

Manual

U150

Charger

No. 6472



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Introduction

Thank you very much for purchasing a **U150 Graupner charger**. Please read this manual carefully before use.

Read this manual carefully to achieve the best results with your charger and first of all to safely control your models. If you experience any trouble during operation, take the instructions to help or ask your dealer or **Graupner** Service Centre.

Due to technical changes, the information may be changed in this manual without prior notice. Be always updated by checking periodically on our website, **www.graupner.de** to be always uptodate with the products and firmwares.

This product complies with national and European legal requirements.

To maintain this condition and to ensure safe operation, you must read and follow this user manual and all the safety notes before using the product and you have to respect those notes also for future use!

To make sure you have the best possible experience with this product, please check if there is an update for the charger and always use the latest software. The software can be found at **www.graupner.com** in the article under Downloads.



Note

This manual is part of that product. It contains important information concerning operation and handling. Keep these instructions for future reference and give it to third person in case you gave the product.

Service centre

Graupner Central Service Graupner GmbH Henriettenstrasse 96 D-73230 Kirchheim / Teck	Servicehotline ☎ (+49) (0)7021/722-130 Monday- Thursday: 9:15 am- 4:00 pm Friday: 9:15 am- 1:00 pm ✉ service@graupner.de
Graupner USA 3941 Park Dr Suite 20-571 El Dorado Hills, CA 95762	Website: www.graupnerusa.com Phone: +1 855-572-4746 Email: service@graupnerusa.com

Graupner in Internet

For the service centers outside Germany please refer to our web site **www.graupner.de**.

Intended use

The charger is suitable for RC models. It is also suitable for testing the servo functions, PPM and SBUS functions for your model.

Any other type of use is impermissible and may cause significant property damage and/or personal injury. No warranty or liability is therefore offered for any improper use not covered by these provisions.

In addition, it is explicitly pointed out that you must inform yourself about the laws and regulations applicable at your respective starting point before starting the operation. Such conditions may differ from state to state, but this must be followed in every case.



Notes

1. The U150 charger allows input from 7-28V. For best operation ensure the power supply is stable and pay attention to connection polarity.
2. Do not use this product in excessively hot, wet or moist conditions or near flammable objects, liquids or gas.
3. Only use this product while under supervision, do not leave charging batteries unattended.
4. Disconnect batteries or power supply when not in use.
5. When charging please select the charge voltage and current suitable to your battery. Check the battery manufacturers specifications for further details. Do not charge batteries above their rated voltage and amperage specifications.
6. It is recommended to use LiPo safety bags when charging batteries. Eg No. 8372, 8373, 8374, 8377, 8378. In addition, the batteries and the charger must be on a non-combustible surface.

Target group

The item is not a toy. It is not suitable for children under 14. The operation of the charger must be performed by experienced modelers. If you do not have sufficient knowledge about dealing with R/C models battery chargers, please contact an experienced modeller or a model club.

Package content

- 6472 U150 charger
- Quick Start Guide, USB Cable, XT-60 / Crocodile Clip Cable

Technical data

Charging	Input	7-28V@MAX12A
	Type of battery	LiPo LiHV LiFe Lion@1-6S NiMh @1-16S Pb @1-12S
	Bal. current	400mA @2-6S
	Resolution	±0.01V
	Charging Power	0.1-10A@150W
	Discharging Power	0.1-10A@150W Recycle Mode 0.1-2A@5-8W Normal Mode
	USB	2.1A@5V upgrade
Measuring	PWM	880us-2200us @20-400Hz
	PPM	880us-2200us*8Ch @20-50hz
	SBUS	880us-2200us*16ch @20-100Hz
	Voltage	1.0V-5.0V @1-6S
	IR	1-500mR @1-8S
Output	PWM	500us-2500us @20-1000Hz
	PPM	880us-2200us*8ch @50hz
	SBUS	880us-2200us*16ch @74Hz
	Power	1-10A@1-28V Mode: CC+CV
Display	LCD	TFT 1.8 inch 160*128 resolution
Product	Size	70mm*50mm*26mm
	Weight	80g
Individual packing	Size	75mm*75mm*35mm
	Weight	140g

Symbol description

Always observe the information indicated by these warning signs. Particularly those which are additionally marked with the words **CAUTION** or **WARNING**.



The signal word **WARNING** indicates the potential for serious injury, the signal word **CAUTION** indicates possibility of lighter injuries.

The signal word **Note** indicates potential malfunctions. **Attention** indicates potential damages to objects.

Safety notes



These safety instructions are intended not only to protect the product, but also for your own and other people's safety. Therefore please read this section very carefully before using the product!

- Do not leave the packaging material lying around, this could be a dangerous toy for children.
- Persons, including children, with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, or not capable to use safely the charger must not use the charger without supervision or instruction by a responsible person.
- Operation and use of chargers and batteries needs to be learnt! If you have never charged a battery, especially a Li-battery, find out about the correct charger setting and monitor the entire charging process. If the battery blooms, unplug it immediately and place it outside on a non-combustible surface.
- Only use the components and spare parts that we recommend. Always use matching, original **Graupner** plug-in connections of the same design and material.
- Make sure that all of the plug-in connections are tight. When disconnecting the plug-in connections, do not pull the cables.
- Protect the U150 from dust, dirt, moisture and foreign parts. Do not expose it to vibrations or to extreme heat or cold. The use should take place only in normal outside temperatures such as from -10°C to +55°C.
- If you have questions which cannot be answered by the operating manual, please contact us or another expert in the field.

For your safety by handling the charger and the batteries



WARNING

Always charge your batteries on a fireproof surface. Use LiPo safety bags or safety boxes for the battery.



CAUTION

Avoid every kind of short-circuit in all sockets of your charger or batteries! Risk of fire! Use only the suitable connectors. In no case the electronic component may be changed or modified. Due to licensing reasons, any reconstruction and/or modification of the product is prohibited.

Product description

The U150 is a multi-function charger and discharger that integrates receiver and servo test functions along with power supply functions.

- LiPo, LiHV, LiFe and Lion 1-6S. NiMh 1-16s. PB 1-12s battery charging and discharging and balance management for Li-batteries

- Charging current: Maximum 10A @150W

- Discharge current:

Energy recovery mode MAX 10A@150W

Normal mode MAX 2A @ ca. 5-8W

- The charging voltage of the lithium battery can be adjusted (TVC)

- The battery voltage and the internal resistance of the battery can be measured.

Lithium Battery Balance Management

- Measurement of signal values like PWM / PPM / SBUS

- can output a PWM / PPM / SBUS standard signal.

- Constant current source with constant voltage. Can output a constant voltage of 1-28V. 1-10A constant current. Max. 150W

- can be adapted to the mainstream UAV battery. automatically activated and charged.

- USB 2.1A@5.0V output. rechargeable mobile device or transmitter with USB charge function.

- Mass Storage Feature: For updates, simply copy the upgrade file to the main directory.

For your safety by handling the batteries



CAUTION

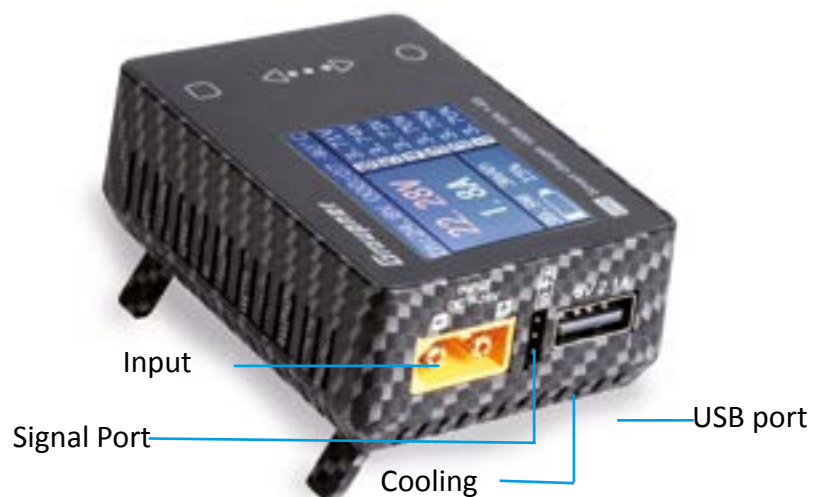
- **Protect the batteries from dust, dirt, moisture, heat and vibrations. Only use in dry locations.**
- **Do not use any damaged battery.**
- **Batteries may not be heated, burned, short-circuited.**
- **If handled improperly, there is a danger of fire, explosion, irritation and burns.**
- **Leaked electrolyte is caustic and should not be touched or come into contact with your eyes. In case of emergency, rinse with a large quantity of water and consult a Med. Doctor.**
- **Stock the batteries in dry and fresh conditions.**
- **Dispose of the battery in the proper disposal centers.**

U150 Layout

Front side (right)



Back side (left)



Quick start



1. The 7-28V power supply is connected to the input port on the back of the U150
2. The display shows the bootup logo and stays for 2 seconds
3. Accompanied with do-re-mi bootup sound
4. The starting process is complete. The display enters into the main interface as shown
5. Press [up] or [down]. Move the cursor to select the function. Press the [OK] key to call up the selected function and enter the corresponding menu page
6. After entering the corresponding function menu page, press [up] or [down] to move the cursor to select the setting item or value.

Press [OK] and change the option or the value. After the modification is completed, press the [OK] to confirm.

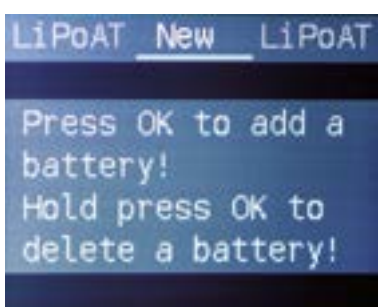
7. Press the [back] key to end the modification or return to the previous screen.



Note

1. Short press the [OK] once to determine the key function.
2. Press and hold the [OK] for 2 seconds as the delete key function.
3. Pressing any button will give a sound prompt.

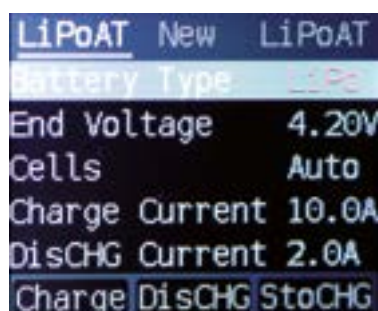
Charge and discharge



After selecting the [Charge] function on the main interface press [OK] to enter the charging function. The following interface is displayed.

1. Battery type setting

Press [up] or [down] to move the cursor. Select the battery type to be set. Press [OK] to enter the battery setting interface as shown below.



Move the cursor to [LiPo] and press [OK] to modify the battery type with [up] or [down]. The charger supports charging and discharging five types of batteries: Lipo, LiHV, LiFe, Lilon. NiMh. Pb. After selecting the correct battery that matches the actual battery, briefly press [OK].



Attention

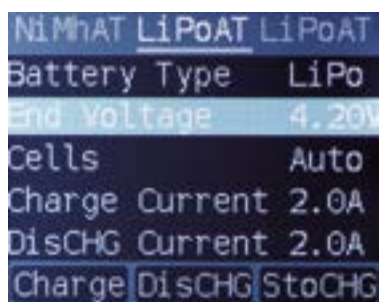
1. Incorrect charging of the battery may damage the battery and the charger and cause damage and burns or fire, etc. Please be double careful.
2. Please do not use this product for charging batteries where the battery type cannot be specified.



Note

1. LiPo: Often referred to as a lithium polymer battery. Nominal voltage 3,70V. Fully charged 4,20V
2. LiHV: Often referred to as a high-voltage Lithium battery. Nominal voltage 3,85V. Fully charged 4.35V.
3. LiFe: often referred to as lithium-iron Phosphate battery. Nominal voltage 3.30V. Fully charged 3.60V.
4. Lilon or Lilo: often referred to as a lithium-ion battery. Nominal voltage 3.60V. Fully charged 4.10V.
5. NiMh: Often called nickel-metal hydride battery. Nominal voltage 1.20V.
6. Pb: often referred to as lead-acid battery. Nominal voltage 2.00V.

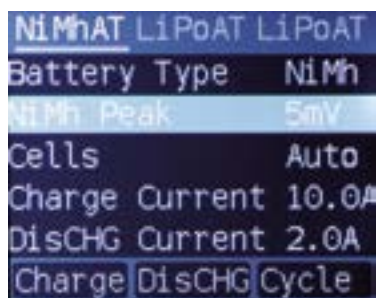
2. Cutoff voltage setting TVC



Move the cursor to [End Voltage] and press [OK] to modify the battery charge cut-off voltage. Press [up] or [down] to adjust the value and step 10mV.

1. Only with LiPo, LiHV, Lion and LiFe Lion batteries, the cut-off voltage can be set.
2. Do not modify the cutoff voltage when you are unfamiliar with battery characteristics.
3. The cut-off voltage can be set in the range of + - 50 mV of the recommended charging voltage
4. TVC: Terminal voltage control corresponds to constant current / constant voltage charging method

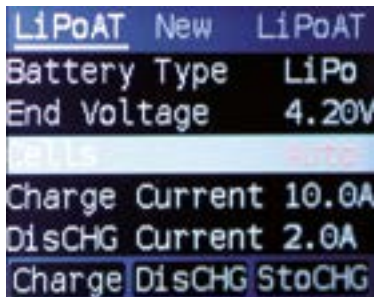
3. NiMH Setting (PeakV)



When the battery type is NiMh. you can set the negative DeltaPeak voltage value when the battery is full. and the range can be set from 5mV to 20mV. as shown below.

Tips:

1. Only for a NiMh battery, you can set the negative DeltaPeak voltage value of the battery
2. negative delta peak voltage value: peak voltage drop per cell when the NiMH battery is full



4. Battery Setting

Move the cursor to the [Cells] and press the [OK] button to change the number of battery cells. Press [up] or [down] to adjust the value. When set to [Auto], the charger will automatically recognize the number of cells on the connected batteries according to the voltage of battery which connected with output port

Tips:

1. the battery which was over- discharged or over-charged. may cause the number of cells to be recognize falsely. You need to manually set the correct number of cells.
2. If the number of cells was set incorrectly. The battery cannot be full charged. or be overcharged and damaged. Please set it carefully.

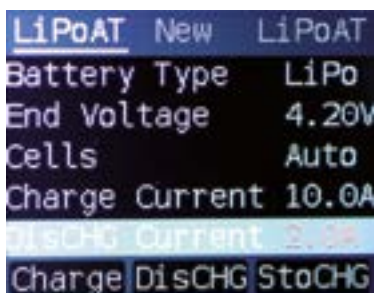
After the Lixx battery is connected to the balance connector. the number of battery cells can be more accurately identified.

5. Current setting



Move the cursor to the charging current [Charge Current] position and press [OK] to modify the charging current. Press up or down to adjust the value and step 0.1A. Hold the button up or down to quickly increase or decrease. The charger supports up to 10.0A.

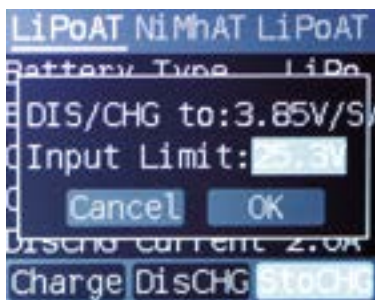
Move the cursor to the [Discharge current] position and press [OK] to modify the discharge current. Press [up] or [down] to adjust the value and step 0.1A. Hold down the [Up] or [Down] key to quickly change the value. The charger supports two discharge modes.



1. Normal discharge mode (setting Intern). Through internal heat dissipation discharge. Maximum support 2.0A@5-8W.
2. Energy recovery-discharge mode (recycle). When the input power source is a battery this function can recover electrical energy to the input battery. The maximum supported current rate is 10.0A. The maximum voltage of the input battery must be set and confirmed so that it cannot be overloaded.

Tip:

1. Please set the charging rate at 1-2C according to the battery capacity. For example. if the battery capacity is 2000mAh. please set the charging current to 2.0-4.0A.
2. The charging and discharging current is only valid in the corresponding working mode.
3. For the discharge mode setting. refer to the <Settings> chapter of this manual.



6. Working mode

Move the cursor to [Charge] [DisCHG] [StoCHG] position. press [OK]. The charger will work in the mode of the selected function. When selected as [Charge]. it will indicate the target voltage that will charge the battery. As shown below

When [Discharge] is selected, the target discharge voltage is displayed. The battery is discharged to this set voltage. If the discharge mode is used to restore the discharge (Discharge Mode Recover), the max. Voltage of the input battery can be set, which is used as a power source. As shown in the line Input limit:

Tip:

1 To use energy recovery discharge mode (recycle) please read the details on setting discharge mode of this manual.

When [stoCHG] is selected, the set voltage for charging and discharging the battery is displayed. If the discharge mode is to recover the discharge to the power source batter. it is also necessary to set the cutoff voltage of the battery. As shown below.

The high limit voltage of recovered. The default is 0.5V higher than the input voltage. Please set according to the maximum limit voltage of the input battery. When using a power supply, this setting must not be selected. To cancel the operation. move the cursor [back] or press [back]. Move the cursor to [OK]. short press [OK] to start charging. and display the charging and discharging work interface.

Tip:

1. The discharge/charging voltage should be set according to the storage conditions of the battery.
2. After the input limit voltage is set to the highest end-of-charge voltage of the input battery, the charger will automatically stop the recovery discharge. Setting a high overvoltage may damage the input power. Do not set the input limit higher than the maximum charging voltage of the battery of the power source.

Charge and discharge



When charge and discharge starts, the following screen appears.

Press [up] or [down] key on this screen to switch the bottom status display information or press and hold [OK] for 2 seconds to dynamically set the working current. As shown below.

22.28V: The battery voltage of the output port.

1.8A: Charging or discharging current

P: Charging power.

C: maximum current

I: input over current or Power

A: activate charge

F: The battery at the output has full voltage or a single cell is full

39.9W: Charge or discharge power of the charger

3mAh: Capacity that has been charged and discharged this time

In: 24.8V: Input supply voltage

001:17: Time since the work has started. Unit: minutes: seconds

40'C: internal temperature of the charger

LiPo 6S: currently set battery type and number of cells

0.9Wh: Charge/discharge energy

2.0A: Current operating current set. Long press to modify.

1 3.70V: 1st battery voltage

2 3.70V: 2nd battery voltage

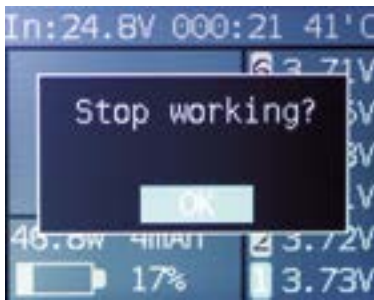
3 3.70V: 3rd battery voltage

4 3.73V: 4th battery voltage

5 3.74V: 5th battery voltage (balancing)

6 3.71V: 6th battery voltage

---V : no battery connected



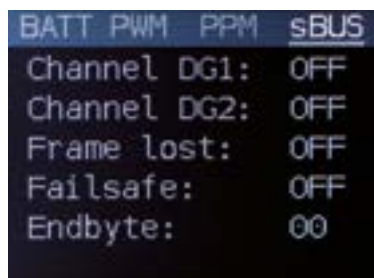
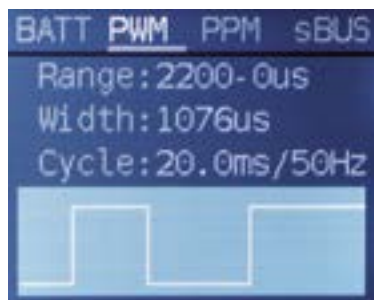
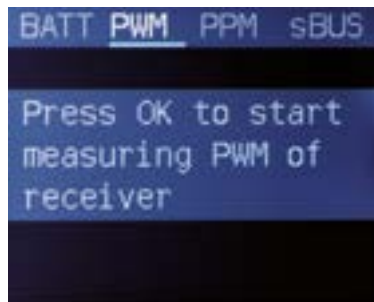
To end the charge and discharge work, short press [back]. In the pop-up prompt box, select [OK] to exit.

When charging is complete or charging is wrong, a pop-up window displays and a tone sounds.

Tip:

1. Only charge or discharge batteries under supervision. Do not leave the charger unattended.
2. When charging and discharging the lithium battery, if only connect with the main port of battery, it will not be balanced. Please pay attention to the balance of the battery. Connect the battery with balance port so the balance management is automatically performed.
3. When charging is completed, unplug the battery. After accessing the new battery, it will automatically continue to charge and discharge according to the setting mode. When set to a fixed number of cells, you need to access the same number of batteries. When setting to automatically detect the number of battery cells, please pay attention to whether the number of detected cells matches the actual ones.

Signal measurement



After selecting the [Measurer] function on the main interface, press [OK] to enter the function and display the following interface. Press up or down to select the type of signal to be tested.

Move the cursor to the [PWM] item, press [OK] to enter the PWM test interface as shown below.

Tip:

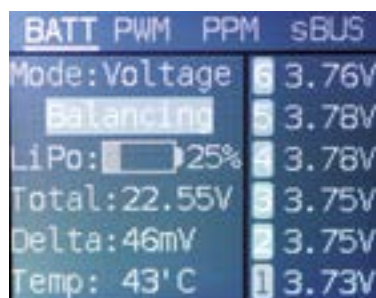
1. PWM and PPM signals can automatically identify and switch to the corresponding interface.

2. sBus is an inverted signal. Baud rate 100kbps 8-bit data bit 2-bit stop bit even parity

Press up or down switch on the measurement main interface to move the cursor to the [PPM] item. Press [OK] to enter the PPM test interface as shown below.

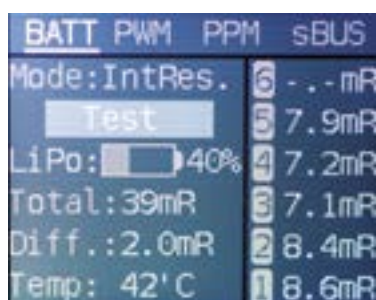
Move the cursor to the [SBUS] item and press [OK] to enter the compatible signal test of SBus. Press up or down and switch channels 1-8 or 9-16 or the status display. .

Battery Measurement



After selecting [Measurer] on the BATT main menu page, press [OK] to enter the function and display the following menu page.

This interface displays the current battery voltage value and range. Move the cursor select [Balance] and press [OK] to start balancing management of the batteries. Move the cursor to the [Voltage] position press [OK] to switch to internal resistance mode and display the following figure.

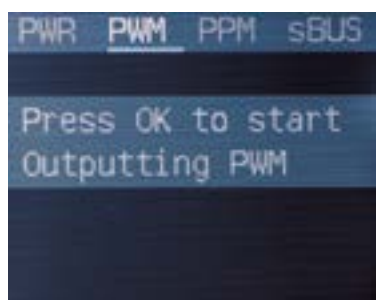


Move the cursor to [Test] press [OK] once to start testing the internal resistance. The testing is finished after about 5 seconds and shows the internal resistance of the battery

Tip:

This testing needs to charge the battery for 5A current for a short time. Please ensure that the input power is sufficient and the battery is not overcharged.

Signal output



After selecting the [Output] function on the main interface press [OK] to enter the function. and the following interface is displayed.

Press [up] or [down] to move the cursor to [PWM]. Press [OK] to enter the PWM test interface as shown below.

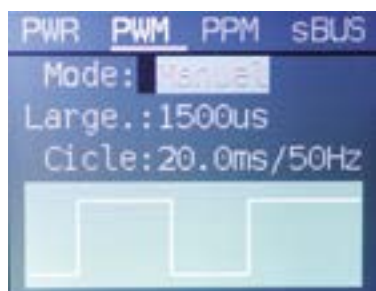
Move the cursor to [Manual] and press [OK] to set the output mode that can be set to Manual or Auto 1, Auto 2, Auto 3.

When the mode is set to manual. you can move the cursor to the pulse width and period items to set the signal value to be output.

When set to Auto 1. 2. 3. the pulse width value of the output PWM will automatically change at 3 different speeds.

Pulse width can be set from 800 to 2200us. The cycle can be set from 2.5ms (400Hz) to 50.0ms (20Hz).

Press [up] or [down] on the output main interface to move the cursor to the [PPM] item. press [OK] to enter the PPM output interface as shown below.



BATT	PWM	PPM	sBUS
01			1835
02			1570
03			1329
04			1208
05			1521
06			1521
07			1121
08			1825

BATT	PWM	PPM	sBUS
Channel DG1:	OFF		
Channel DG2:	OFF		
Frame lost:	OFF		
Failsafe:	OFF		
Endbyte:	00		

Press [up] or [down] to move the cursor to the value that needs to be modified. Press [OK] to modify the output pulse width value of this channel. Press up or down under the output main interface to move the cursor to the [SBUS] item. press [OK] to enter the compatible signal output of SBus. Press up or down and switch channel display 1-8 of 9-16 or the status display. The display interface is as shown below (9-16 channel and status display interface diagram omitted). Press [up] or [down] to move the cursor to the value of the channel to be modified. Press [OK] to modify the output pulse width value of this channel.

Power output

PWR	PWM	PPM	sBUS
Typical: Custom			
12.0V	10.0A	Stop	
12.0V	0.0A	0.0W	
		000:06	
		41 °C	
		CV	
		In:24.3V	

Press [up] or [down] on the [Output] main page to move the cursor to the [PWR] item. Press [OK] to enter the power output function. This menu will output the input power according to the setting voltage and current. constant voltage and constant current. The display interface is as shown below.

Typical value: It is a common typical output mode. Which can be set into the following 3 modes.

1. **Feedthrough:** The input voltage is output directly through the output connector.
2. **User:** With the User setting, you can manually set the value of the voltage and current limit as needed.
3. **Frequently used drone battery charge:** (Mavic2, Mavic S, Phantom, Inspire) Select the appropriate battery and automatically configure the appropriate output voltage and current.

Configure the relevant output voltage and current

12.0V: The voltage output from the output main port can be set to 5-30V.

10.0V: Maximum current limit output from the main port. the range of 1-15A can be set.

Start: Output Start, the output starts to the output, Output Stop corresponds to interrupt

12.0V 0.0A 0.0W: Current output current and power of the main port.

00:04 output time

41 ° C: current internal temperature of the device.

CV CC: current working mode. CV: constant voltage CC: constant current.

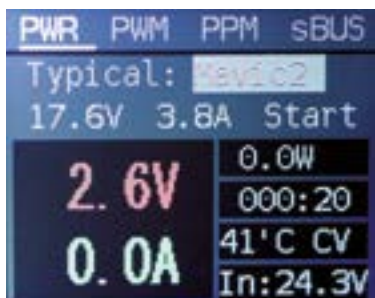
In: 24.4V: current input voltage



Attention

Never charge a normal battery in this mode while the power is on. Otherwise, the battery or the device may be damaged.

Charge drone battery



Press [up] or [down] on the main interface [Output] to move the cursor to the [PWR] menu point. Press [OK] to enter, then move the cursor to the Typical: and change the output mode to the corresponding drone model that needs to be charged. Move the cursor to [Start] and press the enter key. The charger will output the set voltage. The display interface is as shown below

Typical: For common drone models, it can be set to the following four types of drones. Mavic2. Mavic. Phantom. Inspire.

17.6V: The voltage value when the current battery is full cannot be changed.

3.8AV: Maximum current for charging, adjustable current.

Start: Start output, stop output equals stop

17.0V 3.7.0A 64..8W: Voltage, current and power output from the main port.

02:30 Working hours

In: 12.0V: Input voltage.

32 °C: Current internal temperature of the device.

CV CC: Working mode. CV: constant voltage CC: constant current

Tip:

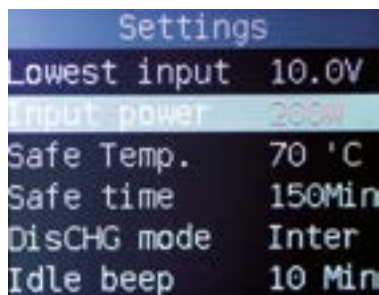
There is no need to open the battery before charging. Automatic activation and charging.



Attention

Do not charge a regular rechargeable battery in this working mode as the battery may damage the device.

Setup



After selecting the [Settings] function on the main interface, press the [OK] key to enter the function display the following interface. Press [up] or [down] to switch to the second interface. As shown below

Operating instructions:

Minimum input voltage: Below this voltage, the device will stop the function of the main port output.

Maximum input power: The maximum power obtained from the input port during charging. Use a power supply, then enter the max. Power supply or a slightly lower value.

Safe temperature: Above this temperature value, the device stops the function at the output

Save Charge Time: The maximum time for continuous charge and discharge. Loading and unloading stops working when exceeded

Discharge mode: Can be set to normal discharge discharged by internal heat dissipation (Internal setting: 5-8W Discharge capacity). Or with the setting Recycle recover some of the energy and recharge the battery at the input (the battery at the input must be rechargeable, no power supply may be connected to the input).

Buzzer: After the set time, the device reports a beep and reminds that it is still connected to a voltage source, although no function is active. Disconnect the input voltage when not using the charger.

SBUS value: The display mode of sBus when measuring or outputting. can be set to pulse width value (1000-2000). or original value (0-2047).

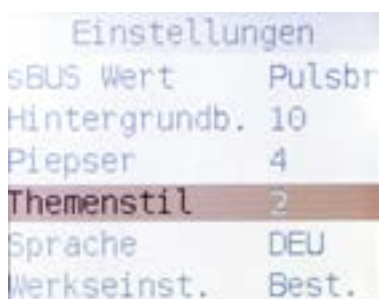
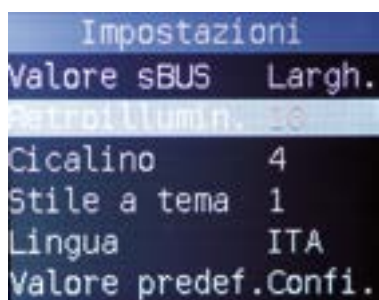
Backlight: The brightness level of the backlight of the display can be set to 1-10

Buzzer: The tone of the buzzer can be set to off or to 1-7.

Theme style: 1 = background dark, 2 = background light (white).

Language: Language selection: German, English, French, Italian, Chinese

Factory setting: Restore all settings to their default values.



Other functions

1. Firmware upgrade

After you connect the U150 to the computer using the included USB cable, the computer detects the USB mass storage drive. Download the upgrade file app.upg on the official website to overwrite the files in the USB flash drive to upgrade the firmware.

2. USB 5.0V output

In addition to the above upgrade functions. the USB interface can also output 2.0A current to charge mobile devices or a transmitter with USB charge function (eg. Graupner mz-12 PRO, mc-26, mc-28, mz-16 or mz-32).

3. energy saving reminder

When the U150 is idle for 5 minutes. the backlight will automatically decrease.

4. Automatically continue to charge and discharge after the next one,

unplug the battery for 2 seconds. then access the next battery. The device will automatically continue to charge and discharge.

5. Fan function

When the internal temperature of the device reaches 40 ° C. the fan work at the half-speed air volume to reduce noise. When the internal temperature reaches 50 ° C. the fan turns on the full speed air volume to enhance heat dissipation.

6. Manually calibrate the voltage.

Connect the power to the input port. When in the logo interface. press the [back] button once. The system will enter the manual calibration voltage function. Use a voltmeter to measure the actual voltage of each battery cell and the total voltage; move the cursor to the corresponding voltage value. and modify the voltage value to match the voltmeter value for calibration. After the calibration is completed. move the cursor to save. short press once. the buzzer sounds once and the save is successful. Exit or Turn off device.

7. Supplement

When the lithium battery is fully charged. the prompt "fast charging has ended". If the battery is not removed. constant voltage trickle charging will be performed automatically to bring the battery to the even more full state.

SIMPLIFIED DECLARATION OF CONFORMITY

Graupner/SJ hereby declares that the charger **U150** complies with the Directive 2014/30/EU.

The full text of the EU Declaration of Conformity is available at the following Internet address: **www.graupner.de**

Produced for:

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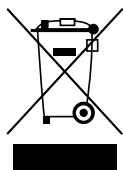
Manufacturer:

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Importer for Europe:

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Henriettenstr. 96
73230 Kirchheim/Teck

Notes on environmental protection



If this symbol is on the product, instructions for use or packaging, it indicates that the product may not be disposed with normal household waste once it has reached the end of its service life. It must be turned over to a recycling collection point for electric and electronic apparatus.

Individual markings indicate which materials can be recycled. You make an important contribution to protection of the environment by utilizing facilities for reuse, material recycling or other means of exploiting obsolete equipment.

Batteries must be removed from the unit and disposed of separately at an appropriate collection point. Please inquire if necessary from the local authority for the appropriate disposal site.

Care and maintenance



The product does not need any maintenance. Always protect it against dust, dirt and moisture.

Clean the product only with a dry cloth (do not use detergent!) lightly rub.

Warranty conditions

Graupner/SJ GmbH, Henriettenstrasse 96, 73230 Kirchheim/Teck grants from the date of purchase of this product for a period of 24 months. The warranty applies only to the material or operational defects already existing when you purchased the item. Damage due to misuse, wear, overloading, incorrect accessories or improper handling are excluded from the guarantee. The legal rights and claims are not affected by this guarantee. Please check exactly defects before a claim or send the product, because we have to ask you to pay shipping costs if the item is free from defects.

These operating instruction are exclusively for information purposes and are subject to change without prior notification. The current version can be found on the Internet at **www.graupner.de** on the relevant product page. In addition, the company **Graupner/SJ** has no responsibility or liability for any errors or inaccuracies that may appear in construction or operation manuals.

Not liable for printing errors.

