※ **Thank you for selecting the Tracer-CPN MPPT solar charge controller. Please read this manual carefully before using the product and pay attention to the safety information.**
※ **Do not place flammable or explosive materials around the product, or install the product on wall made of non-heat resistant materials, and avoid direct sunlight.**

## MPPT Solar Charge Controller

1. Overview

The Tracer-CPN solar charge controller adopts the advanced Maximum Power Point Tracking charging technology. Increase the system charging efficiency yet lower the system cost. The controller supports various batteries. With the water-proof RS485 communication port, users can view the working status and set parameters through PC software or APP. Tracer-CPN provides reliable protection for your battery and load in cases of disconnection. It ensures that the controller output for both the battery and load remains constant at the equalization voltage. This feature prevents any potential harm or damage to the battery and load system, making Tracer-CPN the ideal choice for those seeking reliable and safe battery control. It is widely used in RVs, household system and field monitoring.

The features are listed below:

- Support lead-acid and lithium-ion batteries
- Lithium battery self-activating and low-temperature protection function
- Constant voltage output function
- MPPT charging, with maximum DC/DC conversion efficiency of 98%
- PV power limitation function
- Real-time energy statistics function
- Connect the IoT (Internet of Things) modules and Cloud Server to realize remote monitoring
- Built-in Bluetooth module (Only Tracer-CPN(BLE) supports)
- Standard Modbus protocol, waterproof RS485 port provides a 5VDC power with short-circuit protection
- Comprehensive electronic protections
- Silent and low self-consumption design
- IP68 protection level
- Comply with EN/IEC62109 and civilian level EMC (EN61000-6-1/3) standards

2. Appearance
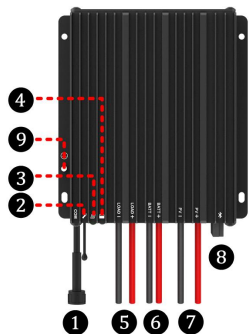
❶	RS485 waterproof port[1]
❷	Temperature Sensor[2]
❸	Charging Status indicator
❹	Battery Status indicator
❺	Load Positive and Negative Wires
❻	Battery Positive and Negative Wires
❼	PV Positive and Negative Wires
❽	Built-in Bluetooth module[3]
❾	Grounding terminal

(1) The RS485 waterproof port can provide a DC power of 5VDC/200mA, and have the short-circuit protection function. The port is isolation design for Tracer7810CPN/ Tracer7810CPN(BLE), and non-isolation design for other series. The pin definition is shown below:

Pin	Definition	Color
1	+5VDC	Red
2	RS485-A	White
3	RS485-B	Yellow
4	Power ground	Black

RS485 PORT

4 GND — VCC 1
3 B — A 2
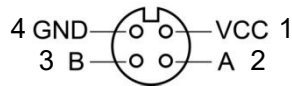
⚠ **CAUTION: When the RS485 port is not working, the waterproof cap must be installed to prevent water from getting in.**

(2) If the temperature sensor is short-circuited or damaged, the controller shall be charging or discharging at the default temperature of 25℃.

(3) Only the Tracer-CPN (BLE) series are designed with the built-in Bluetooth module; please select as you require.

3. Wiring

● **Connection sequence**

1) Connect components to the controller in the sequence ①**Battery** > ②**load** > ③**PV** as shown above and pay much attention to the "+" and "-." Please don't connect the fast-acting fuse or circuit breaker during the installation. When disconnecting the system, the order will be reserved.

2) The Tracer-CPN/Tracer-CPN (BLE) controllers are common-negative; all the negative terminals can be grounded simultaneously, or anyone can be grounded. However, according to the practical application, the negative terminals of the PV array, battery, and load can also be ungrounded. Still, the grounding terminal on the shell must be grounded. It effectively shields electromagnetic interference from the outside and prevents some electric shock to the human body.

3) Connect a fast-acting fuse in series with the battery +. The fast-acting fuse must be 1.25 to 2 times the rated controller current. The installed distance is within 150mm.

4) After powering the controller, the battery LED indicator on the controller shall flash

green. If it's not green, please refer to chapter 10, Troubleshooting.
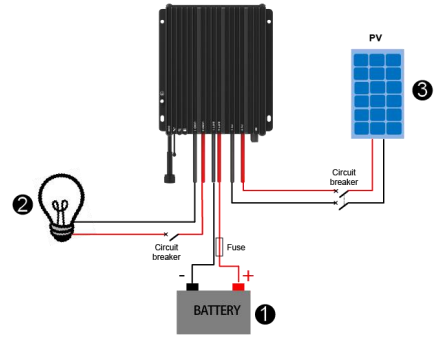
⚠ CAUTION	● Co-negative systems (e.g. RV applications) are recommended to use a co-negative controller, which can damage the controller if a co-positive controller is used in the co-negative system and the positive pole is grounded. ● The cable length of the battery should not exceed 3 meters. ● The recommended cable length of the PV array should not exceed 3 meters (Note: If the cable length of the PV array is less than 3 meters, the system meets EN/IEC61000-6-3 requirements. If more than 3 meters, the system may not meet EN/IEC61000-6-3 requirements).

● **Load self-test function**

The load is automatically turned ON after powering on the controller for 10s. After the load keeps ON status for 10s, the controller restores to the set working mode.
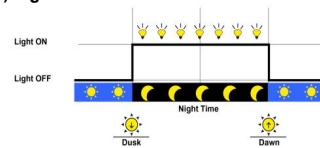
4. LED Indicators

Indicator	Color	Status	Instruction
(PV panel)	Green	On Solid	PV connection normal but low voltage(irradiance) from PV, no charging
		OFF	No PV voltage(night time) or PV connection problem
		Slowly Flashing(1Hz)	In charging
		Fast Flashing(4Hz)	PV overvoltage
(battery)	Green	On Solid	Battery normal
		Slowly Flashing(1Hz)	Battery full
		Fast Flashing(4Hz)	Battery overvoltage
	Orange	On Solid	Battery under voltage
	Red	On Solid	Battery over-discharged
		Fast Flashing(4Hz)	Battery overheating Lithium battery low temperature
Charging indicator(green) and battery indicator(orange) flashing simultaneously			System voltage error※

※**When connecting with a lithium battery, the controller does not recognize the system voltage automatically.**
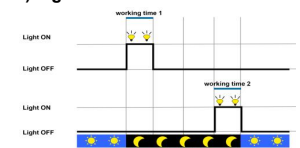
5. Load Working Mode

1) Manual Mode (Default ON)
2) Light ON/OFF
3) Light ON+ Timer

Turn-On voltage (Adjustable):
5V (12Vsystem), delay10min.
Turn-Off voltage (Adjustable):
6V (12Vsystem), delay10min.
Note: 24V system voltage×2

4) Real-time Control
Control the load ON/OFF time by setting a real-time clock.

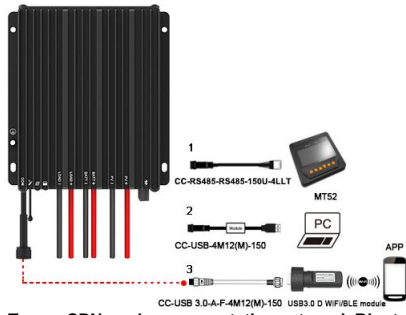| ⚠ CAUTION	In the Light ON/OFF and Light ON/Timer modes, the Load is turned on after 10 minutes.

6. Accessories (optional) and Software

1）PC software download: www.epever.com > "Solar Guardian Power Management Installation"
2）APP download:

iOS QR code or search for "Solar Guardian" in the Apple Store.		Android QR code	

Note: Only the Tracer-CPN series support the external Bluetooth module, the Tracer-CPN (BLE) series has a built-in Bluetooth module. MT52 is not waterproof. If used outdoors, please ensure proper waterproofing and dust protection. And MT52 cannot set the relevant parameters of the lithium battery and load mode.

7. Protection

- **PV Over Current**

  The controller will limit the battery charging current to the rated charge current. Therefore an oversized solar array may not work at peak power.

- **PV Short Circuit**

  The controller will stop charging when the PV input is short-circuited or the short-circuit occurs at the low-power charging. Clear faults to resume work.

⚡ **WARNING**	The controller may be damaged when the PV input is short-circuited on a high-power.

- **PV Reverse Polarity**

  The controller will not be damaged when the PV array is reversely connected under: ①Only the PV is connected to the controller. ②The battery is correct connected, and the PV open-circuit voltage is lower than 85V.

⚡ **WARNING**	The controller will be damaged when the PV array is reversely connected, and the PV array's actual power exceeds 1.5 times the rated charge power!

- **Battery Reverse Polarity**

  The battery can be reversely connected when the PV is disconnected or reversely connected. Correct the wire connection to resume work.

⚡ **WARNING**	The controller will be damaged when the PV connection is correct and the battery connection is reversed!

- **Battery Over Voltage**

  When the battery voltage exceeds the Over Voltage Disconnect Voltage, the controller will stop charging the battery to protect the battery from being overcharged.

- **Battery Over Discharge**

  When the battery voltage is lower than the Low Voltage Disconnect Voltage, the controller will stop discharging the battery to protect the battery from being over-discharged.

- **Battery Overheating**

  The controller detects the environment temperature by the external temperature sensor. If the environment temperature exceeds 65℃, the controller will stop working and recover below 55℃.

- **Lithium Battery Low Temperature**

  When the battery temperature is lower than the low-temperature protection value, the Lithium battery charging/discharging is stopped. It resumes work when the battery temperature exceeds the low-temperature protection value.

- **Load Overload**

  If the load current exceeds 1.05 times the rated load current, the controller will disconnect the load after a delay time. Overloading must be cleared by reducing the load and restarting the controller.

- **Load Short Circuit**

  The load will be switched off when the short circuit (≥4 times rated load current) happens. The controller will automatically attempt to reconnect the load five times. Suppose short circuit protection still exists after the fifth attempt. In that case, the user has to clear the short circuit, restart the controller or wait for one night-day cycle (night time>3 hours).

- **Temperature Sensor Breakdown**

  When the temperature sensor is short-circuited or damaged, the controller will charge or discharge at 25°C by default to avoid damage to the battery caused by overcharge or over-discharge.

- **High-voltage Transients**

  The controller is protected against small high-voltage transients. In lightning-prone areas, additional external arrester is recommended.

- **Controller Overheating**

  The controller can detect its internal temperature by the temperature sensor. The controller stops working when its internal temperature exceeds 85 °C and resumes work when its temperature is below 75 °C.

9. Troubleshooting

Faults	Possible reasons	Troubleshooting
Charging LED is off during the daytime, and sunshine falls on PV modules properly	PV array disconnection	Confirm that PV and battery wire connections are correct and tight
No LED indicator	Battery voltage may be less than 8.5V	Measure battery voltage with the multi-meter. A minimum of 8.5V can start up the controller
Battery LED flashes green quickly	Battery over voltage	Check if the battery voltage exceeds the OVD, and disconnect the PV
Battery LED is red ON solid	Battery over-discharged	The load will recover when the battery voltage is restored to or above the LVR (low voltage reconnect voltage).
Battery LED flashes red	Battery Overheating	The controller will resume when the battery temperature declines to 55℃ or below.
The load has no output	Load Overload①	①Please reduce the number of electric equipment. ②Restart the controller. ③wait for one night-day cycle (night time>3 hours).
	Load Short Circuit①	①Check carefully the loads' connection and clear the fault. ②Restart the controller. ③wait for one night-day cycle (night time>3 hours).

①When the load is overloaded or short-circuited, the load will automatically restore output five times, respectively, delaying 5S, 10S, 15S, 20S, and 25S.

10. Disclaimer

This warranty does not apply to the following conditions:
- Damage from improper use or use in an unsuitable environment.
- PV or load current, voltage, or power exceeds the rated value of the controller.
- The actual working temperature exceeds the limited working temperature.
- The user disassembly or attempted to repair the controller without permission.
- The controller is damaged due to natural elements such as lighting.
- The controller is damaged during transportation and shipment.

8. Technical Specifications

Item Model	Tracer5206CPN/Tracer5206CPN(BLE)	Tracer7810CPN/Tracer7810CPN(BLE)
Battery Rated Voltage	12/24VDC Auto(Lithium battery cannot automatically identify system voltage)	
Battery Work Voltage Range	8 ~ 32VDC	
Rated Charge/Discharge Current	20A	30A
Rated Charge Power	260W/12V; 520W/24V	390W/12V; 780W/24V
PV Maximum Open-circuit Voltage	60V (at minimum operating environment temperature) 46V(at 25℃ environment temperature)	100V (at minimum operating environment temperature) 92V(at 25℃ environment temperature)
MPPT Voltage Range	(Battery voltage +2V) ~ 36V	(Battery voltage +2V) ~ 72V
Battery Type	**Lead-acid battery:** Sealed(Default) / Gel / Flooded/User; **Lithium battery:**LiFePO4/ Li-NiCoMn/User	
Lead-acid Equalize Charging Voltage	Sealed: 14.6V, Gel: No, Flooded: 14.8V, User: 9-17V (✕2/24V)	
Boost Charging Voltage	Sealed: 14.4V, Gel: 14.2V, Flooded: 14.6V, User: 9-17V (✕2/24V)	
Float Charging Voltage	Sealed/Gel/Flooded: 13.8V, User: 9-17V (✕2/24V)	
Low Voltage Reconnect Voltage	Sealed/Gel/Flooded: 12.6V, User: 9-17V (✕2/24V)	
Low Voltage Disconnect Voltage	Sealed/Gel/Flooded: 11.1V, User: 9-17V (✕2/24V)	
Lithium Boost Charging Voltage	LiFePO4: 14.5V, Li-NiCoMn: 12.5V, User: 9-17V (✕2/24V)	
Low Voltage Reconnect Voltage	LiFePO4: 12.8V, Li-NiCoMn: 10.5V, User: 9-17V (✕2/24V)	
Low Voltage Disconnect Voltage	LiFePO4: 11.1V, Li-NiCoMn: 9.3V, User: 9-17V (✕2/24V)	
Static Losses	≤10mA(12V); ≤7mA(24V)	≤15mA(12V); ≤9mA(24V)
Temperature Compensation	-3mV/℃/2V (Lithium batteries don't have temperature compensation coefficient)	
Communication Method	RS485/BLE	
Work Temperature Range	-40℃ ~ +50℃ (Above 45℃, please operate in derating)	
Enclosure	IP68	
Dimension (L x W x H)	Tracer5206CPN: 150.6mm × 130mm × 50mm Tracer5206CPN(BLE): 159mm × 130mm × 50mm	Tracer7810CPN: 158.6mm × 141mm × 51.5mm Tracer7810CPN(BLE): 167mm × 141mm × 51.5mm
Mounting Hole Size	Φ4.5mm	Φ4.5mm
Mounting Size (L x W)	121mm × 120mm	132mm × 120mm
Power Cable (PV/BAT/LOAD)	PV:11AWG, BAT/LOAD: 10AWG	PV:11AWG, BAT/LOAD: 10AWG
Net Weight	1.25kg	2.60kg

Any changes without prior notice! Version number: V1.4