs in **OUTPUT MAPPING**. The **SETUP ASSISTANT** is described under Point 5.

### - EXPERT MENU

If you work through the Assistant procedure and then find that some fine-tuning is desirable - perhaps in the timing of the sequence - you can make these changes in the **EXPERT MENU**:

The **TASK** is the key to all adjustments. A **Task** can be defined as the movement of one servo from the start position to the stop position, with defined start and stop times. Twelve tasks are available for the retraction process, and a further twelve tasks for the extension process. This means that it is possible to program 24 different movement sequences.

A single **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	700 $\mu$ s – 2300 $\mu$ s
Servo STOP position	700 $\mu$ s – 2300 $\mu$ s
Start time	0 – 25.0s
Stop time	0 – 25.0s

Here is an example which demonstrates how the system works:

```
o ACTION: UP » DOWN
TASK: 1     SERVO: 3
START-POS: 1152  $\mu$ S
STOP-POS:  1830  $\mu$ S
STARTTIME:  1.0 s
STOPTIME:   4.0 s OK
```

**UP » DOWN:** all the tasks which you set up with this direction are carried out when the retract switch on the transmitter is moved to the “Extend” position.

In our example we have selected door sequencer output 3. The servo runs from the **START POSITION: 1152 $\mu$ s** (right-hand servo end-point) to the **STOP POSITION: 1830 $\mu$ s** (left-hand servo end-point).

The servo only starts moving **1.0** seconds after the switch is operated, and the transit time is **3.0**s (difference between 1.0s and 4.0s).

```
o ACTION: DOWN » UP
TASK: 1     SERVO: 3
START-POS: 1830  $\mu$ S
STOP-POS:   1152  $\mu$ S
STARTTIME:  0.0 s
STOPTIME:   3.0 s OK
```

**DOWN » UP:** all the tasks which you set up with this direction are carried out when the retract switch on the transmitter is moved to the “Retract” position.

In this example the servo immediately starts moving when the switch is operated (start time 0.0s), and moves from the left servo end-point (**1830 $\mu$ s**) to the right end-point (**1152 $\mu$ s**) within 3.0 seconds.

The positional values vary according to your linkages, and must therefore be set individually to suit the specific model. It is important to ensure that the wheel doors do not jam mechanically. The times stated in our example are also just an illustration, and need to be set to suit your preference.

The timing of the tasks does not need to coincide with the task numbering. For example: it is permissible for **Task 5** to occur before **Task 2**.

Our example clearly shows how the function is built up. Additional movements or intervals between opening or closing the wheel doors can be inserted at any time; all you have to do is set up a new free task. This freedom is intended to remove all restrictions which might otherwise prevent the model's undercarriage retracting and extending in the exact scale manner.

**Important:** the first **START POSITION** in the **UP » DOWN** sequence must always coincide with the last **STOP POSITION** in the **DOWN » UP** sequence. This means: intermediate steps can be made individually, but the final task must always take the servo back to its starting position!

**Caution:** if you notice unusual or unexpected servo movements in the sequence, you need to check your tasks!

#### - **GEAR UP – OUTPUT OFF:**

The door sequencer of the **Mercury SRS** includes a further auxiliary function which makes it possible to switch off a channel when the undercarriage is retracted. For example, the nosewheel should not deflect in parallel with the rudder when the undercarriage is in its retracted state, as this could jam the system mechanically; this function solves the problem.

At this menu point simply enter the output which you wish to switch off as soon as the undercarriage is retracted. When you confirm your choice by pressing the **SET button**, the unit stores the position of the nosewheel which it is to adopt when the wheels are raised.

**Caution:** once you have completed the set-up procedure, it is important to check all the model's control surface systems with the undercarriage both retracted and extended. For example, if you were accidentally to assign the **GEAR UP – OUTPUT OFF** function to the elevator output, then your model would surely be wrecked immediately after take-off!

## 10.5. Input Mapping

Modern **SRS** bus technology makes it possible to assign channels for particular functions without restriction. The quickest method of assigning the **Input Mapping** functions is to use the **Setup Assistant**, but it is also possible to assign them manually at this point.

Since V07 this facility also includes Gain channels for adjusting the gain of the individual gyro axes. If you wish to adjust an individual axis in flight, assign a rotary or slider control at the transmitter which can be adjusted over the range -100% to +100%. This ensures that any gain adjustment you make only affects the flight mode which is currently selected. For example, if you assign a gain control to Aileron A, and Flight Mode 2 is selected, you can adjust the gain for Aileron A in flight mode 2. You can also see this in the **Gyro Settings** menu.

As with the **iGyro 3e**, the slider's travel is divided into two ranges:

- In the range -100% to 0% Attitude Assist is active
- In the range 0% to +100% the adjustment affects Rate Mode only

The gain settings for this axis and this flight mode are saved when you disable the Gain channel again in **Input Mapping**.

CH	FUNCTION
1	AILERON A
4	AILERON B
2	ELEVAT A
3	ELEVAT B

CH	FUNCTION
10	GAIN AILE A
10	GAIN AILE B
-	GAIN ELEV A
-	GAIN ELEV B

To assign a channel, use the SET button to select the appropriate function, then move the transmitter stick, rotary knob or switch which you wish to assign.

**Note:** if more than one channel is assigned for a particular transmitter control (e.g. channels 2 and 6 for the ailerons), move the stick repeatedly away from centre and back again until the appropriate channel is selected. An alternative method is to assign the functions using buttons I and II.

## 10.6. General Settings

Most of the points in the **General Settings menu** have already been explained in Point 4. Those not previously covered are explained below:

- **SET ORIENTATION:** this is the point where the installed position of the **Mercury SRS** in the model is established. As in the **Setup Assistant**, all you have to do after selecting this menu point is raise or lower the model's tail. The on-screen bar shows when the angle of tilt is sufficient. Once the bar has filled to the right, you need to hold the model motionless; the process ends automatically once the **PowerBox** has unambiguously detected the unit's installed orientation.

- **Aircraft Type:** this point is also normally carried out as part of the **Setup Assistant** process. Carrying it out in the **General Settings** menu resets the **Output Mapping**, which then reverts to the arrangement shown in the table in section 6.

- **GYRO SENSE x4:** This option quadruples the gyro effect; this is often necessary with large, sluggish models in order to obtain the optimum stabilizing effect.

**Caution:** Select this option only if 100% gyro effect is inadequate! Selecting this option resets all gain settings to 0%!

Re-start the **Testfly Assistant**, and fly the model again to establish the optimum values.

## 10.7. Factory Reset

This option can be selected if you wish to reset the **Mercury SRS** to the factory default settings. You will see a security query whose purpose is to prevent an accidental reset.

## 10.8. PC-Control

The **PC-CONTROL** option permits the **Mercury SRS** to be connected to a PC, a tablet or a mobile telephone. In this way you can load updates into the **Mercury SRS** to ensure that it constantly reflects the latest state of development. The following methods are available:

a) Using the **BlueCom Adapter** (iOS: 9021, Android: 9022), a mobile telephone and the free **PowerBox Mobile Terminal App**. You will find the **Mobile Terminal** App in your App Store.

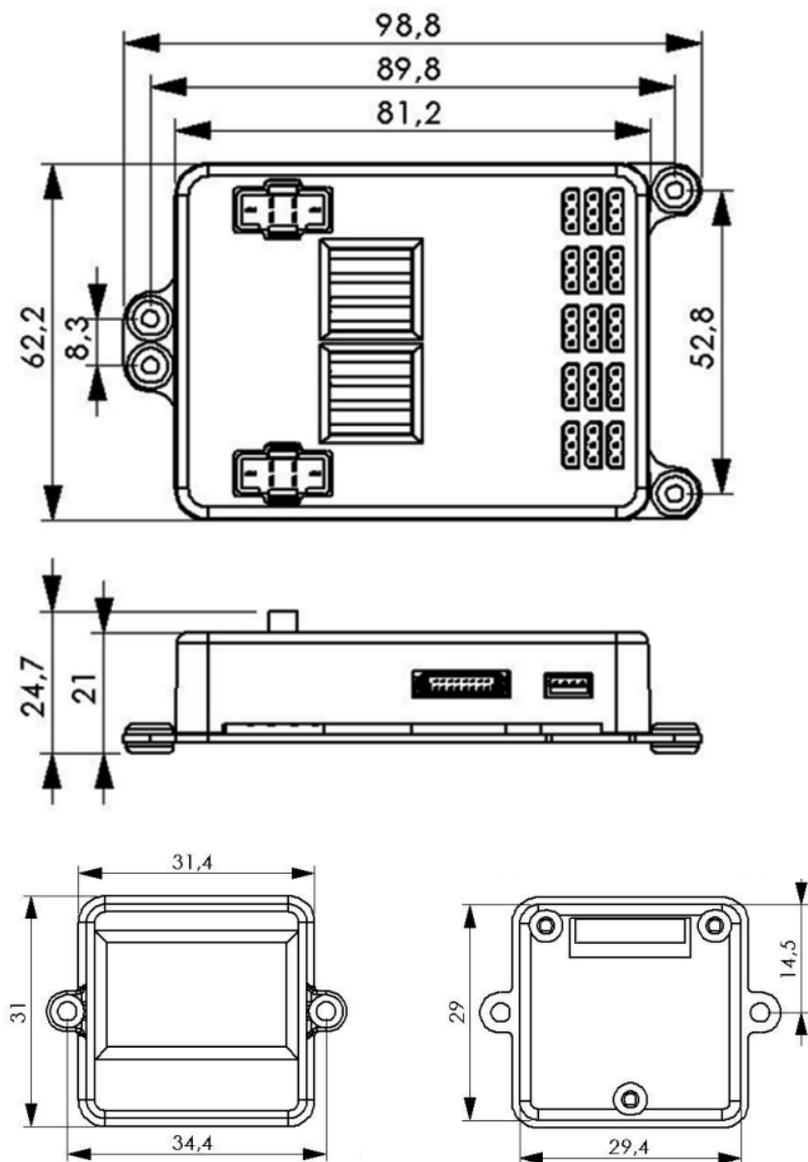
b) Using the **USB Interface Adapter** (9020), a PC and the **PowerBox Terminal** program. The **PowerBox Terminal** software is available as a free download from our website.

Connect the **BlueCom Adapter** or the **USB Interface Adapter** to the **Tele**-Input.

## 11. SPECIFICATION

Operating Voltage:	4,0V - 9,0V
Battery type:	2s LiPo/Lilon, 2s LiFePo, 5s NiMH/NiCd
Current drain (ON):	approx. 99mA
Current drain (OFF):	approx. 3 $\mu$ A
Output voltage regulated:	5,9V and/or 7,4V
Max. output current:	Peak 2 x 20A
Dropout voltage:	0,3V
Signal resolution:	0,5 $\mu$ s
Output framerate:	12ms, 15ms, 18ms, 21ms
Display:	OLED 128x64 pixels, graphic
Servo sockets:	15
Channels	max. 18
Telemetry:	PowerBox, Futaba, Jeti, Spektrum, Hott, M-Link, JR DMSS
Size:	93x67x19 mm
Weight incl. Switch and screen:	115g
Temperature range:	-30°C to +75°C
EMV approval:	EN 55014-1:2006
CE approval:	2004/108/EG

## 12. DIMENSIONS



## 13. SET CONTENTS

- **PowerBox Mercury SRS**
- OLED-Display
- **SensorSwitch**
- 3 Patchwires 3-pole, 200mm
- 8 mounting screws
- Operating instructions

Optional: **GPS Sensor**

## 14. SERVICE NOTE

We make every effort to provide a good service to our customers, and have now established a **Support Forum** which covers all queries relating to our products. This helps us considerably, as we no longer have to answer frequently asked questions again and again. At the same time it gives you the opportunity to obtain assistance all round the clock, and even at weekends. The answers come from the **PowerBox team**, which guarantees that the answers are correct.

Please use the Support Forum **before** you contact us by telephone.

You will find the forum at the following address:

**[www.forum.powerbox-systems.com](http://www.forum.powerbox-systems.com)**

## 15. 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 **24 month guarantee** on our **PowerBox Mercury 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 Donauwoerth

Germany

## 16. LIABILITY EXCLUSION

We are not in a position to ensure that you observe our instructions regarding installation of the **PowerBox Mercury 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 Mercury 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 **Mercury SRS**.



Donauwoerth, December 2020

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