Orbit POCKETLADER

03/05

Orbit® electronic
Hard- & Software Engineering

Contents

Preface

With the Orbit POCKETLADER, we have rounded out our range of reliable Orbit battery chargers. Our objective with this device was to create a compact and rugged charger for universal use. With the POCKETLADER, all common battery types, such as nickel metal hydride (NiMh), nickel cadmium (NiCd), lead acid (Pb) and especially lithium ion polymer batteries (LiPo + Lion) from 1 V to 21 V and 50 mA to 4 A, can be charged and discharged.

Due to a new technical concept, all functions of the battery charger are managed by a fully digital control system. Furthermore, the technical innovations of the POCKETLADER also include a step-up/step-down converter, which can charge up from a single battery cell with a full 4 Amperes. This principle not only assures an extremely low power dissipation, but also a reduction of the operating current to a minimum with small numbers of cells.

The POCKETLADER can be upgraded to support all common and future battery types and charging methods by means of a simple software update. The latest control software (firmware) can be downloaded at any time via the Internet from the Orbit website (http://orbit-electronic.de) and saved in the flash memory of your POCKETLADER. Thus your POCKETLADER is optimally prepared for today's and tomorrow's applications.

Its ultra-compact dimensions and robust design make the Orbit POCKETLADER a constant companion for both indoor and outdoor R/C adventures. We wish you a lot of fun and always a good flight or drive!

Yours Orbit team

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Safety Notes

In order to guarantee a safe operation of your POCKETLADER, please always observe the safety notes on this page. Orbit electronic takes no responsibility for damage caused by improper use.

● Only connect suitable power adapters (8 V - 15 V DC, stabilised) or batteries for power supply.

● The housing of the charger serves as a heatsink. Operate the device in a place where the heated air around the housing can be dissipated.

● If the charger, the power adapter or the battery gets very hot, immediately interrupt the power supply. A moderate warming of the charger (up to approx. 45 °C / 110 °F) is normal at high-power operation.

● When connecting the battery, take care of the correct polarity (red **+**, black **–**).

● Always observe the charging current limits recommended by the battery manufacturer. Excessive currents can damage the battery.

● Do not charge or discharge unattended batteries. Especially lithium batteries have a high risk of fire and explosion.

● Do not operate the device in a wet environment (for example, do not place it on wet grass).

● Do not open the housing. In case of defects of the device, please contact Orbit electronic directly.

● Do not clean the device with aggressive detergents, but with a soft, dry or barely damp cloth.

Technical Specifications

|	
Power supply (reverse polarity protected):	8 V - 15 V DC (stabilised) or battery
Operating current:	typ. 54 mA - max. 5 A
Stand-by current (OFF):	< 100 µA

Output (reverse polarity protected):	1 V - 21,5 V / 50 mA - 4 A
	Corresponding to:
	    1 - 12 (14) NiCd/NiMh cells
	    or 1s - 5s lithium
	    or 2 - 16 V lead battery

Charging power:	10 - 60 W (adjustable)
Discharging:	50 mA - 3 A, max. 7 W
LCD display:	2 x 16 characters, backlit
SIO interface:	Connector for PC measurement curves, flash software updates (via Orbit Microlog software) and extensions such as the Orbit LiPo-Checker for individual cell balancing [Art. no. 0605]
Dimensions (L x W x D):	110 x 69 x 24 mm 4.3" x 2.7" x 0.9"
Weight:	200 g / 0.44 lb

Connectors

On the left side of the housing, you will find the connector for the power supply (stabilised DC power adapter or battery).

On the right side are the plug sockets for the connection of the battery to be charged as well as the SIO interface for data exchange with a PC (e.g. for recording charging curves or for firmware updates).
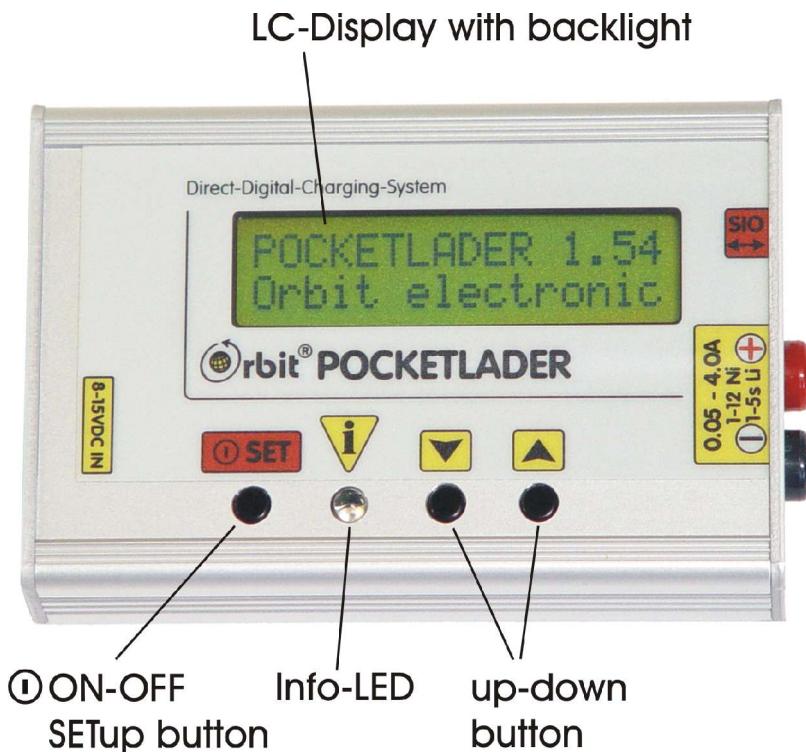

Input ⊕ ⊖ MPX/MG6
8V - 15V DC max.5A
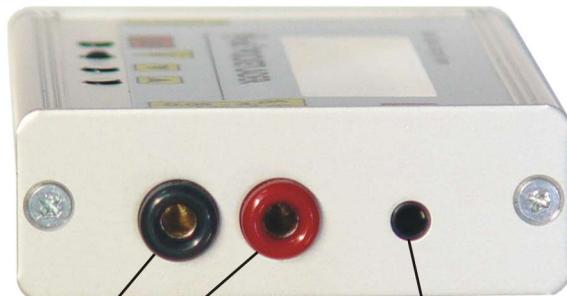
⊖ ⊕ 4mm 3.5mm stereo
output-battery SIO-interface
1V - 21.5V DC

Controls

All keys and displays for controlling the device are located on the upper side of the housing.

More information about using the keys and the meaning of the displays can be found in the following sections.

Turning On and Off

First connect the power supply (stabilised DC power adapter with 8 V - 15 V or a sufficiently dimensioned battery) to the charger.

● To turn the device **on**, keep the **SET** key pressed for **2 seconds**.

   You can also configure the device to switch on automatically as soon as the power supply is connected (see section **Setup Mode**, page 15, setup parameter 16:POWERUP-ON YES).
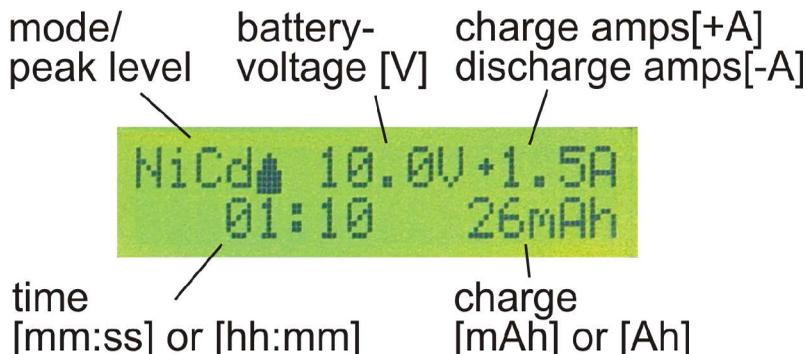
● By keeping the **SET** key pressed for **4 seconds** when turning the device on, the charger switches into **Setup** mode. In this mode, you can modify the basic configuration settings of your POCKETLADER. For more information, see the section **Setup Mode** starting on page 15.

● To turn the charger **off**, press the **SET** key again and keep it pressed until the device switches off.

Charging and Discharging

First select the charging program (mode) suitable for your battery type by pressing the **Up/Down** keys. The program is shown in the upper left corner of the display.

1. NiCd and NiMh Batteries

These battery types are charged with a selectable constant current. The charging process is terminated by delta peak detection (cut-off when the battery is full) or, at the latest, after 14 hours (cut-off timer). The display shows the following information:

mode/   battery-   charge amps[+A]
peak level   voltage [V]   discharge amps[-A]

```
NiCd▲ 10.0V+1.5A
    01:10    26mAh
```

time   charge
[mm:ss] or [hh:mm]   [mAh] or [Ah]

For each battery type (NiMh and NiCd), two different delta peak switch-off values can be selected, symbolised by the size of the triangle icon (delta) after the program name.

Program	Delta peak	per cell
NiMh ▲	-0.30 %	≈ -4.5 mV
NiMh+ ▲	-0.50 %	≈ -7.5 mV
NiCd ▲	-0.70 %	≈ -10.5 mV
NiCd+ ▲	-1.30 %	≈ -19.5 mV

To achieve an optimal charging result and temperature beha-viour, we recommend the higher delta peak values (programs **NiMh+** and **NiCd+**) for charging currents up to 1.5 C* and the smaller values (**NiMh** and **NiCd**) for currents above 1.5 C*.

Charging current preselection

To select the charging or discharging current, first press the **SET** key and then the **Up/Down** keys to switch between the available values.

● For **charging**, select a **positive** current value
(+0.05 A to +4.0 A).

● For **discharging**, select a **negative** current value
(-0.05 A to -3.0 A).

Program	Recommended charging current
NiMh ▲	1.5 C to 2 C*
NiMh+ ▲	0.5 C to 1.5 C*
NiCd ▲	1.5 C to 4 C*
NiCd+ ▲	0.5 C to 1.5 C*

Caution: Please always observe the charging current limits recommended by the battery manufacturer!

The following **Setup** parameters are relevant for these programs (see section **Setup Mode** starting on page 15):
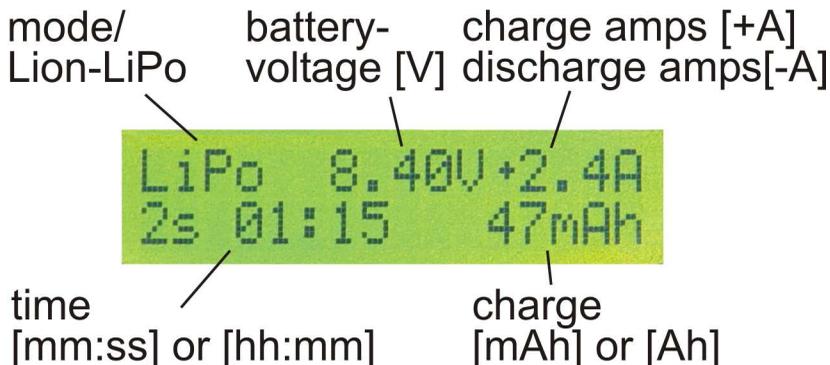
12: AUTO-DISCHRG YES / NO

13: CHARGEPOWER 10W to 60 W

* The charging rate C is the battery capacity per hour. Example: RC2400 ⇨ 2400 mAh/h ⇨ 0.5 C = 1.2 A; 1 C = 2.4 A etc.

2. Lithium Ion and Lithium Polymer Batteries

These battery types are charged with a manually selected current CC and a constant charging voltage CV. The charging process is terminated automatically when a full battery is detected due to a decrease of the charging current, or, at the latest, after 14 hours (cut-off timer).

First select the charging program (mode) suitable for your battery type (**Lion** or **LiPo**) by pressing the **Up/Down** keys. The program is shown in the upper left corner of the display. If an Orbit **LiPo-Checker** (see page) is actively monitoring at the SIO interface (flashing), a ***** is displayed behind the program name (**LiPo***).

mode/ battery- charge amps [+A]
Lion-LiPo voltage [V] discharge amps[-A]

```
LiPo  8.40V +2.4A
2s 01:15    47mAh
```

time   charge
[mm:ss] or [hh:mm] [mAh] or [Ah]

The cell number of the connected battery (1s to 5s) is detected automatically and shown in the display. In case the number displayed is not correct, use the **Up/Down** keys to select the correct number of cells. Afterwards, confirm your selection with the **SET** key. The constant charging voltage is set as follows, depending on the number of cells:

Program	Charging voltage (1s to 5s)	per cell
Lion	4.1 V 8.2 V 12.3 V 16.4 V 20.5 V	4.1 V
LiPo	4.2 V 8.4 V 12.6 V 16.8 V 21.0 V	4.2 V

Caution: Always make sure that the correct charging voltage for the respective number of cells is used, because excessive voltage can cause the battery to burn or explode! For your 4.2 V lithium batteries, we recommend the Orbit LiPo-Checker (see page) as an additional protection.

Charging current preselection

To select the charging or discharging current, first press the **SET** key and then the **Up/Down** keys to switch between the available values.

- For **charging**, select a **positive** current value (+0.05 A to +4.0 A).

- For **discharging**, select a **negative** current value (-0.05 A to -3.0 A).

Program	Recommended charging current
Lion	0.5 C to 1 C*
LiPo	0.5 C to 2 C*

Caution: Please always observe the charging current limits recommended by the battery manufacturer!

The following **Setup** parameters are relevant for these programs (see section **Setup Mode** starting on page 15):

      12: AUTO-DISCHRG YES / NO
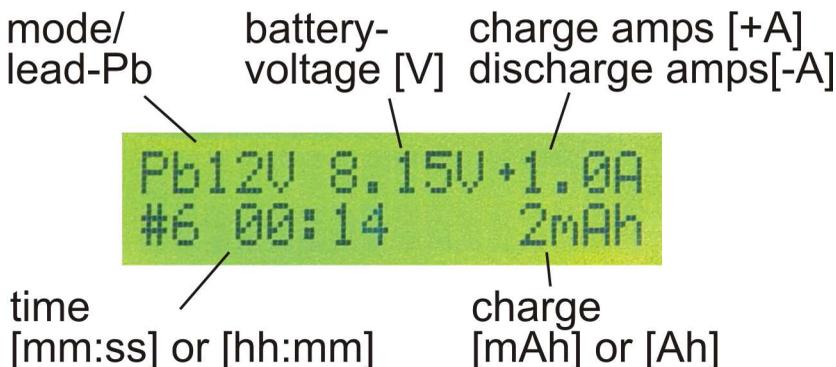
      13: CHARGEPOWER 10W to 60 W

      17: Li-Pb INFO C/2 to C/160   typ. C/10

* The charging rate C is the battery capacity per hour. Example: RC2400 ⇨ 2400 mAh/h ⇨ 0.5 C = 1.2 A; 1 C = 2.4 A etc.

3. Lead and Lead Acid Batteries (Pb)

These battery types are charged with a manually selected current CC and a constant charging voltage CV. The charging process is terminated automatically when a full battery is detected due to a decrease of the charging current, or, at the latest, after 14 hours (cut-off timer).

First select the charging program (mode) **Pb** by pressing the **Up/Down** keys. The program is shown in the upper left corner of the display. The display shows the following information:

mode/   battery-   charge amps [+A]
lead-Pb   voltage [V]   discharge amps[-A]

```
Pb12V 8.15V+1.0A
#6 00:14    2mAh
```

time   charge
[mm:ss] or [hh:mm]   [mAh] or [Ah]

The cell number of the connected battery (Pb2V to Pb16V) is detected automatically and shown in the display. In case the number displayed is not correct, use the **Up/Down** keys to select the correct number of cells. Afterwards, confirm your selection with the **SET** key.

The constant charging voltage is set as follows, depending on the number of cells:

Program	Charging voltage Pb2V to Pb16V	per cell
Pb	2.45 V 4.9 V 7.35 V 9.8 V 12.25 V 14.7 V 17.15 V 19.6 V	2.45 V see Setup 18

> **Caution:** Always make sure that the correct charging voltage for the respective number of cells is used, because excessive voltage can cause the battery to overheat!

Charging current preselection

To select the charging or discharging current, first press the **SET** key and then the **Up/Down** keys to switch between the available values.

● For **charging**, select a **positive** current value
  (+0.05 A to +4.0 A).

● For **discharging**, select a **negative** current value
  (-0.05 A to -3.0 A).

Program	Recommended charging current
Pb	0.1 C to 0.5 C*

> **Caution:** Please always observe the charging current limits recommended by the battery manufacturer!

The following **Setup** parameters are relevant for this program (see section **Setup Mode** starting on page 15):

> 12: AUTO-DISCHRG YES / NO
>
> 13: CHARGEPOWER 10W to 60W
>
> 17: Li-Pb INFO C/2 to C/160   typ. C/10
>
> 18: Pb-LEAD CELL 2.00V to 2.50V

** The charging rate C is the battery capacity per hour. Example:
RC2400 ⇨ 2400 mAh/h ⇨ 0.5 C = 1.2 A; 1 C = 2.4 A etc.*

Setup Mode

In the **Setup** mode of the Orbit POCKETLADER, you can modify the basic configuration settings of the charger. To enter the Setup mode, press the **SET** key while the device is off and keep it pressed until the Setup mode is shown in the display (after about 4 seconds).

Use the **Up/Down** keys to select the Setup parameter you want to change. Pressing the **SET** key briefly will turn the respective option on/off or cycle between the available values.

The table on the following page lists all the Setup parameters you can change.

To quit the Setup mode, keep the **SET** key pressed until the device switches to normal operation.

Configurable Setup Parameters

No.	Name	Settings	Description
11	SOUND	OFF, SHORT, MARCH, CLASSIC, HAPPY	Ring tone selection for "battery full" signal
12	AUTO-DISCHRG	YES / NO	Enables / disables automatic discharging with current reduction
13	CHARGEPOWER	10 W to 60 W	Adaptation of the max. charging power to the power supply / battery
14	MIN.VOLTAGE	8.0 V to 12.0 V	Sets the minimum input voltage for alarm and charging abort
15	LED-FLASH	YES / NO	YES: Info LED flashes when battery is full NO: Info LED continous on when battery is full
16	POWERUP-ON	YES / NO	Enables / disables automatic switch-on
17	Li-Pb INFO	C/2 to C/160	Adjustable C charging rate for the info LED display (see also 15)
18	Pb-LEAD CELL	2.00V to 2.50V default 2.45V	Adjustable cell voltage for lead batteries. Standby: 2.30V Fastcharge: 2.45V

The SIO Interface

The SIO connector (**S**erial **I**nput / **O**utput) of your Orbit POCKET-LADER serves as an interface for data exchange with a PC. For the data transfer, you need a serial SIO cable, which you can order via the Orbit webshop (http://orbit-electronic.de, item no. 0588, SIO PC cable COM, or item no. 0590, SIO PC cable USB).

Together with the cable, you will receive the Windows application **Orbit Microlog**, which you can use, for example, to record and display the charging curves of your batteries, to identify battery problems and to update the control software (firmware) of your POCKETLADER (see next page). You can always download the latest Microlog version on the order page of the SIO PC cable in our webshop.
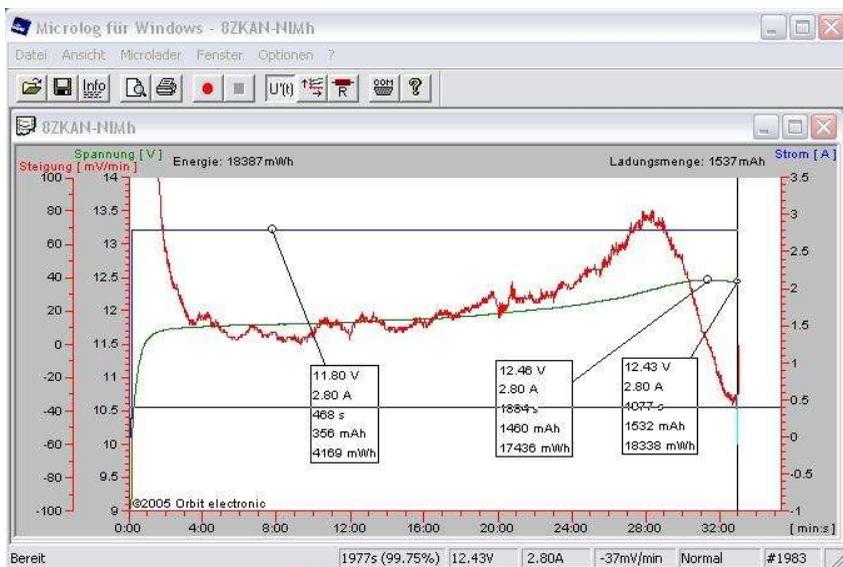
The Microlog software in action

Updating the POCKETLADER Firmware

1. Connect the POCKETLADER to the PC using the SIO cable.

2. Launch the Microlog application on the PC and select the menu item *Firmware-Info / Flash-Utility* in the *Options* menu.

3. Turn the POCKETLADER on. It is detected by Microlog, and the current firmware version number is displayed.

4. Now select whether the new firmware should be downloaded directly from the Orbit server via the Internet, or you want to load a local firmware file (e.g. from a floppy disk).
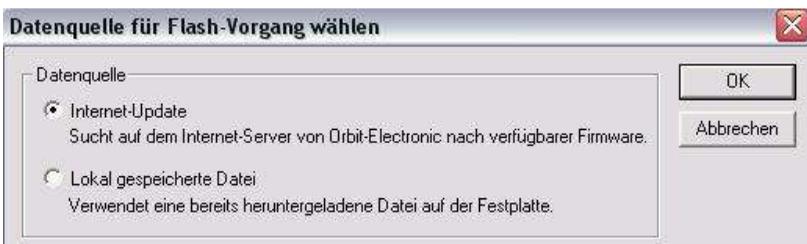
5. The firmware versions available on the server or in the selected local directory are listed. Select the desired version and language, and click on *OK*.

6. The new firmware is transferred into the flash memory of the POCKETLADER. This will take about 2 minutes. After that, your POCKETLADER is immediately ready for operation again.

Specifications of the SIO Interface

During operation, the POCKETLADER constantly sends the current operating parameters via the SIO interface according to the following specification:

Plug	3.5 mm stereo jack
Transmission format	9600 bps, 8/n/1
Data output during charging / discharging	#[MC],[seconds],[mV],[±mA]CRLF each second e.g. #N00125,12455,+2500
Charging stop	#C,00000,[mAh],±0000CRLF

"MC" stands for "Mode Code" – depending on the operating mode, one of the following letter codes is sent:

MC	Operating mode
P	Delta peak automatic charging
D	Discharging
R	Reflex charging
F	Forming
N	Normal charging
B	Lead battery charging
L	Lithium

Accessory: Orbit LiPo-Checker 4.2 V
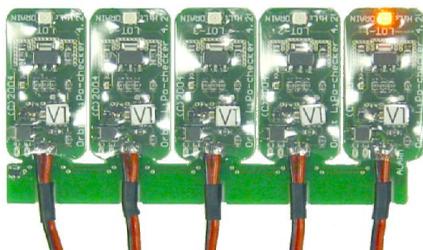
The Orbit LiPo-Checker is a precision voltage monitor for lithium polymer battery cells (LiPo, 4.2 V). It is simply connected in parallel to one our several lithium cells. In the case of voltage differences between the cells, a controlled current sink discharges the cells to the allowed level, thus balancing the voltage in the battery pack. If the allowed voltage range is exceeded nevertheless, an SIO signal is sent to the POCKETLADER via a 3.5 mm stereo jack cable. The charging current is then automatically reduced to protect the battery cells.

Technical Specification of the LiPo-Checker:

Operating current:	10 µA, max. 550 mA
Connectors:	Selectable: JR/Uni or BEC (Tanic) plug system
Allowed voltages:	+2.1 V to +4.5 V
Switching level:	< 2.7 V, > 4.20 V, >=4.23 V
Dimensions:	50 x 5 x 105 mm / 2" x 0.2" x 4.1"
Items included:	Orbit LiPo-Checker (5s), connection cables, plugs

The LiPo-Checker can be ordered via the Orbit webshop: http://orbit-electronic.de, item no. 0605

Recommended Charging Currents (Overview)

Battery type	Program	Recommended charging current
Nickel metal hydride	NiMh	1.5 C to 2 C*
	NiMh+	0.5 C to 1.5 C*
Nickel cadmium	NiCd	1.5 C to 4 C*
	NiCd+	0.5 C to 1.5 C*
Lithium ion	Lion	0.5 C to 1 C*
Lithium polymer	LiPo	0.5 C to 2 C*
Lead / lead gel	Pb	0.1 C to 0.5 C*

Caution: Please always observe the charging current limits recommended by the battery manufacturer!

The charging rate C is the battery capacity per hour. Example: RC2400 ⇨ 2400 mAh/h ⇨ 0.5 C = 1.2 A; 1 C = 2.4 A etc.