M500 Specification

V5S Protocol



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Revision History

Version	Revised by	Date	Content	Page
A01	Jun Xing	2023-11-23	First version	

Statement

This product function specification is the standard function definition description of our products and is a part of the technical archives of our products.

All instrument products of our company are allowed to adjust their function definitions according to customer needs. This document is a reference for product function definitions, operation instructions and fault analysis. The product function status you get will be subject to the confirmation and communication of actual customer needs. As a component unit of human-computer interaction of electric vehicle, the instrument plays a role in the interaction between the whole vehicle and users. However, all interaction functions depend on the function definition and data support of the overall electrical system, and the realization of some functions will depend on your vehicle system definition.

If you have any questions about the understanding of this product specification, please consult our sales or technical support personnel in time.

（BigStone ®）We reserve the right to interpret and explain this product function specification.

Nanjing Bigstone Electronic &Technology Co., Ltd

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A. Product introduction

1. Product name and model

2.0 Inch TFT color display instrument for Electronic Power Assist bicycle.

Product model：M500

● M500 includes UART communication and CAN communication two hardware version.M500 is UART version; M500-CAN is CAN bus version.

2. Product brief

✧ The screen adopts imported tempered glass

✧ High brightness 2.0-inch 240*320 resolution Color TFT LCD Screen

✧ Four key design, key combination ergonomic design

✧ Excellent outdoor waterproof design, meeting the waterproof capacity of IP67

✧ Optional UART communication or MS-CAN2.0A communication

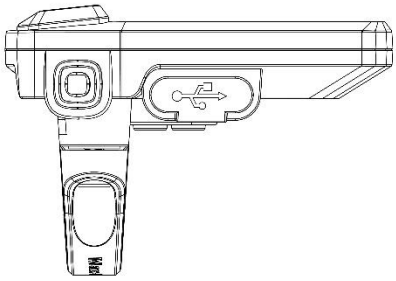
✧ It supports firmware upgrade function, which can quickly realize firmware upgrade and parameter setting, and facilitate maintenance services

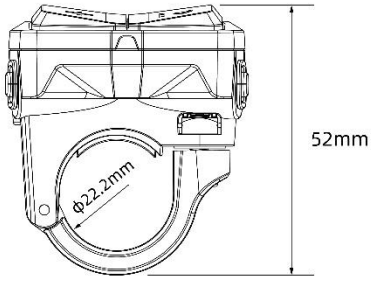
3. Range of application

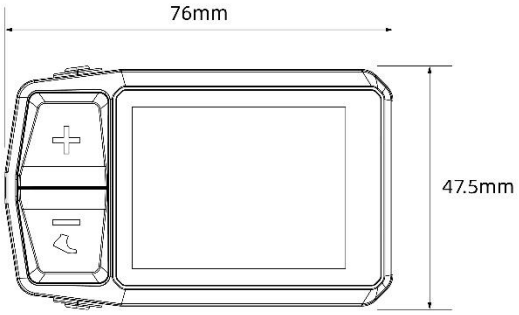
Suitable for electric power assist bicycle in accordance with the standard of EN15194:2017.

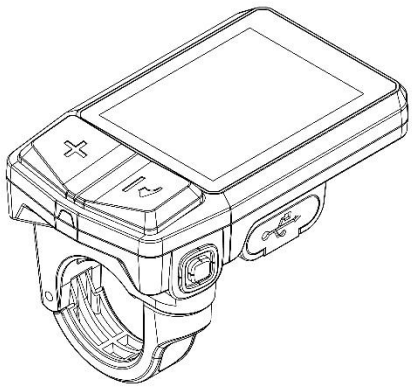
4. Appearance and Dimension

The material of M500 is ABS, and the panel adopts high hardness imported tempered glass. The product is suitable for left installation φ 22.2mm handlebar grips









5. Product coding rules

M500	-CAN	
		CAN communication, if it is CAN communication suffix, add -CAN
	Product family name. If there is no suffix by default, it is serial port communication	

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B. Product Description

1. Specifications

① Power supply：DC 24V/36V/48V/52V

② Rated current：<30 mA

③ Shutdown current：<1uA

④ Screen specification：2.0 ” 240*320 resolution Color TFT LCD Screen

⑤ Communication method：UART/ CAN-BUS optional

⑥ Operating temperature：-20°C ~ 60°C

⑦ Storage temperature：-30°C ~ 80°C

⑧ Waterproof level：IP67

2. Functional overview

① Four ergonomic buttons

② Digital assisted level indication

③ Units: KMH / MPH switch

④ Speed display: Real-time speed

⑤ Battery indicator combined percentage display

⑥ Range display（*Battery BMS provides support in case of margin information）

⑦ Front light control and status indication

⑧ Mileage display: (TRIP), (ODO)

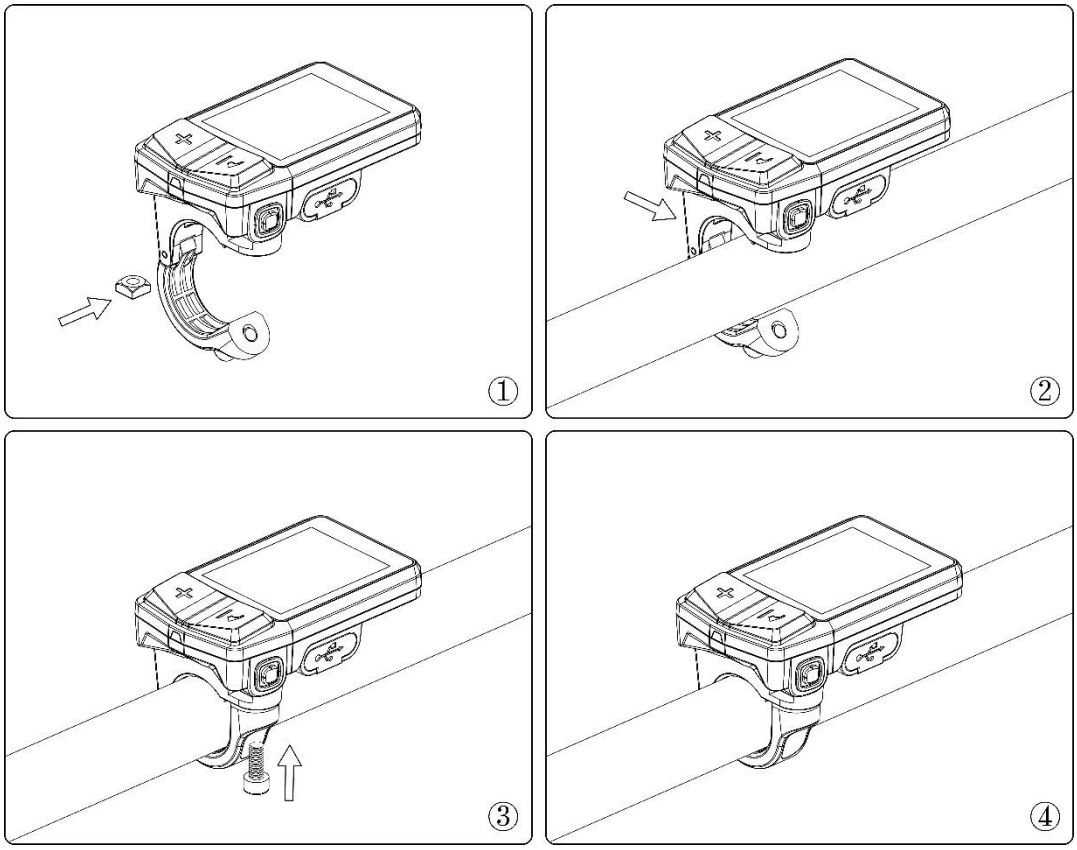
⑨ Walk assistance function

⑩ Parameter setting function and advanced setting function

⑪ Error code indication

⑫ Display riding time

3. Installation



① Open the display lock clip, set the display in the left handlebar (standard handlebar size:Φ22.2.Adjust to a position easy to operate tighten and fix the screw by M4 hexagon. Tightening torque: 0.5N.m.)

* Damage caused by excessive torque is not covered by the warranty.

②Connect display cable to driver interface cable.

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4. Interface

4.1 Startup screen



The customer logo will be displayed for 2 seconds when system power on. After the communication connection is established, the display will enter the basic function display screen, and the display will show the information obtained from the controller.

(The displayed data information is executed according to the communication protocol provided by the customer)

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4.2 Basic screen and button



① M500 include 4 buttons, On/off , button +/-,and SET button.

② The screen adopts 2.0-inch Color TFT LCD Screen,meet the customization and modification requirements of the startup interface and local UI interface.

4.3 Function introduction

Startup screen, password screen and basic function screen



After startup, the bigstone logo will be displayed for 2 seconds. If the password is enabled, enter the password input form, and enter the password to enter the basic function interface; If the password is not enabled, you can directly enter the basic function interface. The boot logo can be customized.

The display reads Information about the controller and BMS information then show on screen. The ride mode can be set in the general settings, and each mode corresponds to its style as follows:

ECO



NORMAL



POWER



Other function

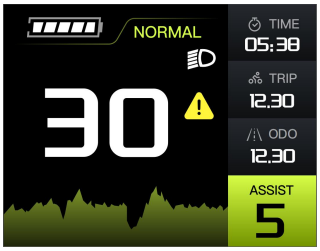
Walk assistant function

In the basic function interface, when the power gear is not 0, long press — to enter the assist mode, the instrument display interface is as follows:



Fault code indication on screen

After receiving the fault information returned by the controller, the M500 will show the fault code to prompt the user of relevant electrical system fault information. The fault code is displayed in numerical format. Refer to "10. fault information" for fault code.



Setting function

On the basic function screen, hold down the SET key to enter the Settings screen.

Short press the + or — keys to select the setting items in sequence according to the order of each setting item.

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- Gen. Set： Trip Clear,Max Speed,Wheel Size,Speed Unit,Sys. Voltage,Ride Mode,Brightness,Battery Mode,Password.
- Adv. Set：Assist. PWM1，Assist. PWM2，Assist. PWM3,Assist. PWM4,Assist. PWM5,Max Current,Speed Magnet,Assist. Magnet,Start Magnet,Start Strength,Assist. Direction,Thro. Speed,Thro. Follow.
- Dev. Inf.：Instrument software and hardware version, Error Code.
- Save&Exit：Save the Settings and exit

See Part 7 for the definition of detail set operations.

5. Buttons definition

5.1 Definition of buttons



Turn Power button: hold to on/off system power, press to switch front light.

SET button: Switching the function display and entering the parameter setting operation.

Adjust button: Adjust the assist level during cycling and set it up with the function switch button, and the specific function operation can be carried out with the long button

5.2 Button operation

Operation type	Description
Press down	Press down and release
Press and hold	Press down and hold until the function was active. Hold time is about 2s.

6. Operation

6.1 Turn on/off

Press down power button at power off state, M500 will be power on and show logo 2 seconds, then switch into the basic function screen and start work; in power on status, press and hold power key to shut down system. If the rider has no any operation within the set turn-off time, and the speed is 0, and the bus current is less than 1A, the M500 will automatically power off.

6.2 Assist level switch

In power on state, at basic function screen, press down + or — button can change the power assist level, and the adjustable range is 0-5.



Press + button to increase assist power, press — button to decrease assist power.

6.3 Front light function

When the battery is loaded into the vehicle and the vehicle is powered on, press the power button to turn on the headlight. At the same time, the indicator icon will be displayed on the instrument interface to indicate the light on state, and the instrument will display the normal function state. Press the power button again to turn off the headlights.



6.4 Walk assist mode

When assist level is not zero, hold ━ button in 2 seconds to start walk assist, the motor outputs power according to the set push speed value and controls the actual push speed. M500 shows the walk assistant icon  at right bottom position on screen. walk assistant is in-active after release ━ button, M500 recovery to normal display, the walk assistant active screen as follow:

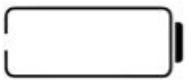


6.5 Battery capacity indicator

When the battery capacity is less than 5 % or the battery voltage is lower than the under-voltage value, the battery indicates shows 0 grid, the battery frame flashes at 1 Hz.

Battery capacity percentage and icon corresponding table is as follows

Percentage	Battery bar instructions	Explained
80% ≤ SOC		Display full 5

60% ≤ SOC < 80%		Display 4
40% ≤ SOC < 60%		Display 3
20% ≤ SOC < 40%		Display 2
10% ≤SOC < 20%		Display 1
5% ≤ SOC < 10%		Display 0
0% ≤ SOC < 5%		Display 0, And the battery symbol flickers at 1Hz

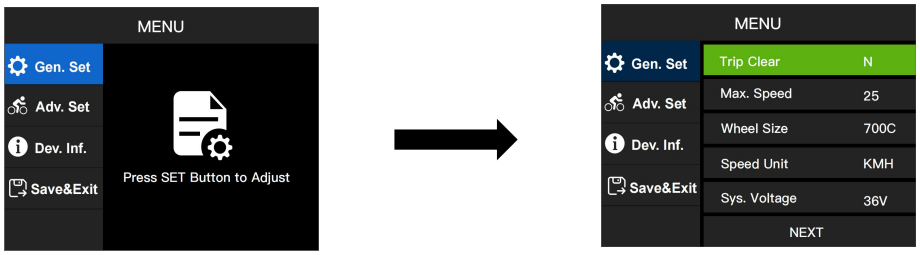
- Note about the power display function:

The meter can display the corresponding battery cell number according to the received battery information, and can also estimate the battery number according to the voltage and display the corresponding battery cell number;

7. General function settings

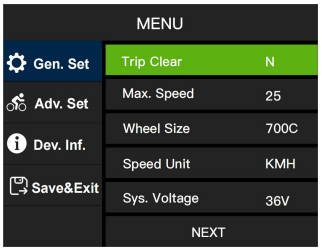
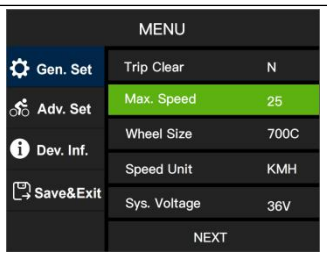
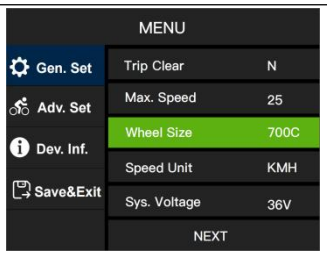
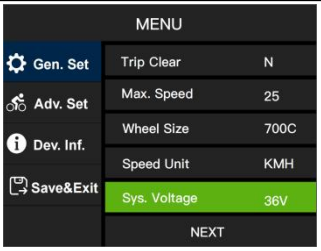
The instrument provides a specific parameter setting function, and the optional items of the setting function will be reduced according to different market and different product standards. The following is a complete description of parameter Settings and information reading functions in the default state of the instrument. If there is any inconsistency with the real goods, please promptly communicate with our sales and technical support team for verification and confirmation.

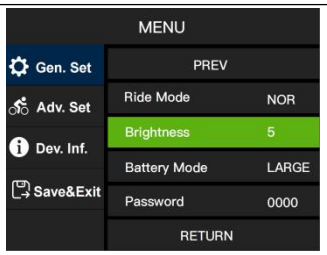
After power on, in the System function screen, Hold SET button 2 seconds can enter the first-level list of the setting, and press down SET key again then enter the second-level setting list, as shown in the follow:



Tap + or — to select the Settings icon. Short press the SET key to select the setting item corresponding to the icon to modify; On the Settings screen, press RETURN to exit the current configuration screen and return to the level-1 screen.

Setting function and each parameter setting is described as follows:

Setting items	Detail screen	Setting parameter	Parameter values	Remarks
Trip Clear		Clear the TRIP value	N-Save TRIP Y- Clear TRIP	
Max. Speed		Maximum speed set	Parameter values are 10 to 40KM/H and 99KM/H	Default: 25KM/H Fixed Unit
Wheel Size			Parameter(inch): 16-28inch	Default: 700C
Speed Unit		KMH-kilometer MPH-mile		Default: KMH-kilometer
Sys. Voltage		Parameter values:24V,36V,48V,52V		Default: 36V
Ride Mode		Set Ride Mode	Parameter values: ECO, NOR, PWR	Default: NOR

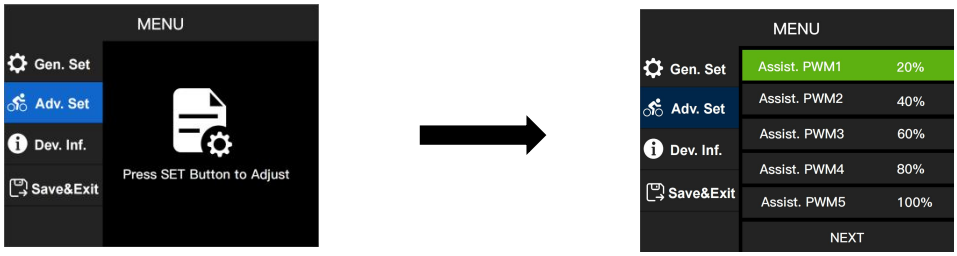
Brightness		Adjust the backlight brightness	Parameter values:0-5	Default: 5
Battery Mode			MEDIUM: indicates the medium battery symbol and the percentage of battery charged. LARGE: Large battery display	Default: LARGE
Password		Set Password		the startup password is set to any non-zero value is enabled. set to 0000 is disabled

8. Advance setting

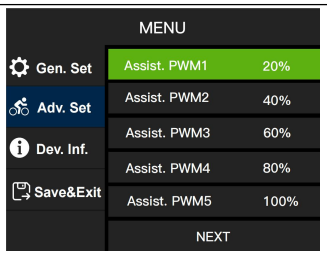
* Warning

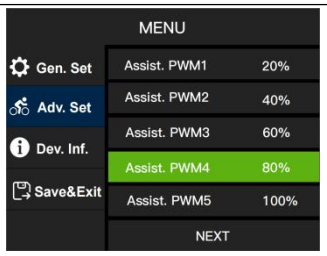
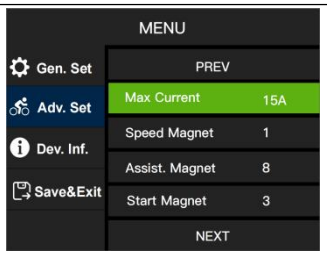
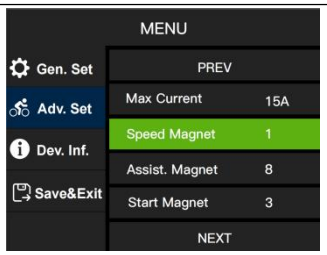
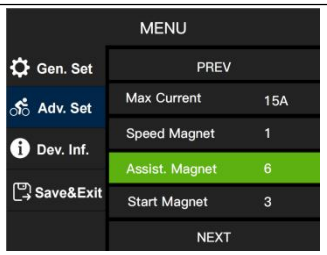
The advance setting function is based on specific protocol content, allowing the modification, and setting of controller and system parameters through M500. This feature suggests professional operation, such as bicycle manufacturers, distributor, and other objects with professional technical ability. Allows necessary system debugging and maintenance through user setting functions. If there is incorrectly parameter setting or other setting problems, the bicycle system will not work properly, or even other failure problems.

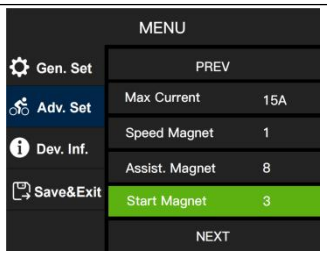
Advance setting function operation



Each function parameter under the user setting function is described as follows:

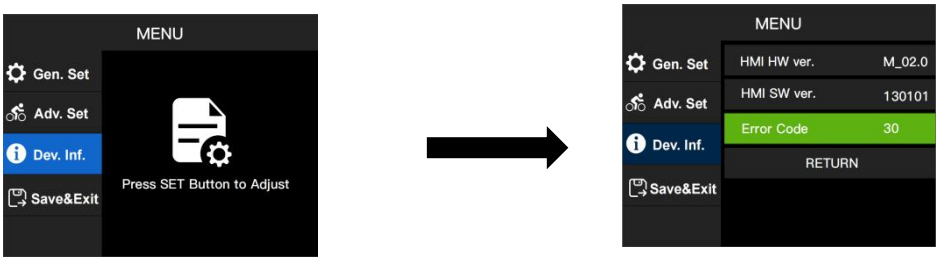
Set items	Screen Content	Setting parameter	Parameter values	Remarks
PWM1			Parameter value: 0-100%	Default: 20%
PWM2			Parameter value: 0-100%	Default: 40%

PWM3			Parameter value: 0-100%	Default: 60%
PWM4			Parameter value: 0-100%	Default: 80%
PWM5			Parameter value: 0-100%	Default: 100%
Max Current			Parameter value: 3-30A	Default: 15A
Speed Magnet			Parameter value: 1 or 6	Default: 1
Assist. Magnet			Parameter value: 6 or 12	Default: 6

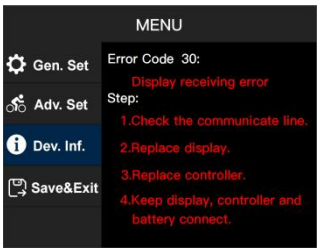
Start Magnet			Parameter value: 3-24	Default: 3
Start Strength			Parameter value: 0-3	Default: 0
Assist. Direction			Parameter value: F(Forward) or B(Backward)	Default: F
Thro. Speed			Parameter value: 6KM/FULL	Default: FULL
Thro. Follow			Parameter value: N or Y	Default: N

9. Device information

Setting screen You can choose to enter the device information screen, as shown in the following figure:



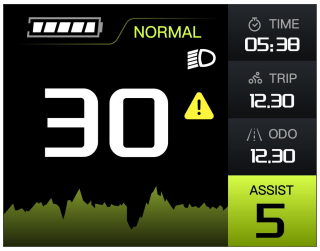
M500 hardware version (HMI HW ver.),M500 software version (HMI SW ver.) and error code. Selecting the fault code and pressing the SET button can display the fault code explanation and fault relief method.



10. Error information

After starting up, in the basic function interface, when a fault occurs, the error code is often displayed.

The error code shows as follows:



The V5S protocol fault code table is as follows:

Error code	Definition
21	Current error
22	Handle error
23	Motor out of phase

24	Hall fault
25	Brake failure
30	Instrument communication failure

(* The corresponding fault code of different system protocols is different. If the fault code of the instrument is displayed, please promptly communicate with our sales and technical support team for verification and confirmation!)

11. Wire definition

Definition of standard cable

Table 1 cable color and function

No.	Color	Function
1	Red	Battery+
2	Blue	Weak lock line
3	Black	Battery-
4	Yellow	TX
5	Green	RX

C. Packing specification

Standard shipment, according to three layers of corrugated box packing plus pearl cotton packaging bag packaging products; there are 20 small grids in each layer of corrugated grid.

Box specification: 452mm * 407mm * 379mm

D. Notes

✧ In the use of the display, pay attention to the security, do not plug the display in and out the when the power is on.

✧ Try to avoid use exposure in harsh environments like heavy rain, heavy snow, and strong sunlight.

✧ When the display can’t be used normally, it should be send to repair as soon as possible, Otherwise it will affect the normal operation of the system.