EPEVER

Tracer-AN (10~40A)

Troubleshooting

BEIJING EPSOLAR TECHNOLOGY CO., LTD

2021

CONTENTS

Tool List

① Lead-Acid battery

12V or 24V

or

② Tracer-AN(10A~40A) Series Controller

③ PV panel or DC power

Voc >17V for 12V battery;
Voc >32V for 24V battery

④ DC Load

⑤ Multimeter

Note: Make sure all tools are working fine except the Controller to be checked.

Voltage Setpoint Notes

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Note 1: In the following troubleshoot steps, below default lead-acid voltage setpoints (Sealed) are used. If the voltages in the controller to be tested had been altered, take the altered volatge setpoints.

Battery type / Voltage	Sealed	Gel	Flooded	User
Over Voltage Disconnect Voltage	16.0V	16.0V	16.0V	9～17V
Charging Limit Voltage	15.0V	15.0V	15.0V	9～17V
Over Voltage Reconnect Voltage	15.0V	15.0V	15.0V	9～17V
Equalize Charging Voltage	14.6V	——	14.8V	9～17V
Boost Charging Voltage	14.4V	14.2V	14.6V	9～17V
Float Charging Voltage	13.8V	13.8V	13.8V	9～17V
Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V	9～17V
Low Voltage Reconnect Voltage	12.6V	12.6V	12.6V	9～17V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V	9～17V
Under Voltage Warning Voltage	12.0V	12.0V	12.0V	9～17V
Low Voltage Disconnect Voltage	11.1V	11.1V	11.1V	9～17V
Discharging Limit Voltage	10.6V	10.6V	10.6V	9～17V
Equalize Duration	120 min	——	120 min	0～180 min
Boost Duration	120 min	120 min	120 min	10～180 min

Voltage Setpoint Notes

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Note 1: In the following troubleshoot steps, the default lead-acid voltage setpoints (check the table in corresponding EPEVER controller manual) are used. If the voltages in the controller to be tested had been altered, take the altered volatge setpoints.

Note 2: Below is the default voltage setpoints in EPEVER controllers for Lithium batteries, refer to the table below if the battery is of lithium type.

Lithium Battery Type	4s LiFePO4 (Rated Voltage 12V)	8s LiFePO4 (Rated Voltage 24V)	3s Li(NiCoMn)O2 (Rated Voltage 12V)	6s Li(NiCoMn)O2 (Rated Voltage 24V)
Over Voltage Disconnect Voltage	15.60V	31.20V	13.50V	27.00V
Charging Limit Voltage	14.60V	29.20V	12.60V	25.20V
Over Voltage Reconnect Voltage	14.70V	29.40V	12.70V	25.40V
Boost Charging Voltage	14.50V	29.00V	12.50V	25.00V
Boost Reconnect Charging Voltage	13.20V	26.40V	12.10V	24.20V
Low Voltage Reconnect Voltage	12.80V	25.60V	10.50V	21.00V
Under Voltage Warning Reconnect Voltage	12.80V	25.60V	12.20V	24.40V
Under Voltage Warning Voltage	12.00V	24.00V	10.50V	21.00V
Low Voltage Disconnect Voltage	11.10V	22.20V	9.30V	18.60V
Discharging Limit Voltage	10.60V	21.20V	9.30V	18.60V
Boost Duration	120m	120m	120m	120m

Common Fault List

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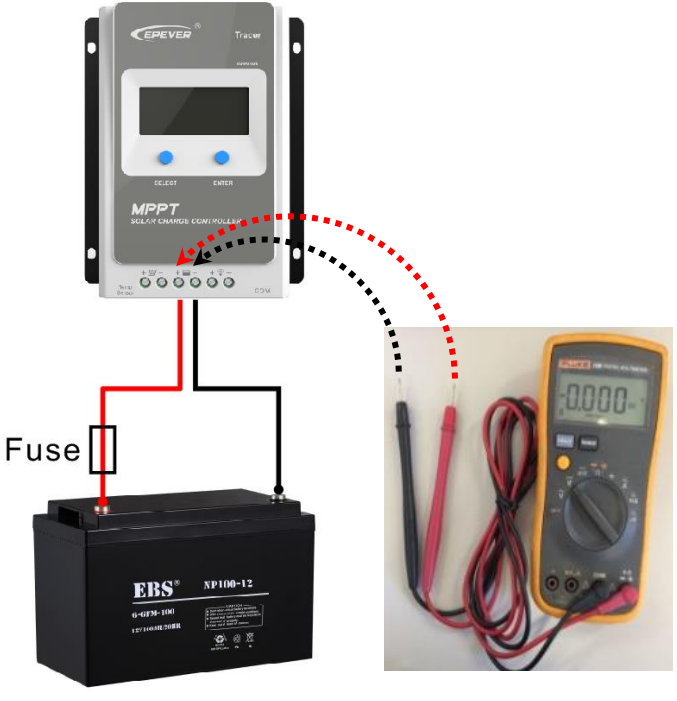
Faults	Causes	Solutions	Notes
Cannot power on	①Wrong or loose battery connection; ②Battery voltage lower than 8.5V; ③Controller is faulty.	①Correct/tighten the connection; ②Replace it with a battery of higher voltage; ③Replace the Controller.	
 Both icons flash	①Battery over discharged; ②System voltage error; ③Battery is faulty.	①Charge the battery, the alarm will disappear when voltage reach Low Voltage Reconnect Voltage; ②Replace/set the battery with correct rated voltage; ③Replace the battery.	Upon over discharged, load output will be turned off.
 Both icons flash	①Battery over voltage; ②System voltage error; ③Battery is faulty. ④PV is connected prior to battery	①Alarm will disappear automatically when battery voltage drops below Over Voltage Reconnect Voltage; ②Replace/set the battery with correct rated voltage; ③Replace the battery ④Disconnect all wires and connect battery first	Upon over voltage, the Controller will allow discharging but stop charging.
 Both icons flash	①Load short circuit; ②Over load.	①Find and resolve the short circuit fault, reboot the controller or press the ENTER button to recover the output; ②Replace with a lower wattage load, reboot the controller or press the ENTER button to recover the output.	Don't connect loads that have high surge current to the Load terminal (e.g., inverter, motor, etc.), otherwise controller could shut off load output due to the surge current.
 Both icons flash	①Battery over temperature; ②Controller over temperature; ③Temperature sensor faulty; ④Controller faulty.	①Alarm will disappear automatically when battery temperature drops below the threshold; ②Alarm will disappear automatically when controller temperature drops below the threshold; ③Replace the temperature sensor; ④Replace the Controller.	Upon over temperature, both input and output will be turned off.
PV charging abnormal	①Wrong or loose PV or battery connection; ②PV panel faulty; ③External interference; ④Controller faulty.	①Correct/tighten the connection; ②Replace the PV panels; ③Remove the interference source; ④Replace the controller.	
Discharging abnormal, no output or cannot control output on/off	①Wrong or loose load connection; ②Load working mode mis-match; ③Load faulty or load voltage mis-match; ④Controller faulty	①Correct/tighten the connection; ②Change the load mode; ③Replace the load; ④Replace the controller.	

1.1 CONNECT BATTERY OR DC SOURCE TO THE CONTROLLER - LCD NO DISPLAY



TEST STEPS:

① Check the battery connection

Check if the connection is correct and reliable, make sure there is no polarity inversion.

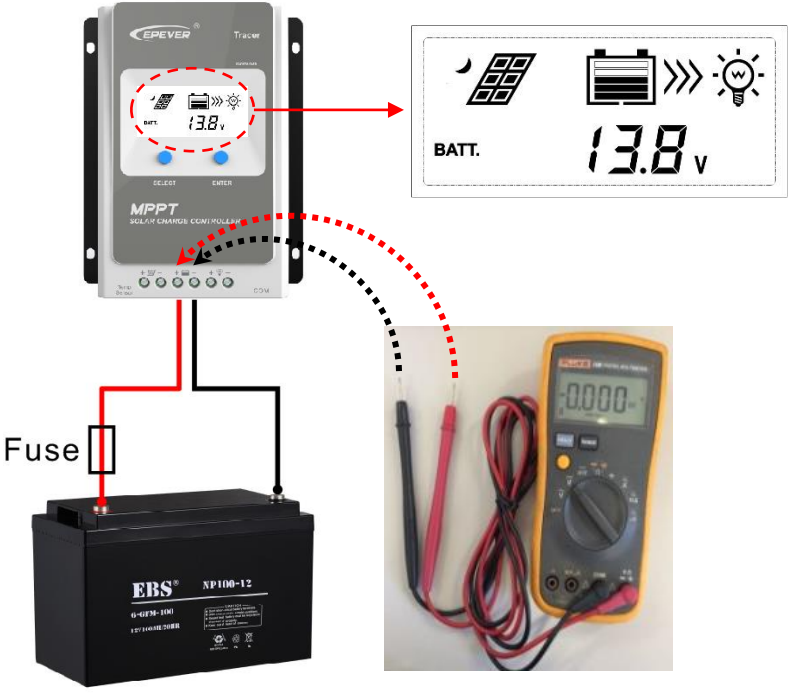
② Check the battery voltage

Check if the battery volage is higher than 8.5V. The controller is faulty if battery voltage is higher than 8.5V. If the battery voltage is lower than 8.5V, change the battery with a new one with voltage higher than 8.5V and contiune the test.

Notes

Controller cannot be powered on if battery voltage is lower than 8.5V.

1.2 CONNECT BATTERY OR DC SOURCE TO THE CHARGER - VOLTAGE READINGS HAVE LARGE DIFFERENCE



TEST STEPS:

Check the battery voltage on the charger terminal

Check the battery voltage on the charger terminal with multimerter and compare it with the reading on the charger:

a. The difference is within ±1.5% → ok;

b. The difference is ±3% or more) → charger faulty

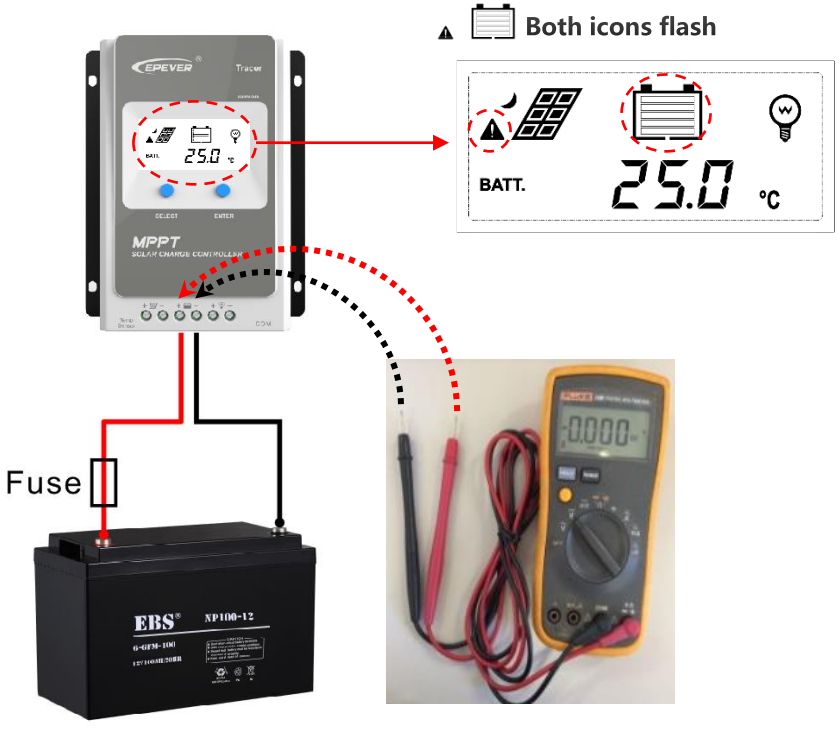
⚠ Possible reasons:

① Wires between battery and charger are long and thin and cause large voltage drop;

② Internal voltage sampling fault;

③ Factory calibration fault (If this is case, this would happen on the new installed charger)

1.3 CONNECT BATTERY OR DC SOURCE TO THE CONTROLLER - OVER DISCHARGE ALARM



TEST STEPS:

Test battery voltage (controller terminal BAT+ and BAT-)

Check if the voltage is lower than the LVD voltage.(settable, the default value is 11.1V for 12V system, 22.2V for 24V system.)

① If V_{Bat}<11.1V, replace the battery or recharge the battery before continuing the test. (12.6V<V_{Bat}<16V), Power on again and check if the alarm will be cleared:

a. Alarm cleared → Confirm the alarm was triggered by low BAT voltage.;

b. Alarm persists → Continue the test in below Step ②

② Replace the battery with a 24V battery, power on and check if the alarm has been cleared:

a. Cleared → Confirm the alarm was triggered by wrong Controller "Rated Voltage Level" setting.

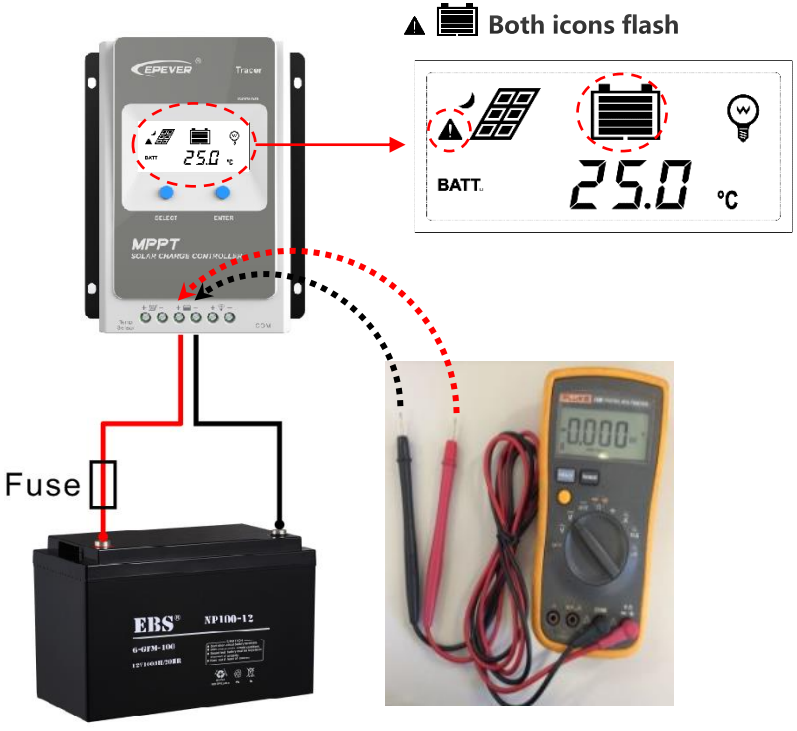
b. Alarm persists → Faulty controller.

Conclusion

① When Rated Voltage Level has not been set as "Self-recognition", Controller will trigger alarm when wrong battery voltage is connected in. e.g., if Rated Voltage Level has been set as 24V, then connecting a 12V battery will trigger LVD (Low Voltage Disconnect) alarm.

② 12V battery, normal voltage range 11.1V<V_{Bat}<16V ;
24V battery, normal voltage range 22.2V<V_{Bat}<32V

1.4 CONNECT BATTERY OR DC SOURCE TO THE CONTROLLER - OVER VOLTAGE ALARM



TEST STEPS:

Test battery voltage

Check if the voltage is higher than the OVD voltage.(settable, the default value is 16V for 12V system, 32V for 24V system.)

① If V_{Bat}>32V, Replace the battery or discharge the battery before continuing the test (22.2V<V_{Bat}<32V), power on again and check the alarm will be cleared:

a. Alarm cleared → Confirm the alarm was triggered by high battery voltage;

b. Alarm persist → Continue the test below Step ②

② Replace with a 12V battery, power on and check if the alarm will be cleared:

a. Alarm cleared → Confirm the alarm was triggered by wrong Controller "Rated Voltage Level" setting;

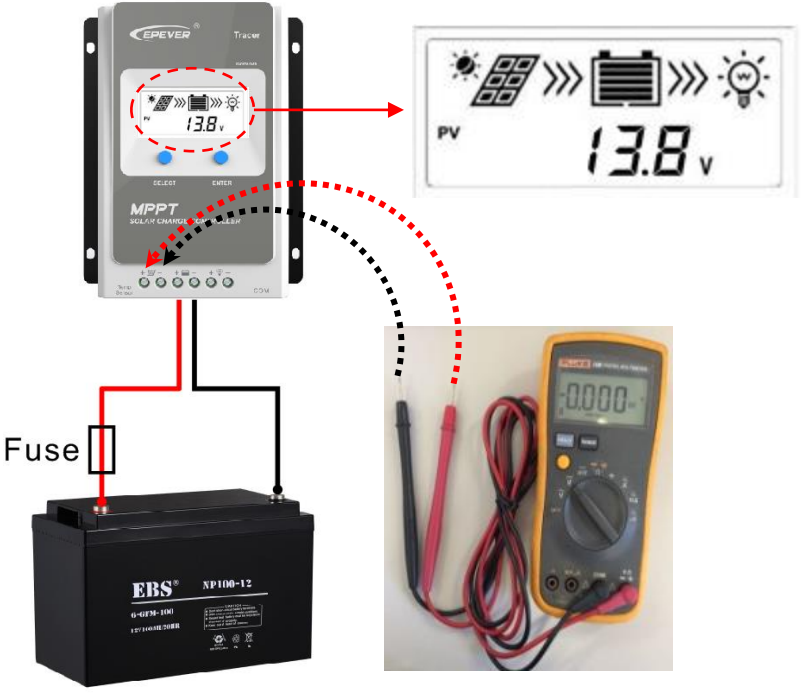
b. Alarm persists → faulty controller

Conclusion

① When Rated Voltage Level has not been set as "Self-recognition", Controller will trigger alarm when wrong battery voltage is connected in. e.g., if Rated Voltage Level has been set as 12V, then connecting a 24V battery will trigger OVD (Over Voltage Disconnect) alarm.

② 12V battery, normal voltage range 11.1V<V_{Bat}<16V ; 24V battery, normal voltage range 22.2V<V_{Bat}<32V

1.5 CONNECT BATTERY OR DC SOURCE TO THE CONTROLLER - CHARGER SHOWS PV VOLTAGE/CHARGING

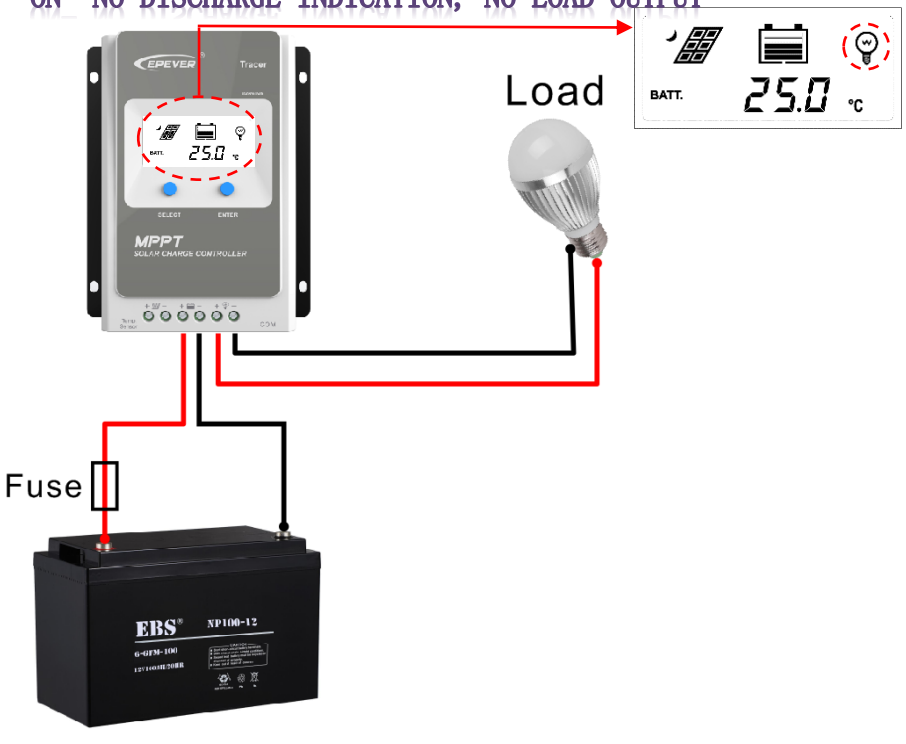


TEST STEPS:

Check PV voltage on the charger terminal

Check PV voltage on the charger terminal with multimeter, it it is close to the battery voltage, it is very likely the anti-reverse MOS has been broken down, refer to the Appendix for further checking.

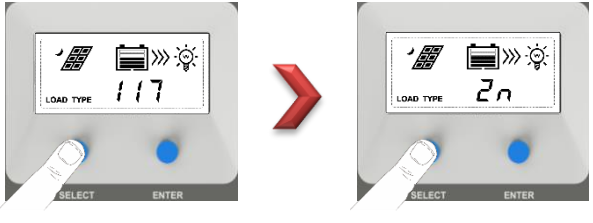
2.1 CONNECT DC LOAD AND PRESS ENTER BUTTON TO TURN ON- NO DISCHARGE INDICATION, NO LOAD OUTPUT



TEST STEPS:

Check load working mode

Browse the LCD by short pressing the SELECT button, check if the load working mode is Manual (Timer1=117, Timer2=2n) , if not, change it to Manual mode and press the ENTER button to check if the load can be turned on.

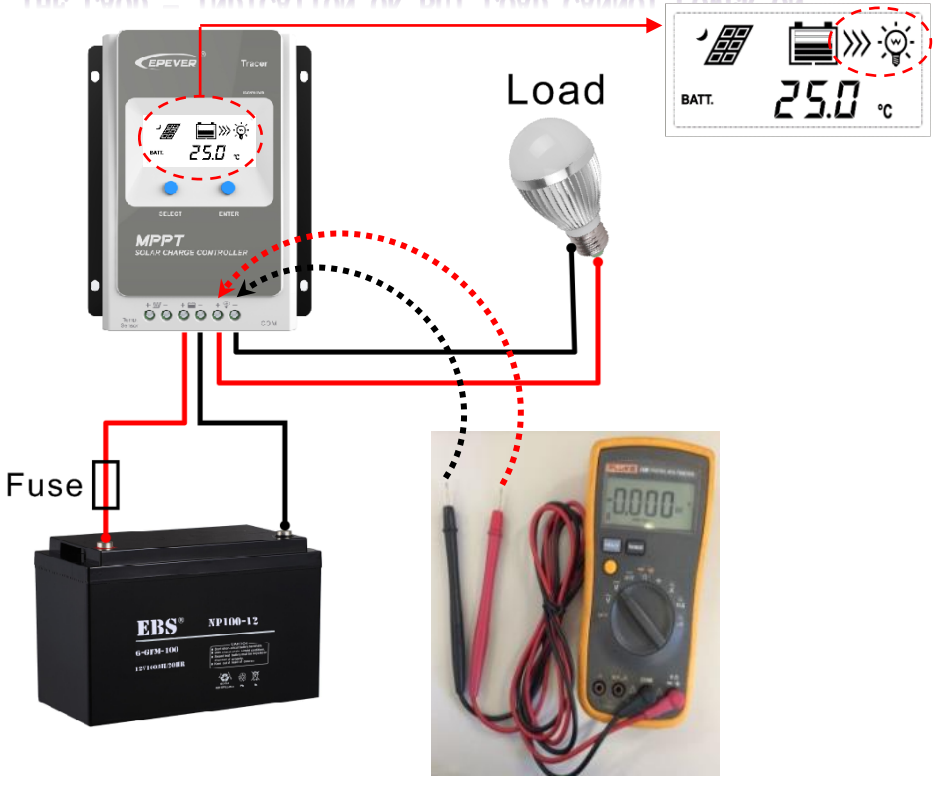


NOTE: Change the load working mode: Browse the LCD page to load page, long press "ENTER" button, the Timer1 or Timer2 will flash, press "SELECT" button to select the mode, press "ENTER" button to confirm the mode.

Conclusion

If load working mode is not Manual, it is impossible to turn on the load by pressing the ENTER button.

2.2 CONNECT DC LOAD AND PRESS ENTER BUTTON TO TURN ON THE LAOD - INDICATION OK BUT LOAD CANNOT POWER ON



TEST STEPS:

① Check load connection

Check if the load connection is reliable and has no reverse polarity.

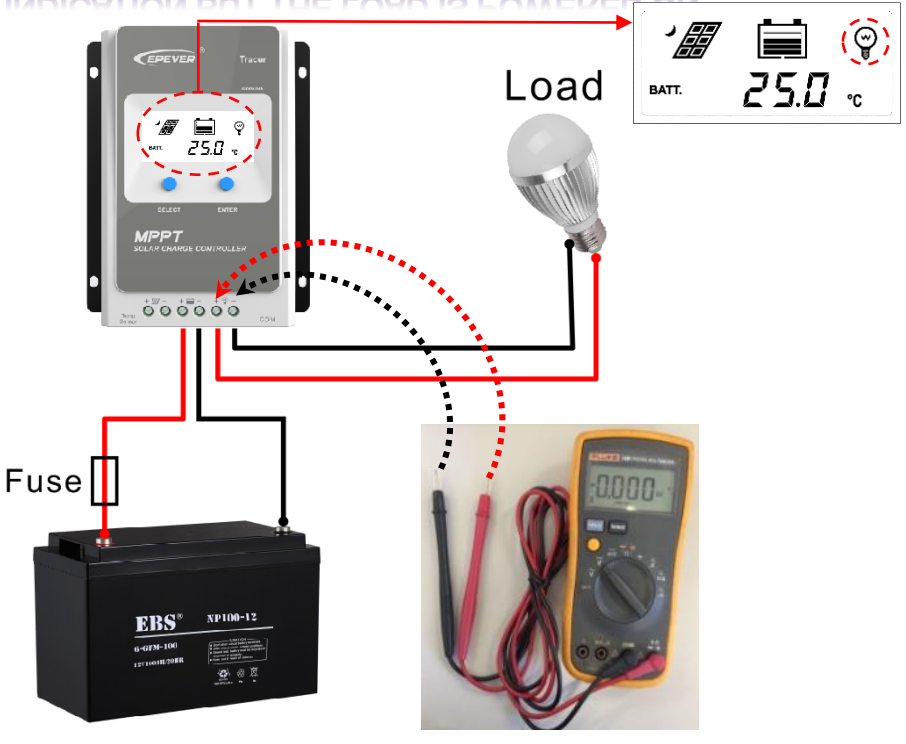
② Disconnect the load, check the Load voltage on the charger terminal

Check Load terminal voltage with multimeter:

a.No voltage → Controller faulty (driver circuit or auxilary power circuit is broken) ;

b. voltage ok ($V_{Load} \approx V_{Bat}$)→ battery voltage does not match with the required votlage of loads, change the battery or load and test again.

2.3 CONNECT LOAD BUT LOAD CANNOT BE CONTROLLED BY PRESSING THE ENTER BUTTON: NO LOAD OUTPUT INDICATION BUT THE LOAD IS POWERED ON

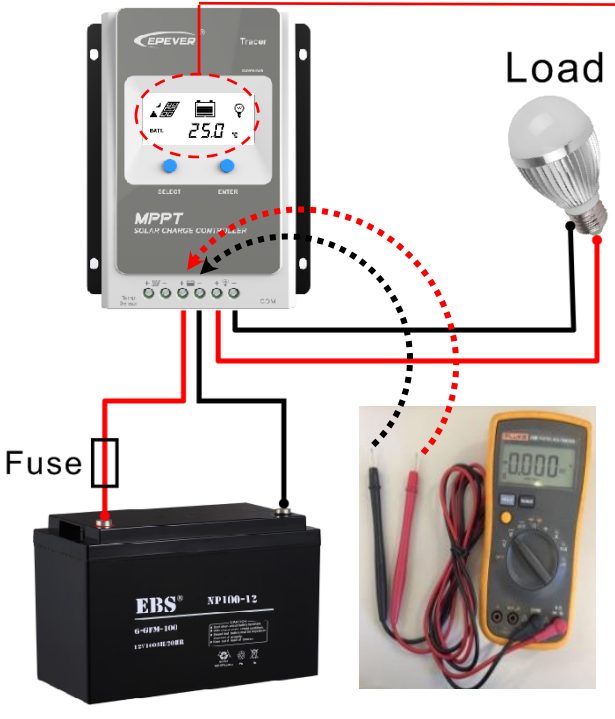


TEST STEPS:

① Disconnect the load and check the Load voltage on the charger with multimeter

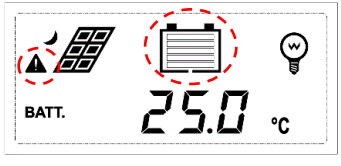
Check Load terminal voltage and if $V_{Load} \approx V_{Bat}$ and cannot be turned off, that means the Controller is faulty. Please refer to Appendix to check the load MOS.

2.4 CONNECT LOAD AND START THE OUTPUT – NO OUTPUT, LCD FAULT ALARM



① ⚠ Both icons flash

② ⚠ Both icons flash



⚠ Battery overdischarged causes:
① PV panel not enough; PV panel shaded by tree, building, etc.
② Continuous rainy days
③ Battery desulfation

TEST STEPS:

① Disconnect the load

Disconnect the load and press the ENTER button to start the output, check if the alarm will be cleared::
a. Alarm persists → Faulty controller, check load MOS;
b. Alarm cleared → Load issue (short or overload), change with a small load and test again.

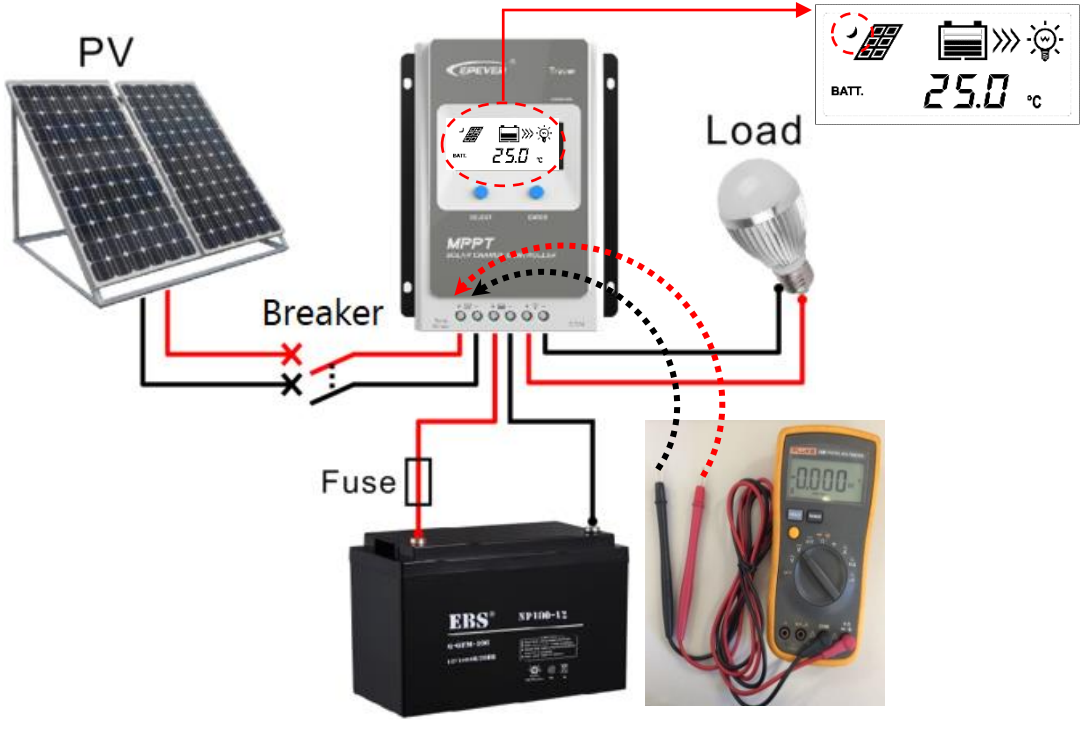
② Check battery voltage

Check with multimeter if battery voltage is lower than LVD. (settable, the default value is 11.1V for 12V system, 22.2V for 24V system.) ,
If V_{Bat}< LVD, charge it (to 12.6V<V_{Bat}<16V or 25.2V<V_{Bat}<32V) and check if the alarm will be cleared:
a. Alarm cleared → Battery voltage too low;
b. Alarm persists → Faulty controller

Conclusion

① Don't use load with high surge current (e.g., inverter, motor, etc.) during the test or it could trigger the controller protection.
② When battery voltage is lower than LVD, the controller will disconnect the output. When the battery voltage is recovered, (V_{Bat}>LVR) (settable, the default value is 12.6V for 12V system, 25.2V for 24V system.), the LVD alarm will be cleared.

3.1 CONNECT PV - PROPER SUNLIGHT EXISTS AND BATTERY NOT FULLY CHARGED BUT NOT CHARGING



TEST STEPS:

① Check PV connection

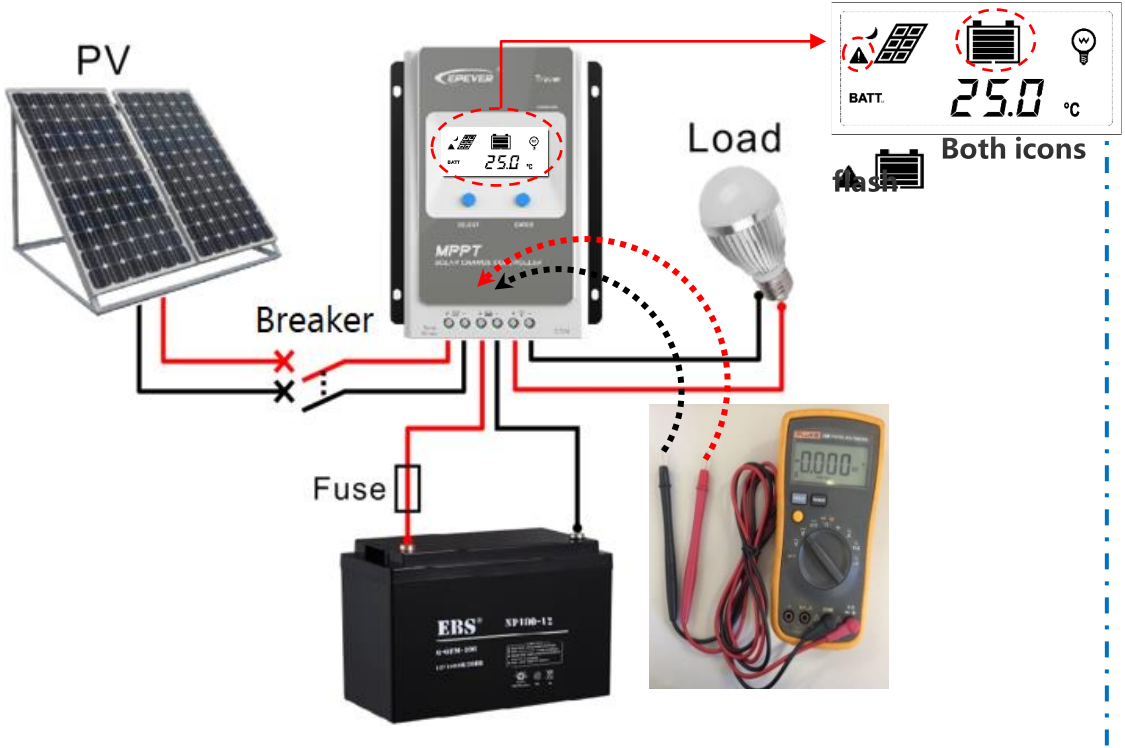
Check if the connection is correct and reliable, make sure there is no polarity inversion.

② Check PV voltage on Controller

Check if PV voltage is in the range V_{Bat}+2V< V_{PV} < 46V(or 92V), if yes, the controller is faulty.

Note: Max Voc for Tracer**06A is 46V@25C, Max Voc for Tracer**10AN is 92V@25C

3.2 CONNECT PV - NO CHARGING AND OVD ALARM



TEST STEPS:

USE LEAD-ACID BATTERY ONLY FOR BELOW TEST!

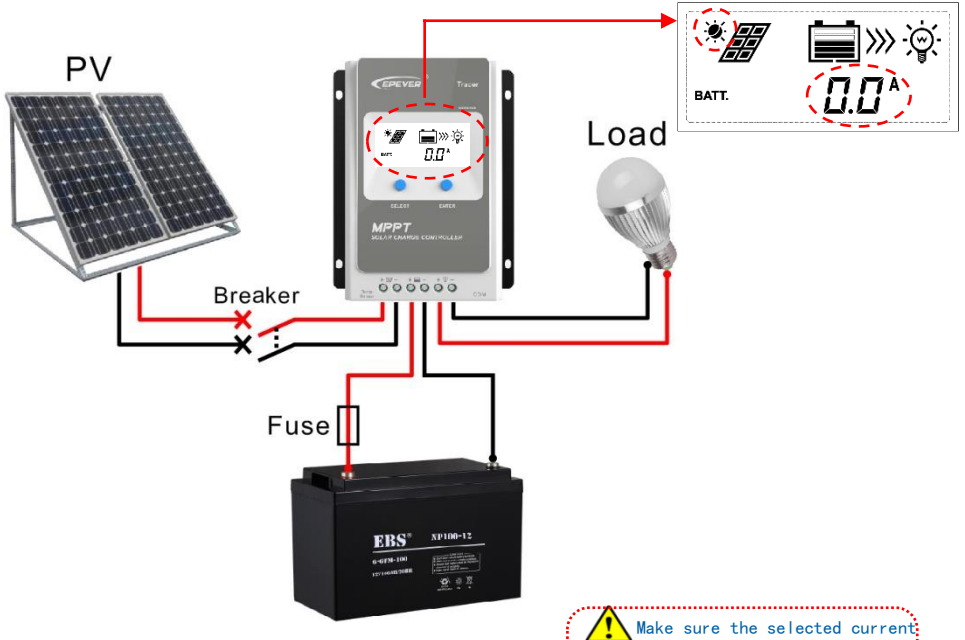
Check battery voltage on the charger terminal

Check if battery voltage is higher than OVD voltage (settable, the default value is 16V for 12V system, 32V for 24V system.), if yes, discharge it, test again and check if the alarm will be cleared when battery voltage is lower than OVR. (settable, the default value is 15V for 12V system, 30V for 24V system.):

a. Alarm cleared → Battery voltage too high or faulty;

b. Alarm persists → Controller is faulty, refer to the Appendix to check the charge MOS.

3.3 CONNECT PV - BATTERY SHOWS NOT FULL BUT CHARGE CURRENT IS 0



⚠ Make sure the selected current range is higher than the Isc of the solar panel, or the multimeter could be damaged.

TEST STEPS:

⚠ USE 12V BATTERY AND V_{MPP}=30V/34V SOLAR PANEL (DO NOT USE BENCH POWER SUPPLY)

① Check the connection of PV and battery

Check if the connection is correct and reliable, make sure there is no polarity reversal.

② Check battery voltage

Check if the battery is lower than 13.2V on LCD (settable, default 13.2V for 12V system, default 26.4V for 24V system) :

a. Yes → Go to next step;

b. No → Normal, Controller in Float stage and the current is very small

③ Reboot controller

Reboot controller and check if the alarm will be cleared:

a. Alarm cleared → Weather change traps the MPP tracking.

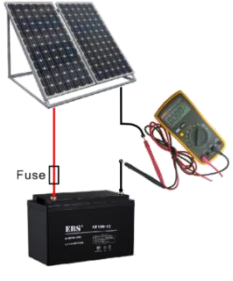
b. Alarm persists → Go to next step

④ Check if PV panel is normal

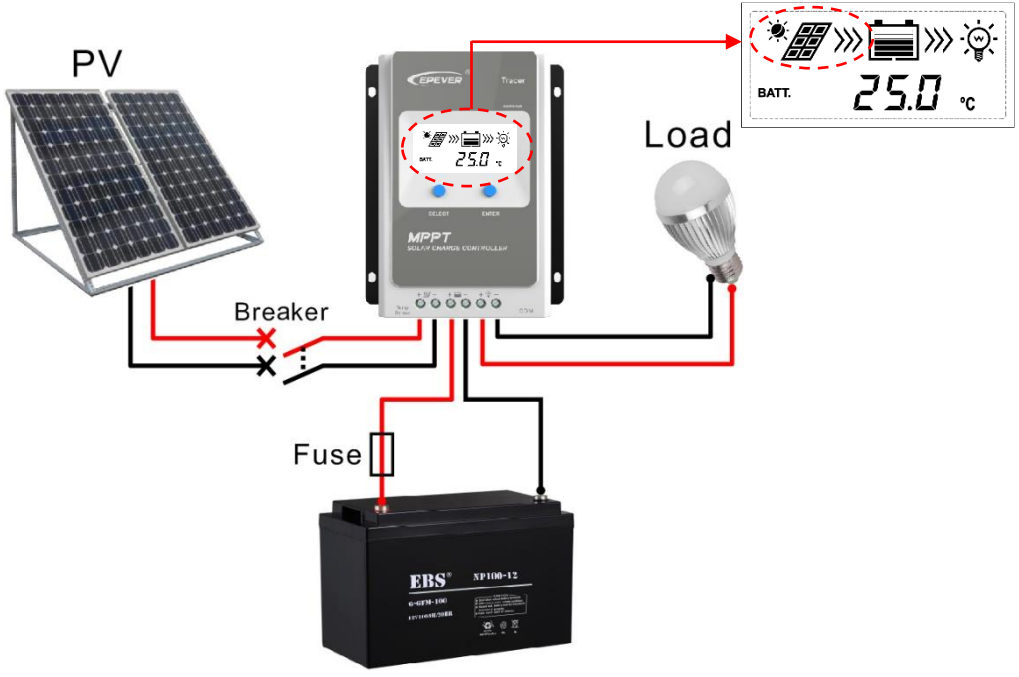
Connect the PV to the battery directly and use multimeter to check the current I_{PV} :

a. Exist → PV is ok, controller is faulty, refer to the Appendix to check charge MOS;

b. No current → PV is faulty



3.4 CONNECT PV - LCD SHOWS PV VOLTAGE AND/OR CURRENT AT NIGHT



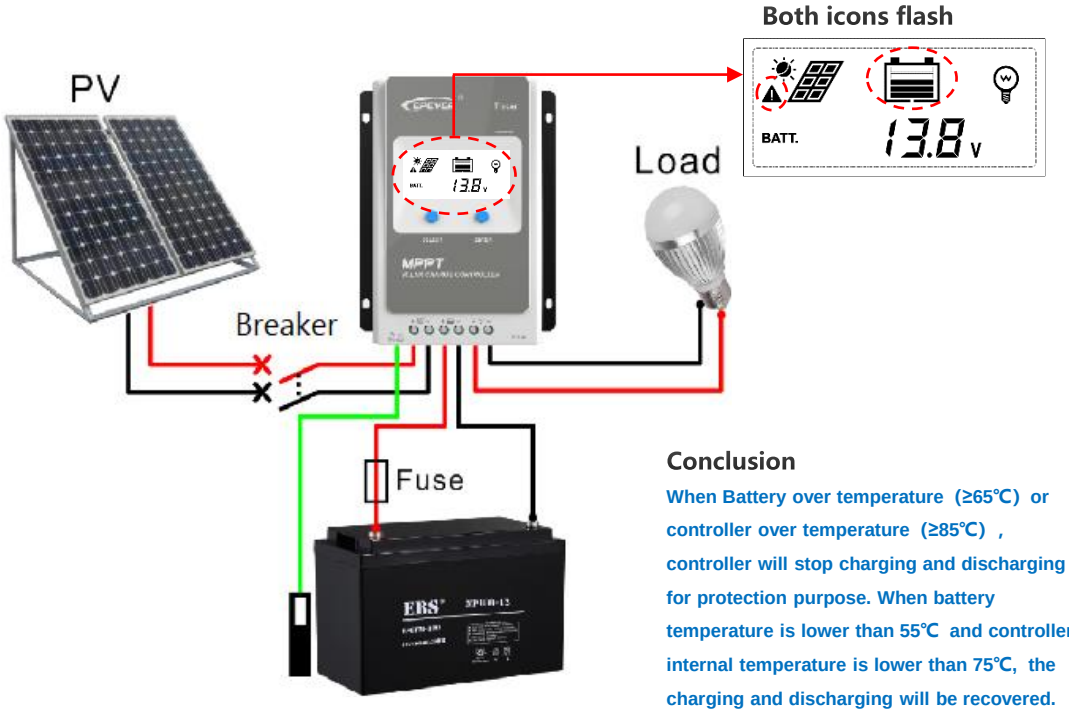
TEST STEPS:

Disconnect PV, See if the alarm will be cleared or not

a.Cleared → External light source interference;

b.Persist → Sampling circuit (or calibration) and/or charge MOS, and/or anti-reverse MOS is faulty, refer to Appendix to check the MOS

4 CONECT REMOTE TEMPERATURE SENSOR - NO CHARGING AND DISCHARGING, LCD SHOWS OVER TEMPERATRUE ALARM



Conclusion

When Battery over temperature (≥65℃) or controller over temperature (≥85℃), controller will stop charging and discharging for protection purpose. When battery temperature is lower than 55℃ and controller internal temperature is lower than 75℃, the charging and discharging will be recovered.

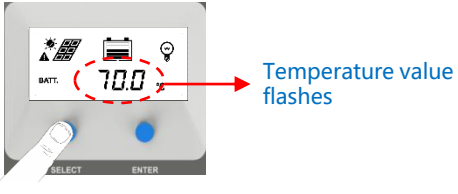
TEST STEPS:

① Check battery temperature

Press the SELECT button and check if the battery temperature is higher than 65℃, if the value flashes, cool it down to 55℃ or below and check if the charging and discharging will be recovered:

a. Recovered → Battery over temperature;

b. Not recovered → Go to ②



② Disconnect temperature sensor

Disconnect the sensor and check if the reading on controller is 25℃, and if the alarm will be cleared:

a. Yes, 25℃, and alarm cleared → sensor is faulty;

b. Yes, 25℃, but alarm persists → controller internal over temperature, cool it down to below 75℃, and power on to recheck;

c. Not 25℃ → Controller is faulty

UPON CHARGER FAULT IS IDENTIFIED ACCORIDNG TO THE PREVIOUS STEPS, DISCONNECT ALL WIRES ANDWAIT FOR 10 MINUTES BEFORE OPENING IT UP

1. Check if there is visible damaged elements on the PCBA

NOTES:

1： Check if there is any burnt elements, see if the flexible cable is loosed, see if there is faulty solder joint, see if the MOS element reliably adheres to the heat sink, see if there is water, corruption, etc.

2: The left pictures are for reference.

⚠ 1.Possible reasons for bolts and nuts or cable connection issues:

① Violent vibration during transportation;

② Insects;

③ Flexible cable quality issue, or processing issue, factory’s fault.

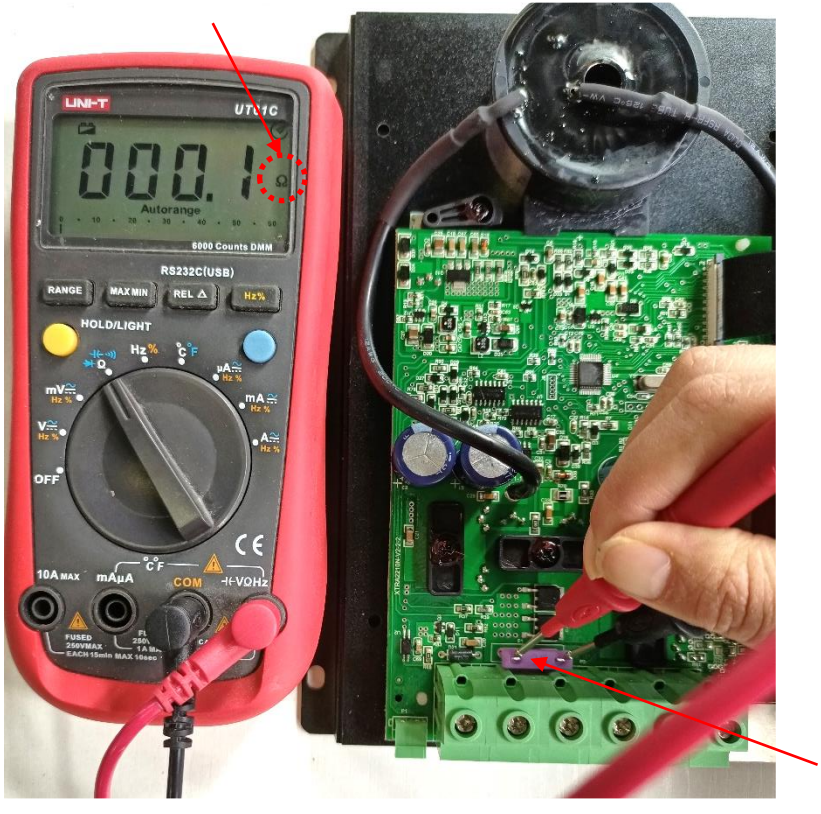
2.Possible reasons for PCBA corruption:

① Installed in a dusty, moisture or corruptive environment.② Outdoor installation without proper waterproof measures

③ No conformal coating, factory’s fault.

Appendix

2. Check if the fuse is ok: switch to ohm range to check



NOTES:

1: Normally it should be 0Ω

2: Left pictures are for reference only.

⚠ Possible reasons for fuse to fail:

① PV polarity ok, but battery polarity is reversed;

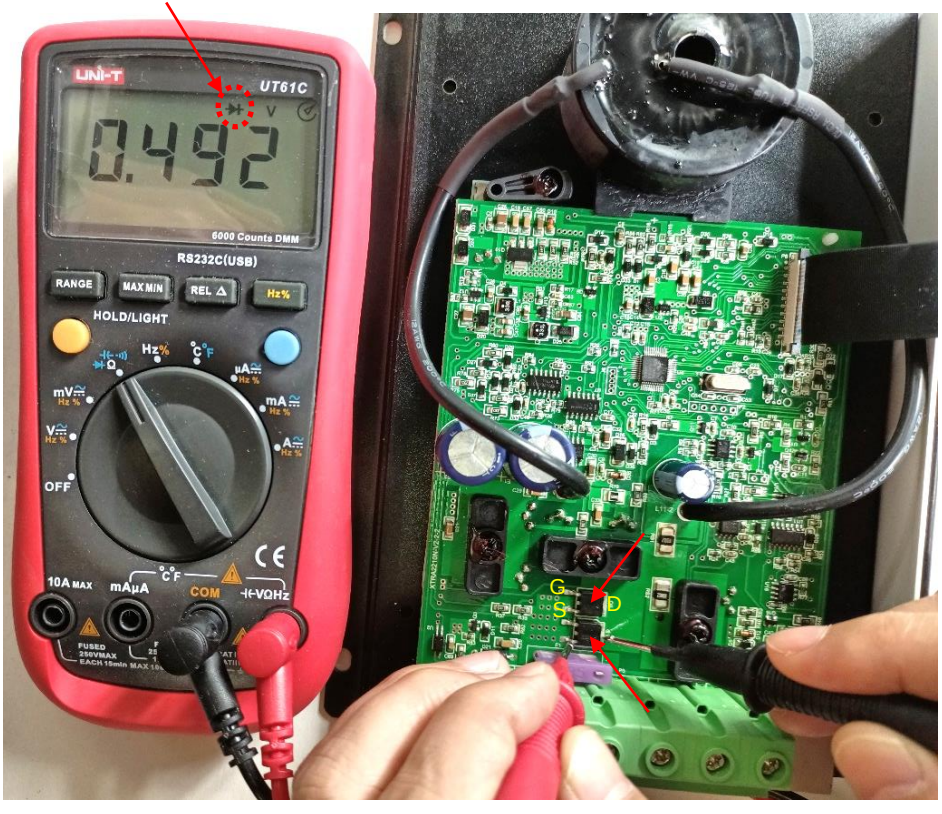
② The charger is put in a closed and hot environment;

③ MOS element shorted and lead to fuse broken;

Note: Refer to the next slide to check the MOS;

④ Fuse quality issue.

3. Check if the anti-reverse MOS is ok: Switch to beeper range to check



NOTES:

1: Normally, V_{DS} is about0.2~0.5V;

2: Identify the three pins, G (left) 、D (middle) 、S (right) ;

3: Switch to beeper range to check, Red probe on S, Black probe on D;

4: Scratch the conformal coating on the pins before testing;

5: Left pictures are for reference only, MOS of the same type can be test with the same method above.

Possible reasons for the anti-reserse MOS get dameaged:

① PV polarity ok, but battery polarity is reversed.

② Battery voltage exceeds the allowed range

③ The charger is put in a closed and hot environment

④ MOS is shorted by water, metal, etc

NOTE: If the resistance between G and S is 0~1KΩ, the MOS is damaged.

⑤ MOS element quality issue

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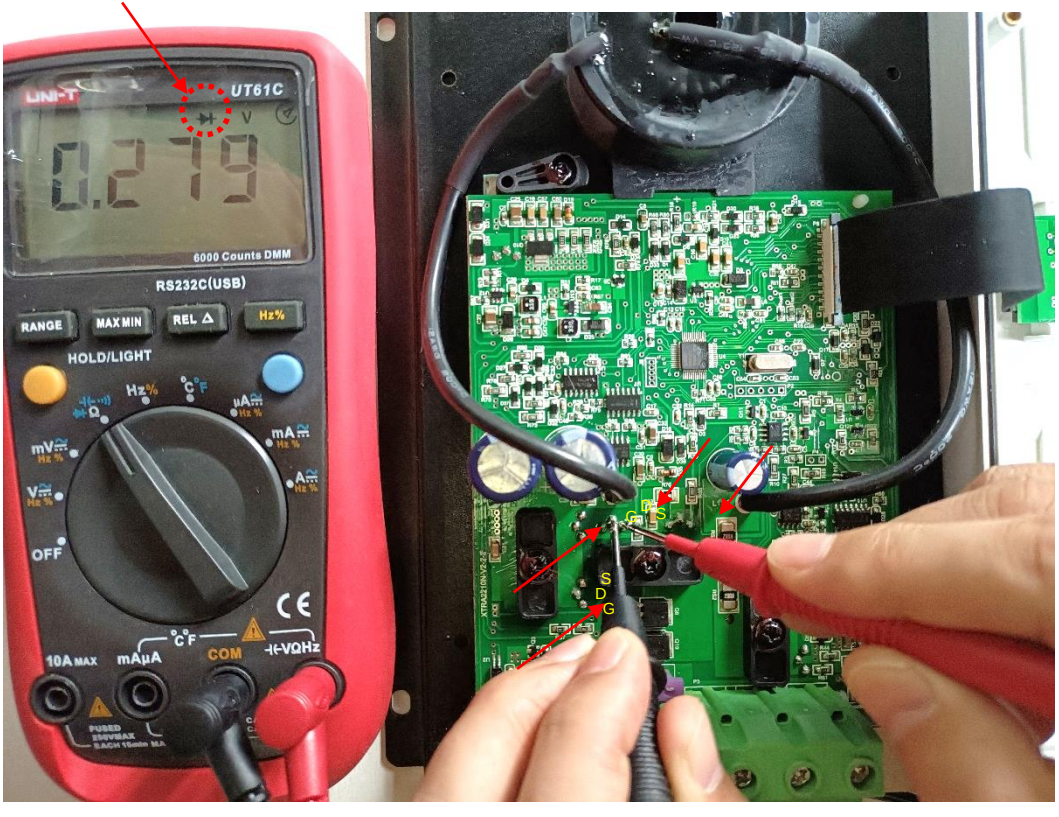
4. Check if the charge MOS is ok: switch to beeper range to check



NOTES:

1: Normally, V_{DS} is about0.2~0.5V;

2: Identify the three pins, G (left) 、D (middle) 、S (right) ;

3: Switch to beeper range to check, Red probe on S, Black probe on D;

4: Scratch the conformal coating on the pins before testing;

5: Left pictures are for reference only, MOS of the same type can be test with the same method above.

⚠ Possible reasons for the charge MOS get dameaged

① PV polarity ok, but battery polarity is reversed.

② PV Voc and power exceed the allowed ratings;

③ Surge on the battery terminal (e.g., inverter);

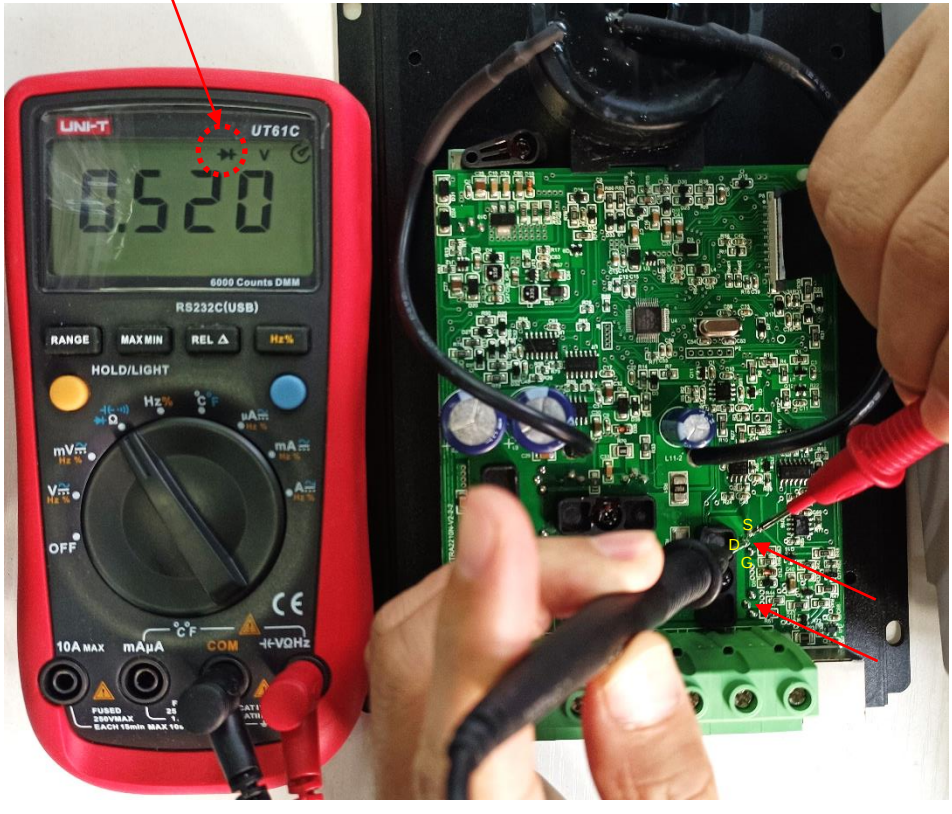
④ The charger is put in a closed and hot environment

⑤ MOS is shorted by water, metal, etc

NOTE: If the resistance between G and S is 0~1KΩ, the MOS is damaged.

⑥ MOS element quality issue

5. Check if the discharge MOS is ok: switch to beeper range to check



NOTES:

1: Normally, V_{DS} is about0.2~0.5V;

2: Identify the three pins, G (left) 、D (middle) 、S (right) ;

3: Switch to beeper range to check, Red probe on S, Black probe on D

4: Scratch the conformal coating on the pins before testing;

5: Left pictures are for reference only, MOS of the same type can be test with the same method above.

⚠ Possible reasons for the discharge MOS get dameaged

① Hgh surge from inductive or capacitive loads.

② The charger is put in a closed and hot environment.

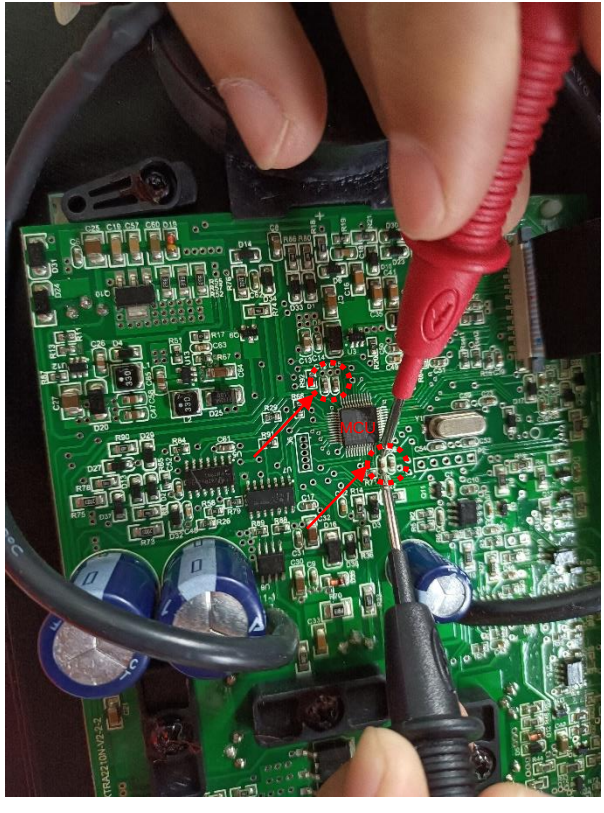
③ MOS is shorted by water, metal, etc.

NOTE: If the resistance between G and S is 0~1KΩ, the MOS is damaged;

④ MOS element quality issue.

Appendix

6. Check the resistance of the capacitors around the MCU, to determine whether the MCU or auxilary power is ok: Switch to ohm range to check.



NOTES:

1: Normally, the resistance of the capacitors around the MCU is much higher than 1kΩ, if it is lower than 1kΩ, the MCU or auxilary power must be broken.

2: The firmware file is not disclosed according to the company policy. The charger should be returned back to EPEVER if the MCU is broken

3: Scratch the conformal coating on the pins before testing;

4: Left pictures are for reference only, elements of the same type can be test with the same method above.

⚠ Possible reasons for the MCU or auxilary power broken:

① Electrostatic charge;

② PV Voc or power exceeds the allowed ratings;

③ The charger is put in a closed and hot environment.

④ MOS or auxilary power broken and causes the MCU broken

⑤ MCU or auxilary power elements quality issue

7. Check if the TVS is ok: Switch to kilo-ohm range to check

Method 1

Method 2

NOTES:

1: Normally the resistance of the TVS is much higher than 1kΩ, if the resistance is lower than 1kΩ , the TVS is broken

2: Scratch the conformal coating on the pins before testing;

3: Left pictures are for reference only, elements of the same type can be test with the same method above.

⚠ Possible reasons for the TVS broken:

① External SPD is not added when the charger is installed in a lightning-rich area;

② PV Voc exceeds the limit;

③ TVS quality issue

8. Notes

Upon faulty elements are identified, check the notes below before changing the faulty elements:

① The charger has to be powered off before changing elements. Change the faulty elements with exactly the same models;

② Use heat gun to remove the IC chip from the PCB;

③ If the MCU or sampling circuit is broken, the charger should be returned to EPEVER for repair;

④ When to bend the pins to the MOS, bend it smoothly withough sharp angle to improve the current flow performance;

⑤ Put also new silica films to replace the existing one if the MOS is to be replaced.;

⑥ Be careful and not get burnt by heat gun or solder iron;

⑦ Do not set the temperatue too high when using the heat gun or solder iron, do not heat the PCB for too long to avoid permanent burnt on the PCB;

⑧ After changing the faulty elements, check again if there is any visual connection issues again, before powreing up the charger.

EPEVER

Thank you

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