

# Tracer Dream TD2210/TD2410 User's manual of MPPT solar charge controller



**Max PV input Voltage 100V**

**12V/24V 20A 40A**

**Dear Users:**

**Thank you for selecting our product. Please read this manual carefully before you use this product.**

Thank you for choosing MPPT solar charge controller. This series product adopts positive design with LCD displaying. Based on advanced MPPT technology which track the maximum power point of PV array accurately and quickly under any environment, MPPT solar charge controller can constantly obtain Max power from solar panel, thus increasing the charging efficiency of solar panel. It can be used for communication system, off-grid solar system, solar street light system and field monitoring and so on. Excellent digital protect function and professional connector

can avoid damage, due to system fault or installation error, in maximum degree.

## **Features:**

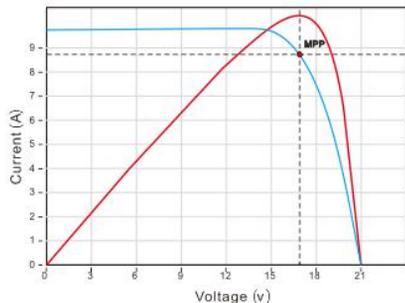
- Advanced MPPT technology, can rapidly and steadily track the Maximum Power Point, tracking accuracy is 99.5%
- Adopt Synchronous Rectifier Technology, (dramatically) improving the transfer efficiency of circuit, maximum 98%.
- Accurate identification and tracking multi peak power point function
- PV array limited power input function, ensuring that the controller does not overload operation under any conditions.
- Widely voltage range of PV array Maximum Power Point, Max PV input Voltage to 100V
- 12/24VDC system voltage automatic recognition
- Humanized LCD displaying, dynamic display operation data and working state
- Built-in operation log, recording system working state
- Varied load control mode: Normal Mode, Sensor Mode, Timer and Sensor Mode
- 3 stages of charging mode. 3 types of battery, Sealed, Gel, and Flooded, alternative charging procedure
- Temperature Compensation Function
- Function of accumulated charging and discharging power as well as real-time display power generation.
- Fulllest digital protection functions: Reverse connection, Overcharging, Over-discharging, Over voltage, Overload, Short circuit.
- Unique 16mm2 connectors, red and black connectors distinguish positive and negative poles

## **MPPT Technology Introduction**

MPPT means Maximum Power Point Tracking. It is a more advanced solar charging mode. According to the nonlinearity feature of solar panels, there is a Maximum Power output Point( $P_{Max}$ ) on its power curve, and this point under changing light intensity and temperature. Using traditional PWM solar charge controller, the voltage of solar panel will be clamped by battery, and the voltage can not be maintained at  $P_{Max}$  to charge the battery, which greatly reduce the utilization rate of solar panels. MPPT solar charge controller adopts efficient DC-DC power conversion technology, combining with advanced algorithm to track the MPP of solar panels in (real time) to obtain Max power from solar panel for charging battery. Compared with PWM controller, MPPT solar charge controller could increase the energy utilization rate around 15%-30%.

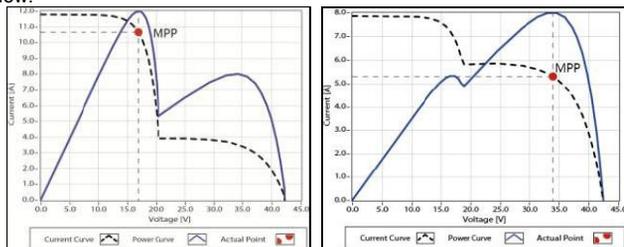
The  $V_{pp}$  of solar panel used for 12 system is 17V. When the 12V battery is charged by solar panel, the solar pane voltage will be clamped by battery as a result of the constant current characteristic of solar panels. If the max charging current is 10A at this time, then the input power to the battery= 10A x 12V =120W, which not yet completely achieve the maximum utilization rate of solar panels. However, MPPT controller could constantly adjust the voltage and current of solar panels to reach Max output power, and therefore the input power to the battery= 9A x 17V x

0.98(circuit exchange efficiency)=150W. It can be shown that the MPPT controller could significantly improve the charging efficiency.



The MPPT point under changing light intensity and temperature of environment. The MPPT controller could adjust the MPP timely according to different conditions.

In practical application, if the solar panel has burnt cells or shadow effect, it may led to the appearance of multi MPP, only one of which is actual MPP. As shown below:



MPPT double peaks drawing

If the program handles improperly when multi MPP points appear, the solar system would work in the wrong points rather than the actual MPPT point. As a result, it would waste the most of power from solar panel as well as seriously affect the normal operation of solar system. Our company's MPPT controller could accurately track the actual MPP point in the double peaks or multi peaks state so as to improve the utilization of solar array and avoid the waste of resources.

### Important Safety Information

- ① This controller is developed on the basis of the characteristic of solar panel. If using other power supply instead of solar panel, the controller may work abnormally.
- ② It is better to install controller indoor. If install the controller outside, please keep the environment dry, avoid direct sunlight, and keep dustproof and waterproof.
- ③ The controller will be hot in the process of working. Please do not touch by hand directly, keep the environment ventilated, and away from other heaters



and flammable.

- ④ Under the sunlight, the solar panel voltage will be very high (especially 24V/48V system). Please avoid touching or terminal short circuit. Keep your hands dry, use insulating tool, and stand on dry field when it need to be operated.
- ⑤ The battery has acidic electrolysis. Please put on goggles during installation. If you are accidentally exposed to electrolysis, please rinse with water.
- ⑥ The battery has huge power. Forbid any conductor short circuit of the positive and negative poles of battery. Suggest to add a fuse between battery and controller. (Slow motion type, and the action current of the fuse should be 1.5 times more than the rated current of the controller)
- ⑦ Please install the controller in a place where children can not touch.

### The suggestion of using

- ① The controller could detect the environmental temperature to adjust the charging voltage. Accordingly, the controller should be closed to battery as near as possible.
- ② Recommend system current density of cables should be less than 3A/mm<sup>2</sup>. Unreasonable selection of cables will increase the system consumption or even causing burning.
- ③ Try to use multi strand copper wire in order to connect with the terminal more firmly. Loose power connection and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials or even cause fire.
- ④ Please keep the battery full charged frequently(one time each month at least), or the battery will be destroyed.
- ⑤ This product has solar panel input limited power function, which means, theoretically, no matter how much power input, the controller will limit the input power to operating under the rated power. But please pay much attention to the following two points:
  - ◆ The short circuit of solar panel should be less than rated current of controller.
  - ◆ The lower the temperature, the higher the Open Circuit Voltage of solar panel. Please ensure that in no case will the Open Circuit Voltage of solar panel array exceed 100V, otherwise it will trigger protection or damage the controller.



### Installation Instructions

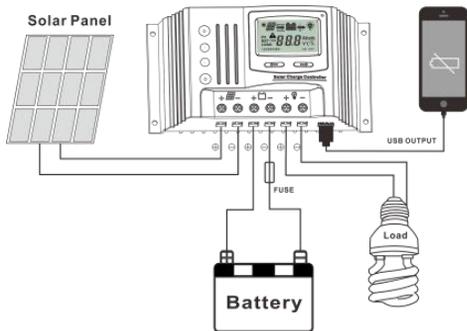
#### Controller Fixed

- 1) The controller should be installed in well-ventilated place. Avoid direct sunlight, high temperature and place where water can easily enter the controller.
- 2) Please select correct screw to fix the controller on the wall or other platform. Screw M4 or M5. Screw cap diameter should be less than 10mm.
- 3) Please reserve enough space between the wall and controller to allow for cooling and cable connection.
- 4) The mounting holes distance of controller are 189mm\*85mm. and the diameter of mounting recess is 5mm.
- 5) The controller has aluminum fins for natural cooling, so we strongly suggest hanging installation for better air flow cooling effect.

#### Controller Connection

- ★ All terminals are in tight status after factory. In order to connect well, please loose all terminals at first.
- ★ Please do not change the following order of connection. The controller has battery voltage auto selection function, so battery should be connected at first, otherwise it will cause system voltage recognition fault.
- ★ Before connection, please confirm the system voltage fit for your choosing controller, and the open circuit of solar panel and maximum power are both at the using range of controller as well.





In order to avoid fault installation, please refer to below procedures

- As shown above, first of all, connect battery to the correct poles of controller (red is plus and black is minus). To avoid short circuit, please screw the battery cable to the controller at first, then to the battery poles. If your connection is correct, the LCD displaying will show battery voltage and other technical data. If not, please check the fault and reconnect according to the "fault and handling" in this manual. The cable length between battery and controller should be as short as possible. Recommend 30CM -100CM.

**Short circuits on the terminals of controller would result in fire or explode. Please be careful. (We strongly suggest to connecting a fuse that is 1.5times more than the rated current of controller at the battery side.)**

- As shown above, connect solar panels to the correct poles of controller. With successful connection and full sunshine, the LCD will show solar panel symbol and an arrow from solar panel to battery will be lighted, which means the solar panel is charging. As for solar panels connection, below are suggestions.



- Please pay attention to protection measure for the risk of electric shock.
  - The max input voltage from solar panel could reach 100V. Please try to use series connection to simplify cables.
  - In Series connection could reduce the current of solar panel, sectional area of cable and voltage drop.
- For example: there is a 17V 120Wx2 solar panel charging a 12V battery. If we use PWM controller, we have to in parallel connection. In this moment, the solar panel array voltage is 17V, the current is 14A, and current density is 3A/mm<sup>2</sup>. So we need cable whose sectional area is 5 mm<sup>2</sup>. On the other hand, If in series connection, the solar panel array voltage is 34V, the current is 7A. Therefore, at this time we need cable with 2.5 mm<sup>2</sup> sectional area, which is half less than the former.

- As the figure shows, connect loads to the correct position of controller. In order to avoiding damage from load voltage, please close the output function button in the controller. Then connect the load to the controller. The controller do not offer reverse connection protection for load. Hence, reverse connection may destroy loads.

**Attention: If users want to connect inverter or start other inrush current loads, please connect them with battery directly, and do not connect them**



**with controller, otherwise the terminals of load may not be started, or even be destroyed.**

- Insert external temperature sensor: external temperature sensor is used for temperature compensation. Please let it close to the battery as near as possible. If the temperature sensor doesn't be plugged in, the controller will default 25°C.
- RS485 communication interface: Monitor the controller by professional wire and host computer. (optional)
- USB output: USB could offer 5V. Max 1000mA for mobile, laptop, MP3 and so on. **(40A controller do not available this function at the moment)**

**Warning: Please do not connect USB loads to any other place! The USB output negative poles is in series with the load negative poles.**

#### ■ About ground connection of solar system

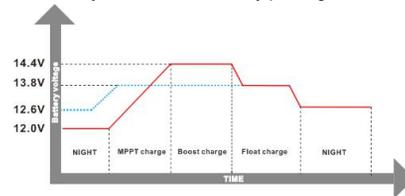
Please remember, the solar charge controller is designed by all positive connection, that is, all components inside the controller are positive combined together. If your solar system needs ground connection, please let positive ground connect.



**Warning: Some forced ground connection system, such as solar communication system and portable solar system, which have been negative ground connected, should not be positive connected again, otherwise it may cause short circuit.**

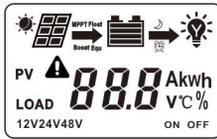
### Battery Charging Process

This controller has 3 stages charging mode: bulk, boost, float. Through these fast, efficient, and safety charging mode, the battery life can be effectively prolonged.



- Bulk charging:** In this stage, the voltage of battery doesn't reach the full charged set point (Float point or Boost point). The controller will work at MPPT mode, charging in process of Maximum Power of solar panel.
- Boost charging:** Each time the battery voltage is less than 12.6V, the controller will auto boost charging once until reach up to the point degree of boost charging. Then the controller will come into constant voltage charging mode instead of MPPT mode, and gradually reduce the charging current. The boost charging will last 2 hours before it turn to float charging mode. (Due to the load capacity and changing generated energy, the controller can't keep charging at constant voltage. So the constant voltage charging time will be accumulated and this mode won't cancel until the accumulated time reach 2hours.)
- Float charging:** After entering into float mode, the controller will decrease the charging current and charging with weak current to keep the battery at float voltage. (If the voltage isn't under 12.6V, the controller will not start boost charging mode, but only keep float charging)

### Main Interface

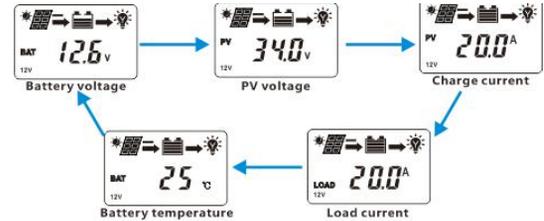


Name	Symbol	Indicate function
Solar Panel		Correct solar panel connection and in daytime
		No solar panel connected or wrong connection or at night
		MPPT charging mode
		Float charging mode
		Boost charging mode
		no charging
	<b>PV</b>	Data about charging
Battery		Battery capacity indicator
	<b>12V24V48V</b>	Present System Voltage
	<b>BAT</b>	Data about battery
	<b>BAT TYPE</b>	Battery Type
Load		Load on
		Load off
		Load Sensor Timer mode output
		Load Sensor mode output
	<b>LOAD</b>	Data about load
	<b>LOAD TYPE</b>	Load working mode

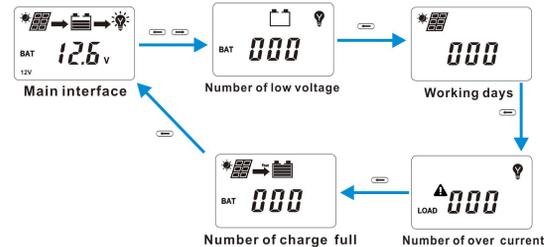
## Operation and Indication of controller

### ➤ Main Interface

If no operation in the main interface in 10s, the main interface will rotate the battery voltage, environmental temperature and battery type at 3s intervals. Long press "→" could speed loop display.

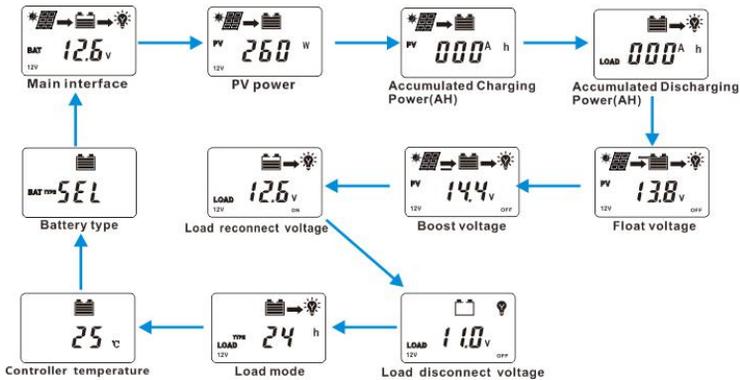


- ❖ Short press "→" in the main interface could on or off the load.
- ❖ Long press "←" and "→" together 5s in the main interface could show operation log, such as number of LVD, working days, number of over current protection, number of HVD.



### ➤ Press "←" in the main interface could enter into menu interface

Long press "←" button ≥ 5S in the main interface could come into data setting state. Loose button and short press "←" and "→" could set the data. Long press "←" again more than 5s could save the data and cancel setting state.



- 1) PV Power: This interface show the solar panels current output power.
- 2) Accumulated Charging Power(AH): Accumulate the charging power of this system. Long press "→" button to reset.
- 3) Accumulated Discharging Power(AH): Accumulate the discharging power of this system. Long press "→" button could reset.
- 4) Float Voltage: When the battery voltage reach this set point, the controller will start constant voltage charging mode, limit the rising of battery voltage, decrease the charging current, and keep the battery in full condition. Press "←" button enter into menu interface of float voltage. Long press "←" button ≥5S, the parameter in the main interface will flash, and here is setting up state. Loose the button, and short press "←" or "→" could modify the data. After set the needed data, long press "←" ≥5S to save the data and exit. If no operation in 20s, it will automatically back to the main interface.
- 5) Boost Voltage: When the battery voltage is less than 12.6V, the constant voltage will auto reach up to 14.4V and back to float voltage after 2 hours' charging.
- 6) Low Voltage Reconnect Voltage(LVR): After the controller detect the low voltage of load and stop the output, battery voltage must be higher than LVR voltage if it reconnect the output. Or press "→" in the main interface to release. The procedure is the same as (4).
- 7) Low Voltage Disconnection Voltage(LVD): When the controller detect the battery voltage is less than LVD point, the output will be immediately shut down. At the same time, the status of controller is in lock. Users have to charge the battery, and the load will reconnect when the battery voltage is higher than LVD voltage or press "→" in the main interface to release. The procedure is the same as (4)
- 8) Load Working Mode Selection: The system default load working time is 24h. When the Load Working Time is set to 24hours, the load will keep working 24hours if there is no fault. When the load working time is set to ≤23H, it means starting the load timer or sensor function. The procedure is the same as (4). If the battery capacity is enough, the load will start-up at sunset and work in set hours or stop working till sunrise.

**When the load come into timer or sensor mode, if the set working time is more than actual night time, the load output will be closed at sunrise, although the working time is not reach the set hours. For example, the local actual night time is 10hours, and the working time user set at night is 12hours. But when the sunrise 10hours later, the output will be closed automatically**



**No matter how many hours after the sunrise will be zeroing and the load will work with next sunset.**

- 9) **Controller inside Temperature detection:** When the inside temperature of controller is more than 75°C, the charging current will be reduced. It will stop charging when the temperature exceed 85°C.
- 10) **Battery Type Selection:** 3 types battery data in the internal system. Different battery refer to different parameter. (Default SEL battery parameter)

**Attention: About the control parameter of battery, we have taken every working condition into consideration. Hence, if customers want to adjust the parameter, please refer to battery suppliers' suggestion, or unreasonable adjust will destroy battery.**

## Protection Function

### ❖ Fault Symbol Indication

State	Symbol	Condition
LVD Protection	 	Empty Battery and Warning Flash together
Battery Over Voltage Protection	 	Full Battery and Warning Flash together
Load Over Current Protection	 	Load and Warning Flash together
Controller Over Temperature Protection	 	Temperature symbol and Warning Flash together
Solar Panel Over Voltage Protection	 	Solar Panel symbol and Warning Flash together

- ❖ **Solar Panel Short Circuit and Reverse Connected Protection**  
When the solar panels have input short circuit or reverse connection, the controller will be stopped charging immediately until correcting the faults.
- ❖ **Solar Panel Over Voltage Protection**  
When solar panel input voltage is more than 100V, the controller will be stopped charging immediately until the input voltage is less than 100V.
- ❖ **Battery Reverse Connection Protection**  
If the battery reverse connect, the controller won't be damaged and will normally work after corrected the connection.
- ❖ **Battery Over Voltage Protection**  
When the voltage of battery is more than 16.5V, the controller will be automatically stopped charging and discharging to avoid the damage of the battery and loads.

❖ **Battery Low Voltage Protection (LVD)**

When the battery voltage reach the LVD (Low Voltage Disconnection) point, the controller will auto closed the output to avoid the damage due to over-discharging.

❖ **Overload Protection**

If the load current is 1.1times more than the rated current of controller, the controller will disconnect the load after 60s and be in lock. Users have to correct the mistake of load and press“→”to release, or 30s later the controller will auto restart.

❖ **Load Short Circuit Protection**

When load current is 2times more than the rated current, the controller will confirm it as short circuit, and auto cut off the output and stay in lock. Users have to remove the short circuit and press“→”to unlock, or 30s later the controller will auto restart.

❖ **Over Temperature Protection**

When the controller inside temperature is higher than 75℃, the controller will stop charging and discharging with temperature symbol and warning flash. The controller will auto feedback when the temperature get down to 65℃.

❖ **Lightning Protection**

This product could only protect small lightning induction, we suggest users to use lightning rod at frequency area.

**Fault and Handling**

Fault Phenomenon	Possible reason	Solution
no LCD display after battery connection	<ul style="list-style-type: none"> <li>● Battery Low Voltage</li> <li>● Battery Reverse Connection</li> <li>● The connection cut off</li> </ul>	Please confirm the battery get enough voltage and reconnect the controller with battery firmly and correctly.
no solar symbol and charging symbol on LCD when there's full sunshine on solar panel.	The solar panel connection open circuit, short circuit, or reverse connection	Please check whether the solar panels cable are connected correctly and firmly.
The controller is displaying LVD	The battery is over discharging	Please check if the system design is reasonable. Please full charge the battery
The controller is displaying Over Voltage Protection of battery	The voltage of battery is too high	Please first cut off the solar panel and see if the voltage get down to normal level. If not, please disconnect the battery with controller and reconnect again
The controller is displaying Over Current Protection	The load is short circuit, or over load or high surge power	Please check the load cables if there has short circuit, or the power of the load is over rated design, or

Battery Type	SEL	GEL	FLD
Over Voltage Protection	16.5V	16.5 V	16.5 V
Charging Limited	15.0 V	15.0 V	15.0 V
Over Voltage Reconnection	15.0 V	15.0 V	15.0 V
Boost charging	14.4 V	14.2 V	14.6 V
Float charging	13.8 V	13.8 V	13.8 V
Boost Restart	12.6V	12.6V	12.6V

		the surge power of load is too high
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**Technical Data**

Mode	TD2210	TD2410
System Voltage	12V/24V	
PV Max Input Voltage	100V	
PV Max Input Power	12V 260W; 24V 520W	12V 520W; 24V 1040W
Self-consumption	≤23mA	
Max Charging current	20A	40A
Max Discharging current	20A	40A
LVD	11.0V ADJ 9V....12V; *2/24V	
LVR	12.6V ADJ 11V....13.5V; *2/24V	
Float Voltage	13.8V ADJ 13V....15V; *2/24V;	
Boost Voltage	14.4V ; *2/24battery voltage less than 12.6v restart boost 2hours	
Battery Over Voltage Protection	16.5V ; *2/24V	
Reverse Connection Protection	Yes	
Load Over Current Protection	Yes, each 30s auto restart again	
Controller Over Temperature Protection	Yes	
Charging Type	MPPT	
Temperature Compensation	-24 mV /℃ for 12Vsystem ; *2/24V; *4/48V	
Working Temperature	-20℃---+55℃	
Terminals scale	16mm <sup>2</sup>	
Waterproof grade	IP32	
Size	200mm×127 mm×50mm	
New weight	0.82KG	1.3KG

\* Please under rated power if used under high temperature environment.

**Optional communication function RS485**

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