M6AC

Manual V1.0
2024.11

Introduction

Thank you for purchasing the M6AC balance charger, please read this manual carefully before use.

Key Points

 Tips

 Important

 Information

Further information

To ensure you have the best experience with this product, please follow us on Facebook @ToolkitRC to stay up to date with news, information and firmware updates for your charger; this information could be found at www.toolkitrc.com

⚠️ Safety

1. allows input voltage of DC 7-28V or AC 100-240V. Ensure the charger is only connected to a suitable power source and correct polarity.

2. Do not use this product in hot, humid, flammable or explosive environments.

3. Please do not use this charger without supervision. Never leave charging batteries unattended.

4. When not using this product, please unplug the input power.

5. When using the charging function, please set a current that matches the battery. Do not set an excessive current for charging to avoid damage to the battery. Check the guidelines of your battery's manufacturer for correct charging instructions.

Contents

Product description

The M6AC is a multifunctional tool that integrates functions such as a balance charger and discharge, a signal measuring device, and a signal source.

- Support AC or DC dual input。
- Charges, discharges and balances (where applicable) LiPo, LiHV, LiFe, Lilon, LTO 1-6S, NiMH 1-16S, Pb 1-10S batteries.
- Charge current：MAX 15A @MAX300W.
- Discharge current：
  Recycle Max 15A@300W.
  Internal mode Max 3A @20W.
- Lithium battery cut-off voltage can be adjusted at will (TVC function).
- Measures battery voltage, battery internal resistance, and balances lithium packs automatically.
- Measures / outputs PWM/PPM/SBUS standard signals with an accuracy of 1 us.
- Constant current and constant voltage source output, customizable 1-28V constant voltage, 0.5-15A constant current.
- Can be adapted for charging consumer-grade drone batteries.
- Multi-language user interface.
- Easily upgradable via USB.

M6AC Layout

Display

USB output

Balance port

Signal port

Output port

buttons

Front

DC input

Cooling fan

AC input
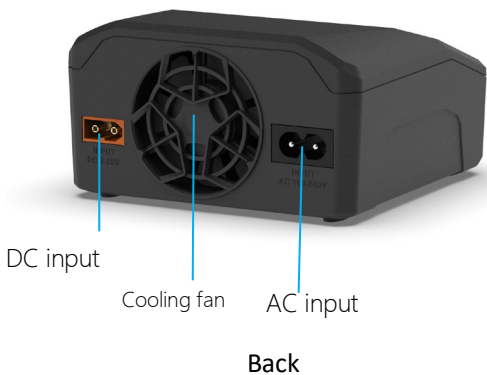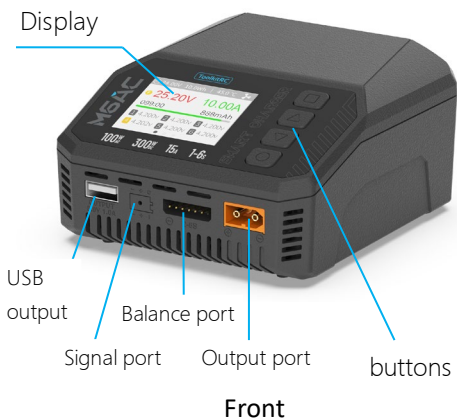
Back

Quick start

1, Connect a 7-28V or AC 100-240V power supply or Battery/Power Bank to the input port on the back of the M6AC.

2, The display shows the boot logo and stays for 2 seconds.

3, A welcome sound (voice pack dependent) is played simultaneously.

4, After booting up, the screen enters the main interface as shown below:
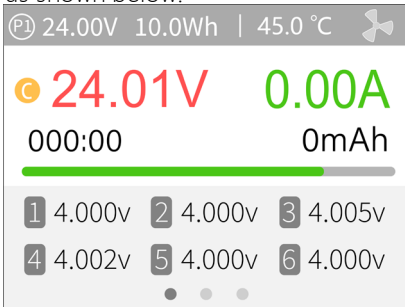
5, Press and hold [■button] can enter into the Multi-function interface.

6, Press [▲▼button] to switch between pages.

7, When the charger idle, short press [●button] to set the charging parameters. Press [●button] during the charging process to adjust the amperage or stop the charge process.

8, When the charger idle, Press and hold [●button] to enter the system setting interface.

9, Short press [■button] or return to the previous interface.
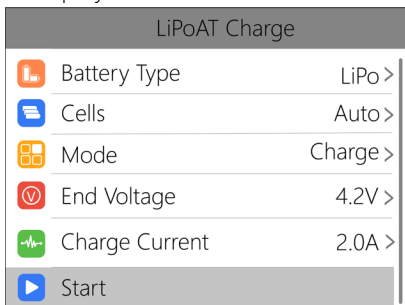
Charge and discharge settings

In the main interface, select and short press [●button] to enter the charging function,

If open the battery selection option under setup page, and the following interface will be displayed. (Not enabled by default)

|			
🔲 Battery selection			
LipoAT	10.0A	Charge	›
LiHv 3S	5.0A	Charge	›
New			›
			›
			›
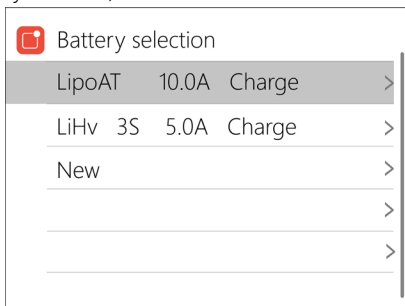
1. Battery type setting

Press [▲▼button], and select one of the presets, or create a new battery. Up to 32 battery files can be created. Press [●button] to enter a specific battery setting, the display is as follows:

	LiPoAT Charge	
🟧	Battery Type	LiPo ›
🟦	Cells	Auto ›
🟨	Mode	Charge ›
🔴	End Voltage	4.2V ›
🟩	Charge Current	2.0A ›
🔵	Start	

Move the cursor to [Battery Type] and press [●button] to modify the battery type, the display is as follows:

🔋 Battery Type
Lipo
LiHv
LiFe
Lion
NiMh
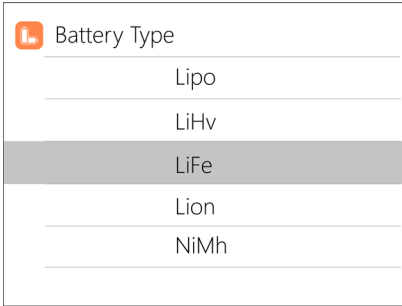
The charger supports charging and discharging of 6 types of batteries: LiPo, LiHV, LiFe, LiIon, LTO, NiMH, and Pb. There is also a smart battery mode to choose from. Battery destruction support to LiIon, LiHV, LiFe, LiIon, LTO.

After selecting the battery type that matches the battery on charge, short press [●button]and [■button] to save and return to the previous interface.

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⚠️ **Warning:**

1. Ensure the correct battery type has been selected prior to charging. An incorrect choice may damage the battery and/or become a fire hazard. Please use caution.

2. Do not use this product to charge non-compatible battery chemistries.

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📋 Glossary of battery terms explanation:

1, **LiPo**: often referred to as a lithium polymer battery with a nominal voltage of 3.70V and a fully charged battery of 4.20V.

2, **LiHV**: often referred to as a high-voltage lithium battery with a nominal voltage of 3.85V and a fully charged battery of 4.35V.

3, **LiFe**: often referred to as iron-lithium battery, with a nominal voltage of 3.30V and a fully charged battery of 3.60V.

4,**LiIon**: often referred to as a lithium-ion battery with a nominal voltage of 3.60V and a fully charged battery of 4.10V.

5, **LTO**: often referred to as a lithium-ion battery with a nominal voltage of 2.40V and a fully charged battery of 2.70V.

6, **NiMH**: often called NiMH battery, nominal voltage 1.20V.

7, **Pb**: often called lead-acid battery, nominal voltage 2.00V.

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2. Cell Setting

Move the cursor to [Battery Section], then press [●

button] to modify the number of cells. The display is as follows:
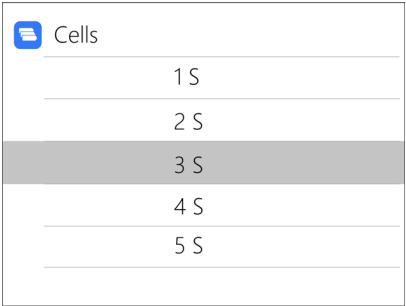
🗂 Cells
1 S
2 S
3 S
4 S
5 S

Press the [▲▼button] to adjust the value. When set to [Auto], the charger will automatically identify the number of cells by checking the total voltage against the balance port data. Short press [●button] and [■button] to take effect and return to the previous interface.

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Tips:

1. If the connected battery is over-discharged or over-charged, this may cause an incorrect cell-count, in which case the cell number needs to be adjusted normally.

2. If the cell count is set incorrectly, it may lead to overcharging, which can present itself as a fire risk.

3. The cell count can be more accurately determined if the balance port is connected.

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3. Work Mode

Move the cursor to [Mode] and press [●button] to

modify the work mode, as shown in the figure below:
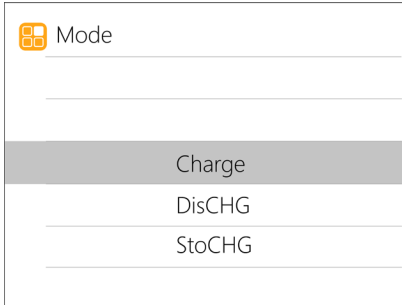

LiPo, LiHV, LiFe, LiIon LTO batteries can be Charged, discharged, stored and destroy. NiMH battery can be charged, discharged, or cycled. Pb battery can be charged and discharged. Short press [●button] and [■ button] to take effect and return to the previous interface.

4. Discharge mode

Under discharge, storage, and cycle modes, the option of discharging the battery will appear.

Move the cursor to [Discharge Mode] and press the [●button] to modify the discharge mode, as shown below:

Discharge mode
Inter
Recycle
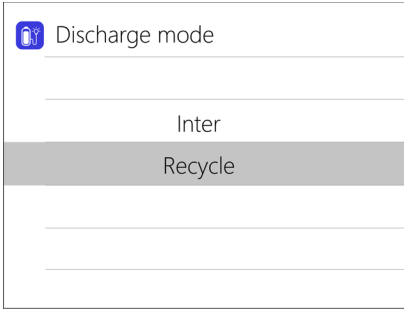
The charger supports 2 discharge modes.

1. Normal mode: discharge using internal heat dissipation, maximum 3.0A@15W discharge.

2. Recycle mode: when a battery is used as the input, the power is recovered to the input side battery through this function, max 15.0A@300W discharge.

5. Max input voltage

When the discharge mode is selected to recycle (Need set "power type" to Battery, under input setting firstly) the Max input voltage option will appear. Move the cursor to [Max Input Vol.] and press [●button] to adjust. If the input voltage reaches this voltage value during discharge, the discharge will stop. As shown below:

🔲 Input MaxVol
27.8V
27.9V
28.0V

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Tips:

Please set the Max input voltage to the highest protection voltage of the power supply. After the voltage is reached, the charger will automatically stop recycling discharging. Setting high overvoltage may damage the input power

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6. End voltage setting (TVC)

Move the cursor to [End Voltage] and press [● button] to modify the end voltage for the individual cells.

When charging, it is the charge cut-off voltage, and the range is plus or minus 50mV of the full voltage. When discharging, it is the discharge cut-off voltage. Press [▲▼button] to adjust the value, step 0.01V.

Ⓥ End Voltage
4.18V
4.19V
4.20V
4.21V
4.22V

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💡 1. Only LiPo, LiHV, LiFe batteries can set the cut-off voltage.

2. Do not modify the cut-off voltage if you are not familiar with the battery characteristics.

3. The charging cut-off voltage can be set to a range of plus or minus 50mV of full voltage.

4. **Nomenclature:**

TVC: English abbreviation for terminal voltage control

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7. Current setting

Move the cursor to the [Charge Current] or [DisCHG Current] position, and press [●button] to modify the current. Press [▲▼button] to adjust the value, step by 0.1A. Press [▲▼button] quickly to increase or decrease. The charger supports up to 15.0A.

DisCHG Current
1.8A
1.9A
2.0A
2.1A
2.2A

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Tips:

1. Please set the charging rate of 1-2C according to the battery capacity. For example, if the battery capacity is 2000mAh, please set the charge current to 2.0-4.0A.

2. The charge /discharge current is only valid in the corresponding work mode.

3. For the discharge mode setting, please refer to the <System Settings> chapter of this manual.

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8. NiMH setting (PeakV)

When the battery type is **NiMH**, the peak voltage value when the battery is fully charged can be set, the range of which can be set is 5mV-15mV, as shown below:

Nixx Peak	
	5mv
	6mv
	7mv
	8mv
	9mv

```
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```

Tips:1, This function is only available on NiMH cells

PeakV: The maximum voltage drop per cell, when the nickel-metal hydride battery is fully charged

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9. Cycle setting

When the battery type is **NiMH**, and under cycle mode, the option of Cycle time and Rest time will appear, as shown below:

NiMhAT Cycle	
Nixx Peak	5mV >
Charge Current	2.0A >
DisCHG Current	2.0A >
Cycle times	2 >
Rest time	2Min >
Start	

Move the cursor to [Cycle times] and press [●

button] to set the range of cycle times to 2-12.

The charger will follow the pattern:

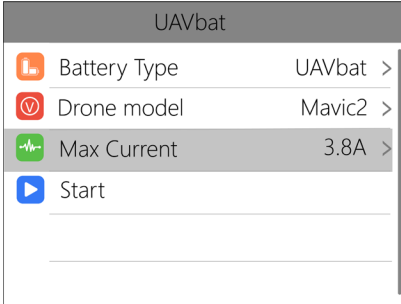Discharge -> charge -> discharge -> charge....

"Discharge -> charge" is 2 times.

🔁 Cycle times
2
3
4
5
6

Move the cursor to [Rest time] and press [●button] to set the rest time of cycle charge. The range is 2 minutes to 10 minutes. As shown below:

⏰ Rest time
2Min
3Min
4Min
5Min
6Min

10. Smart battery setting

When UAV battery is selected as the battery type, there are only two options for battery setting: drone type and Max current. As shown below:

UAVbat	
Battery Type	UAVbat >
Drone model	Mavic2 >
Max Current	3.8A >
Start	

Move the cursor to [Drone model] and press [● button] to select between different drone models. As shown below:

Drone model
Mavic2 17.6V
MavicS 13.05V
Phantom 17.4V
Inspire 26.1V
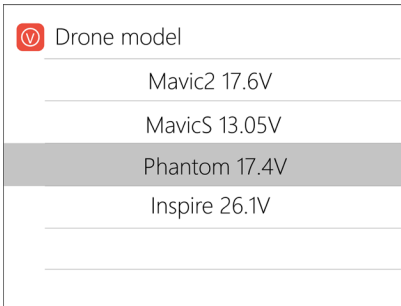
Move the cursor to [Max Current] and press [● button] to set the charge current. The range is 0.5A to 15A.

Charge and discharge work

When charging and discharging starts, the charger enters the following interface:
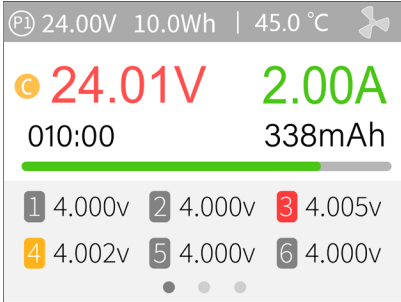
Press [▲▼ button] on this interface to toggle between 3 different displays.

P1: Power selection in system settings

24.01V: Input voltage

10.0Wh: Accumulated power consumption

45.0℃: The internal temperature of the charger

V : Constant voltage sign   **C:** Constant current sign

24.01V: Main port voltage

2.00A: Main port current

010:00: Working time
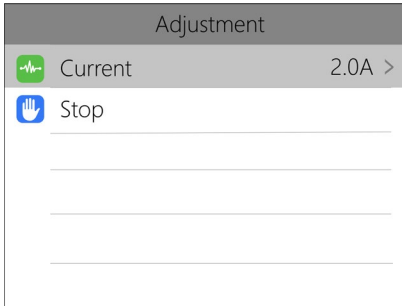
338mAh: Charged capacity

1   **4.000V:** Voltage for the first battery cell

....

-.---v : No battery connected

Short press [●button] to dynamically set the charge

current or stop charging. As shown below:

To end the charge and discharge process, short press [●button], move the cursor to [Stop], short press [● button], stop charging and return to the main interface.

When charging is complete or a charge error occurs, a popup will appear along with an audible tone.

Press [▲▼button] to switch to the second page, which shows the internal resistance information. As shown below:
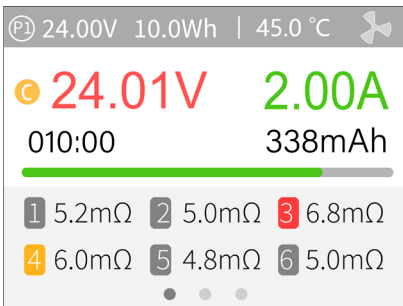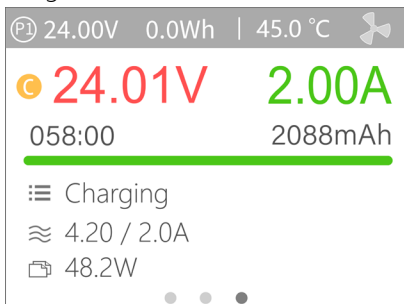

1   **5.2mΩ:** Internal resistance of the first battery cell

......

T:**32mΩ:** Total of internal resistance.

Press [▲▼button] to switch to the third page, which shows general information. As shown below:

Charging: Indicates the current charging status
4.20V/2.00A: end voltage/charge current
48.2W: The current charging power

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Tips:
1. When charging and discharging, never leave the cells unattended.
2. When charging and discharging lithium batteries, balancing only occurs if the balance plug is connected. The charger will automatically balance each cell if a balance plug is detected.
3. Charging will automatically start for the next battery if the initial battery is disconnected after being fully charged. If a set number of cells is set, ensure that the subsequent cell count matches the cell count of the initial battery. If

set to automatic, make sure that the cell count matches what is detected.

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Accessibility

After selecting and press and hold [■button] in the main interface, you can enter the auxiliary function interface, as shown below:

⚙ Accessibility	
Measure resistance	>
Measure signal	>
Signal output	>
ESC test	>
Power	>
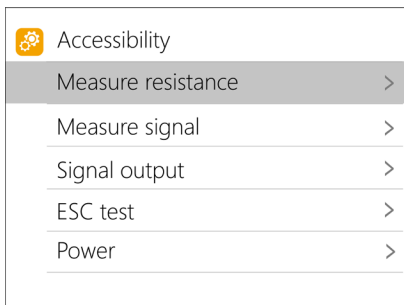
1. Measure resistance

Short press [●button] to test the internal resistance of the connected battery and return to the main interface display.
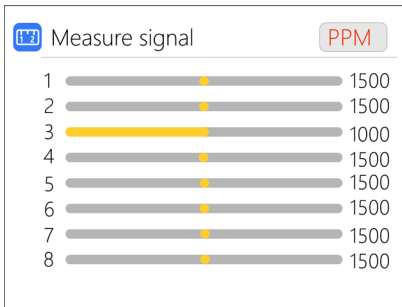
2. Measure signal

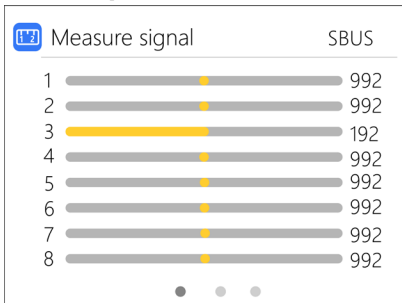Move the cursor to measure signal, short press [● button] to enter the signal test interface.

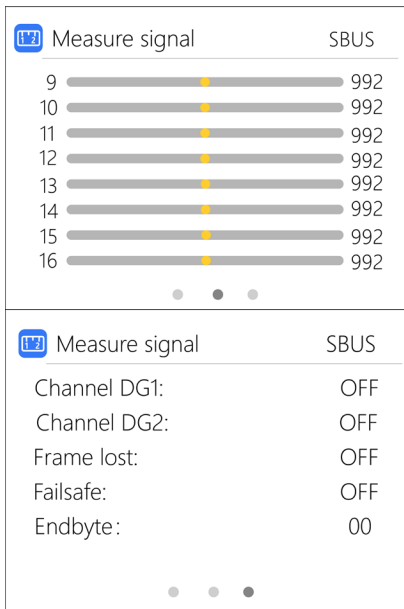Press [▲▼button] to select the signal type. Select PWM, as shown below:
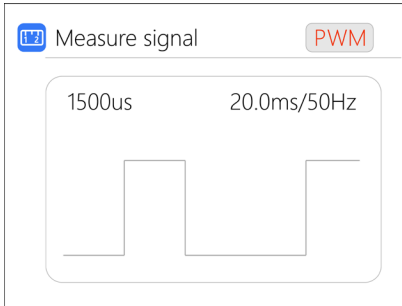
Select PPM, as shown below:

Select SBUS, press [▲▼button] to display [channels 1-8], [channels 9-16], and overall status. As shown below:

🔲 Measure signal		SBUS
9		992
10		992
11		992
12		992
13		992
14		992
15		992
16		992

● ● ●

🔲 Measure signal	SBUS
Channel DG1:	OFF
Channel DG2:	OFF
Frame lost:	OFF
Failsafe:	OFF
Endbyte:	00

● ● ●

3. Signal output

Move the cursor to Signal Output, short press [● button] to enter the Signal Output interface

Press [▲▼button] to select the type of signal to be tested. Choose PWM.

Press the [▲▼button], move the cursor to [Manual], press [●button] to set the output mode, which can be set to manual, auto 1, auto 2, and auto 3.
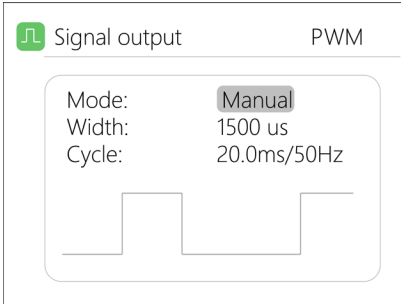
In manual mode, you can change pulse width and cycle values by using the cursor.

When set to auto 1, 2, 3, the pulse width value of

output PWM will automatically change at 3 different speeds.

The width can be set from 800 to 2200us.
The cycle can be set between: 2.5ms (400Hz) to 50.0ms (20Hz). As shown below:
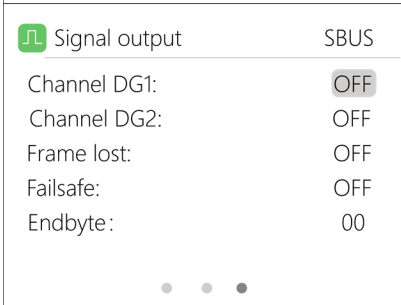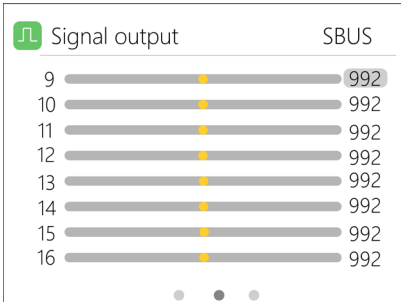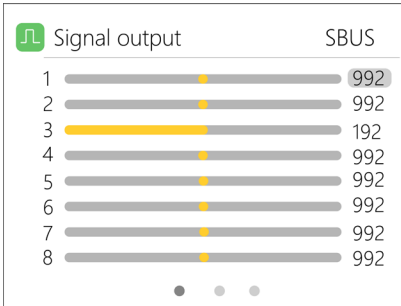

Select PPM, press [▲▼button] to move the cursor to the value of the channel to be modified. Press [● button] to modify the output pulse width value of this channel. As shown below:
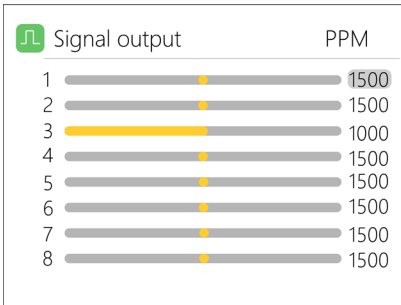
Select SBUS, press [▲▼button] to move the cursor to the value of the channel to be modified. Press [●

button] to modify the output pulse width value of this channel. As shown the following 3 pictures:

Signal output	SBUS
1	992
2	992
3	192
4	992
5	992
6	992
7	992
8	992

Signal output	SBUS
9	992
10	992
11	992
12	992
13	992
14	992
15	992
16	992

| Signal output	SBUS
Channel DG1:	OFF
Channel DG2:	OFF
Frame lost:	OFF
Failsafe:	OFF
Endbyte:	00

4. ESC test

Select ESC test with the cursor, press [●button] to enter the ESC test mode, press [▲▼button], move the cursor to pulse width/ cycle, press [●button] to change the corresponding value. As shown below:

Ⓜ ESC test	
1000us	20.0ms/50Hz
19.80V	
0.03A	
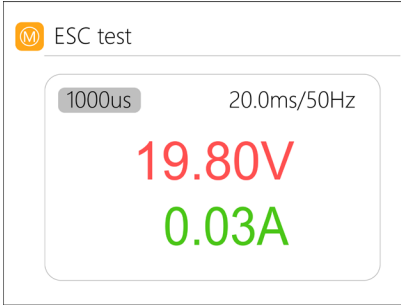
5. Power

Select the adjustable power supply with the cursor, and short press [●button] to enter.

The voltage and current of the output power supply can be set at will. Move the cursor to start, short press [●button] to start power output and return to the main interface. As shown below:

Power	
Ⓥ Output Voltage	20.1V >
⌁ Max Current	2.0A >
▶ Start	
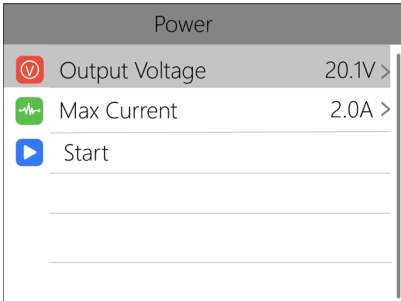
System settings

After long pressing [●button] under the main interface, you can enter the system setting page

Setup	
Input settings	⌄
Security settings	⌄
Personalization	⌄
Battery selection	OFF
Continuous	OFF
Work completed	Trickle

Short press to expand the settings. As shown below:

Setup		
Input settings		⌄
Power select.	Auto	ⓟ1
Power type		Adapter
Max power		90W
Max current		12.0A
Voltage range		7.0 - 24.0V

Input settings: Input power related settings,

Power selection: Preset power 1, power 2, power 3

Power type: Choose between battery pack and adapter. For battery packs, recycle mode is enabled, for adapters, recycle mode is disabled.

Max power: Maximum wattage allowed via the input port during charging.

Max current: Maximum current allowed via the input

port during charging.

Voltage range: Input voltage range

Security Settings: Short press to expand settings. As shown below:

Setup	
🔋 Input settings	⌄
🛡 Security settings	⌄
Safe inter Temp.	70'C
Safe Exter. Temp.	50'C
Safe time	200Min
Safe capacity	20Ah

Safe Inter. Temp.: Charging will stop when the temperature of the device exceeds this value.

Safe Exter. Temp.: Charging will stop when the temperature of the environment exceeds this value.

Safe time: The maximum time limit for continuous charging/discharging operation.

Safe capacity: The maximum accumulated capacity for a charging/discharging session.

Personalization: Short press to expand settings. As shown below:

Setup	
AA Personalization	∨
Backlight	10
Operation volume	Low
Announce volume	Medium
Warning volume	High
Language	English
Theme style	Light

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

Operation volume: The volume of the buttons, can be set to off, low, medium, and high.

Language: System display language. English, Chinese, etc.

Theme style: Can be set to light and dark themes

Setup	
AA Personalization	∨
Backlight	10
Operation volume	Low
Language	English
Theme style	Light
🔲 Battery selection	OFF

Battery selection: Option to show/hide frequently used parameters. The default is not enabled.

Continuous work: Enables/disables continuous charging/discharging after battery replacement.

Work completed: Whether to stop or trickle charge after charge complete. The default is not trickle.

Balance start Vol: Balance cells prior to full current charge.

Default： Restore factory settings.

ID： Independent ID for each device.

Other functions

1. Firmware upgrade

After connecting the M6AC to the computer with the USB cable in the box, the computer will recognize a USB drive named Toolkit. Download the upgrade file app.upg from the official Toolkit RC website and overwrite the files in the drive to upgrade the firmware.

2. USB output

Type-A USB supports 5.0V 1.0A output to charge mobile devices.

3. Automatically continue charging/ discharging

When a battery is fully charged, connect the next battery. The device will automatically continue to charge and discharge, you can start and stop this function under the settings menu

4. Fan level

When the internal temperature of the device reaches 40 degrees, the fan starts to work, the speed is increased by the temperature linear control, and when AC input, when the power input power is higher than 55W, the fan works at full speed.

6. Manual voltage calibration

With the M6AC powered off, press and hold [●button]. without releasing, connect the power supply, and the system will enter the manual voltage calibration mode. Use a voltmeter to measure the actual voltage of each battery, move the cursor to the corresponding voltage

value, modify the voltage value to match the voltmeter value. After the calibration is completed, move the cursor to save, short press once, the buzzer will beep once, the save is successful. Exit or shut down after calibration.

7, Full charge mode

When the lithium battery is fully charged, it will prompt "Fast charge complete". If the battery is not removed, the charger will trickle charge until the battery is disconnected.

Specifications

Charge	Input	AC 100-240V@MAX 120W DC 7-35V@MAX 30A
	Battery type	LiPo LiHV LiFe LiIon LTO@1-6S NiMH @1-16S Pb @1-10S
	Balance	1000mA @4.2V
	Accuracy	<0.005V
	Power	0.1-15A@300W
	Discharge power	0.1-15A@300W Recycle Mode 0.1-3A@20W Internal Mode
	USB A	5.0V/1.0A @10W or upgrade
	Voltage	1.0V-5.0V @1-6S
	Internal resistance	0.1mΩ-99mΩ @1-6S
Measure	PWM	880us-2200us@20-400Hz
	PPM	880us-2200us×8 CH@20-50Hz
	SBUS	880us-2200us×16 CH@20-100Hz
Output	PWM	500us-2500us@20-1000Hz
	PPM	880us-2200us×8 CH@50Hz
	SBUS	880us-2200us×16 CH@74Hz
	Power	0.5-15A@1-28V Mode:CC+CV
Display	LCD	IPS 2.0" 320×240px
Product	Size	108×106×60mm
	Weight	350g
Individual packing	Size	144×158×63mm
	Weight	510g