Advanced Energy

SL POWER
EASY CHARGER WIZARD
PRODUCT AND GUI MANUAL

Three-Stage Battery Charger Kit

Advanced Energy's SL Power Easy Charger Wizard is a flexible kit to make power converters a three-stage battery charger, which can easily fit all frequently used battery types and different battery voltages.

AT A GLANCE

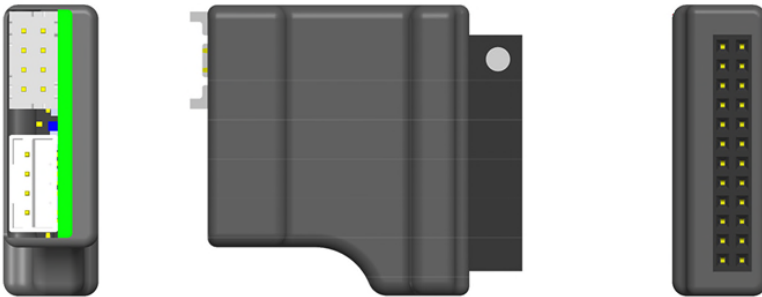**Applied Models**

TF800, TF1500, TF3000

Dimensions

35 x 29 x 9.5 mm

TABLE OF CONTENTS

SECTION 1   PACKING CONFIGURATION

The package of Easy Charger Wizard is consisted of below items:

1.   Charger Wizard Board

2.   Cable 1 (Refer to section 6)

TF series power supply and TF-201 (RS232 communication board) are needed to work with Easy Charger Wizard. For installation instruction, refer to section 4.1.

To change default charger setting, there are 2 ways to do it:

1.   RS232 protocol

2.   Charger Wizard GUI interface

Refer to section 4.2 for more details.

Note - Read carefully the precautions and instructions on the product package & the product guide before installation and use.

| Cable 1 | Cable 2 | Charger Wizard |

SECTION 2 WARNING

Warning 1

You must check the wiring length and gauge to avoid data loss.

AC Input Interface

Item	SMPS Terminal	TF800 Series	TF1500 Series	TF3000 Series
Wire Color	AC Terminal L	Black	Black	Black
	AC Terminal N	White	White	White
	FG (Earth Ground)	Green / Yellow	Green / Yellow	Green / Yellow
Wire Length/Gauge	AC Terminal L	Within 6 feet AWG#16	Within 6 feet AWG#14	Within 6 feet AWG#8
	AC Terminal N	Within 6 feet AWG#16	Within 6 feet AWG#14	Within 6 feet AWG#8
	FG (Earth Ground)	26 to 32 feet AWG#16	26 to 32 feet AWG#14	26 to 32 feet AWG#10 to 8

DC Input Interface

Before installation, the DC cables should be as short as possible (less than 6 feet / 1.8 meters ideally).

The size of the cable should be thick enough to limit the voltage drop to less than 2% when carrying the maximum output current.

The following sizes of cables are recommended distance (< 6 feet) between the batteries and the power supply.

Wire AWG	SMPS Output Current (max.)
#0	≥ 200 to 250A
#1	≥ 150 to 200A
#4	≥ 100 to 150A
#6	≥ 50 to 100A
#8	≥ 0 to 50A

SECTION 2 WARNING

Warning 2

You must check charging voltage / current setting and suitable charging voltage / current according to battery type and spec to avoid damage to the battery.

Warning 3

If the Charger Wizard is pulled out by external force, the TF series will restore the original power supply status (Make sure to power off the power supply before installing or removing the Easy Charger Wizard)

Warning 4

Make sure the Easy Charger Wizard is installed in the correct direction before power on to avoid possible damage.

Warning 5

Suitable SMPS for Charger Wizard：

TF800/1500/3000 Series (12 to 60 VDC)

Warning 6

Make sure to add suitable ORingFET in between the output side of SMPS & battery to avoid battery current damaging power supply. Refer to section 4.1 for the ORingFET recommendation.

Warning 7

The following precautions should be taken when working on the Inverter Charger:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.

SECTION 3 FUNCTIONS & FEATURES

3.1   Easy Charger Wizard

Charger Suggestion Table										
Battery Voltage		12 V			24 V			48 V		
Charging Current (A)		25 - 50	51 - 100	101 - 200	13 - 25	26 - 50	51 - 100	6 - 13	14 - 25	26 - 50
TF800	15 V	●								
	24 V	●								
	30 V	●			●					
	36 V				●					
	48 V				●					
	60 V				●			●		
TF1500	15 V		●							
	24 V		●							
	30 V		●			●				
	36 V					●				
	48 V					●				
	60 V					●			●	
TF3000	15 V			●						
	24 V			●						
	30 V			●			●			
	36 V						●			
	48 V						●			
	60 V						●			●

Note:
1.   Refer to derating curve for the maximum output voltage and current according to product datasheet.
2.   Max. output voltage and current: 105% vs. rated output voltage & current.
3.   Check lithium battery spec. to select suitable charging module (TF Series).
     i.e. If the battery type is 12V that requires 50A charging current, TF800A15K will be more suitable compare to TF800A30K, because the max. output current of TF800A15K is 53.4A; if you select TF800A30K, the max. charging current only support 26.7A.

SECTION 3 FUNCTIONS & FEATURES

The software can automatically detect the model name connected, and allow you to control the output voltage and current within supported spec. and select the suitable battery type.

•   Memorize charging curve setting

•   Programmable charger solution (higher flexibility for different type of batteries)

•   High voltage / current charging requirement

•   LED to show different charging status

•   Overvoltage protection (This function is to protect the battery, and you can select to enable or disable this function. Refer to section 4.2 for setting info.)

3.2   SMPS Features

•   Universal input 90 to 264Vac (Refer to TF series datasheet for the derating curve)

•   Active PFC design with high power density and efficiency (up to 93%)

•   Remote setting multiple RS232 communication

•   Operation temperature -20°C to 70°C (derating at 50°C)

•   Safety standards: UL, TUV, and CB (Worry-Free design-in)

•   EMI conduction & radiation: certified EN55032

•   Protection: OVP, OLP, OTP, fan failure

SECTION 4   INSTALLATION NOTICE

4.1 Hardware Installation

4.1.1 Single Unit Installation
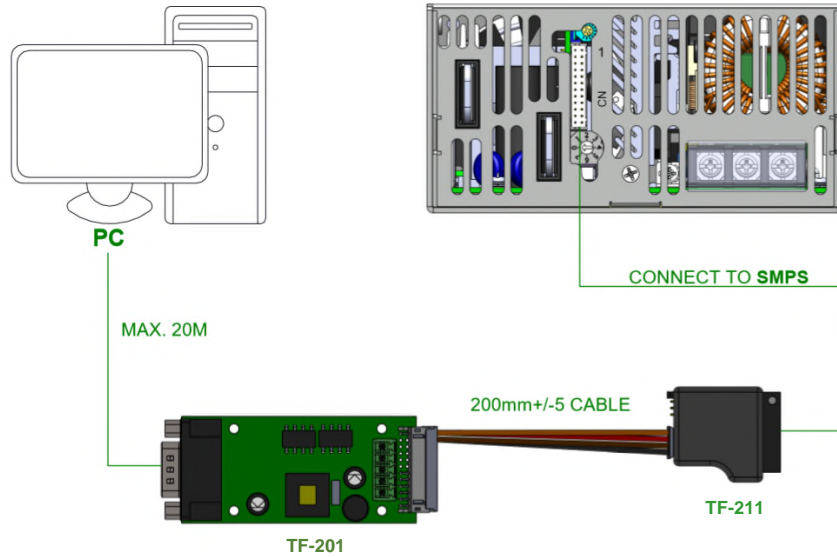
Step 1: Set up TF series power supply with proper wiring. (Make sure the AC is off during wiring process.)

Step 2: Make sure to connect power supply DC wire before connecting battery.

Step 3: Make sure to check battery spec. before setting the charging voltage / current.

Step 4: Add suitable ORingFET between the output side of SMPS & battery to avoid battery current damaging power supply.

Output Voltage	Recommend ORingFET Spec
12V	40V MOSFET BSC010N04LS or equivalent
15V	
24V	
30V	
36V	80V MOSFET BSC026N08NS5 or equivalent
48V	
60V	

Note - ORingFET is not needed for single unit. It's only necessary for parallel condition.

SECTION 4   INSTALLATION NOTICE

Step 5: Install Easy Charger Wizard to SMPS front panel. (Connection diagram as shown below, please be aware of reverse connection.)
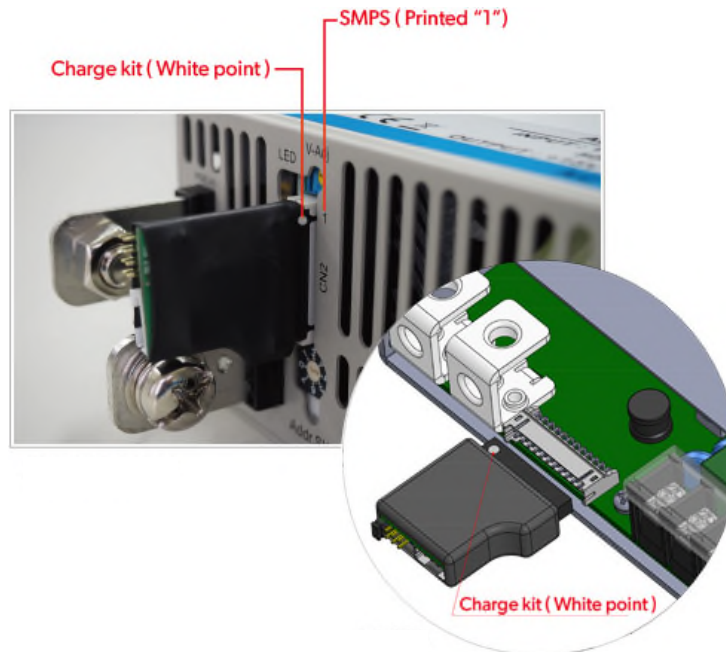
Step 6: Connect cable 1 to 4-pin connector of Charger Wizard.

Step 7: Connect the white 24-pin connector of cable 1 to communication board, TF-201.

Step 8: AC power on.

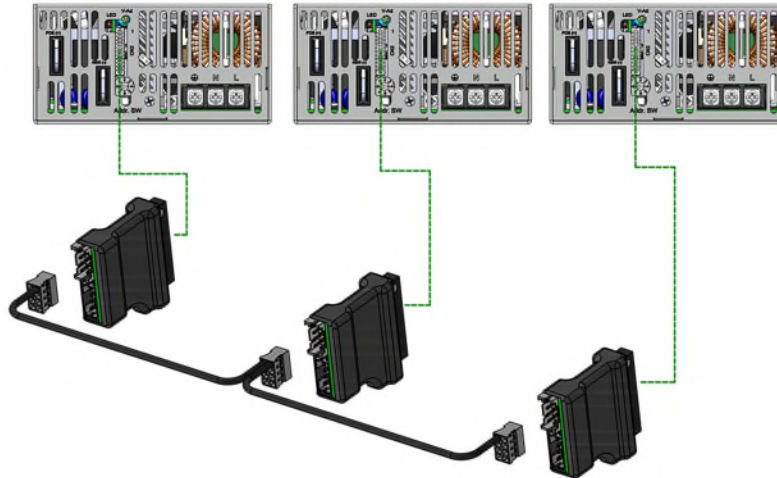**Step 9:** Install Charger Wizard GUI to perform charging curve setting.

Step 10: AC power off.

Step 11: Connect Battery +/- with TF series power supply DC outputs (be aware of reverse polarity).

Step 12: AC power on.

SECTION 4 INSTALLATION NOTICE

4.1.2   Parallel Units Installation

Step 1: Connect the AC wiring of multiple PSU together. (Make sure to switch off the AC power first before installation.)

Step 2:

•   Make sure every PSU must complete steps 2 to 9 in the Single Unit Installation.

•   In parallel connection, make sure the followings:

 a. disable the voltage protection of every PSU from GUI setting.

 b. charging setting curve of each unit must be the same (Refer to section 4.2).
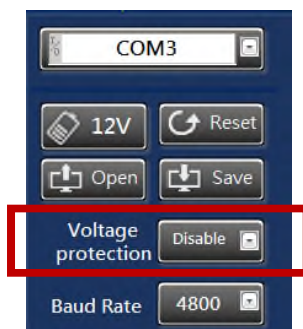
•   After the voltage protection function of the GUI is disabled, the output voltage of the PSU will increase its value according to the GUI charging curve setting per step 9. Make sure the output voltage difference of each unit is < 0.2V.

SECTION 4 INSTALLATION NOTICE

For Example:

When charging a 48V battery, during BULK (C.C) condition,
the output voltage of PSU will increase to 57.6V.
In this condition, the output voltage of each unit must set to 57.6V
and voltage difference of each PSU must less than 0.2V.
(This can be set via V-adj from the PSU front panel.)
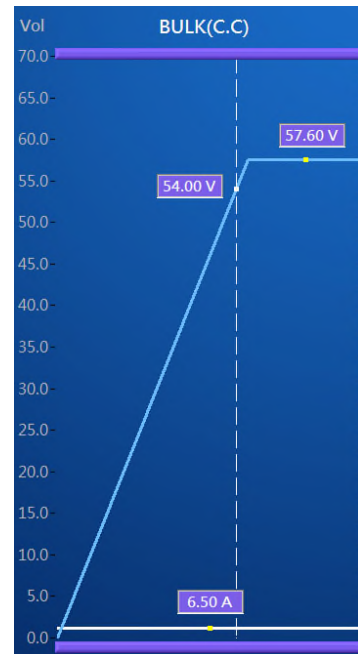
- After calibrate the output voltage of each PSU, if no ORing board connected in between the output of the PSU and the battery, make sure to enable the Voltage Protection from GUI.
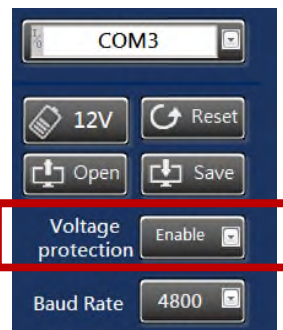
- Turn off the AC power of the PSU

Step 3: Connect the DC output of multiple PSU together, then connect the output of PSU to the battery BAT+/BAT-. (Make sure not to connect the polarity reversely).

Step 4: Connect the CN4 of TF-211.

Step 5: Turn on the AC Power of the PSU to switch on the power.

Note:
1: Among the parallel connection units, output voltage difference of each PSU must be <0.2VDC (This can be set via V-adj from the PSU front panel VR).
2: Total output current must not exceed 90% of the rated power in parallel condition. Maximum output current at parallel condition = rated current per unit x number of unit x 0.9.
3: To ensure current share balance, output current of each PSU unit must be >10% vs. the rated output current.

SECTION 4 INSTALLATION NOTICE

4.2   Charger Wizard Charging Curve Setting

It's also easy to change default settings of Easy Charger Wizard with RS232 or the Charger Wizard GUI.

4.2.1   RS232

•   Connectivity and necessary equipment (Refer to section 4.1)

•   Install "TR Board" GUI software to set charging voltage and current

4.2.2   Charger Wizard GUI interface

•   Connectivity and necessary equipment (Refer to section 4.1)

•   Software: At request
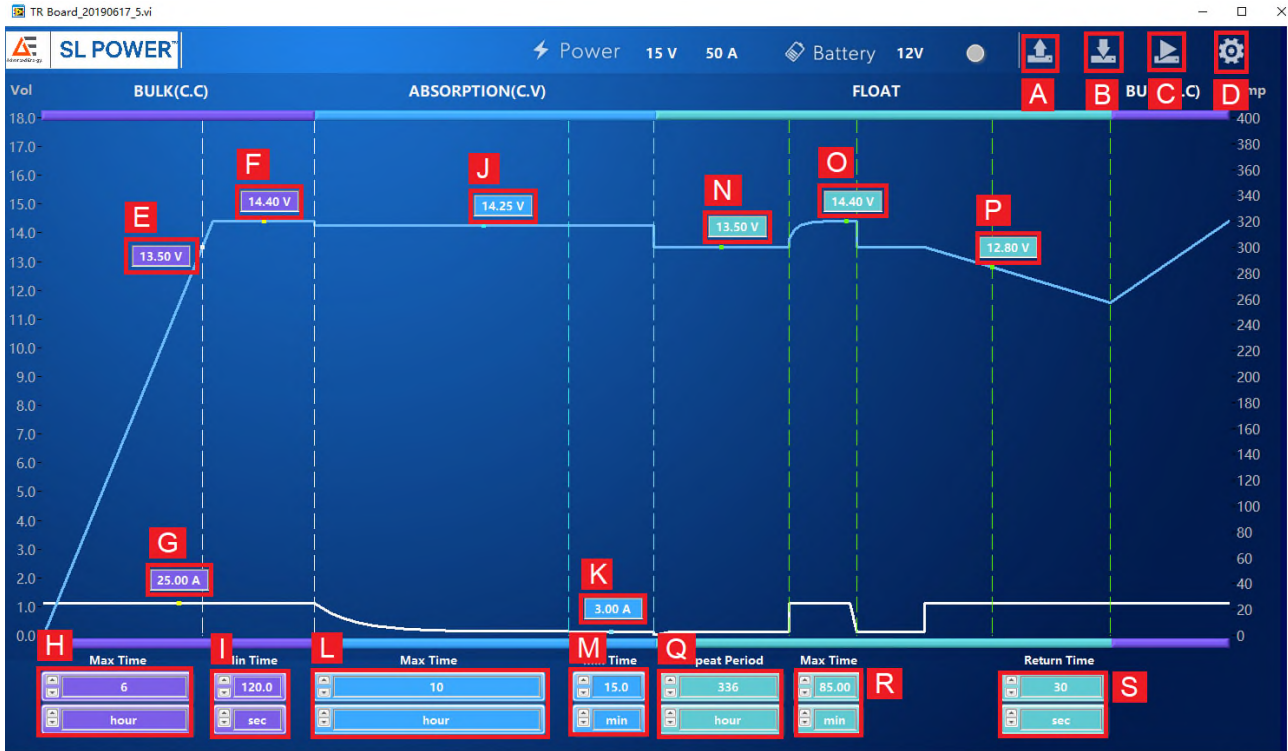
•   A brief explanation of GUI section

4.2.3   Software GUI Main Page
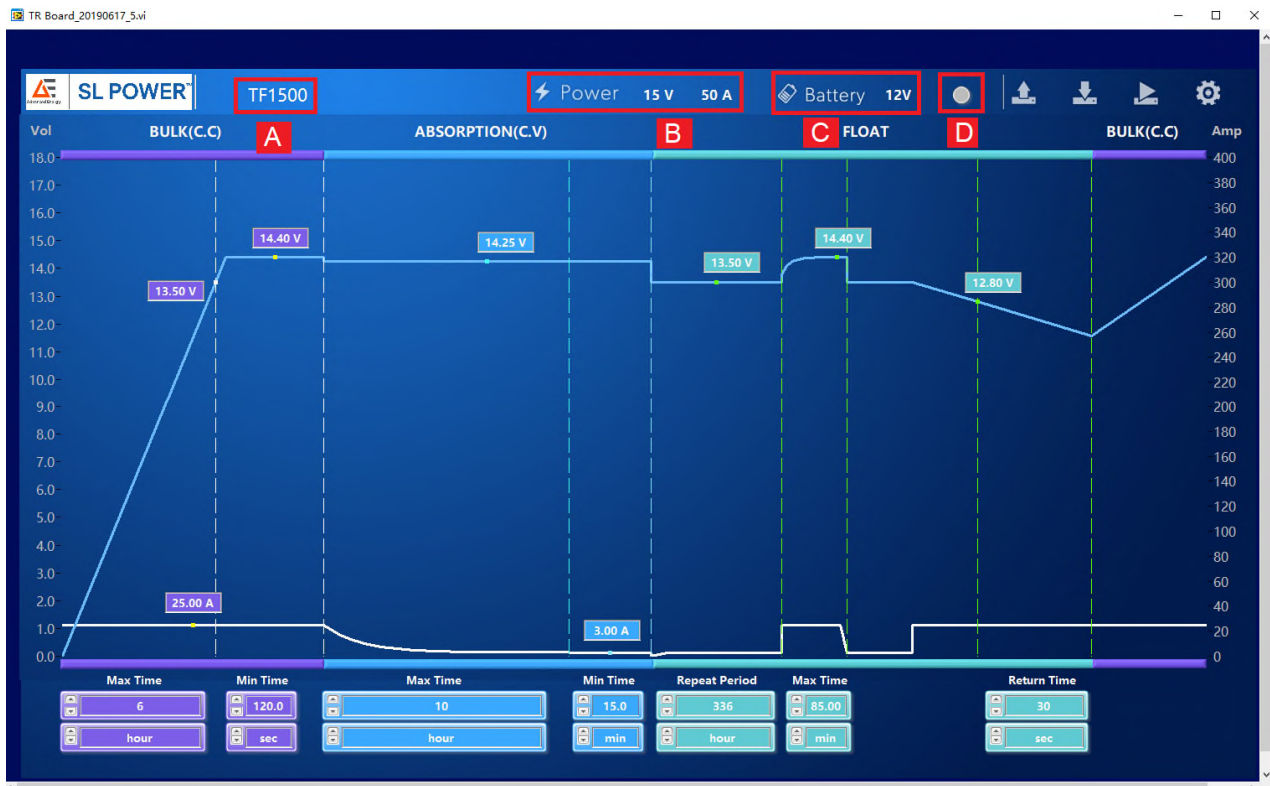
A. Power supply model name

B. Power supply rated output voltage and output current

C. Rated battery voltage

D. Light green when the battery voltage protection is enabled; dark light while disabled

SECTION 4   INSTALLATION NOTICE

4.2.4   Parameter Setting Description

A. Read Charger Wizard setting

B. Save the Easy Charger Wizard setting to EEPROM

C. Transfer the setting values of the software on the PC to the Easy Charger Wizard

D. Set the communication interface, including battery type, reset, and archive before loading or setting

E to S. The charging current and charging voltage parameters can be entered manually or drag the parameter. The maximum setting will depend on the rated voltage and current of SMPS. It will also reference to the rated battery voltage selected by the operator.

Parameters as follow:

E to I. BULK (C.C) Parameter:

- Fixed charging current is 'G' in BULK mode

- Conditions to enter the ABSORPTION mode (either one):

    Start timing 'H' when the battery voltage reaches the 'E' voltage

    When the battery voltage reaches the 'F' voltage and the time will remain per setting "I"

SECTION 4 INSTALLATION NOTICE

J to M. ABSORPTION (C.V) Parameter:

- Fixed charging voltage is 'J' in ABSORPTION mode

- Conditions to enter the FLOAT Mode (either one):

  When the time in this mode exceeds 'L'.

  When the charging current is less than 'K', and the time will remain per setting 'M'.

N, O, Q, R. FLOAT Parameter:

- Repeat steps 1 and 2 after entering FLOAT mode

  Step 1: Change the charging voltage to N, when the time reaches 'Q'

  Step 2: Generate a charging pulse (charge voltage is 'O', time remain at 'R')

P, S Parameter:

- Under ABSORPTION or FLOAT, when the battery voltage is lower than 'P' and the hold time will change to BULK mode if it exceeds 'S'.

4.2.5   Three-Step Plus Charge System

The first step of the three-step plus charge system is the BULK phase, in which the output current of the charger is 100%, and the greater part of the capacity of the battery is rapidly charged. The current charges the batteries and gradually the voltage rises to the absorption voltage of 14.4V (12V models) or 28.8V (24V models).

The bulk phase is followed by the absorption phase. Absorption charging starts when the voltage on the batteries has reached 14.4V (12V models) / 28.8V (24V models) , and ends when the battery is completely full. Battery voltage remains constant at 14.25V (12V models) / 28.5V (24V models) @ 25°C / 77°F throughout this stage, and the charge current depends on the degree to which the battery was initially discharged, the battery type. Once the battery is 100% full, the charger automatically switches over to the float phase.

During the float phase the unit switches to 13.5V (12V models) or 27 (24V models). Once consumption decreases, the charger goes back to normal operation of the three-step charge system.

You can store the charging curve set in the Charger Wizard, and use Charger Wizard tool to adjust the charging curve settings at any time.

SECTION 4 INSTALLATION NOTICE

4.2.6   Function Setting Page
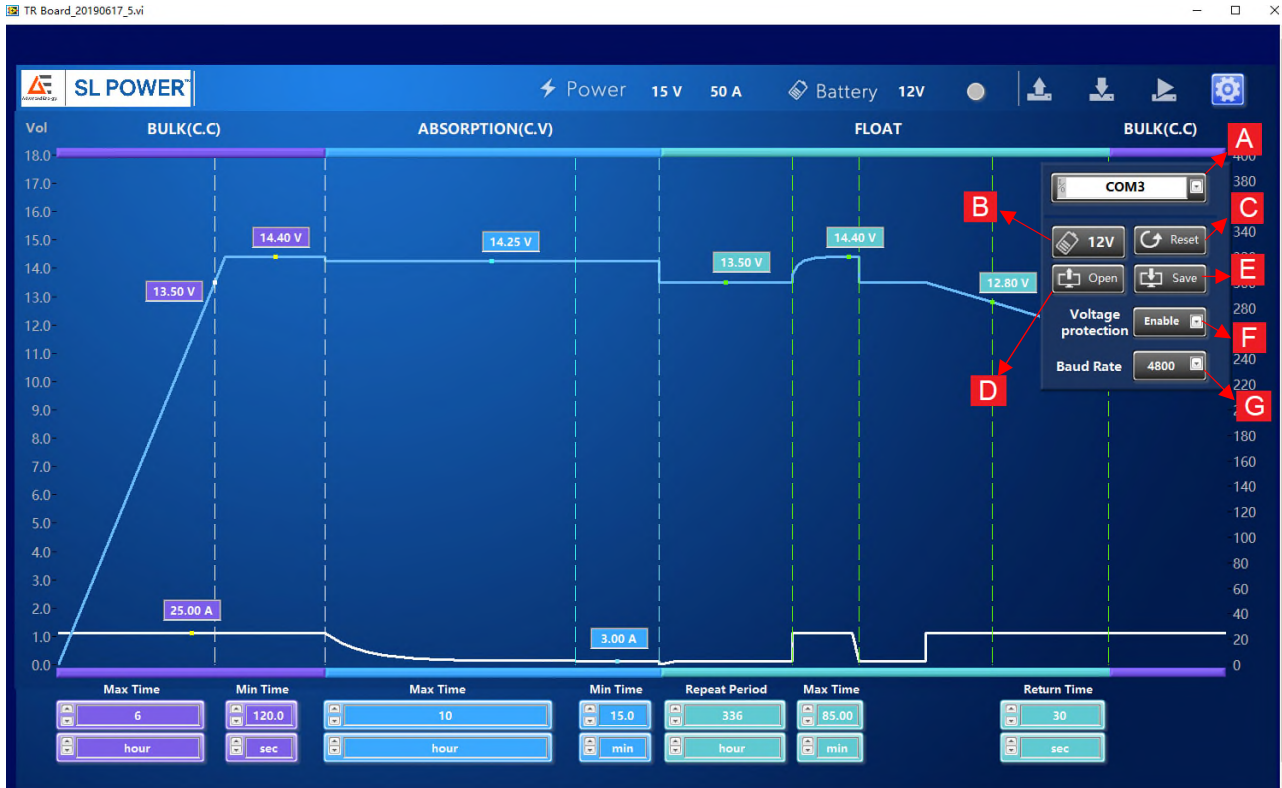
A. Communication port setting

B. Battery voltage setting

C. Reset

D. Load the previously stored settings parameter file

E. Save parameters to the file

F. Battery voltage protection mode (Disable = Turn off, Enable = Turn on)

G. Baud rate setting

Note:
1. Max. charging voltage: 15.6V (for 12V battery), 31.2V (for 24V battery) and 60V (for 48V battery)
2. Max. charging current: same as the rated output current of the power supply installed
3. The battery voltage detection protection function will not take effect until it is written

SECTION 5 LED Indicator

5.1   Failure Indicator

Failure Description	LED Status
EEPROM checksum fail	Solid red
EEPROM null	Red slow every 3 secs
Over current or over voltage	Red light twice flash every 3 secs
Charging voltage or current setting over power supply's rated voltage or current	Red light flash three times every 3 secs
Battery voltage detected is not within the set range Single battery: 8.5 to 16.75V 2 batteries: 16.75 to 33.5V 4 batteries: 33.5 to 67V	Red light flash four times every 3 secs
Power supply communication or status error	Red light flash five times every 3 secs

5.2   Charging Status LED Indicator

Charging Status	LED Status	
Bulk-1	Orange fast	----------------
Bulk-2	Orange slow	– – – – – –
Absorption-1	Orange solid	————
Absorption-2	Green solid	————
Float	Green flash	- - - - - - - - - - - -

SECTION 6   HARDWARE SPECIFICATIONS

Dimensions
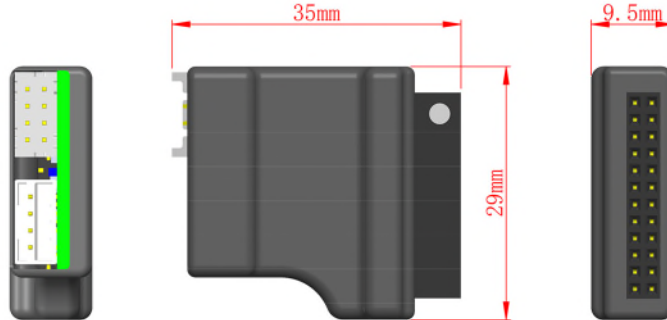
35 x 29 x 9.5 mm

Cable 1
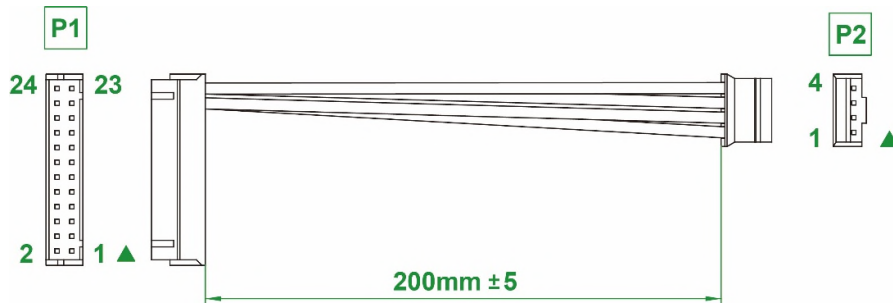
P1		P2		Description
Pin. No.	Function	Pin. No.	Function	
1 to 20	NC	-	-	-
21	AUX	4	AUX	+5V/0.5A or +9V/0.3A auxiliary power
22	GND	3	GND	Ground
23	RX	2	RX	For RS232 receiver function
24	TX	1	TX	For RS232 transmission function

Cable 2
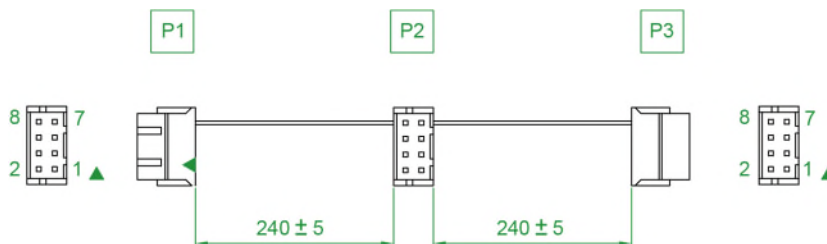
SECTION 7 WARRANTY

We guarantee this product against defects in materials and workmanship for a period of 24 months from production month / year (refer to product serial number). Please contact with your local authorized distributor for RMA (Return Material Authorization) service. Please note that Advanced Energy will ensure our products are operational before delivery and the warranty service is offered to the unit which has defect caused under normal use, in the judgment of Advanced Energy's technician. The warranty is null and void under the following circumstances：

(a) If the unit has been damaged through abuse, misuse, negligence (such as bumping, wetting), fault voltage supply, air/water pollution accidents and natural calamities.

(b) If the serial number has been altered, effaced or removed.

SECTION 8   RECORD OF REVISION AND CHANGES

Issue	Date	Description	Originators
1.0	03.16.2023	First Issue	A. Zhang

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

PRECISION | POWER | PERFORMANCE | TRUST

For international contact information, visit advancedenergy.com.

powersales@aei.com (Sales Support)
productsupport.ep@aei.com (Technical Support)
+1 888 412 7832

Easy Charger Wizard - Rev.03.16.23_#1.0