PowerBox Systems ®

*World Leaders in RC
Power Supply Systems*

PowerBox
ROYAL
SRS

ROYAL SRS

8.23V		8.33V
GPS: Ok		I-BAT 4.2A
GYRO: IDLE		U-BAT₁ 5.97U
RX-STATUS		U-BAT₂ 5.98U
1834		1857

POWERBOX
INFO DISPLAY

Dear customer,

We are delighted that you have decided to purchase the **PowerBox Royal SRS** power supply from our range.
We hope you have many hours of pleasure and great success with your **PowerBox Royal 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 the triple-axis **iGyro** as well as 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 **Royal 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 and the internal **iGyro** both feature integral set-up assistants which make it possible to complete the essential set-up procedures 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 **Royal SRS** features these inputs.

The **Royal 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 **Royal SRS**, some providing telemetry output of battery-relevant data. More systems are in preparation.
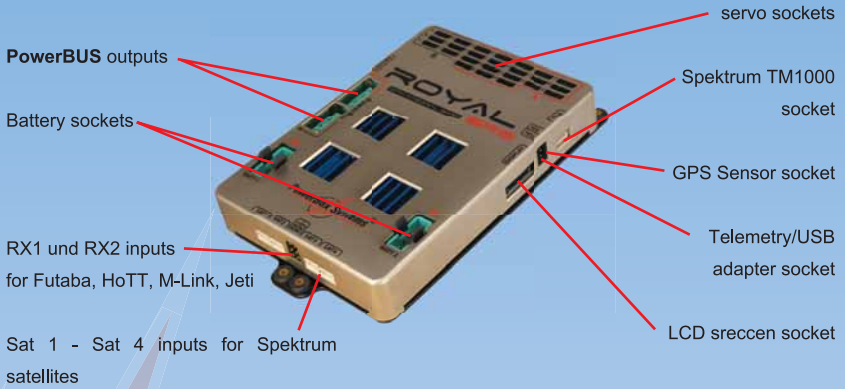
Features:

- Integral **iGyro**: triple-axis gyro system with heading function and set-up assistant
- Six independent gyro outputs for: 2 x ailerons, 2 x elevators, 2 x rudders
- GPS-regulated gyro gain
- Special regulatory algorithm for fixed-wing model aircraft
- Extremely accurate triple-axis MEMS sensor
- Integral Delta and V-tail mixer
- Door sequencer: six freely programmable outputs with set-up assistant
- **PowerBU**S: 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
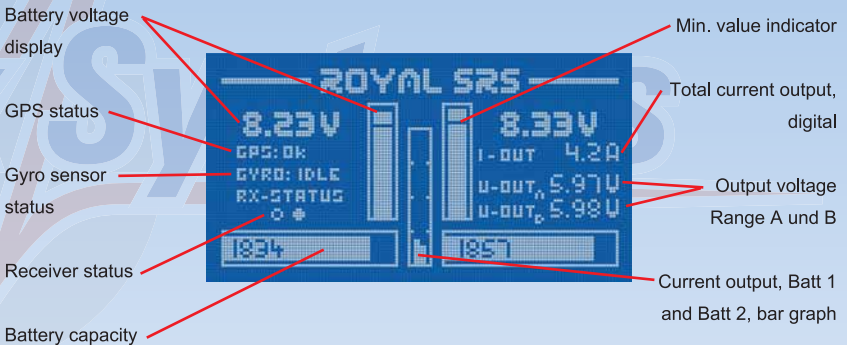- Suppression of any servo feedback currents which may occur

Contents:

1. Layout, connections

servo sockets

PowerBUS outputs

Spektrum TM1000 socket

Battery sockets

GPS Sensor socket

RX1 und RX2 inputs
for Futaba, HoTT, M-Link, Jeti

Telemetry/USB
adapter socket

Sat 1 – Sat 4 inputs for Spektrum
satellites

LCD sreccen socket

2. Main screen, data logger

Battery voltage
display

Min. value indicator

GPS status

Total current output,
digital

Gyro sensor
status

Output voltage
Range A und B

Receiver status

Current output, Batt 1
and Batt 2, bar graph

Battery capacity

Key:

- **Battery voltage indicator:** Shows the exact battery voltage for both batteries, digitally and as bar graph
- **GPS status:** If no GPS is connected here, the screen shows three lines. If switched on with GPS connected, "SEARCH" is displayed while the system searches for GPS satellites. "OK" must be displayed here before each flight.
- **Gyro sensor status:** Information display only. After a "Zero Gyro" the screen should display "IDLE" at this point; an occasional "ACT" for 'active' is normal.
- **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:

POWER - FLIGHT RECORDER		
VALUE	BATT 1	BATT 2
MIN. VOLTAGE	7.45 U	7.42 U
MAX. CURRENT	4.1 A	5.3 A
CONSUMPTION mAh	1205	1374

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.

<u>Note:</u> 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 Royal SRS** are fitted with rubber grommets as standard. The **Royal 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. Since the **Royal SRS** features an integral **iGyro**, particular care is called for here, i.e. a rigid mounting surface.

The **PowerBox Royal SRS** can be installed in any orientation - provided that the case is at right-angles to the fuselage centreline. All you need to do is enter the unit's orientation in the **iGyro** menu or the Basic Setup Assistant. There is no need for the pilot to think about axis designations such as X, Y and Z; instead the familiar terms 'aileron', 'elevator' and 'rudder' can be used. Since the integral **iGyro** incorporates angular rate sensors, the **Royal SRS** does not need to be positioned at the model's Centre of Gravity.

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 **Royal 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 **Royal 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:


```
◦TX-SYSTEM: DSMX
 BIND

FRAMERATE: 18ms
TEACH FAILSAFE POSITIONS


                         OK
```

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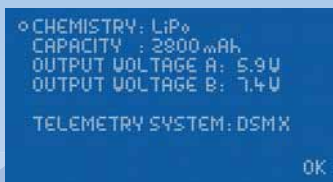
- **CHEMISTRY:**   Select one of the three battery types: LiPo, NiMH or LiFePo

- **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 **Royal SRS** is fitted with a total of <u>four</u> 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 Royal 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 Royal 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*:
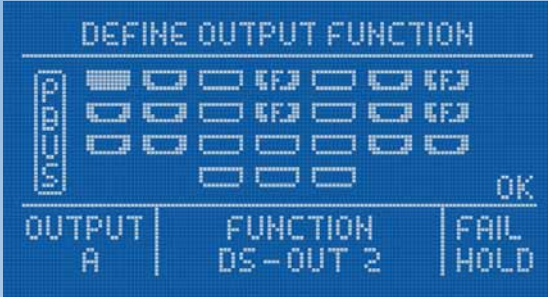
This menu displays a graphic image of the outputs. You can use the cursor to move through the outputs in order to select the one you wish to assign. Pressing the **SET button** at a selected output highlights the *FUNCTION* field, where you can select the signal to be assigned to this output. Pressing 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.

▪ GY AILERON A and B:
If you select one of these functions, this output is linked to the **iGyro** output Aileron A or B.
Example: the left aileron is connected to **GY AILERON B**, the right aileron to **GY AILERON A**.

▪ GY ELEVATOR A and B:
If you select one of these functions, this output is linked to the **iGyro** output Elevator A or B.
Example: the left elevator is connected to **GY ELEVATOR B**, the right elevator to **GY ELEVATOR A**.

▪ GY RUDDER A and B:
If you select one of these functions, this output is linked to the **iGyro** output Rudder A or B.
Example: the rudder is connected to GY **RUDDER A**, the steerable nosewheel to **GY RUDDER B**.

▪ 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 **iGyro** outputs are pre-defined in any case. 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 gyro or the door sequencer, this generally presents no problems, as the changes do not affect the gyro or door sequencer settings.

Default output assignments:
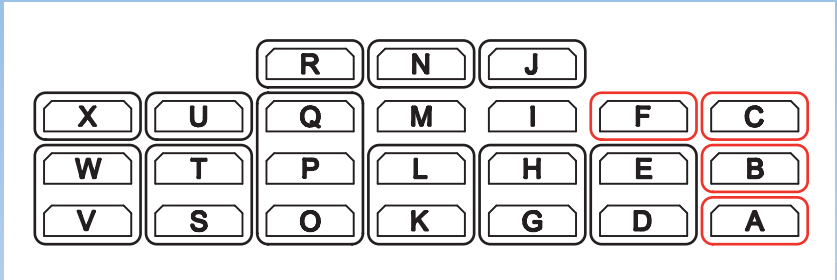
Note:

- 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	Gyro, rudder (A)
P	Gyro, rudder (A)
Q	Gyro, rudder (A)
R	Direct 11
S	Gyro, left elevator (B)
T	Gyro, left elevator (B)
U	Direct 3
V	Gyro, right aileron (B)
W	Gyro, right aileron (B)
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	Gyro, right aileron (A)
H	Gyro, right aileron (A)
I	free
J	Direct 9
K	Gyro, right elevator (A)
L	Gyro, right elevator (A)

g) Using the iGyro Assistant

With the help of the **Setup Assistant** you should be able to set up the integral **iGyro** in no more than ten minutes. Once you have completed the basic settings, only a single flight is required in order to carry out the fine-tuning.
Although the Assistant guides you through the procedure via the LCD screen, please take the time to read right through these instructions, as they contain supplementary information which is important during the set-up procedure.
You will find a detailed description of the **iGyro** under **Point 7**.

The Assistant covers 99% of all model types, but its suitability for the following types is limited:

- Models with canard surfaces
- Models with thrust vectoring

The Assistant can be used to set up the primary functions for these types of model, i.e. aileron, elevator and rudder, but the non-standard functions mentioned above have to be set up manually.

Before you carry out the fine-tuning flight we strongly recommend that you run through the *TESTFLY ASSISTANT* on the ground several times, to familiarise yourself with the sequence of operations and the way it works. It is also extremely helpful to have a fellow-modeller by your side during the set-up flight, as he will be able to follow the flow-chart, and keep track of the adjustment sequence.
The system also incorporates a safety function, should anything unforeseen occur:
Moving the flight mode switch to the FM1 position always disables all the gyro functions!

The set-up procedure is divided into two sections:

- BASICS SETUP ASSISTANT
In this section you select all the model-specific settings, e.g. the gyro's installed orientation in the model, channel assignment, direction of gyro effect.

- TESTFLY ASSISTANT
In this section you adjust the gyro's gain (sensitivity) while the model is flying. It is advisable to run through this section of the Assistant several times **before** flying the model, to ensure that you are familiar and confident with the set-up procedure. Carrying out a 'dry run' in this way does not affect the settings you selected in the *BASIC SETUP ASSISTANT*. If you still find yourself feeling uncertain whilst flying, it is also possible to land after each setting, and check the current state of the procedure on the screen.

The only preparations you have to make are these:

- Enter the radio control system you wish to use under Point **3c)**
- Assign a three-position switch and a rotary knob or slider at the transmitter

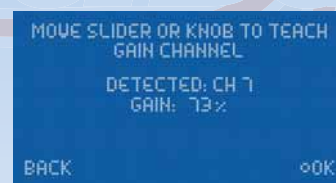Select the **BASICS SETUP ASSISTANT** menu from the **iGyro** menu:

Now follow the instructions on the screen:

SET MOUNTING ORIENTATION

FLIGHT
DIRECTION

WING ⇐ [•]

EXIT   ∘OK

SET WING OR TAIL TYPE

∘ NORMAL
DELTA WING
U – TAIL

BACK   ∘OK

At this screen display you have to define the installed orientation of the **PowerBox**. Use buttons I and II of your **SensorSwitch** to select how the unit is installed in the model. Press the **SET button** twice when you have made your choice.

At this point you need to define your model's wing or tail type. If your model is a delta or V-tail type, do not set up a delta or V-tail mixer at the transmitter; the mixing is carried out by the **iGyro** itself. Confirm your choice by pressing the **SET button** twice.

Note: if the Assistant succeeds in detecting the channel, but fails to accept the setting, increase servo travel at the transmitter to -105% to +105% for that channel. If this also fails to cure the problem, select your transmitter's Servo Monitor, and check that you are only controlling <u>one</u> channel. It is easy to overlook the fact that the switched channels (DG1 or DG2) also move - especially if you are using a Futaba system.

MOVE FLIGHT MODE SWITCH
TO TEACH CHANNEL

DETECTED: CH 9
FM2

BACK   ∘OK

MOVE SLIDER OR KNOB TO TEACH
GAIN CHANNEL

DETECTED: CH 7
GAIN: 73%

BACK   ∘OK

The next step is to define the input channels: the Assistant automatically detects the channels when you operate them at the transmitter. Move the three-position switch on your transmitter. The Assistant does not accept your chosen switch until you have selected all three flight modes. Press the **SET button** when you have made your choice.

Here again all you have to do is move the slider or rotary knob in order to inform the iGyro of the gain channel. The Assistant does not accept your choice unless it detects 0% to 100%.
Press the **SET button** when you have made your choice.

Now move your aileron stick: the Assistant automatically detects whether you are using one or two channels to control the ailerons. If you accidentally touch a different function at the transmitter, simply move the correct one subsequently. Move to your transmitter's Servo Monitor to check the setting. Press the **SET button** when you have made your choice.

Now move the elevator stick. The Assistant automatically detects whether you are using one or two channels to control the elevators. Move to your transmitter's Servo Monitor to check the setting. Press the **SET button** when you have made your choice.

Note: many model jets and warbirds utilise a large number of functions, and you can quite easily "run out of channels". However, the **Royal SRS** provides the complete remedy: use just one channel at the transmitter for each of the functions ailerons, elevator and rudder / nosewheel steering, then use the Servo Match function to set up the second control surface, and adjust the direction and end-points accurately.
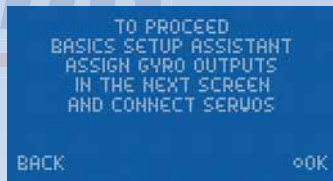
Now move the rudder stick. In this case the Assistant should only detect two channels if two gyro channels are used to control two separate rudders.
Select your transmitter's Servo Monitor to check the setting. Press the **SET button** when you have made your choice.

This message instructs you to move to the next screen display and assign the outputs.
Press the **SET button** twice when you have made your choice.

Note: if your model features a thrust vector control system or canard surfaces, the vector / canard channel must be set up manually. The channels for thrust vector control or canard control must be switched off in the Assistant, and must not be detected for *ELEVATOR* and *RUDDER*.
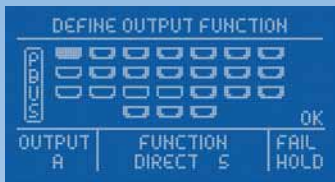
If you have not yet entered any settings at *Output Mapping*, you will see this default display. The output assignment is set as described under 3f). You now have the opportunity to adjust the outputs to suit your model, after which you should confirm your settings with *OK*.
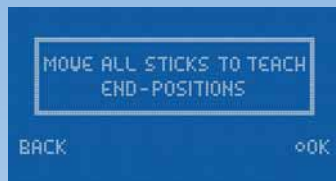
The **iGyro** now automatically activates Heading mode, as this displays the gyro's effect in the clearest fashion. At this point it is essential to check the direction of effect of the control surfaces: if the direction of effect is incorrect, move the cursor to the appropriate channel and press the **SET button** to reverse the direction. **Please take particular care, and work conscientiously here - don't rush it!**
Once all the control surfaces are set up correctly, select *OK*: the **iGyro** is now disabled again.

The basic settings are now complete, and you can fly the model using the *TESTFLY ASSISTANT*.
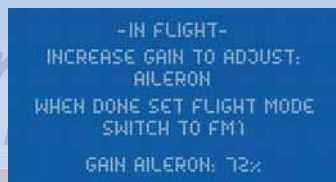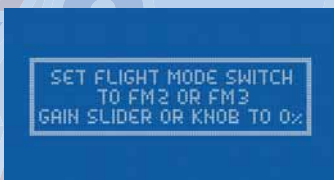
Another reminder at this point: please run through this Assistant **several** times on the ground to ensure that you are familiar with the sequence of operations. We have included small tick-boxes next to each individual step. If you have a friend to help you during the flying stage, he can tick the corresponding box when each stage is completed. If you are not absolutely sure of the status of the Assistant, there is no reason why you should not land the model, check, then fly again.

```
KEEP PLANE STILL
- GYRO IS ZEROING -
  ● ○ ○ ○ ○
```

```
MOVE ALL STICKS TO TEACH
      END-POSITIONS

BACK                    ○OK
```

In the Main menu select the *TEST-FLY ASSISTANT*.

The **iGyro** initially carries out a zero calibration process. During this period you must keep the model motionless. However, it does not need to stand exactly level!
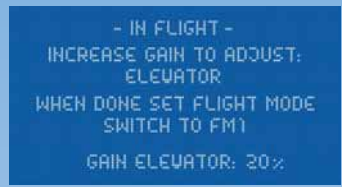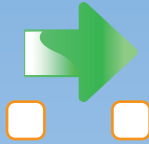
Now move all the transmitter sticks to their end-points in order to teach the **iGyro** the maximum travels. If you have set up a "Dual Rate" switch at your transmitter, ensure that it is set to maximum travels. Select *OK* when you are finished.

```
SET FLIGHT MODE SWITCH
    TO FM2 OR FM3
GAIN SLIDER OR KNOB TO 0%
```

```
       -IN FLIGHT-
INCREASE GAIN TO ADJUST:
        AILERON
WHEN DONE SET FLIGHT MODE
      SWITCH TO FM1

   GAIN AILERON: 72%
```

The **iGyro** now waits until the flight mode switch is moved to *FM2* or *FM3*, and the gain control is set to 0%, before it proceeds.

Now we can go flying!

The gyro is active, the gain adjuster is set to 0%. Fly the model "straight and level", carry out a slow pass, and turn up the gain adjuster until the model just starts to oscillate around the aileron (roll) axis. Back off (reduce) the gain adjuster slightly. If you wish, you can fly several circuits to ensure that the setting is right. When you are confident that it is correct, move the flight mode switch to FM1. This disables the gyro again, and saves the settings.

```
SET FLIGHT MODE SWITCH
      TO FM2 OR FM3
GAIN SLIDER OR KNOB TO 0%
```

```
          - IN FLIGHT -
INCREASE GAIN TO ADJUST:
        ELEVATOR
WHEN DONE SET FLIGHT MODE
     SWITCH TO FM1

    GAIN ELEVATOR: 20%
```
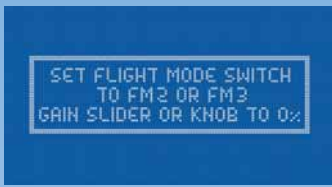
The **iGyro** now again waits until you switch back to **FM2** or **FM3**, and the gain adjuster is returned to 0%. once those requirements are met, gyro gain for elevator can be adjusted in flight.

Again fly the model straight and level, and carry out a slow pass. Advance the gain adjuster until the model just starts to oscillate around the elevator (pitch) axis, then reduce the gain setting slightly. If you wish, you can fly several circuits to check that the setting is correct. When you are confident that it is correct, move the flight mode switch to **FM1**. This action disables the gyro again, and the settings are saved.
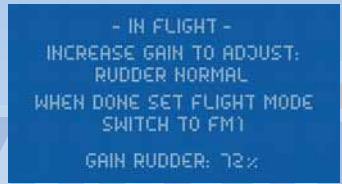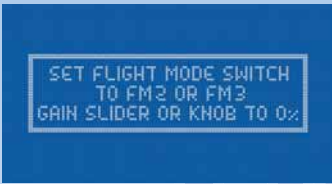

```
SET FLIGHT MODE SWITCH
      TO FM2 OR FM3
GAIN SLIDER OR KNOB TO 0%
```

```
          - IN FLIGHT -
INCREASE GAIN TO ADJUST:
      RUDDER NORMAL
WHEN DONE SET FLIGHT MODE
     SWITCH TO FM1

    GAIN RUDDER: 72%
```

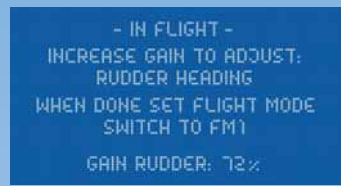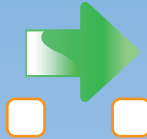The **iGyro** now waits again until you switch back to **FM2** or **FM3**, and the gain adjuster is returned to 0%. The next step - **rudder gain in Normal mode** - can be adjusted once those requirements are met.

The rudder is a special case. The Heading value for rudder has an adverse effect when the model is turning normally, because the gyro tries to maintain the former direction of flight. For this reason the Normal and Heading values for rudder gain are set up separately. Use the gain adjuster to set the gyro effect for the rudder, then move the flight mode switch to **FM1** before continuing.
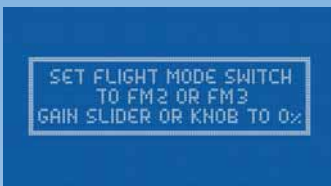
SET FLIGHT MODE SWITCH
TO FM2 OR FM3
GAIN SLIDER OR KNOB TO 0%

- IN FLIGHT -
INCREASE GAIN TO ADJUST:
RUDDER HEADING
WHEN DONE SET FLIGHT MODE
SWITCH TO FM1

GAIN RUDDER: 72%

The **iGyro** now waits again until you switch back to *FM2* or *FM3*, and the gain adjuster is returned to 0%. The next step - **rudder gain in Heading mode** can be adjusted once those requirements are met.

The procedure for setting rudder gain in Heading mode is identical to the preceding method. However, if you are not satisfied with the setting after the first pass, initiate a turn using very gentle rudder in addition to aileron, as this suppresses Heading mode for rudder. The set-up procedure can then be continued. Switch to *FM1* when you are satisfied with the setting.

GYRO SETUP COMPLETED
HAVE FUN!

○OK

The set-up procedure for the **iGyro** is now complete: the Assistant has set up flight modes *FM2* and *FM3*, and *FM2* is set as the standard flight phase. Heading mode for the rudder is disabled. Flight mode *FM3* can be switched on for specific aerobatic manoeuvres such as knife-edge flying and slow rolls.

The **iGyro Test-Fly Assistant** adopts the same gain values for Normal and Heading mode for aileron and elevator. Of course, it is still possible to alter any or all of the settings subsequently in order to fine-tune the gyro's effect. For example, you might wish to enter different settings for Normal or Heading modes, or activate the **Booster** for particular axes. You will find a detailed description of these facilities under **Point 7**.

Note: we recommend that 3D pilots should program at least one flight mode **without** Heading values: when a model is flying a 3D manoeuvre, its lack of airspeed makes it incapable of moving in all directions, and the gyro's attempts to maintain position may cause control surfaces to move to their end-points. If the model then picks up speed again, the deflections could cause the model to carry out unexpected movements.

h) 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:

```
        MOVE GEAR SWITCH
        TO TEACH CHANNEL

            >> UP
               DOWN

 EXIT                      ○OK
```
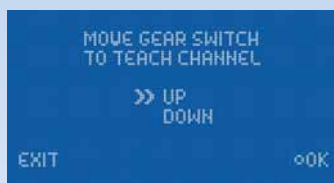
At this point the **Royal SRS** learns which switch is to be used: the unit automatically detects the appropriate channel when you operate the transmitter switch you have assigned for the retractable undercarriage. The double arrow on the screen should move from the *UP* line to the *DOWN* line. If your 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:

```
          SELECT
     MOTION SEQUENCE
         ◦MODE 1
          MODE 2
          MODE 3

BACK                    OK
```

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 RETRACT VALVE
     TO OUTPUT:  A
PRESS BUTTON  I OR II  TO SET
      DOWN POSITION

      [          ▌ ]

BACK                    ○OK
```

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

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

<u>Valve is not triggered</u>, and the undercarriage remains in the extended state.

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


```
CONNECT RETRACT VALVE
     TO OUTPUT:  A
PRESS BUTTON  I OR II  TO SET
       UP POSITION

      [ ▌         ]

BACK                    ○OK
```

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 FRONT DOOR
TO OUTPUT: F
PRESS BUTTON I OR II TO SET
OPENED POSITION

BACK   ∘OK

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**.

CONNECT RIGHT DOOR
TO OUTPUT: B
PRESS BUTTON I OR II TO SET
CLOSED POSITION

BACK   ∘OK

CONNECT RIGHT DOOR
TO OUTPUT: B
PRESS BUTTON I OR II TO SET
OPENED POSITION

BACK   ∘OK

CONNECT LEFT DOOR
TO OUTPUT: C
PRESS BUTTON I OR II TO SET
CLOSED POSITION

BACK   ∘OK

CONNECT LEFT DOOR
TO OUTPUT: C
PRESS BUTTON I OR II TO SET
OPENED POSITION

BACK   ∘OK

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:

SWITCH TO
GEAR DOWN POSITION

OK – PLEASE WAIT

CONFIGURE
DOOR SEQUENCER
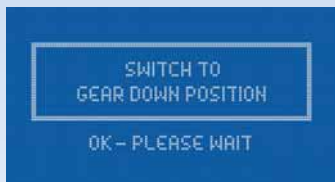
Move your transmitter switch to the "gear down" position. It will now take a few moments for the Assistant to create the necessary tasks, and move the doors to the correct position without any fouling or jamming.
The tasks created by the Assistant are described in detail under Point 8. If the timing (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.

<u>Note:</u> 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 - GY-AILERON A***. If the model features a third pair of aileron servos, ***output I*** should also be assigned to ***GY-AILERON A***.
- 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 **iGyro** or **door sequencer** manually, i.e. without recourse to the *Setup Assistants*. This function is required for models fitted with canard surfaces or a thrust vector control system, so that you can adjust gyro gain for the canards or thrust vector system separately from the main control functions.

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

> 2 x Gyro aileron
> 2 x Gyro elevator
> 2 x Gyro rudder
> 6 x Gain Normal mode
> 6 x Gain Heading mode
> 1 x Gyro flight mode
> 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: if more than one channel is assigned to one transmitter control at the transmitter (e.g. channels 2 and 6 for ailerons), move the transmitter control repeatedly away from the centre and back to centre again until the desired channel is selected. 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 **Royal 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 Gyro Elevator *A*. 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.

<u>Note:</u> 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. iGyro - detailed description

Once again, we strongly recommend that all the adjustments outlined in the following section should be carried out using the *SETUP ASSISTANT*, as described earlier. Using the **Assistant** eliminates the danger of overlooking particular settings, and quickly leads to a satisfactory outcome. However, there are some models which cannot be set up using the **Assistant** - including those with thrust vector control and canard control surfaces - and for these the following points are intended to clarify individual functions. They should also enable the modeller to use the system for non-standard applications.

a) Special features of the regulatory algorithm

The integral **iGyro** operates on all three primary axes, i.e. aileron, elevator and rudder. The gyro has two different working modes:

- **Heading mode:** this acts when the transmitter stick for the associated control surface is at the centre position. When the control surface is at centre, the **iGyro** maintains the last commanded attitude, or heading.
  A concrete example might be the elevator in knife-edge flight: the **iGyro** automatically eliminates any tendency for the model to veer off course due to its Centre of Gravity position; there is no need to make corrective elevator commands.

- **Normal or damping mode:** this acts when the transmitter stick for the associated control surface is moved away from the centre position. In this mode the **iGyro** counteracts external influences.
  A typical example would be a gust of wind, which would normally upset the model; the **iGyro** eliminates the 'wobble' or damps it to a great extent, depending on the gyro gain you have set.
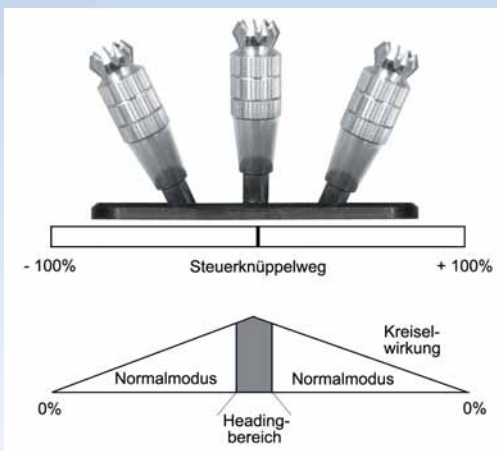
As can be seen from the diagram, gyro gain is suppressed proportionally with increasing stick travel. This reduces the tendency for the **iGyro** to counteract intentional control commands.

b) Speed-dependent gain control

The **PowerBox Royal SRS** can be connected to an optional **GPS Sensor** with the purpose of passing speed data to the gyro.

The **GPS Sensor** supplies data regarding the model's speed to the **iGyro** at a rate of twice per second. This allows the gyro to adjust its gain constantly to suit the actual flying speed; an effect which is particularly important when you are flying a model with a very broad speed range.

Gyro systems which are not speed-compensated in this way can only be set to a low gain setting, because the model would otherwise tend to oscillate at high-speed. Reducing the gain to overcome this problem reduces the gyro's stabilising effect at low speed, e.g. on the landing approach. However, fixed-wing model aircraft are particularly susceptible to gusts of wind and propeller torque effects at low speed, so high gyro gain is desirable for precisely this reason.

The effect of the **GPS Sensor** can be adjusted to any of six levels for each axis, so that maximum gyro effect can be obtained in fast and slow flight alike.

Note: the **GPS** unit designed for use with the **iGyro** is also capable of detecting vertical airspeed, which prevents the model oscillating even when the model is in a dive. The only factor which the GPS system cannot take into account when calculating the model's actual speed is headwind and tailwind. However, that has such a small influence on the model's stability that it can be neglected - even in very windy conditions.

If the **GPS Sensor** briefly has poor or no reception during a flight, gyro gain is automatically reduced to the minimum set value; this prevents the model oscillating regardless of its momentary speed. In any case, the **iGyro** is capable of compensating for external influences on the model even when gyro gain is set to a low value. GPS reception problems are rare, but in any case they are usually of very brief duration, and are generally not even noticed when the model is flying.

The **GPS Sensor** does not require any particular orientation or position in the model. It can simply be mounted using the double-sided adhesive tape supplied in the set. The location should not be subject to vibration, and to ensure optimum reception the sensor must not be shielded by carbon fibre or metallic parts in any direction.

c) Using the flight modes

The **Flight Mode** function can be assigned to any channel you wish, and gives the pilot the ability to activate any of three different gyro settings for particular flight manoeuvres. The gyro is always switched off in **Flight Mode** 1: control signals are passed 1 : 1 to the servo outputs. Naturally the **Delta** or **V-tail** mixer remains active if that function is switched on.

The pilot is free to configure **Flight Modes 2** and **3** in any way he wishes. In most cases the flight mode switch is only needed in order to switch Heading mode on and off for the rudder. In the case of the rudder, Heading mode is only required for particular manoeuvres - such as slow rolls and knife-edge flight - and should be switched off again after the manoeuvre by changing the **Flight Mode**. When a model is negotiating a normal turn, Heading mode for the rudder has an unwanted effect, because the model's tail tries to maintain the aircraft's previous direction, and counteracts the pilot's commands.

Aileron and elevator gain can be set to the same value for all flight situations - the **GPS Sensor** makes flight phases unnecessary for "normal" fixed-wing model aircraft.

d) Defining the installed orientation of the Royal SRS

To simplify operation and installation, the orientation of the **Royal SRS** has to be defined once when it is initially installed in the model. Once this is accomplished, it is possible to use the standard terms *AILERON*, *ELEVATOR* and *RUDDER* in all the other menus - such as *GYRO SETTINGS* and *OUTPUT MAPPING*.

The orientation can either be entered using the *BASIC SETUP ASSISTANT* or in the *GENERAL SETTINGS* menu.

e) Defining the wing type

The **Royal SRS** features an integral Delta and V-tail mixer, which makes it possible to fly deltas and V-tailed models with heading-lock gyro stabilisation! This menu can be activated in the ***GENERAL SETTINGS*** menu: simply select ***MIXER: DELTA-WING*** or ***V-TAIL***.

Caution: it is essential to switch off any delta or V-tail mixer at the transmitter. The mixing must be carried out in the **iGyro** itself.

The integral **iGyro** analyses the aileron and elevator signal from the transmitter, calculates the deviation of the sensors, and passes the signal to the two elevons.
Delta mixing is applied to the ***AILERON-A*** and ***ELEVATOR-A*** output functions, i.e. you should assign aileron to ***AILERON-A***, and elevator to ***ELEVATOR-A***, as described under Point 5.
For example, this leaves ***ELEVATOR-B*** available for a thrust vector or canard control system, which can then be set up independently.

f) Defining the individual axes

Once again we repeat our usual advice: we strongly recommend that you set up the model using the ***BASIC SETUP ASSISTANT*** and the **TEST-FLY ASSISTANT**. Manual installation should only be used if your model requires non-standard settings.
Once the **iGyro** is installed, we can move on to setting the gain and direction of effect of the gyro.

Caution: it is absolutely essential that you set and check the direction of gyro effect with the greatest possible care! Setting an incorrect direction of effect invariably results in the loss of the model.
This is what would happen: any external influence (e.g. gust of wind) upsets the model, and the gyro system tries to correct this. However, as it operates in the wrong direction, the effect is to amplify the problem by applying additional control surface travel. This in turn is assessed as a further external influence, and more corrective action is applied. The net result is that the gyro causes the control surface to run to maximum travel in just a few seconds, and there is no chance of correcting this with the transmitter sticks.

The model must initially be trimmed without the **iGyro**, or with the **iGyro** switched off, and must be set up to fly straight and level. If you subsequently make adjustments to the model's trim, you will need to re-start the set-up procedure, or carry out a zero calibration of the **iGyro**. This action teaches the **iGyro** a new centre, so that the Heading mode can work properly. More on this later.
At least one channel is required for setting gyro gain in flight. If you only have one channel available, six flights are needed for the manual set-up procedure, i.e. setting the correct values for Heading and Normal modes for all three primary axes.

It is faster and more convenient to assign two channels to two rotary knobs or sliders for setting up each axis. In this case only one flight is required for each axis in order to set up Heading and Normal values.
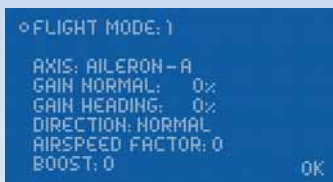
Note: if you wish to fly a non-standard model, such as one with a thrust vector control system, then one channel is sufficient, as the Heading value is not used in any case.

The following instructions assume the use of two assigned rotary knobs or sliders. If you are short of channels, and can only use one channel for gain adjustment, then one flight must be carried out to set the Normal value and one flight for the Heading value for each axis.

Note: as soon as the **iGyro** set-up procedure is complete, the channels you assign for this purpose become available for other functions

Test-flying procedure:

I)   Fly the model with the **iGyro** switched off, and trim it accurately
II)   Assign one or two rotary controls or sliders in the **INPUT MAPPING** menu
III) Set the correct direction of gyro effect
IV) Fly the model in **Flight Mode 1**
V)   Set gyro gain for Normal mode
VI) Set gyro gain for Heading mode
VII) Check the Airspeed Factor
VIII) Disable the rotary knobs or sliders

I) The **Royal SRS** is installed in the model, and the control surface channels and Flight Mode switch have been assigned. Gyro gain should be set to 0% on all axes and in all flight modes. This is accomplished by calling up the **GYRO SETTINGS** menu; you will then see this display:

```
○FLIGHT MODE: 1

AXIS: AILERON-A
GAIN NORMAL:      0%
GAIN HEADING:     0%
DIRECTION: NORMAL
AIRSPEED FACTOR: 0
BOOST: 0                    OK
```

The first and immediate step should be to check the operation of the Flight Mode switch: when you operate the switch, the value at **FM**: must change to 2 and 3.
At the same time you should check that gain for the **AILERON-A** axis is set to 0% in all flight modes. Repeat this test procedure for all axes: **AILERON-A**, **AILERON-B**, **ELEVATOR-A**, **ELEVATOR-B**, **RUDDER-A** and **RUDDER-B**.

If you have previously set up mixers involving elevator and rudder or landing flaps, then these must be disabled at the transmitter; the same applies to mixers involving rudder and aileron. If you overlook this, the integral **iGyro** will not operate in Heading mode, since the control surfaces will no longer be at the calibrated centre positions.

Exponential functions can be set in the usual way, but you may need to reduce the Expo settings slightly when the gyro is active, as its effect tends to counteract control commands when the pilot's commands are small. This behaviour diminishes with increasing stick travel, and disappears completely at full travel.

Note: if your model features other superimposed functions - such as camber-changing flaps and ailerons - then you should be aware that the **iGyro** will not operate in Heading mode when the flaps are deployed. In this case the gyro system only operates in Normal mode, since the transmitter control is no longer at the centre position which the system "learned" when it was switched on.

The direction of gyro effect is of no importance when the gyro is switched off. Test-fly the model now in Flight Mode 1, i.e. with the gyro disabled.

When the model has landed, the system needs to learn the new trim values and end-points of travel. With the engine or motor stopped, select the first point - **ZERO GYRO** - in the **iGyro** menu, and leave the model motionless. The **iGyro** waits a few seconds before the **RESET** is carried out; this pause gives you enough time to release the switch, so that no external movements can falsify the result. During this "zero calibration" procedure the system adopts the new transmitter stick centre points, and resets the end-points. At the same time it calculates any offset values for the MEMS sensors. When the zeroing process is complete, move all the control functions to their end-stops in both directions, and the system automatically "re-learns" the end-points of travel.

Note: if you subsequently make changes to the end-points or the centre position at the transmitter, the **ZERO GYRO** menu point must be selected again, and all the transmitter sticks must be moved once again to their end-stops. The end-point values are then automatically stored.

II) The first step is to set up the aileron axis in a test-flight. This means selecting the *Input Mapping* menu and assigning to the *NORMAL GAIN - AILERON-A* points the rotary knob or slider which you wish to use to "teach" gyro gain for Normal mode. If the model features two aileron channels, assign the same channel for *NORMAL GAIN - AILERON-B*:

TX CH	FUNCTION
1	GYRO AILERON A
11	GAIN NORMAL
12	GAIN HEADING
6	GYRO AILERON B
11	GAIN NORMAL
12	GAIN HEADING

If you have two spare channels available for adjusting gyro gain, assign a further channel for *AILERON-A* and *AILERON-B* under *HEADING GAIN*.

Caution: the gain assignments for *ELEVATOR* and *RUDDER* must be left at 0!

The next step is to check the setting in the *GYRO SETTINGS* menu point: when you move the rotary knob or slider, the values at *GAIN NORMAL* and *GAIN HEADING* must change from 0% to 100%. You can also check the other axes in the *AXIS* menu point. If two ailerons are used, the gain values at *AILERON-B* must also be adjustable. The gain values for *ELEVATOR-A/B* and *RUDDER-A/B* must remain at 0, even when you adjust the gain knob or slider.

In many tests we have found the ideal value for the *AIRSPEED FACTOR* point to be 2. This parameter only has a function when a **GPS Sensor** is in use. A more accurate method of setting the *AIRSPEED FACTOR* is described later in these instructions.

III) Setting the direction of effect: rotate the transmitter control for ***Heading Gain*** to 100%; the direction of effect is most easily checked and set at this setting. Leave the transmitter stick at centre, and move the model: you should clearly see a movement in the associated control surface.

Checking direction of effect: move the right-hand wing up, and the right aileron must deflect up, the left aileron down. If the control surfaces respond in the opposite direction, you must reverse the direction of gyro effect by setting the ***DIRECTION*** point to ***REVERSE***. Ensure that both ailerons move in the correct direction; if your model has two aileron channels, ***AILERON-B*** must also be set correctly.

Note: naturally, this has no effect on the direction of control when you operate the transmitter sticks!

IV) Before you fly the model, set both gain adjusters on the transmitter to 0%, and the flight mode switch to ***FM:1***. Before the flight remind yourself again of the controls you have selected.

The flight mode switch is very important during the set-up phase, because it can be used to disable the **iGyro** immediately if any setting is incorrect: all you have to do is switch to flight mode 1.

It is also important to select rotary control(s) or slider(s) on the transmitter which are easy to reach and adjust while the model is flying.

If you are using the **GPS Sensor**, it is important to check that the **GPS Sensor** status on the main screen displays ***OK*** before you fly the model.

V) We recommend that you fly the model parallel to the runway after taking off, and then move the flight mode switch to position 2. The model should be at a safe height - but not too high, as you must be able to see the model very clearly. The model's speed should also be no more than average, otherwise the **GPS Sensor** will have a marked damping effect on the gyro. An ideal starting point is a straight, level pass at quarter-throttle. Slowly turn up or advance the Normal gain adjuster to the point where the model just starts oscillating slightly. When you reach this point, turn the adjuster back slightly.

Note: it is essential to leave the Heading mode adjuster at 0% at this stage, as the aim is to ensure that only Normal gain has effect in all phases of the flight; this makes it possible to adjust the value accurately.

If Heading gain is set to 0%, the integral **iGyro** works in Normal mode all the time.

VI) By now the model should already be flying much more smoothly. Carry out another pass, this time at maximum speed, to find out if the damping effect of the **GPS Sensor** is adequate. If the model starts to oscillate at top speed, we recommend that you land the model and alter the **AIRSPEED FACTOR** value for **AILERON-A** and **AILERON-B** (if using two aileron channels) to 3.

VII) If the model continues to fly stably at maximum speed, it is time to fly another pass in order to adjust Heading gain: set the model flying straight and level, then leave the aileron stick alone. Now turn up the associated adjuster for Heading gain until the model just begins to oscillate. When that happens, back off on the adjuster slightly - and the job is done.
Important: we also want to adopt these settings in flight mode 3; this is accomplished by briefly moving the flight mode switch to **FM:3**.

Note: in dead-calm conditions it is difficult to set up the gyro accurately, as it has little scope for stabilising the model; the result is that oscillation does not set in until the gain settings are very high.
However, it is possible to force the gyro to provide compensation by - for example - applying a large rudder command to disturb the model's flight path. When setting up the rudder it is a good idea to fly a knife-edge pass in order to force the gyro to compensate.

At this stage it is perfectly safe to land the model with the **iGyro** switched on. You will be rewarded with a stable landing approach which will immediately convince you of the **iGyro**'s effectiveness.

VIII) After the flight there are two possible methods of disabling the assigned gain adjusters:

1) Access the **GYRO SETTINGS** menu, briefly select the two menu points **GAIN NORMAL** and **GAIN HEADING** using the **SET button**, then release the button again. If you have two separate aileron channels, repeat this procedure for **AILERON-A** and **AILERON-B**.

2) Access the **INPUT MAPPING** menu, and set the assignment for **NORMAL GAIN** and **HEADING GAIN** to 0 using the **SensorSwitch**.

To set up the **iGyro** for the elevator function, simply repeat the procedure described above for the ailerons. As a reminder, here is a brief summary of the procedure:

- Assign one or two adjusters for gyro gain.
- Check the adjuster assignment in the *GYRO SETTINGS* menu for both elevators - if present on your model.
- Set the Heading gain to 100% and check the direction of gyro effect: when you raise the model's tail, both elevators must deflect up. If the elevators respond by deflecting down, set the direction of effect to *REVERSE* in the *DIRECTION* menu point.
- Set both gain adjusters to 0% and move the flight mode switch to 1.
- Check the GPS status.
- Fly the model parallel to the runway at around quarter-throttle, slowly advance the gain adjuster for Normal mode until the model just starts to oscillate, then back off the adjuster slightly until the oscillation ceases again.
- Carry out a pass at maximum speed, and observe whether the model oscillates. If oscillation occurs, land the model and increase the value for *AIRSPEED FACTOR*.
- If the model remains stable at top speed, carry out a further pass in order to adjust the gain value for Heading mode: fly the model straight and level at quarter-throttle, and leave the elevator stick untouched. Turn up the Heading gain adjuster until the model starts to oscillate, then back it off again slightly.
- A further pass at top speed will show whether the *AIRSPEED FACTOR* is adequate.
- Briefly move the flight mode switch to 3 in order to adopt the settings in *FM:3* as well as 2.
- The model can now be landed with the **iGyro** active.
- Disable the assignment of the gain adjusters.

The model is now gyro-stabilised in flight modes 2 and 3 on the aileron and elevator axes.

The rudder requires special treatment: if Heading mode is active on the rudder, the gyro tries to maintain the former direction of flight when flown through a turn, causing the model to yaw, and "hang its tail". For this reason it makes obvious sense to set the Heading gain for rudder to 0% in flight mode 2, and only to activate it in flight mode 3.

The method for setting gyro gain for the rudder is almost the same as for the other primary control axes: proceed as far as the point entitled "Setting gain for Heading mode" in exactly the same manner as for the other two axes.

The procedure differs from aileron and elevator in this respect: once Heading gain has been set, disable the **iGyro** by switching to flight mode 1, then land the model with the gyro switched off. However, <u>leave</u> the rotary knob or slider <u>at the new setting</u>.

With the model on the ground, select the *GYRO SETTINGS* menu and enter the values manually. After the flight the menu will look approximately like this - but naturally with the gain values which you have found to be correct during your test-flight:

```
◦FLIGHT MODE: 3

AXIS: RUDDER-A
GAIN NORMAL:   81%
GAIN HEADING:  74%
DIRECTION: NORMAL
AIRSPEED FACTOR: 2
BOOST: 0                    OK
```

Disable the gain adjuster for Normal mode by moving the cursor to *GAIN NORMAL*, and pressing the **SET button** twice.
Use the **SensorSwitch** to set the *GAIN HEADING* value for flight mode 2 to 0%. The menu now looks like this:

```
◦FLIGHT MODE: 2

AXIS: RUDDER-A
GAIN NORMAL:   81%
GAIN HEADING:   0%
DIRECTION: NORMAL
AIRSPEED FACTOR: 2
BOOST: 0                    OK
```

Select the *INPUT MAPPING* menu, and check once more that the assignment of the gain adjusters is disabled. The two channels you previously employed for this purpose are now immediately available again for other functions.

When set up in this way, the model can be flown in flight mode 2 in all phases of flight - including take-off and landing. Since flight mode 1 switches the gyro off, it is no longer required. Flight mode 3 is available to provide support for knife-edge flight, slow rolls and 3D aerobatic manoeuvres.

At this point we would like to mention again the advantages of using the **Assistant**: once the optimum settings have been established with the **Assistant**, the gain adjuster assignments are automatically disabled, and the gain values are automatically set correctly for Heading and Normal modes.

g) Zero Gyro

The *ZERO GYRO* function is the first item in the Main menu. This function has three purposes:

1. To calculate the sensor offset
2. To calibrate the centre position of the transmitter sticks
3. To reset the end-points of the control surfaces

This function must be invoked if you make changes to the model's trim or servo travels.

The function can be used if the control surfaces slowly move in a particular direction when the model is left standing for a long period. However, this movement is not noticeable when the model is flying.

The *ZERO GYRO* function must not be selected unless the transmitter sticks are at centre, and the model is stationary with the engine or motor stopped. When the function has been selected, you must move all the transmitter sticks once to their end-points: the **iGyro** now automatically re-calibrates the end-points of travel.

h) Boost

The default value for this function is 0. It ranks as one of the **iGyro**'s "expert functions", and its basic purpose is to provide better stabilisation for models which are very unresponsive. In extremely windy conditions this function may also provide a better corrective effect. The fundamental effect of the **iGyro**'s Boost function is to produce a brief but very pronounced compensatory action right at the onset of any external influence.

Caution:

- This function should only be used with care, and the value should be increased in small increments, as an excessive setting will immediately cause the model to oscillate in a very pronounced manner.

- As a basic rule we only recommend the use of this function if the "Normal" and "Heading" modes do not provide completely satisfactory stabilisation. This is only likely to apply in the case of unresponsive models with small control surfaces, and aircraft with thrust vector control systems.

i) Important information on handling the iGyro in day-to-day flying

- Switching the system on

When switched on, the **Royal SRS** adopts the current transmitter stick positions as their centre point, and calculates the sensor offset required. For this reason it is important not to touch the transmitter sticks and the model when you turn the system on. When initially switched on, the **Royal SRS** waits a few seconds to give you a chance to ensure that the model is stationary.

- Adjusting the trims of one or more axes

If it becomes necessary to adjust the transmitter trims in flight mode 1 - perhaps due to a change in Centre of Gravity or other structural modification - you need to "inform" the **Royal SRS** of this, either by switching it on and off again, or by briefly selecting the *ZERO GYRO* menu point.
When the **Royal SRS** is switched on, it adopts the new centre positions.

8. Manual door sequencer installation

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

```
SETUP ASSISTANT
GEAR UP – OUTPUT OFF: C
◇ SEQUENCE DIRECTION: UP→DOWN
TASK: 4              DS-OUTPUT: 3
START POSITION: 2000μs
STOP POSITION : 1000μs
STARTTIME:  0.8s
STOPTIME : 22.2s                OK
```

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.

```
SETUP ASSISTANT
GEAR UP - OUTPUT OFF: -
◇SEQUENCE DIRECTION: UP→DOWN
TASK: 1           DS-OUTPUT: 3
START POSITION: 1100µs
STOP POSITION : 1500µs
STARTTIME:  1.0s
STOPTIME :  4.0s              OK
```

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.

```
SETUP ASSISTANT
GEAR UP - OUTPUT OFF: -
◇SEQUENCE DIRECTION: UP→DOWN
TASK: 2           DS-OUTPUT: 3
START POSITION: 1500µs
STOP POSITION : 1800µs
STARTTIME:  6.0s
STOPTIME :  8.0s              OK
```

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.

```
SETUP ASSISTANT
GEAR UP - OUTPUT OFF: -
◇SEQUENCE DIRECTION: DOWN→UP
TASK: 1           DS-OUTPUT: 3
START POSITION: 1800µs
STOP POSITION : 1100µs
STARTTIME:  0.0s
STOPTIME :  3.0s              OK
```

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.

<u>Note:</u> 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:

```
SETUP ASSISTANT
GEAR UP - OUTPUT OFF: -
◇SEQUENCE DIRECTION:DOWN→UP
TASK: 1          DS-OUTPUT: 1
START POSITION: 1900µs
STOP POSITION : 1100µs
STARTTIME:  0.0s
STOPTIME :  0.1s          OK
```

```
SETUP ASSISTANT
GEAR UP - OUTPUT OFF: -
◇SEQUENCE DIRECTION:UP→DOWN
TASK: 1          DS-OUTPUT: 1
START POSITION: 1100µs
STOP POSITION : 1900µs
STARTTIME:  0.0s
STOPTIME :  0.1s          OK
```

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!

9. Channel lock when undercarriage is retracted

The **PowerBox Royal SRS**'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.

10. PowerBUS

The **PowerBUS** is the key to a completely new servo wiring arrangement. The **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

11. Telemetry

The **Royal 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.

12. Reset, Update, Save and Restore

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

```
○ RESET SERVO MATCHING
  RESET DOOR SEQUENCER
  RESET iGYRO
  RESET FAILSAFE
  RESET INPUT MAPPING
  RESET OUTPUT MAPPING
  FACTORY RESET
  PC- CONTROL              OK
```

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.

```
      WARNING - RESET
          SURE ?
      NO            YES
```
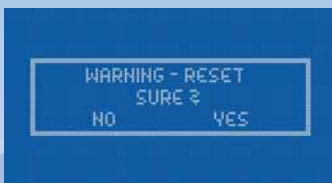
The lowest line in the menu **- *PC-CONTROL* -** has several functions: selecting this point enables you to update the software in conjunction with the **PowerBox Terminal** PC program, save the backer's internal settings on a PC, or restore saved settings from a PC.

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 *TELE* socket on the **Royal SRS** and select the *PC- CONTROL* point in the menu.
From this point on simply follow the instructions on the screen.

13. 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
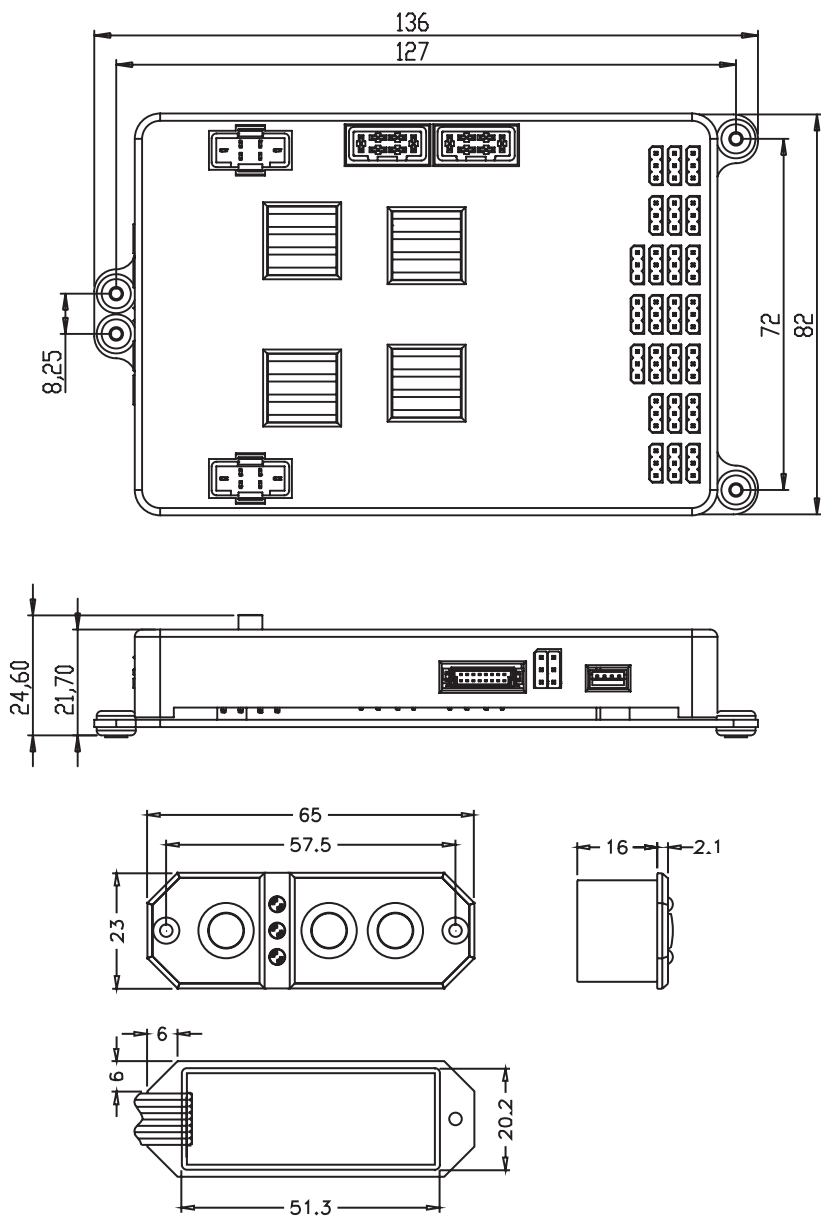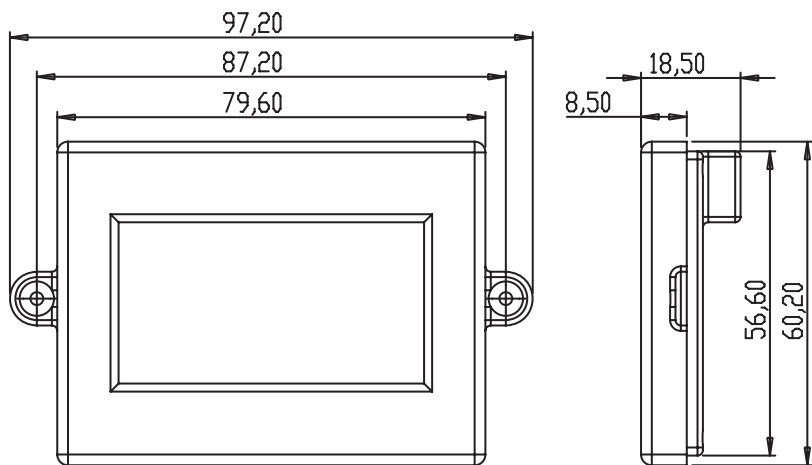
15. Set contents

- **PowerBox Royal 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

- **Options, according to set: GPS sensor**

16. 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 <u>before</u> you telephone us.

You can find the forum at the following address:

www.forum.powerbox-systems.com

17. Guarantee conditions

At **PowerBox System**s 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 Royal 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

18. Liability exclusion

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

Donauwörth, Mai 2013

PowerBox-Systems GmbH
certificated according to DIN EN ISO 9001:2008

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