RC Electronic by EMCOTEC
DPSI systems & LONGGO batteries

DPSI BIC

English

Dual Power System Interface
Battery Information Center

Operating Manual

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1. Foreword

With the **DPSI BIC** (**D**ual **P**ower **S**ystem **I**nterface – **B**attery **I**nformation **C**enter) you have purchased a high quality and reliable power supply system. We thank you for your faith in EMCOTEC GmbH and assure you that you have made the right decision!
Years of experience in development and manufacturing of electronic systems went into the **DPSI BIC.** All products are manufactured completely in house at EMCOTEC GmbH in Germany. In-house manufacturing, careful quality assurance and a 100% test of all shipped systems assure you of the highest reliability and functionality.

Please read this operating manual carefully in order to use all functions of the **DPSI BIC** optimally**.** We wish you success for all times and enjoyment with this high quality product!

2. Features

The **DPSI BIC** (**D**ual **P**ower **S**ystem **I**nterface – **B**attery **I**nformation **C**enter) is the first power supply concept which, besides a battery switching function and a “low drop out” voltage regulation also contains a LC-display, which provides the user with information about the state of his equipment.

The **DPSI BIC** displays all important measured values in plain text. Besides the battery voltages and the current flow of the connected loads (minimal / average / actual / maximum values) the withdrawn capacity and on-time are displayed. Due to the manifold information of the **DPSI BIC,** errors in the receiver set can be detected. Rough running push-rods or defective servos can be diagnosed by increased current consumption.

Reduced battery capacity caused by aging or defectiveness of the batteries are detected by a low voltage warning.

In addition to the visual data provided by the LC-display there is a piezo buzzer integrated into the **DPSI BIC** which indicates error information (e.g. low voltage) acoustically, too.

Three printed circuit boards, equipped on both sides with most modern parts allow for optimal space usage and are integrated into a stable and ergonomic housing.

Usage of pin-and-socket connectors allow for simple exchange of connector cables and guarantees maximum flexibility. The generous sized heat sink serves for good heat dissipation and allows for high currents of the connected loads.

An optional external switch allows for applications where no direct access to the pushbuttons of the **DPSI BIC** is possible.

Attention:
At shipping, the following default parameters are programmed:
Battery type: LONGGO (2-cell LiPo batteries)
Output voltage: 5.5 Volt (constant value – other values only on request!)

Please do not connect 3-cell LiPo batteries or 7-cell NiCd/NiMH batteries! These batteries are intended for other output voltages (on request).

Summary:

The **DPSI BIC** provides the receiver set with a stabilized voltage from two independent batteries and allows for optical and acoustical control of all important parameters. This means:

- Two independent batteries are connectable
- Two independent electronic power switches
- Absolutely safe switching concept using **CSHC** (controller less self holding circuitry)
- High current capable decoupling diode for the batteries
- "Low Drop Out" voltage regulator for a stable output voltage
- 8Bit Microcontroller data acquisition and display control (not used for turn on procedure, which makes it even safer)
- LC-display with indication of voltage, current, capacity, turn on time, error information

3. Characteristics of the DPSI BIC

- Double power supply including regulated voltage for receiver, servos, ignitions and applications of all kind, which need 5.5V (and respectively between 5V and 10V on request)
- Conforms to all manufacturer specifications for RC receiver sets by providing a stabilized voltage
- Continuous constant servo power using constant power supply
- 2 (3*) cell LiIon / LiPo / LONGGO batteries usable
- 5 (6-7*) cell NiCd / NiMH batteries usable
- Electronic failsafe on/off switch with additional connectivity of an external switch
- Up to 20A peak current load capacity
- **IVM** (Intelligent Voltage Monitoring) – including acoustical state indication for five different battery types (programmable)
- Programmable user language (German / English)
- Cable less system, i.e. all connections are pluggable and therefore exchangeable
- High-quality plastic housing including bracket for the battery connectors
- Reliable recognition of damaged servos or push-rods (e.g. raised current consumption)
- Reliable recognition of defective and aging batteries
- Three double-sided printed circuit board assemblies for highest part density and therefore small dimensions
- Generously sized heat sink for efficient heat dissipation
- Each system is 100% tested

* For output voltages higher than 5.5V (only on request from the factory)

3.1. LC-Display

The LC-display shows all information in plain text in two lines, 8 characters each. Besides the actual voltage of both batteries, it also displays the maximum and minimum voltage of each battery on demand. Furthermore the actual current consumption can be read. Here too, besides the actual value, the maximum and average values are displayed in the current turn on cycle. The withdrawn capacity from both batteries as well as the system on-time is displayed and saved in the **DPSI BIC.** Capacity (in mAh and system on-time (in minutes) can be reset on demand).

3.2. IVM (Intelligent Voltage Monitoring)

An internal 8-Bit-microcontroller monitors all voltages based on an intelligent algorithm and displays different errors (low voltage, voltage error and missing battery) on the LC-display in plain text. An acoustic indication takes place through a built in piezo buzzer. The algorithm inhibits erroneous recognition of batteries pretending emptiness and informs the user at approximately 60%-70% discharge of the battery.

4. Packing Contents

Packing contents of **DPSI BIC**

- **DPSI BIC** basis device
- Mounting frame for M3 stop nuts
- 2 screws M3x20 with stop nuts
- Bracket for locking the MPX connectors
- Operating Manual
- Sticker
- Transportation case

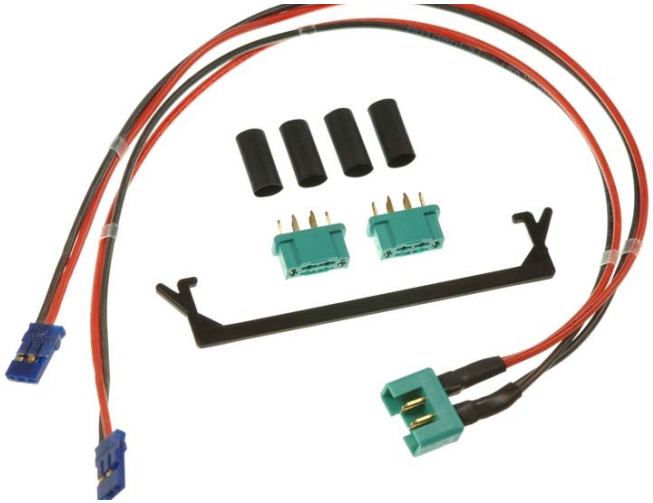
5. Optional Accessories

5.1. DPSI BIC Switch

If the **DPSI BIC** is mounted at a place where it is not accessible easily (e.g. cockpit instrument), an external switch can be connected. The switch can be placed on the sidewall of the fuselage and connected to the **DPSI BIC** by the 4-wire cable (at the lower side of the housing). Inverse polarity protection provides for a safe connection. On/off is done by a connector pin – the optical fault indication via an ultra light LED in the switch.

5.2. DPSI BIC Accessory Set

The **DPSI BIC** accessory set contains all small parts necessary to connect the batteries and the receiver set. Both green MPX high current sockets (incl. heat shrink tube to isolate the soldering points) are to be used for the battery connection cable. The green MPX high current plug is supplied with two 0.5mm^2 silicon cables which supply the receiver (on request with Graupner/JR or Futaba). The silicon cables are carried out twice in order to inhibit power loss and to increase safety. The accessory set also contains a bracket (as spare), which serves as a lock of the MPX connectors.

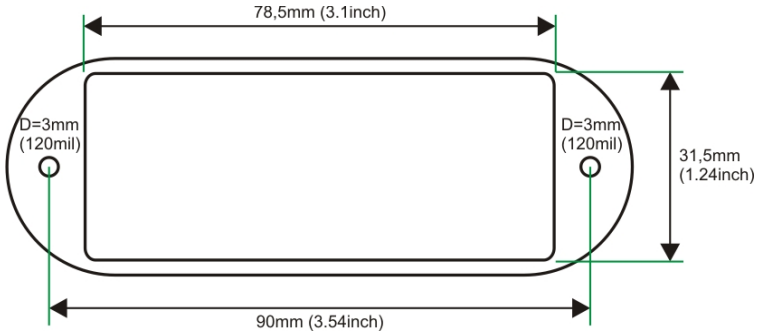


6. Mounting Details

6.1. Mounting the DPSI BIC

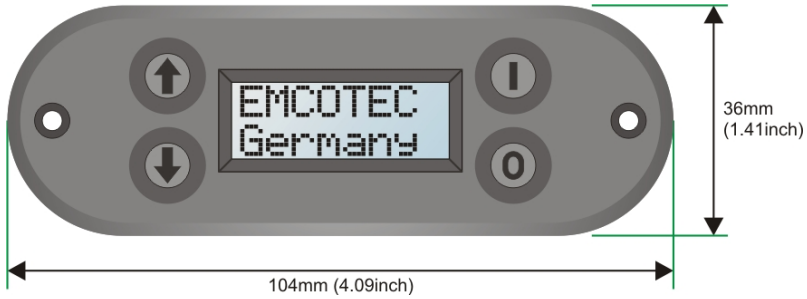
The **DPSI BIC** is designed as a cockpit instrument and can be used as such (especially interesting for scale models). Of course, mounting on a small board inside the fuselage is possible, too. The installation location should not be exposed to extreme vibrations (e.g. side wall of fuselage without reinforcing frame). A counter bearing firmly fixes the **DPSI BIC.** Fastening takes place through supplied M3 screws and stop nuts which do not open even on vibrations.

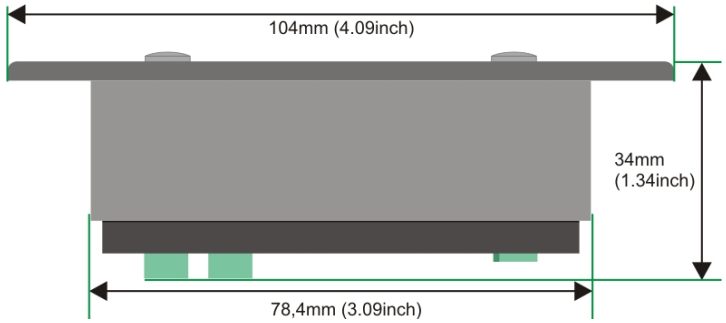
Dimensions for mounting:

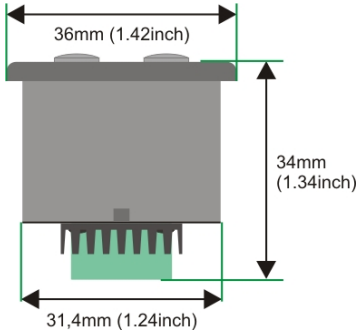


After mounting, the connection cables can be plugged into the corresponding sockets / plugs. In order to inhibit loosening of the connections through vibrations, the supplied bracket is locked between the positive and negative poles of the MPX connector cables and sideways at the housing of the **DPSI BIC**. So, this ensures the connections are secured against potential loosening.

Connector protection using the bracket:

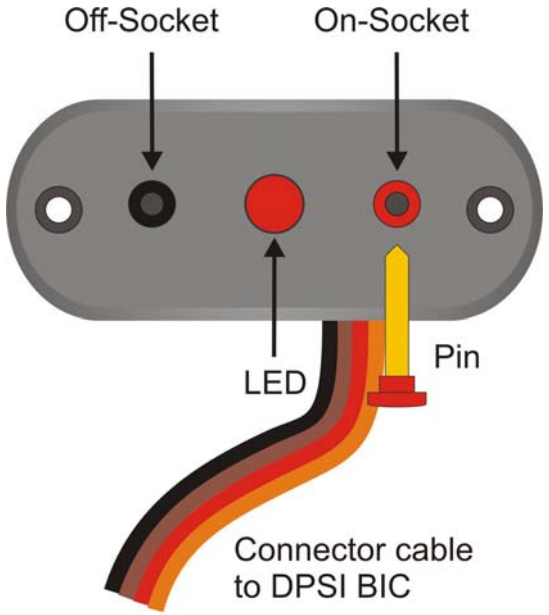






6.2. Connecting the optional switch

Positioning the switch is arbitrary (e.g. at side wall of fuselage).The connection cable with the plug is connected to the strip inside the **DPSI BIC.** Reverse polarity is impossible thanks to the reverse polarity protection.



Turning the **DPSI BIC** on is done by putting the pin into the red socket. Putting the pin into the black socket, turns the **DPSI BIC** off.

The central ultra light LED in the switch is lit when the **DPSI BIC** is turned on (pin in the red socket). In case of an error the LED blinks synchronously with the piezo buzzer, if the buzzer is enabled.

Hint:
The LED in the switch blinks in case of an error only if the buzzer is activated. If the buzzer is deactivated through programming, the LED is lit constantly during the complete turn on event (even with occurring errors).

Hint:
A lost pin can be substituted by a 2mm wire or 2mm screw by putting it into the corresponding socket.

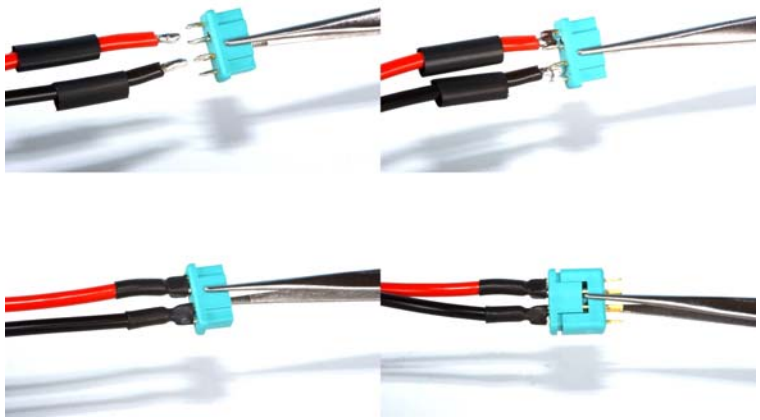
Hint:
Once the **DPSI BIC** has been powered on it stays on if the pin is lost or the external switch is removed.

Hint:
If the pin is put into the black (off)-socket, the receiver set is completely turned off. In the turned off state, the batteries are not being discharged. The minimum current draw of the **DPSI BIC** is far below of the self-discharge of the connected batteries.

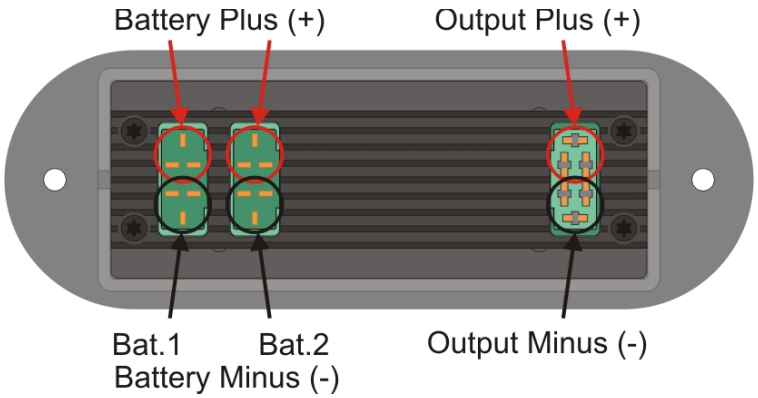
7. Soldering the battery connectors

The MPX high current sockets / plugs are marked with + and – on the soldering side. **It is mandatory to observe this marking!** The insulation of the cables is first stripped (5mm / 0.2”) and then tin-plated. Push a heat shrink tube over the particular cable end before soldering the socket / plug. The cable is soldered inside of all 3 pins of the plug/socket (see photo). If thin cables are used, the pins of the socket can be bent toward the virtual center. In order to guaranty good contact, use plenty of solder. Afterwards shrink the heat shrink tubes using a heat gun.

Soldering Multiplex sockets:



Hint:
It suffices to use just one shrink tube (see photo) for isolation. Do not put a shrink tube over both cables! There must be enough room left between the positive and negative poles for the bracket.



CAUTION:
The DPSI BIC is not reverse polarity protected! Please observe that the batteries are always connected correctly, i.e. the red wire always to the positive pole and the black wire always to the negative pole. Please double check!

8. Charging the batteries

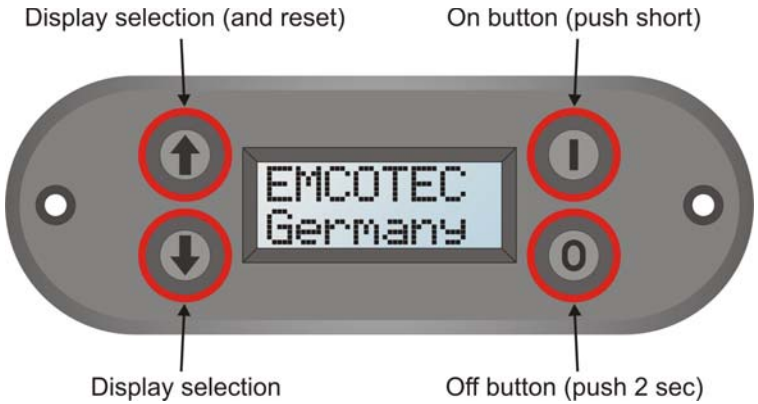
The **DPSI BIC** switches battery positive, i.e. both batteries are, if connected to the **DPSI BIC**, connected through negative (ground). If charging of the batteries should be possible if they are connected to the **DPSI BIC**, a second cable must be soldered to each battery or the batteries must be connected by a V-cable (there is a charging socket already integrated into LONGGO batteries). If in doubt, it is reasonable and safer to disconnect the batteries from the **DPSI BIC.** The bracket must then be unlocked, if used.

Hint:
Batteries with additional charging connection (e.g. V-cable or charging connector) which are connected to the DPSI **BIC** during charging must be charged separately!
Exception:
LONGGO batteries can be charged in parallel (i.e. simultaneously), without disconnecting them from the **DPSI BIC**, if using a special V-cable.

Hint:
Two identical batteries have to be used, i.e. same battery type (NiCd, NiMH or LONGGO) and same number of cells. The capacity may be different, although it makes no sense.

Attention:
If the batteries are connected to the **DPSI BIC** during charging, a charger must be used, whose output voltage (charge voltage) never exceeds 14V (=> limiting step up converter). This is true for e.g. all chargers from “ORBIT Electronic”. If the step up converter is not limited, damage to the **DPSI BIC** is possible. If in doubt ask the manufacturer of your charger!

9. Beginning of Operation



Initial operation, turn on, operation display:

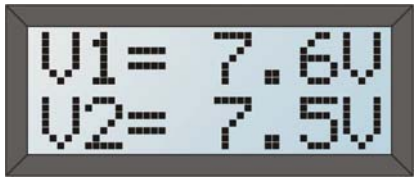
For power, two batteries of same type and capacity are necessary. 5-cell NiCd / NiMH or 2-cell LiPo batteries can be used (other cell numbers for changed output voltage). Batteries must be equipped with MPX sockets or identical connector system.

If the electrical connections are established, the **DPSI BIC** can be turned on. After turning on and completed initialization (display: “EMCOTEC Germany”) the used battery type is optically (LC-Display) and acoustically (piezo buzzer) indicated. Thereby:

1 x beep	5 cells NiCd / NiMH
2 x beeps	6 cells NiCd / NiMH
3 x beeps	7 cells NiCd / NiMH
4 x beeps	2 cells LiPo
5 x beeps	3 cells LiPo
No beep	buzzer deactivated

Afterwards, the voltages of both batteries are displayed and the **DPSI BIC** enters normal operation mode. Using both pushbuttons marked with arrows, different information can be recalled.

If in sequence the ⬇ button is pressed, the values are displayed in the indicated order.



This standard display in normal mode shows the actual voltage of both batteries.

Minimal battery voltage battery 1 since last turn on.

Minimal battery voltage battery 2 since last turn on.

Maximum battery voltage battery 1 since last turn on
(Maximum value 15.20V).

Maximum battery voltage battery 2 since last turn on
(Maximum value 15.20V).

Actual current flow of connected loads. If current rises over 4A, display shows “overload”. It is an error if current rises over 2.0A if servos are idle (defective servo, rough running push-rod, etc.)! (Maximum value of display 8.82A).

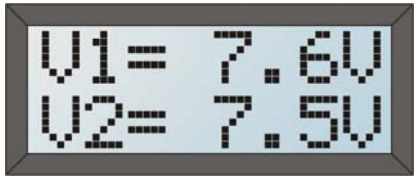
Maximum current since last turn on. This value indicates current peaks, which occur in the system and reaches up to 8.82A. Higher values are displayed as „>8.82A“.

Average current consumption since last turn on. This value should stay below approximately 3A (for LiPo batteries), because this is the maximum continuous current of the **DPSI BIC**. Normally you can assume approximately 1.0A to 1.6A if using 5 servos.

Withdrawn capacity since last reset of memory. This value represents the withdrawn capacity of BOTH batteries! If e.g. using two 2000mAh batteries this value can reach 4000mAh. Display of low voltage occurs much earlier. If rising higher than 9999mAh “>9999mAh“ is being displayed.

Turn on time (flight time) in minutes since last reset of memory. Attention: only whole minutes are saved! If turned off after 1:59, display is 1min after next turn on. If rising over 9999min the value “>9999min” is displayed.

Effective output voltage of the voltage regulator of the **DPSI BIC.** The real value is displayed. Other output voltages can be requested.



From here on, the display repeats, i.e. the voltages of the batteries are displayed.

Hint:
If the **DPSI BIC** already indicates a low voltage warning (battery almost empty), but the withdrawn capacity is far below the nominal capacity of the battery, this indicates a bad battery (which is inapplicable for that reason). The internal resistance of that battery is probably too high, i.e. the battery “breaks down” at high loads. Possibly the batteries are damaged (capacity loss). This can be verified by using a commercially available charger. It also can mean an error in the mechanics (e.g. constantly rough running push-rods). In this case though, the average current would be high, too.

10. Resetting the saved values

The values for turn on time (flight time in minutes) and withdrawn capacity (in mAh) can be reset. This is usually done after charging the batteries. Because the batteries have full capacity after charging, the **DPSI BIC** counts starting from 0 after resetting of the values.

To reset the saved values push the ⬆ button and turn the **DPSI BIC** on. Press the ⬆ button for approximately 5 seconds.

When the ⬆ button is pressed for 5 seconds during turn on, this display appears. Releasing the ⬆ button causes the next frame to be displayed:

Reset can now be confirmed by the ⬆ button or canceled by pressing the ⬇ button. If none of the buttons are pressed, the **DPSI BIC** changes to normal operating mode after a timeout of 5 seconds.

Confirmation of the resetting of the values. After deleting the values a reset occurs and the **DPSI BIC** starts operation in normal operation mode.

11. Error Messages

The **DPSI BIC** displays error messages on a LC-display in plain text. The error indication alternates with the actual notion (every 5 seconds). The function of the buttons for selection of the view remains available. Errors (except one) are irreversible. This means: an error, once recognized, is displayed until the **DPSI BIC** is turned off, even when the error should disappear.

Errors are also acoustically indicated by a piezo buzzer. If the external switch (accessory) is connected to the **DPSI BIC**, the central LED of the switch blinks at the same beat as the piezo buzzer and therefore indicates the error, too.

The following errors can be displayed:

Low voltage battery 1. If the battery is discharged down to about 60% - 70%, this text is displayed. At the same time the error code is beeped by the buzzer every 7 seconds (3 short and one long beep).

Low voltage battery 2. The buzzer sounds now every 7 seconds 3 times short and 2 times long.

Low voltage of both batteries. The buzzer now alternates between the errors for battery 1 and 2.

Missing or defective battery 1 or loose contact in the input lead. At the same time a buzzer signal sounds (2Hz). This error is also indicated until turning off.

Missing or defective battery 2. Due to the constant error indication, even short lasting errors (breaks) can be diagnosed.

If the withdrawn current exceeds 4A, overload is displayed. In this case the buzzer sounds constantly. This indication disappears as soon as the current drops below 4A – this is the only reversible error!

Special case:

That display appears, if an internal memory overrun in the **DPSI BIC** happens. This only can happen under (theoretical) laboratory conditions and does not point to a malfunction in the **DPSI BIC.**

12. Programming the DPSI BIC

Through simple programming, some of the options of the **DPSI BIC** can be adjusted. That is, besides selection of the displayed language, the programming of the used batteries. Additionally, it is possible to deactivate the integrated piezo buzzer, in case the acoustical indication of errors should be suppressed.

In order to connect different battery types to the **DPSI BIC**, the low voltage recognition must be adapted to the particular battery type. This is done by programming the battery type.

Battery type	Battery voltage	Possible output voltage
5 cells NiCd/NiMH	6.2 / 6.0V	5.0V / **5.5V**
6 cells NiCd/NiMH	7.4 / 7.2V	**5.5V** / 6.0V / 6.5V
7 cells NiCd/NiMH	8.6 / 8.4V	6.0V / 6.5V / 7.0V / 7.5V
2 cells Lithium Polymer	7.4V	**5.5V** / 6.0V / 6.5V
3 cells Lithium Polymer	11.1V	9.0V / 9.5V / 10.0V

Bold: nominal value. Other values on request!

Hint:
For the use in air model flights (standard 5.5V output voltage) 5-cell NiCd/NiMH batteries or 2-cell LiPo batteries are recommended.
7-cell NiCd/NiMH batteries or 3-cell LiPo batteries are not permissible with the standard output voltage of 5.5V!
6-cell NiCd/NiMH batteries do not make sense for the standard output voltage of 5.5V, because the excessive voltage, in contrast to 5-cell batteries, must be totally converted to heat!

For programming, both ⬆ and the ⬇ buttons are pressed simultaneously and the **DPSI BIC** is turned on. The ⬆ and the ⬇ are pressed for 5 seconds, then programming mode starts, which works like this:

If both arrow buttons are pressed for 5 seconds during turn on, the programming mode starts. Releasing the buttons changes to the next frame in the display:

The notion of the LC-Display can be carried out in German or English. After 2 seconds the display changes to the language selection:

Should the language be German, press the ↓button, for the English language, press the ↑ button. If there is no button pressed, the next programming option is started after 5 seconds (without changing the programmed language).

With this menu, the programming of the battery type is initiated. After 2 seconds the display changes:

Pressing the ↑ button causes the individual battery types to be displayed (5, 6, 7 cell NiCd/NiMH or 2, 3 cell LiPo).

If the appropriate battery type appears in the display, confirm this value by pressing the ↓ button. If there is no button pressed, the next programming option is started after 5 seconds (without change of the battery type).

The last programming option allows the suppression of the piezo buzzer. After 2 seconds the display changes:

Pressing the ↑ button turns on the acoustical error indication, pressing the ↓ button turns it off. If there is no button pressed within 5 seconds, the actual value is unchanged.

When the new values are being saved, this text appears. After saving, a reset occurs and the **DPSI BIC** starts in normal operating mode.

Hint:
If 2-cell Lithium-**Ion** batteries (Li**Ion**) are being used, programming battery type 6-cell NiCd/NiMH batteries are recommended. This corresponds to the characteristics of LiIon batteries best.

13. Safety Instructions

- In general, all connection cables should not be installed in a way that they interfere with moveable or hot parts in the model (e.g. servos, servo wires or mufflers).
- Protect the **DPSI BIC** from wetness and humidity.
- The **DPSI BIC** must have sufficient free space surrounding it to ensure good air flow and heat dissipation of the heat sink.
- Improper usage of the **DPSI BIC** can cause severe property damage or personal injury!
- Always double check all connections in your model before any usage! All connections must be of the correct polarity, have a clean contact and be secured. Loose cables pose a potential hazard!
- Under no circumstances use power sources which exceed the denoted voltages.
- Current leading contacts must not be short cut. Otherwise shorted cables can heat up or even melt.
- The **DPSI BIC** must not, under any circumstances, be taken apart or technically altered. There are no parts at all within the **DPSI BIC** which could be maintained or repaired by the user.
- Do never misuse the **DPSI BIC** for other reasons than for RC modeling in the hobby area. Especially the application in manned machines is specifically prohibited.
- Operate the **DPSI BIC** exclusively with RC components for modeling.
- Always pay attention to fully charged batteries when operating your model. Empty batteries lead inevitably to the breakdown of the RC components and therefore to the loss of the model.

- Do not expose the **DPSI BIC** to extremely hot or cold temperatures, wetness or humidity. Here, there is danger of malfunction, damage or reduced performance.
- Only use our or from us released accessories in connection with the **DPSI BIC** (e.g. on/off switch).

14. Technical Data of DPSI BIC

Power sources	5, 6, 7-cell NiCd / NiMH cells, 2, 3-cell Lithium-Polymer batteries (LONGGO, LiPo)
Operating voltage range	6.0V.... 16.0V
Nominal input voltage	6.0V.... 12.6V
Output voltage	5.5V stabilized (other values between 5.0V...10.0V on request)
Quiescent current (when off)	< 1µA
Quiescent current (when on)	approx. 30mA (with no buzzer sounding)
Max. continuous current @ 5.5V (15min for LONGGO batteries)	3A
Max. peak current @ 5.5V (100ms for LONGGO batteries)	20A
Drop-Out-Loss @ 1A	approx. 0.5V
CE test	according to 89/336/EWG
Environmental conditions (when on)	-10°C.... +50°C
Permissible temperature range	-25°C.... +85°C
Maximum power dissipation (P)	5.7 Watt ($P = U_{batt} - 5.5V * I$)
Display range battery voltage	0.1V ... 15.20V (respectively > 15.20V)
Display range current	0.03A ... 8.82A (respectively > 8.82A) if I > 4A (actual current) display = "Overload"
Display range capacity	0mAh ... 9999mAh
Display range flight time	0min ... 9999min
Display of the output voltage	real value
Nonvolatile RAM (reset able)	withdrawn capacity, flight time (turn on time)
Low voltage indication	using "IVM", intelligent voltage monitoring (irreversible within current on cycle)
Fault indication by	LC-display (in alternation with current display) as well as the integrated buzzer using different beep pattern.
dimensions (width x height x depth)	104mm x 36mm x 34 mm (39mm incl. clamping yoke) 4.1" x 1.42" x 1.34" (1.54" incl. clamping yoke)
Screw diameter for mounting	2x 3.1mm (0.122") for M3 screws with stop nut
Hole spacing for fastening	90mm (3.54")
Mounting cutout	78.5mm x 31.5mm (3.09" x 1.24")
Weight	approx. 75 gram (2.64 oz)
Warranty	24 month

14.1. Measuring Parameters of DPSI BIC

Voltage display	2% / 1 Digit / resolution 0.1V
Current display	2% / 1 Digit / resolution 0.01A
Capacity display	1% / 1 Digit / resolution 1mAh
On time	1% / resolution 1min
Accuracy of output voltage	+/- 0.2% (+/- 110mV @ 5.5V)
Sampling rate A/D converter	1kHz
Peak value acquisition	arithmetic mean over 10msec

Technical modifications and errors reserved!

Hint:
A regular digital voltmeter is much slower in peak value acquisitions as the **DPSI BIC**, current peaks are therefore not recognized by the instrument if they are of very short duration. The extremely fast measurement of the **DPSI BIC** sheds light on the real peak values during short time periods which are reached by the system.

15. Warranty

EMCOTEC GmbH shall issue a 24-month warranty on the "**DPSI BIC**". The guarantee period shall begin with delivery of the equipment by the retailer and shall be not extended by any guarantee repair or guarantee replacement.

During the period of guarantee, the warranty shall cover the repair or replacement of any proven manufacturing or material defects at no charge. There shall be no specific entitlement to repair work. In case of a guarantee claim, the manufacturer shall reserve the right to exchange the equipment for a product of equal value if repair of the item is not feasible for economic reasons. There shall be no assumption of liability for consequential damages that are brought about by a proven defect during operation of the "**DPSI BIC**". There shall be no extended claims for damages.

- All transportation, packaging and travel expenses are the responsibility of the purchaser.
- No liability shall be assumed for any damages during transport.
- If repair is needed, the equipment must be sent to the appropriate service center of the respective country or directly to EMCOTEC GmbH.
- The guarantee shall only be valid when the following conditions are met:

  The guarantee document (original invoice) must include the delivery date, the company stamp, the serial number and signature of the retailer.

  No intervention in the equipment may have been undertaken. It must have been operated in accordance with our operating instructions.

  Only the power sources and other accessory devices and components that were recommended by us may have been used.
- The guarantee document, the original invoice and other pertinent information regarding the malfunction (a short description of the defect) must be included with the transmittal.
- The equipment must still be the property of the initial purchaser.
- If equipment is sent in that later proves to be functional following an initial inspection, we shall impose a flat processing fee of € 15.
- In all other respects, the general business terms and conditions of EMCOTEC embedded controller technologies GmbH shall apply for any items not listed.

(P) Version 1.0 as of December, 09 2005 Robert Hussmann

Legal Information:

Trademarks:
The following names are registered trademarks:
- EMCOTEC
- DPSI - Dual Power Servo Interface

Other product names mentioned in this manual may also be trademarks or registered trademarks of their respective owners.

Manual Note:
EMCOTEC GmbH reserves the right to make changes to this manual and to equipment described herein without notice. Considerable effort has been made to ensure that this manual is free of errors and omissions. We shall not assume responsibility or liability for any errors that may be contained in this manual nor for any incidental, concrete or consequential damage that may arise from the provision of this manual, or the use of this manual in operating the equipment, or in connection with the performance of the equipment when so operated.

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