MPPT Solar Charge Controller

TRACER1206,TRACER1210,TRACER1215

10 AMP 12V/24V auto switch

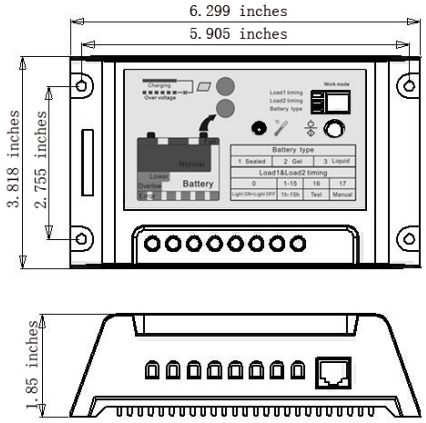
INTELLIGENT SOLAR CHARGE CONTROLLER

INSTALLATION AND OPERATION

MANUAL

Ningbo Star Solar Co.,Ltd Tel:(86) 574 26266608 Fax:(86) 574 26266618 56664636 Email:Sales@pvsolarchina.com Http://www.pvsolarchina.com

TRACER Dimensions



Specification Summary

System Voltage	12V DC / 24V DC*[1]
Rated Battery Current	10A
Rated load current	10A
Max. Input Voltage*[2]	
TRACER-1206	60V DC
TRACER-1210	100V DC
TRACER-1215	150V DC
Max.PV Input Power	
12V System	120W
24V System	240W

1. The controller will recognize the system when powered up. If the battery voltage is lower than 18V, it will recognize the system as 12V. If the battery voltage is no less than 18V, it will recognize the system as 24V.

2. The voltage of PV panel(s) should never exceed the max. input voltage to avoid the damage of the controller.

Table of Contents

1 Important Safety Information

Save These Instructions。

This manual contains important safety, installation and operating instructions for TRACER。

The following symbols are used throughout this manual to indicate potentially dangerous conditions or mark important safety instructions，please take care when meeting these symbols.

WARNING: indicates a potentially dangerous condition.

Use extreme caution when performing this task.

CAUTION: Indicates a critical procedure for safe and proper

Operation of the controller

NOTE: Indicates a procedure or function that is important for the

Safe and proper operation of the controller.

General Safety Information

·Read all of the instructions and cautions in the manual before beginning installation.

·There are no user serviceable parts inside the TRACER. Do not disassemble or attempt to repair the controller

·disconnect the solar module and fuse/breakers near to battery before installing or adjusting the TRACER。

·it is strongly recommended to install external fuses/breakers。

·Do not allow water to enter the controller。

·Confirm that power connections are tightened to avoid excessive heating from loose connection。

2 Introduction

2.1 Overview

Thank you for selecting the TRACER controller which represent advanced technology of our company. The features listed below:

·12/24V auto recognized, 10A rated charging current.

·Advance maximum power point tracking technology to optimize using the solar system

·Widely used，automatic recognize daytime/night

·Timer function with 1-15 hours option for street light

·Dual-load output can be individually controlled, and enhance the flexibility of the system

·Sealed, Flood and Gel battery optional

·Adopting temperature compensation and correcting the charging and discharging parameters automatically, improving the battery lifetime

·Electronic protection: Overcharging, over discharging, overload , short circuit, and reverse polarity of PV and battery

·RJ45 interface with remote meter MT2, convenient to check operating parameters of controllers.

The TRACER series controller is for off-grid solar system and control the charging of discharging of the battery. There is an advanced tracing algorithm inside it to get the max. Power point of PV module and charge the battery. At the same time, the low voltage disconnect function (LVD) will prevent the battery damage from battery over discharging.

The TRACER controller charging process has been optimized. It can extend the battery life and improve system performance.

The comprehensive self-diagnostics and electronic protection functions can prevent damage from installation mistakes or system faults.

In addition, the TRACER controller has a RJ45 interface to realize communication with Meter for long distance surveillance.

Although the TRACER controller is very easy to operate and use, please take your time to read the indication and instruction of this operator's manual. This will help you make full use of all the functions and improve your PV system.

The features of TRACER controller are shown in Figure 2-1

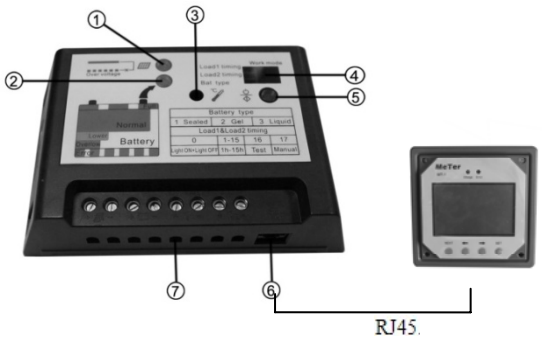


Figure 2-1. TRACER features.

1 – Status LED

An LED indicators that shows charging status and also indicates when a solar input fault condition exists.。

2 – Battery status LED and load fault conditions indicator LED.

An LED indicators that shows battery status or load fault condition exists.

3 –Temperature sensor

Measures ambient temperature

4 –Setting & Work mode indicators

Controller setting and work mode indicators

5 –Setting switch/ON/OFF switch

Setting two loads work mode and battery type

6 – RJ45 Meter port

Communication with MT2

7 –Terminal block

Terminals for system Solar, Battery, Load1, Load2 connections.

2.2 Optional Accessories

Remote Meter(Model：MT2)

The digital Remote Meter displays system operating information, error indications, and self-diagnostics read-out. Information is displayed on a backlit LCD display. The large numerical display and icons are easy to read and large buttons make navigating the meter menus easy. The meter can be flush mounted in a wall or surface mounted using the mounting frame(included). The MT2 is supplied with 1.5m of cable (custom –made according to demand), a mounting frame。The MT2 connects to the RJ45 Meter port on the TRACER.

3 Installation Instructions

3.1 General Installation Notes

·Read through the entire installation section first before beginning installation

· Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash and clean any contact with battery acid

· use insulated tools and avoid placing metal objects near the batteries。

· Explosive battery gasses may be present during charging. Be certain there is sufficient ventilation to release the gasses

· Do not install in locations where water can enter the controller

· Loose power connections and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials, or even cause fire. Ensure tight connections and use cable clamps to secure cables and prevent them from swaying in mobile applications.

· Only charge suitable type batteries (seal, gel, flooded batteries).

· TRACER Battery connection may be wired to one battery or a bank of batteries. The following instructions refer to a singular battery, but it is implied that the battery connection can be made to either one battery or a group of batteries in a battery bank.

3.2 Mounting

NOTE: When mounting the TRACER, ensure free air through the controller heat sink fins. There should be at least 6 inches(150 mm) of clearance above and below the controller to allow for cooling. If mounted in an enclosure, ventilation is highly recommended.

WARNING: Risk of explosion! Never install the TRACER in a sealed enclose with flooded batteries! Do not install in a confined area where battery gassed can accumulate.

Step 1: Choose Mounting Location

Locate the TRACER on a vertical surface protected from direct sun, high temperature, and water.

Step 2: Check for clearance

Place the TRACER in the location where it will be mounted. Verify that there is sufficient room to run wires and that there is ample room above and below the controller for air flow.

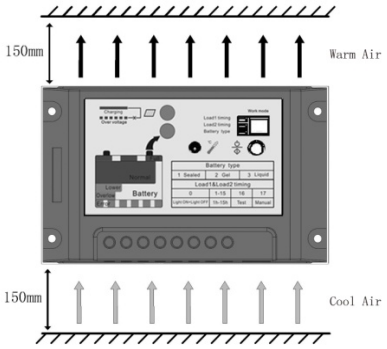


Figure 3.1 Mounting and cooling

Step 3: Mark Holes

Use a pencil or pen to mark the four (4) mounting hole locations on the mounting surface.

Step 4: Drill Holes

Remove the controller and drill4mm holes in the marked locations.

Step 5: Secure Controller

Place the controller on the surface and align the mounting holes with the drilled holes in step 4. Secure the controller in place using the mounting screws(included)

3.3 Wiring

NOTE: A recommended connection order has been provided for maximum safety during installation.

NOTE: The TRACER is a negative ground controller. Any combination of negative connections can be earth grounded as required. Grounding is recommended.

CAUTION: The output connected with inverter is prohibited.

CAUTION: The total current draw of all system loads connected to the TRACER LOAD terminals cannot exceed the 10A load current rating. All the loads surfing current cannot exceed the 10A load current rating.

CAUTION: For mobile applications, be sure to secure all wiring. Use cable clamps to prevent cables from swaying when the vehicle is in motion. Unsecured cables create loose and resistive connections which may lead to excessive

heating

and/or fire.

Step 1: Load Wiring

The TRACER load output connection will provided battery voltage to system loads such as lights, pumps, motors, and electronic devices.

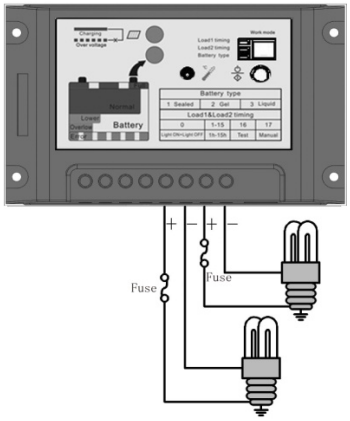


Figure 3-2 Load wiring

Connect load positive (+) and negative (-) load wires to the system load(s) as shown in figure 3-2.

Refer to the wire gauge chart on Appendix A of this manual for correct wire size.

An in-line fuse holder should be wired in series in the load positive (+) wire as shown. DO NOT INSERT A FUSE AT THIS TIME.

If wiring the load connection to a load distribution panel, each load circuit should be fused separately. The total load draw should not exceed the 10A load rating.

Step 2: Battery Wiring

WARNING: Risk of explosion or fire! Never short circuit battery positive (+)and negative(-) or cables

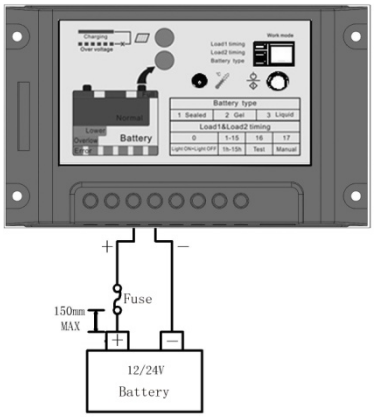


Figure 3-3. Battery wiring

Before connecting the battery, measure the battery voltage. It must be over 7 volts to power the controller. For 24 volts, the voltage must be greater than 18 volts to properly detect a 24V battery. The 12/24 volt battery detection is automatic and the check is only performed at start-up.

Wire an in-line fuse holder no more than 150mm from the battery positive terminal. DO NOT INSERT FUSE AT THIS TIME.

Step 3：Solar Wiring

WARNING: Risk of electric hock! Exercise caution when handling solar wiring. The solar array high voltage output can cause severe shock or injury. Cover modules from the sun before installing solar wiring.

TRACER CAN ACCEPT 12V, 24V norminal off-grid solar module arrays. Grid –tie solar module(s) may be used if the open circuit voltage does not exceed the maximum solar input rating. The solar module(s) norminal voltage must be equal to or greater than the norminal battery voltage.

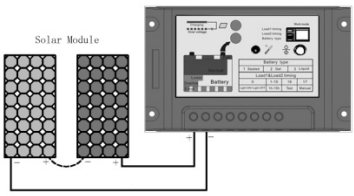


Figure3-4. Solar input wiring

Step 4: Accessories (optional)

Install the Remote Temperature Sensor and Remote Meter(both purchased seperately) if required. Refer to the instructions provided with each accessory for detailed installation procedures.

Step 5: Confirm Wiring

Double-check the wiring in step1 through 4. Confirm correct polarity at each connection. Verify that all eight power terminals are tightened.

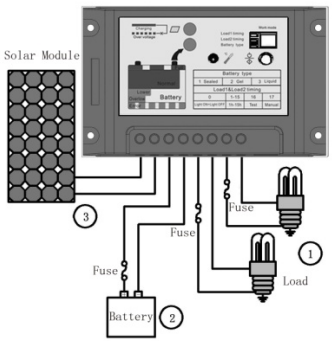


Figure3-5. System Wiring Review

Step 6: Install Fuses

Install a 15 Amp DC-rated fuse in each fuse holder in the following order:

1. Load circuit
2. Battery circuit

Step 7: Confirm Power-up

The TRACER should begin the power-up LED when battery power is applies.

If the TRACER does not power up or Battery Status LEDs error exists, refer to Section 5 Troubleshooting

4 Operation

4.1 MPPT Technology

The TRACER utilizes Maximum Power Point Tracking technology to extract maximum power from the solar module (s). The tracking algorithm is fully automatic and does not require user adjustment, TRACER technology will track the array *maximum power point voltage* (Vmp) as it varies with weather conditions, ensuring that maximum power is harvested from the array through the course of the day.

· Current Boost

In many cases, TRACER MPPT technology will “boost” the solar charge current. For exemple, a system may have 8 Amps of solar current flowing into the TRACER and 10 Amps of charge current flowing out to the battery. The TRACER does not create current! Rest assured that the power into the TRACER is the same as the power out of the TRACER. Since power is the product of voltage and current(Volts×Amps), the following is true:

(1) Power Into the TRACER-Power Out of the TRACER

(2) Volts In×Amps In=Volts Out×Amps Out

* Assuming 100% efficiency. Losses in wiring and conversion exis

If the solar module's Vmp is greater that the battery voltage, it follows that the battery current must be proportionally greater than the solar input current so that input and output power are balanced. The greater the difference between the maximum power voltage and battery voltage, the greater the current boost. Current boost can be substantial in systems where the solar array is of a higher nominal voltage than the battery.

· **An Advantage Over Traditional Controlers**

Traditional controllers connect the solar module directly to the battery when recharging. This requires that the solar module operate in a voltage range that is below the module's Vmp. In a 12V system for exemple, the battery voltage may range from 11-15Vdc but the module's Vmp is typically around 16 or 17V.

Figure 4-1 shows a typical current VS. voltage output curve for a nominal 12V off-grid module.

Current VS. Voltage in 12V system Output power in 12V system

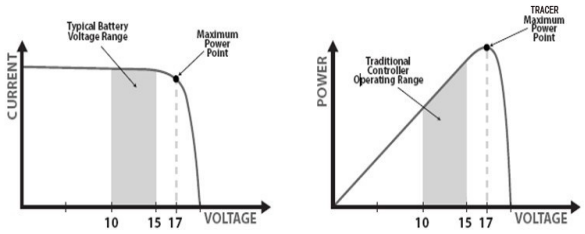


Figure 4-1. Nominal 12V Solar Module I-V curve and output power graph

The array Vmp is the voltage where the product of current and voltage (Amps×Volts) is greatest, which falls on the "knee" of the solar module I-V curve as shown in Figure4-1. Because Traditional controllers do not operte at the Vmp of the solar array, energy is wasted that could otherwise be used to charge the battery and power system loads. The greater the difference between battery voltage and the mp of the module, the more energy is wasted.

TRACER MPPT technology will always operate at the Vmp resulting in less wasted energy compared to traditional controllers.

• **Conditions That Limits the Effectiveness of MPPT**

The Vmp of a solar module decreases as the temperature of the module increases. In very hot weather, the Vmp may be close or even less than battery voltage. In this situation, there will be very little or no MPPT gain compared to traditional controllers. However, systems with

modules of higher norminal voltage than the battery bank will always have an array Vmp greater than battery voltage. Additionally, the savings in wiring due to reduced solar current make MPPT worthwhile even in hot climates.

4.2 Battery Charging Information

Four Charging Stage

The TRACER has a 4-stage battery charging algorithm for rapid, efficient, and safe battery charging. Figure 4-2 shows the sequence of the stages.

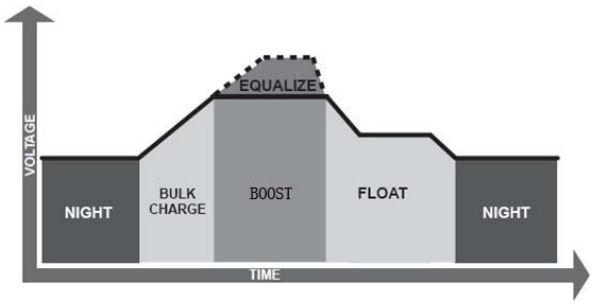


Figure 4-2. TRACER MPPT charging algorithm

·Bulk Charge

In this stage, the battery voltage has not yet reached boost voltage and 100% of available solar power is used to recharge the battery.

·Boost Charge

When the battery has recharged to the Boost voltage setpoint, constant-voltage regulation is used to prevent heating and excessive battery gassing. The Boost stage remains 120 minutes and then go to Float Charge

·Float Charge

After the battery is fully charged at the Boost voltage stage, TEACER will recduce the battery voltage to Float voltage point. When the battery is fully recharged ,there can be no more chemical reactions and all the charge currents transmit into heat and gas at this time . Then it enters the floating stage, **charging with smaller voltage and current, in this way, it reduces the temperature of battery and releases the gassing, but also charging at the same time. The purpose of float stage is to offset the power consumption caused by self consumption and small load in the whole system, while maintaining full battery storage capacity.**

In Float stage, loads can continue to draw power from the battery. In the event that the system load(s) exceed the solar charge current, the controller will no longer be able to maintain the battery at the Float set point. Should the battery voltage remains below the Boost setpoint ,the controller will exit Float stage and return to Bulk charging.

·Equalize

WARNING: Risk of explosion!

Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary

NOTE: Equipment damage!

Equilibrium maybe increase battery voltage to the level damaging sensitive DC load. All load allowable input voltage required to verify is greater than the equalizing charging setpoint.

NOTE: Equipment damage!

Over-charging and excessive gas precipitation may damage the battery plates and active material shedding on them. Too high equalizing charge or too long time may cause damage. Please carefully review the specific requirements of the battery used in the system.

Certain types of batteries profit from periodic equalizing charge, which can stir electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge improves battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

If it detects battery over discharges ,solar controller will automatically turn the battery to equalization charging stage ,and the equalization charging will be 60mins. Equalizing charge and boost charge are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

4.3 LED Indications

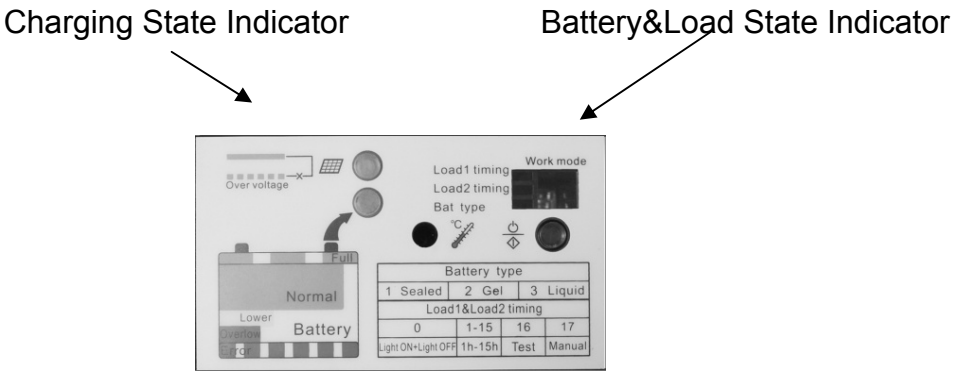


Figure 4-3. LED Indicator

·Charging State Indicator

The green LED indicator will light whenever sunlight is available for battery charging, the green charging LED will stay on in normal charging. The charging LED indicator flashes when system over voltage. Please refer to Chapter 5 for troubleshooting.

Color	Indication	Operating State
Green	On Solid	Charging
Green	Flashing	Over-voltage

Table4-1 Charging State LED definitions

·Battery&Load State Indicator

GREEN ON when battery voltage in normal range

YELLOW ON when battery under voltage

RED ON when battery over discharged

RED FLASHING SLOWLY when over load (the load amp is 1.25times of rated current for 60 seconds , the load amp is 1.5times of rated current for 5 seconds)

RED FLASHING FAST when short circuit(load amp is more than four times of rated current)

Please refer to Chapter 5 for troubleshooting.

Color	Indication	Operating State
Green	On solid	Normal (battery)
Yellow	On solid	Under voltage(battery)
Red	On solid	Over discharging(battery)
Red	Slow flashing	Over load
Red	Fast flashing	Short circuit

Table 4-2. Battery & Load status LED definition

4.4 Setting Operation

. Load Control Settings

1. Lighting Mode

The solar module voltage reaches lower than setpoint of start voltage when sundown, solar controller will recognize the starting voltage and turn on load working after 10 minutes transition; The solar module voltage reaches higher than setpoint of start voltage when sunrise, solar controller will recognize the starting voltage and turn off load working after 10 minutes transition.

2. Lighting +hours on

The solar module voltage reaches lower than setpoint of start voltage, the controller will turn on the load for several hours which users set timer. The timer setting operation is referred to “Load Working Mode Setting”.

3. Testing mode

It is used to test the system, there is no 10 minutes transition when controller recognize the setpint of start voltage. When lower the voltage, the controller will turn on load, if higher, it will turn off load. The test mode is easy to check the system installation.

4. ON/OFF mode

This mode is to turn on/off load by Setting Switch

. Load Working Mode Setting

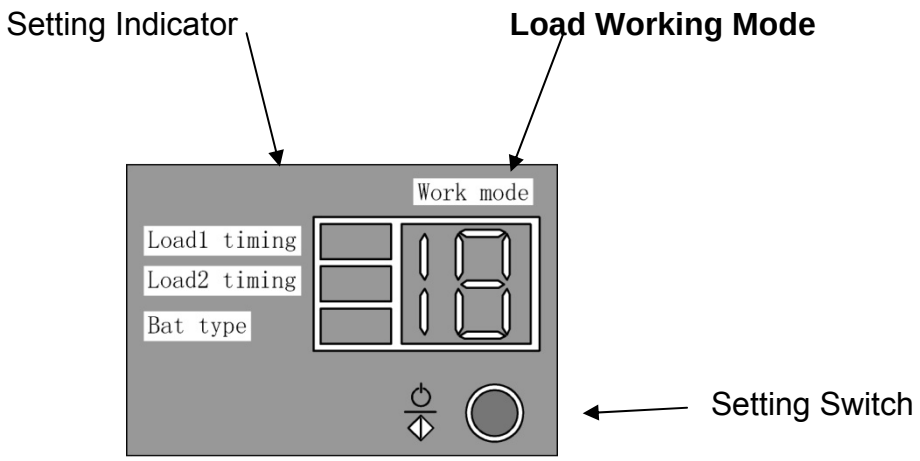


Figure 4-4. Instruction figure on setting

Press the Setting Switch, and the led will switch from load 1 work mode, load 2 working mode

and battery type setting mode.

Press the Setting Switch and hold on 5 seconds when the led is on load 1 work mode setting, continue pressing and the number will repeat , and stop pressing when the expected number appears according to the following setting table until it is still.

Setting work mode of load 2 is the same as load 1 when the led is on load 2 work mode setting.

Work Mode of Load	LED Digital Number
Dusk to down, light is on all night	0
Light will be on for 1 hour after ten minutes delay since sunset	1
Light will be on for 2 hours after ten minutes delay since sunset	2
Light will be on for 3 hours after ten minutes delay since sunset	3
Light will be on for 4 hours after ten minutes delay since sunset	4
Light will be on for 5 hours after ten minutes delay since sunset	5
Light will be on for 6 hours after ten minutes delay since sunset	6
Light will be on for 7 hours after ten minutes delay since sunset	7
Light will be on for 8 hours after ten minutes delay since sunset	8
Light will be on for 9 hours after ten minutes delay since sunset	9
Light will be on for 10 hours after ten minutes delay since sunset	10
Light will be on for 11 hours after ten minutes delay since sunset	11
Light will be on for 12 hours after ten minutes delay since sunset	12
Light will be on for 13hours after ten minutes delay since sunset	13
Light will be on for 14 hours after ten minutes delay since sunset	14
Light will be on for 15 hours after ten minutes delay since sunset	15
Test mode	16
ON/OFF mode	17

Table 4-3. Load Work Mode

Note: There will be 10 minutes delay for the load turned on after sunset and turned off before sunrise. Because the controller requires 10 minutes of continuous transition values before it starts to work. These constraints avoid false transitions due to lightning or dark storm clouds.

Note: when Load 1 work mode is TEST MODE, Load 2 will be also in TEST MODE.

Note: In case that neither mode is set as Test Mode(16), and further in case that

either of the both work modes are set as ON/OFF(17) mode, then both work modes will be ON/OFF(17) modes.

·Battery Type Setting;

Press Setting Switch and hold on 5 seconds until the LED is on battery type setting. Continue to press and the number will repeat from 1 to 3. Stop pressing until the relative number appears according the following setting table:

Battery Type	LED digital indicator
Sealed battery	1
Gel battery	2
Flooded battery	3

Table 4-4 Battery Type Setting

5 Protections, Troubleshooting and Maintenance

5.1 Protections

·Solar Overload

TRACER will limit battery current to the 10A maximum rating. An over-sized solar array will not operate at peak power. The solar array should be less than the TRACER nominal max. input power rating for optimal performance.

·Load Overload

If the load current exceeds the maximum load current rating, the TRACER will disconnect the load. The greater the overload the faster the load will disconnected. A small overload could take a few minutes to disconnect. The TRACER will attempt to reconnect the load two times. Each attempt is approximately 10 seconds apart. The load will remain disconnected until power is removed and reapplied.

·Solar Short Circuit

Solar input power wires are short-circuited. Charging automatically automatically resumes when the short is cleared.

·Load Short Circuit

Fully protected against load wiring short-circuit. After two automatic load reconnect attempts (10 seconds between each attempt), the fault must be cleared by removing and reapply power.

·High Voltage Input

If the solar input open circuit voltage(Voc) exceeds the maximum input voltage of TRACER(TRACER-1206/60Vdc; TRACER-1210/100Vdc; TRACER-1215/150Vdc), the array

will remain disconnected until the Voc falls safely below the maximum rating.

·**PV Reverse Polarity**

Fully protection against PV reverse polarity, no damage resulted to the controller. Automatic recover to normal after correct operation.

·**Battery Reverse Polarity**

Fully protection against battery reverse polarity, no damage resulted to the controller. Automatic recover to normal after correct operation.

·**Damaged Internal Temperature Sensor**

If the internal temperature sensor short-circuited or damaged, the controller will be charging or discharging at the default temperature 25℃ to prevent the battery damaged from overcharging or over discharged.

·**High-Voltage Transients**

Solar, battery, and load power connections are protected against high voltage transients. In lightning prone areas, additional external suppression is recommended.

5.2 Troubleshooting

Troubleshooting according to the following instructions:

Faults	Possible reasons	Troubleshooting
Charging LED indicator is off during daytime and sunshine falls on PV modules properly.	PV array disconnection	Check that PV and battery wire connections are correct and tight.
Green charging LED indicator is fast flashing	Battery voltage higher than over voltage disconnection voltage(OVD)	Check if battery voltage Over high. Disconnect the solar module
Battery and load LED indicators are Yellow color	Battery under voltage	Load output is not affected, charging LED indicator will return to green automatically when fully charged.
Battery and load LED indicators stay on RED color, and loads are not working.	Battery over discharged	The controller will cut off the output automatically, LED indicator will return to green automatically when fully charged.
Battery and load LED indicators are RED slowly flashing.	Load power exceeds rated power	Remove some loads, then press the power switch, the controller will return to work after 3 seconds,.

Battery and load LED indicators are RED fast flashing	Load power exceeds 4 times of rated power or load short circuit.	Check load connections and cut off the trouble loads, press the switch button once, output will be recovered after 3 second. There is one time reconnect attempt after 10 seconds when first time short circuit. If short circuit occurs twice continuously, only press the switch button can recover output.

Table 5-1 Troubleshooting

Note：If no LED indications

With a multi-meter, measure the battery voltage at the battery terminal, it can only be powered when battery voltage over 9V.

Note：If no charging LED indication when connection is normal

Measure the PV input voltage at the PV terminals, input voltage must be greater than battery voltage before charging begins.

5.3. Maintenance

The following inspections and maintenance tasks are recommended at least two times per year for best controller performance.

- Check that the controller is securely mounted in a clean and dry environment.
- Check that the air flow and ventilation around the controller is not blocked. Clear all dirt or fragments on the heat sink.
- Check all the naked wires to make sure insulation is not damaged for serious solarization, frictional wear, dryness, insects or rats etc. Maintain or replace the wires if necessary.
- Tighten all the terminals. Inspect for loose, broken, or burnt wire connections.
- Check and confirm that LED or Digit Tube indication is consistent with operation result. Pay attention to any troubleshooting or error indication with necessary corrective action.
- Confirm that all the system components are ground connected tightly and correctly.
- Confirm that all the terminals have no corrosion, insulation damaged, high temperature or burnt/discolored sign, tighten terminal screws to the suggested torque.
- Inspect for dirt, insects and corrosion, and clear up.

Warning：Risk of electric shock! ! !

Make sure all the power off before above operations, and then do the corresponding inspections and operations.

6. Warranty

The TRACER-MPPT charge controller is warranted to be free from defects for a period of TWO (2) years from the date of shipment to end user. Epsolar will, at its option, repair or replace any such defective products.

• Claim Procedure

Before requesting warranty service, check the Operator's Manual to be certain that there is a problem with the controller. Return the defective product to your authorized Epsolar distributor with shipping charges prepaid if problem cannot be solved. Provide proof of date and place of purchase. To obtain rapid service under this warranty, the returned products must include the model, serial number and detailed reason for the failure, the module type, array size, type of batteries and system loads. This information is critical to a rapid disposition of your warranty claim.

7 Technical Specifications

• Electrical

Description	Parameter
Norminal system voltage	12Vdc or 24Vdc
Max. battery current	10A
Battery volt range	9-36V
Max. solar input voltage	TRACER-1206 60VDC TRACER-1210 100VDC TRACER-1215 150VDC
Max. PV input power	12V 120W 24V 240W
Self-consumption	≤16mA
Meter connection	8pin RJ45
Load surge protect	35A

Table 7-1 Electrical Parameters

• **Battery Charging**

Description	Parameter
Charging mode	4 stage
Temp compensation coefficient	-5mV/℃/cell（25℃ ref）
Temp compensation range	-30℃ to +60℃

Table7-2 Battery Charging Parameters

• **Battery Setpoints（Tem.：25℃）**

Charging Parameter			
Battery charging setting	Gel	Sealed	Flooded
High Volt Disconnect	16V; x2/24V	16V; x2/24V	16V; x2/24V
Charging limits voltage	15.5V; x2/24V	15.5V; x2/24V	15.5V; x2/24V
Equalization voltage	——	14.6V; x2/24V	14.8V; x2/24V
Boost voltage	14.2V; x2/24V	14.4V; x2/24V	14.6V; x2/24V
Float voltage	13.8V; x2/24V	13.8V; x2/24V	13.8V; x2/24V
Boost return voltage	13.2V; x2/24V	13.2V; x2/24V	13.2V; x2/24V
Low voltage reconnect	12.6V; x2/24V	12.6V; x2/24V	12.6V; x2/24V
Under voltage recover	12.2V; x2/24V	12.2V; x2/24V	12.2V; x2/24V
Under voltage warning	12V; x2/24V	12V; x2/24V	12V; x2/24V
Low voltage disconnect	11.1V; x2/24V	11.1V; x2/24V	11.1V; x2/24V
Boost duration	2hours	2hours	2hours
Equalize duration	1hour	1hour	1hour

Table 7-3 Battery Charging Setting

• **Environmental**

Environmental	Parameter
Ambient temperature range	-30℃ to +60℃
Storage temperature	-30℃ to +80℃

Humidity	10%-90%(NC)
Enclosure	IP30（Indoor）

Table 7-4 Environment Parameters

- **Mechanical**

Mechanical	Parameter
Dimension	160mm x 97mm x 47mm
Mounting holes	150mm x 70mm
Weight	0.45kg

Table 7-5 Mechanical Parameter