

PowerBox Systems

World Leaders in RC
Power Supply Systems

PowerBox Professional

40/24

Operating Instructions



With seven servo signal amplifiers,
two independent voltage monitors
and regulated receiver power supply

Dear customer,

we are delighted that you have decided to purchase the **PowerBox 40/24 Professional** from our range. Your valuable model aircraft can now be fitted with an extremely capable and reliable power supply system, enabling you to couple two batteries (battery backer) and also monitor the voltage of both packs (voltage monitor) constantly. This modern power supply system for models also features an integrated two-way signal amplifier for each of **seven** receiver channels, allowing you to connect multiple servos to a single output without problem.

Although this power supply system is simple to operate, you do need to understand certain points if you are to exploit its advantages to the full, especially if you are not familiar with this **new technology**, which is an **in-house development**. Please read through these instructions, and you will quickly feel 'at home' with your new accessory.

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1. How the PowerBox 40/24 Professional works:

The **PowerBox 40/24 Professional** is a modern power supply system which performs the functions of a battery backer whilst constantly monitoring the voltage and readiness of the two batteries connected to it. The condition of each pack is indicated by a chain of five coloured LEDs.

You can choose whether to install four-cell or five-cell batteries in your model. A bridging plug (jumper) on the underside of the unit on the right-hand side allows you to set the battery type you wish to use. The **PowerBox 40/24 Professional** is supplied as standard with the jumper fitted, i.e. the default is for five-cell operation. If you wish to use a four-cell receiver battery, simply remove the jumper. Re-fit it, and the voltage monitor is set to work with five cells again. **Important:** the operation of the backer is not affected in any way by the jumper.

With this power supply unit you also have “**remote access**” for up to seven channels from the receiver. We have coined this term because we are absolutely convinced - and countless tests have confirmed our conviction - that not all receiver channels should be operated using an external power supply. Why should that be? After all, the standard receiver sockets are in no way bad, and they are always adequate for certain servos and model functions. Even so, there are particular applications in model aircraft for which it is not good practice to use the standard receiver connections.

That is why we recommend that you set up “remote access” to certain channels from the receiver; the channels concerned are **as follows**:

1. channels which are required to control multiple servos (several servos per control surface, integrated signal amplification required);
2. channels which are operated using very long servo leads (more than 60 cm);
3. channels which have to supply extremely powerful, high-performance servos with correspondingly high current drain (digital servos, Jumbo servos, Power servos);
4. channels which require special interference suppression measures (RF suppression of long servo leads, turbine electronics, flasher units, throttle servo, ignition servo, and many more);
5. channels which are operated constantly when a normal model is in flight, e.g. aileron, elevator and rudder.

All the other servos of your receiving system (flaps, retracts, aero-tow release etc.) can be connected to the appropriate receiver sockets in the usual way. Which of the channels you “access remotely” from the receiver is up to you, but it is usually those mentioned above.

Another special performance feature of the **PowerBox 40/24 Professional** is its double stabilisation circuit for the receiver voltage. This circuit stabilises the voltage ultra-precisely at exactly 5.0 Volts (+/- 0.05 Volt), and supplies the receiver and the servos connected directly to it. The stabilisation is achieved by means of two “very low-drop” fixed voltage regulators with an output current of 1.50 A each. This means that a total current of 3.0 A is available to supply the receiver (or receivers) and the direct-connected servos. The circuit is designed to ensure that the power supply to the components remains reliable if an overload condition should occur, even if the input voltage falls substantially below 5.0 Volts, although the stabilisation circuit can no longer be effective in this situation.

The backer (battery change-over switch) function is based on an extremely high-performance **40 Amp Dual Schottky diode**; both diodes are housed in their own case. This diode arrangement ensures that voltage losses in operation are extremely low (0.25 Volt), and this is the reason why the unit can also be used safely with four-cell batteries. If both batteries are in good condition, both contribute to the receiving system's power supply. This means that each battery only bears half the total load, and both are recharged to the same level during the charge process. This arrangement avoids premature damage to your battery cells, and extends the useful life of your receiver packs significantly.

The **PowerBox 40/24 Professional** is fitted with two independent IC-controlled voltage monitors which check the condition and performance of both power sources. The momentary voltage of each battery is indicated on five coloured LEDs: three green, one orange and one red LED display the voltage of each battery separately. For this reason we recommend that you install the **PowerBox 40/24 Professional** in your model in such a position that you can clearly see these voltage monitor LEDs.

Check **before** every flight - by "stirring the sticks" - that the voltage of both batteries remains stable. If the batteries in your model are too "weedy" for the application, i.e. of inadequate capacity, this check will immediately show up the shortcoming. In general terms, small batteries of high capacity are not suitable for use as receiver power supplies because they have a very high internal resistance; this means that their current delivery capacity is often inadequate for powerful, high-speed digital servos. **Please believe what the voltage display tells you!**

For even better monitoring of the power sources, the backer also features a minimum value memory (**low voltage memory**) for both packs. This memory records all voltage collapses during the flight, separately for each battery. This is a very important feature, as it provides you with important information. You can now check the state and performance of your batteries both in a brief pre-flight test, and also in a long-term test (over the full duration of the flight).

You can call up the low voltage memory after every flight by "pressing" on the marked button (low voltage memory) in the centre of the PowerBox; you must do this before you switch the system off.

The memory is reset when you switch off the power supply system; the recording process begins anew when you switch on again.

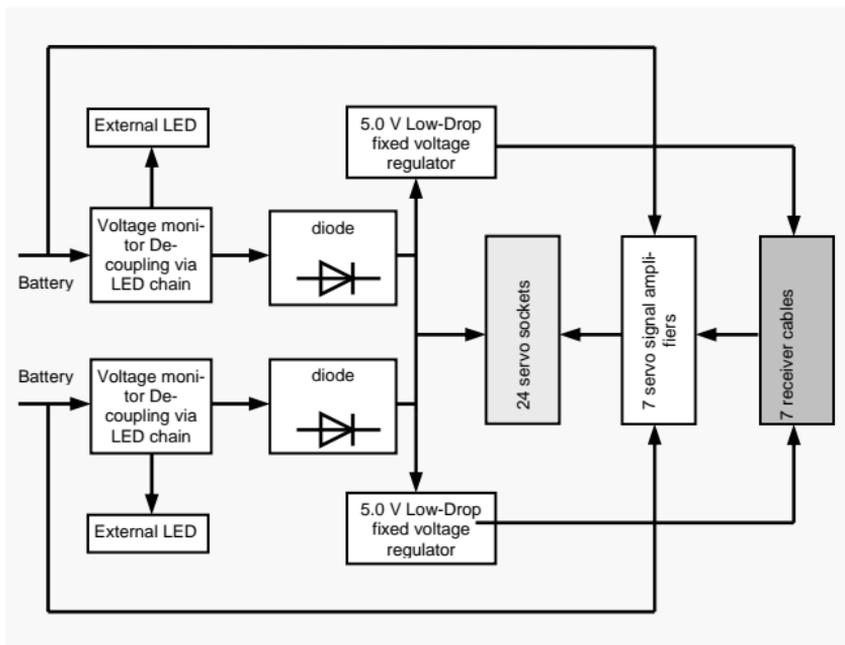
The voltage display is not linear, but matched to the discharge curve of today's Nickel-Cadmium (NC) and Nickel-Metal-Hydride (NiMH) cells.

It is not possible to predict useful battery operating times, because this varies according to the battery capacity, the number of servos, the type of servos, and the frequency of control commands.

The **PowerBox 40/24 Professional** is equipped with seven **stabilised** two-way signal amplifiers, i.e. a separate amplifier for each channel. In our opinion this additional complexity is worthwhile, as it completely prevents the problem of “crosstalk” between the different channels, which can occur when only one IC is used for this purpose. The signal amplitude is maintained exactly at a constant 5.0 Volts: another feature which is only found in our systems. Many servos do not respond correctly to signals whose voltage fluctuates.

These modern, short circuit-protected signal amplifiers are also necessary in order to block out interference which could penetrate the system via the servo leads connected to the unit.

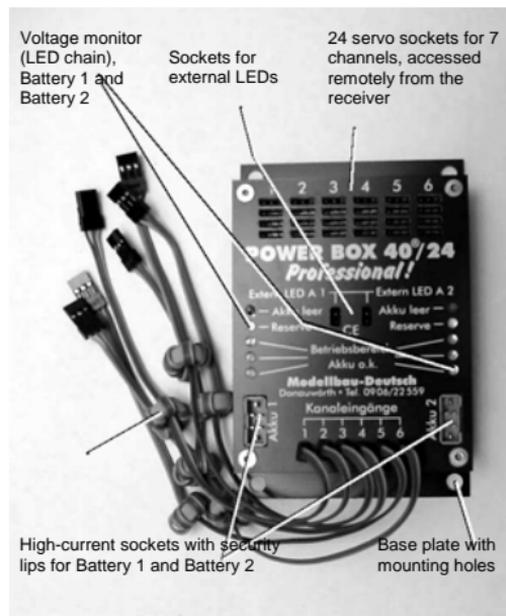
The block circuit diagram below is intended to clarify the method of working of the **PowerBox 40/24 Professional**. It shows the sequence of operations of the individual components in graphic form.



2. Specification:

Operating voltage:	4 Volt to 8 Volt
Power supply:	2 x 4-cell or 2 x 5-cell NiCd or NiMH batteries
Current drain:	approx. 60 mA
Voltage loss:	approx. 0.25 V
Max. receiver current:	2 x 1.5 A at 5.0 V (stabilised))
Servo sockets:	24 sockets, 7 channels
Max. continuous current:	40 A
Temperature range:	-10°C to +55°C
Dimensions:	115 x 75 x 19 mm (incl. base plate)
Weight:	125 g

3. Connections, controls:



The two receiver batteries are connected via the pair of integral high-current sockets. In theory the **PowerBox 40/24 Professional** will also work with a single battery, but this forfeits the extra security of a dual-battery power supply.

If you have to make up your own battery connecting leads, please take great care to avoid reversed polarity, as this would immediately destroy the battery backer's voltage monitor circuits.

Power is fed to the receiver and all the other servos via all seven servo leads. Please connect the servo plugs to the channel sockets of your receiver; the socket marked "B" (battery) should be left unused. All the connecting leads at the receiver can be connected in any sequence. The only requirement is that the assignment number at the PowerBox input must be identical to the channel number of the PowerBox output; these are therefore numbered from 1 to 7.

4. Operating the unit, safety notes

It is essential to use low-resistance batteries of the best possible quality to supply your receiving system. Don't be tempted to use receiver packs of inadequate capacity, as just one of them will have to power the whole system on its own if one pack should fail in flight. We recommend that you use batteries of at least 1700 mAh capacity, and for large-scale models batteries of 3000 mAh or more are appropriate. You can use either Nickel-Cadmium (NC) batteries or Nickel-Metal-Hydrate (NiMH) packs. **The PowerBox 40/24 Professional is not designed to be used with Lithium-Polymer cells.** If you wish to use Lithium packs, we recommend the **PowerBox 40/24 Competition** from our range, which shares the same dimensions as this unit.

We can supply a wide range of high-quality batteries, suitable for most applications in modelling, and we recommend that you make use of our experience in ensuring the security of your model. As you would expect, if you wish us to make up batteries for your own use you can state the exact cable length you require.

Naturally it is possible to connect two separate receivers to this battery backer. If you wish to do this be sure to observe the information supplied by your RC manufacturer concerning the use of two receivers in a model, otherwise there may be problems with inter-action between the two units. (minimum physical separation 20 cm). Power is supplied to the receivers via the seven servo leads of the **PowerBox 40/24 Professional**.

In the centre of the top panel of the **PowerBox 40/24 Professional** you will find two polarized sockets. To each of these you can connect an ultra-bright red LED (supplied in the accessory pack) for each battery via the extension lead.

These LEDs can be mounted in the fuselage side of your model. When the model is in the air these LEDs provide you with a visual warning if one or both batteries should run flat, or if some other fault should occur in the power supply system. If you see one of the LEDs light up, please land the model immediately. We recommend that you install both LEDs as close together as possible, as this doubles the effective strength of the light output, making it easier to pick up in the air.

In this case the ferrite rings fitted to the backer cables are not designed for additional RF suppression, since the integral servo signal amplifiers already fulfil this task reliably. The ferrite rings de-couple the earth (ground) between receiver and backer. This ensures that the operating conditions for the receiver are exactly the same as those for which the radio manufacturer originally set up the unit. In practical terms the receiver's earth surfaces represent the earth base, i.e. the counter-balance to the aerial. The earthing conditions should not be altered by more than a particular amount, otherwise the optimum tuning of the receiver will be affected. This is the reason why each connecting lead of our battery backer systems is fitted with a ferrite ring.

Install the battery backer in the model aeroplane with adequate vibration protection, as used for the other components of the receiving system.

You will find that the mounting plate with its four screw-holes makes it easy to install the backer. We suggest that you install the unit in the model in a position where it is clearly visible from outside. We recommend that you connect the two batteries using a switch harness (**PowerSwitch set**), but it is also permissible to connect the batteries to the backer directly.

To check the system we recommend that you operate first the one switch, then the other. In each case the voltage monitor LEDs for the associated battery must light up. Connect the unit to the receiver with the power switched off. Note that the receiving system must work properly even when only one battery is connected. Check this by switching on the transmitter and operating the controls.

The **battery backer fulfils the EMV protection requirements**, entitling it to carry the **CE symbol**. However, please note that the unit is designed and approved solely for use in modelling applications, and may only be employed in radio-controlled models.

The unit may only be used with a Direct Current (D.C.) power supply corresponding to an NC or NiMH battery consisting of up to five cells. **It must never be connected to a mains PSU.**

5. Guarantee conditions

During the production process each battery backer undergoes a series of tests. We take the maintenance of the highest quality standards very seriously, and that is why we are able to grant a **24 month guarantee** on all our battery backer systems, valid from the initial date of purchase. The guarantee covers proven material faults, which will be corrected by us at no charge to you. We wish to emphasise expressly that we reserve the right to replace the unit if a repair is impossible for economic reasons.

Proof of the commencement and progress of this guarantee period is the receipt which you received when you purchased the unit. Repairs carried out for you do not extend the guarantee period. Misuse and maltreatment, such as reversed polarity, excessive voltage and the effects of damp invalidate the guarantee. The same applies to faults due to severe wear or excessive vibration. The guarantee does not cover any additional claims, such as consequent damage. **We expressly deny liability for damages which are caused by the device, or arise through the use of the device.**

Liability exclusion

We are not in a position to ensure that the battery backer is installed properly, nor that it is operated under the correct conditions, nor that the entire radio control system is maintained in the appropriate manner.

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

Unless otherwise prescribed by binding law, our obligation to pay compensation, regardless of the legal argument employed, is limited to the invoice value of that quantity of our products which was immediately and directly involved in the event which caused the damage..

6. Optional accessories:

We recommend that you use the **PowerSwitch**, developed expressly for use with our battery backers, to connect the receiver batteries to the unit. These switches are packaged as **sets**, complete with connectors and a charge lead, and are available in the colours black and grey. The switches are accurately matched in performance to the **PowerBox 40/24 Professional**, and are capable of handling much higher currents than the standard switches which are commonly used in modelling to switch receiving systems on and off.

Our PowerSwitches are genuine safety switches.

We wish you every success using your new battery backer, and hope you have loads of fun with it.

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