Instruction Manual

PowerBox Systems®

World Leaders in RC Power Supply Systems

PBR-14D

Dear PowerBox customer,

We are delighted that you have decided to purchase a **PBR-14D** transceiver, which almost certainly represents the most highly developed and most advanced transmitting and receiving system for your valuable models available anywhere in the modelling world. Unprecedented range in the 2.4 GHz band, and ultra-fast, ultra-precise data transfer in both directions - these are the outstanding features of this radio system.

1. PRODUCT DESCRIPTION

If you study the specifications closely, it is clear that **PowerBox receivers** are by no means “receivers” in the usual sense; they are “transceivers”. They are capable of transmitting and receiving at the same data rate and the same range as the associated system transmitter.

All **PowerBox transceivers** feature a radio chip, but an essential difference is the integral pre-amplifier, which is one of the factors which make the system’s extremely long range possible. The **PowerBox radio** link is a hopping system which uses at least 66 of 198 possible channels. An intelligent hopping sequence is employed, ensuring interference-free operation even when the frequency band is heavily used.

The suffix D, S/XS or SL indicates the number of radio units installed in the transceiver. The D types **PBR-9D** and **PBR-26D** incorporate two fully independent receive / transmit units.

Other systems feature two aerials, switching between them 50-50, but if one aerial loses the signal, 50% of the information is inevitably lost; our design does not

suffer that drawback. There are also no switching diodes which have a damping effect on the signal as it arrives; this has a particularly adverse effect on the radio chip.

In contrast, both the receive units in **PowerBox transceivers** pick up the data packet in undamped form, and subject it to a full analysis. If one of the two packets contain errors, or if the signal strength is poor, or if the signal is completely absent, the data packet picked up by the other receive unit is used, and passed to the servo outputs or digital outputs. The result is a 100% signal even if one aerial is completely blocked.

As of **software version 3.5** it is possible to connect a supplementary receiving unit, such as the **PBR-26XS**, to the FastTrack socket of receiver types **PBR7S**, **PBR9D** and **PBR10SL**. If the primary receiver should receive no data from its integral aerials, the gap is filled seamlessly with the data from the “satellite receiver”.

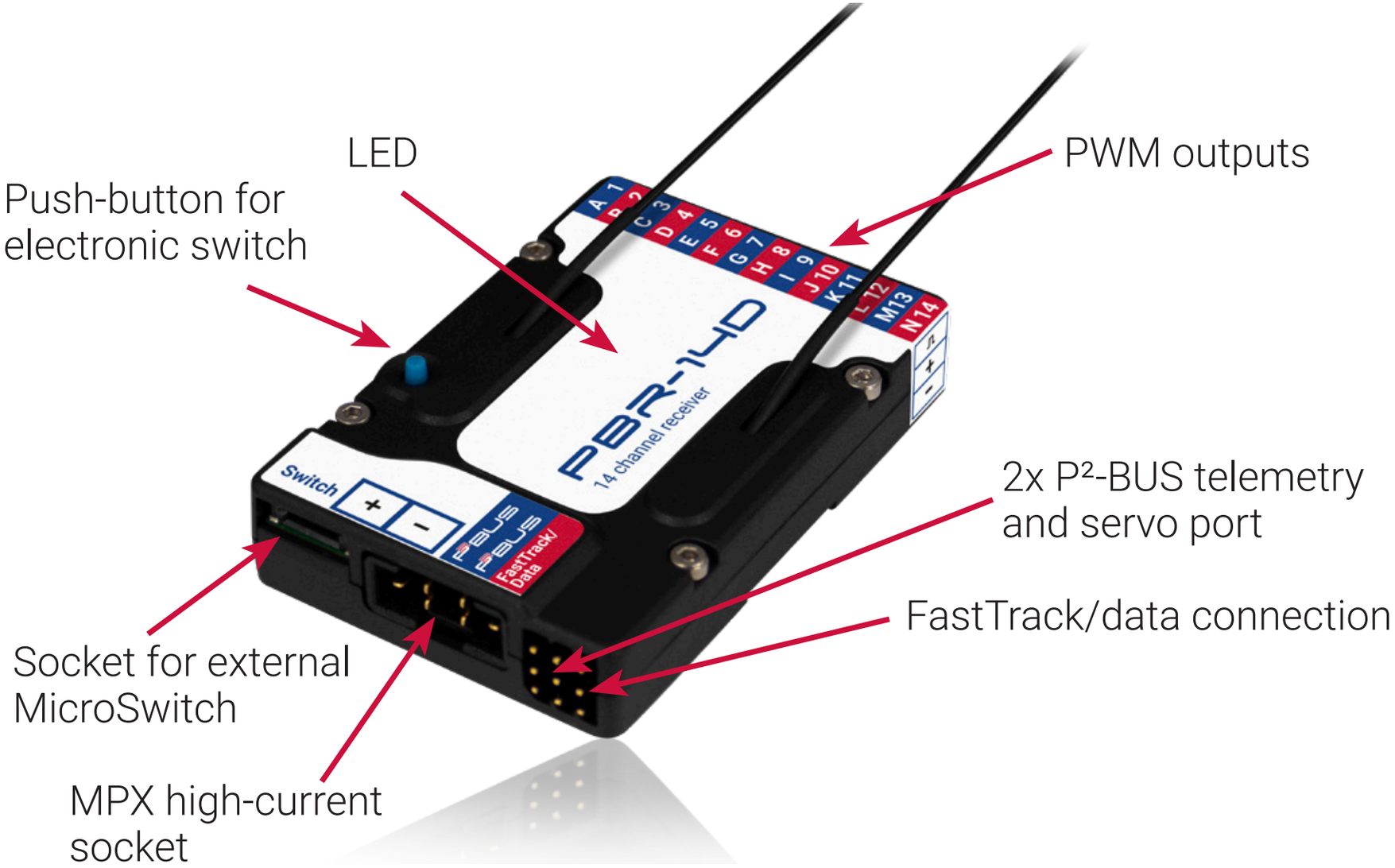
A further important feature is the integral iGyro system. The **PBR-7S**, **PBR-9D**, **PBR-10SL** and **PBR-26D** receivers have the iGyro software installed as standard, providing control of six separate axes. To make use of the iGyro all you have to do is connect an **iGyro SAT** to the FastTrack socket. If the integrated iGyro detects a **GPSIII** or a **PBS-TAV** sensor on the **P²-BUS**, the gyro gain is even speed-compensated!
All iGyro settings can be adjusted conveniently from the transmitter using the Telemetry menu.

All PBR receivers are capable of generating various BUS signals at the FastTrack socket, in order to maintain compatibility with third-part products such as helicopter gyros. In addition to S.BUS and SRXL, as of **Version 3.5** an analogue PPM signal can also be available.

One feature which is unique in the market is the facility to update receivers from the transmitter. You do not even need to remove the receiver or receivers from the model, or connect to the model using a laptop and USB interface, in order to update the receiver software.

2. FEATURES AND CONNECTIONS

- 2.4 GHz transceiver matching the **PowerBox** radio control system
- One or two receive units
- Extreme interference rejection
- Integral electronic switch for more than 20A
- Switch function optionally using integral push-button or external MicroSwitch
- Ultra-long range
- Integrated high-performance six-axis iGyro software
- iGyro system with speed-compensation
- High-performance real-time telemetry transfers 800 values/second
- Integral telemetry for reception quality and battery voltage
- Various Bus systems for compatibility with third-party products
- Receiver updates from the transmitter
- Compact format



3. POWER SUPPLY

Power is supplied to the **PBR-14D** via the MPX high-current socket. Since there is an integral electronic switch, no additional external components are required. The **PBR-14D** can be switched on and off using either the integral blue push-button, or a separately available **MicroSwitch** (#3584) or **MicroMag** (#3585).

This is the switching process: hold the push-button pressed in for about two seconds, release the button briefly, then press it a second time briefly to confirm the switching process. If you use the internal push-button, there is no visible indication of the switching process, but you will see the switched status from the LED which shows the receiver's status. If you use the external **MicroSwitch** or the **MicroMag** magnet switch, you will also see the switched status from the switch's integral LED.

4. BINDING

The transceivers can be bound using either of two methods:

a) Connect the transceiver first
The LED now flashes rapidly for about ten seconds. Press "Bind" at the transmitter, and the transmitter and receiver are bound. If you do not press Bind within ten seconds, the receiver LED switches to a slower flashing rate. At this point the receiver can no longer be bound to the transmitter unless the power supply is first disconnected.

b) Press "Bind" at the transmitter first
After this you connect the receiver to a power supply: the transmitter now binds with the receiver.

5. DETAILED DESCRIPTION OF THE SOCKETS

a) PWM outputs
The PWM outputs are sequentially numbered from 1 - XX, but are also assi-

gned the letters A - I. As an option, you can also set the receiver outputs to generate different channel numbers. For example, the **PBR-9D** can be set to generate outputs 10 - 19 as well as channels 1 - 9 *.

b) P²-BUS

This interface is used for the external ultra-fast **P²-BUS** telemetry system and digital servo output. When the system is switched on, all the sensors connected to this socket are scanned, and displayed at the transmitter.
The **P²-BUS** socket can also be used for updating the receiver using the **USB interface adapter**.

c) FastTrack/Data

This socket can be set to various functions from the transmitter: you can set it to FastTrack, P2BusOUT, S.BUS, SRXL-16, PPM12 or even one further servo output.

- **FastTrack**

  The **iGyro SAT** or a supplementary satellite receiver (**PBR-26XS**) can be connected to this socket. FastTrack is a high-speed real-time bus system. If you wish to use both the **iGyro SAT** and the optional satellite receiver simultaneously, they can simply be connected using a Y-lead. Once an **iGyro SAT** is connected, you have a six-axis iGyro system whose full range of functions can be adjusted from the transmitter.

- **P2BusOUT**

  The purpose of this option is to feed telemetry data wirelessly from the model to ground stations, as are typically used in Triangle flying events. The receiver “listens” to the radio traffic between the transmitter and the receiver in the model, and passes on the telemetry information from the model to the connected ground station.

- **PWM**
  If you select this option, you can connect an additional servo to the FastTrack/Data socket. The channel generated varies according to the type of receiver you are using. For example, if your receiver is a **PBR-14D**, then channel 15 is available at this socket.

- **S.BUS and SRXL-16**
  These digital bus signals can be processed by many gyros and battery backers, and therefore serve as a universal interface for third-party accessories such as helicopter gyros.

- **PPM12**
  As of version V3.5, all receivers also offer the option of generating an analogue PPM12 signal. One practical application for this is a wireless connection for PC flight simulators.

6. MEANING OF THE LED DISPLAY

The integral LED can indicate various types of receiver status:

- Continuous blue light: the transceiver is bound to the transmitter; signal strength is adequate
- Flashing rapidly blue: the transceiver is waiting for a binding signal
- Flashing slowly red: the receiver is picking up no signal
- Continuous red light: the update has failed, and the receiver is in bootloader mode. Use the Rescue mode to restart the update process.

7. INSTALLATION, DEPLOYING THE AERIALS

All **PowerBox** receivers pcb´s are manufactured using the SMT method, and are therefore extremely resistant to vibration and shock. The ideal method of mounting the **PBR-14D** is to use the retaining plate supplied in the set. However, it can also be secured to any firm surface using double-sided adhesive tape.
The ideal method of aerial deployment varies greatly according to the model, the fuselage material and the receiver's position in the model. For most cases we recommend routing the aerials out of the fuselage, as this guarantees optimum reception regardless of the materials of which the model is made.

8. OTHER SETTINGS

The transceivers offer a number of optional settings which can be selected at the transmitter and sent via the radio link:

- **Frame rate**
  This defines the servo signal repeat frequency. The default value for this setting is 18ms. Modern digital servos can operate more accurately and smoothly at 12ms.

- **A Start output**
  Offsetting the Start channel. This feature can be used to "cascade" receivers. For example, you can set up a **PBR-14D** to generate channels 1 - 14, and an additional **PBR-7S** for channels 15 - 21.

- **Hold/Failsafe**
  This setting is adjusted in the Function menu at the transmitter, and not at the

receiver.

- **iGyro**
  You can find a detailed description of the iGyro's features in the instructions supplied with the **iGyro SAT**. The iGyro function integrated into **PowerBox** receivers is completely identical to the iGyro function in our larger PowerBox systems or the **iGyro3xtra**.

9. NOTES ON OPERATION

All **PowerBox** transceivers are able to transmit battery voltage and reception quality by default. The following values are transmitted:

- **Battery voltage**
  This shows the voltage present at the servo sockets. Please note: if you are using a regulated battery backer, the value shown here is the regulated voltage, not the battery voltage.

- **RSSI**
  This value shows the input level at the aerial, and is displayed in dBm - a logarithmic power value.

- **LQI**
  This value indicates the reception quality in percentage form. The value is calculated by the receiver, based on the number of lost data packets and the power level over time.

  LQI is a very instructive value providing information about the quality of the

radio link. In order to monitor it fully, we recommend that you set up a widget at the Telemetry screen showing the LQI value, and set an alarm threshold of 60% to 70%. This ensures that any reception problem immediately triggers an alarm to make you aware of the situation.
As of **version 3.5** an additional LQI value is available which calculates the LQI value taking both aerials into account. The assessment only takes into account those data packets which are lost at both aerials simultaneously.

- **Status**
  This displays status messages, such as the status of an **iGyro SAT** or **GPSIII** connected to the system.

10. TECHNICAL DATA

Frequency	2.4GHz
Operating voltage	4,0V - 9,0V
Number of transmitted channels	26 (at the P²-BUS interface)
Number of PWM outputs	14
Servo output resolution	4096 Steps (12Bit)
Number of receive units	2
Range (line of sight)	> 9km
Telemetry	yes
P²-BUS telemetry interface	2x
FastTrack interface	yes
Parameter settings from the radio	yes
Dimensions in mm	62 x 42 x 13
Weight in Gramm	29
Temperature range:	-10°C to +85°C

11. FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

12. IC

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Appareils radio exempts de licence (ISDE) L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

13. FCC WARNING

To maintain compliance with FCC's RF exposure guidelines, the distance must be at least 20cm between the radiator and your body, and fully supported by the operating and installation configurations of the transmitter and its antenna(s).

14. IC WARNING

The device has been evaluated to meet general RF exposure requirement. To maintain compliance with RSS-102 - Radio Frequency (RF) Exposure guidelines, this equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

le dispositif de a été évalué à répondre général rf exposition exigence.pour maintenir la conformité avec les directives d'exposition du RSS-102-Radio Fréquence (RF). ce matériel doit être installé et exploité à une distance minimale de 20 cm entre le radiateur et votre corps.

15. SET CONTENTS

- **PBR-14D**
- Mounting plate with rubber grommets and screws
- Operating instructions in English and German

16. SERVICE NOTE

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

Please use the Support Forum **before** you contact us by telephone.
You will find the forum at the following address:

www.forum.powerbox-systems.com

17. GUARANTEE CONDITIONS

We are able to grant a **24 month guarantee** on our **PowerBox receiver** from the initial date of purchase. The guarantee covers proven material faults, which will be corrected by us at no charge to you.
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
86609 Donauwoerth
Germany

18. LIABILITY EXCLUSION

We are not in a position to ensure that you observe our instructions regarding installation of the **Power-Box receiver**, fullfil 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 receiver**, or which are connected with such use in any way. Regardless of the legal arguments employed, our obligation to pay damages 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 **PowerBox receiver**!

Donauwoerth, August 2023

8/2023

PowerBox-Systems GmbH

Ludwig-Auer-Straße 5
86609 Donauwörth
Germany

+49-906-99 99 9-200

www.powerbox-systems.com