

SmartSolar Control display manual

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1. Introduction

The SmartSolar Control display is a dedicated display for the following MPPT solar charger ranges:

- SmartSolar MPPT 150/45 up to 250/100
- SmartSolar MPPT 150/70 up to 250/100 VE.Can
- BlueSolar MPPT 150/70 up to 250/100 VE.Can

These solar chargers can also be recognised by a small plastic cover on the front face with the text "display option".



Example of a solar charger without display and with display

The display plugs directly into the front face of the solar charger. It can act as both a permanent or a temporary display. Simply remove the plastic cover that protects the display terminal on the front of the controller and then plug in the display.

The display can be used to monitor the solar charger and to view both live and historic data. The display can also be used to configure solar charger settings.

Examples of live and historic monitoring:

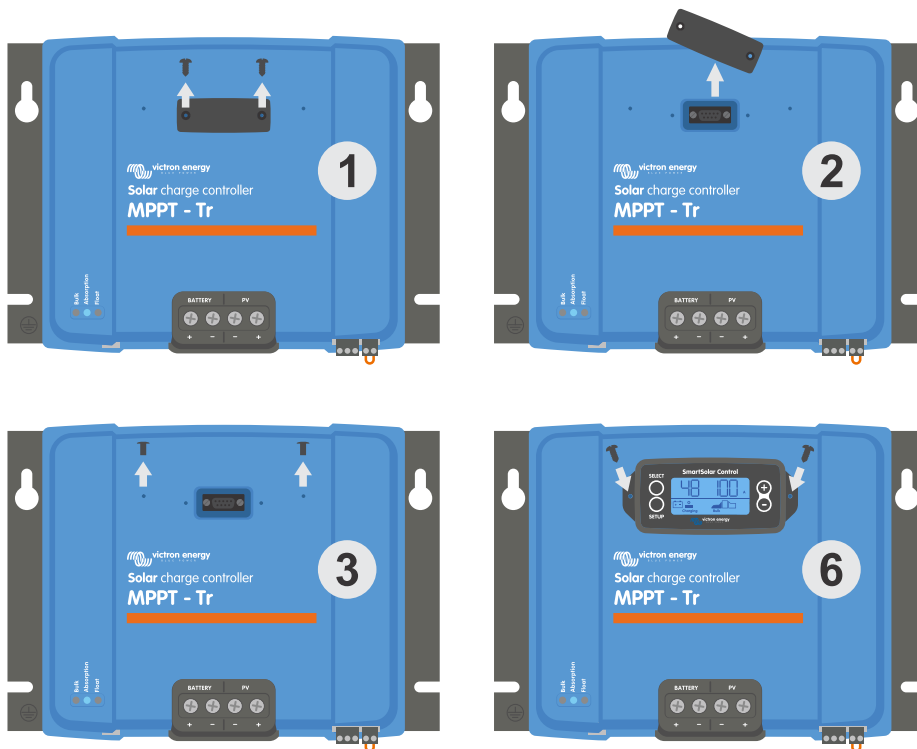
- PV power, yield, voltage and current.
- Battery voltage, current and charge stage.
- Load output state and current (only available if the solar charger is equipped with a load output).
- 30-day historical values.
- Cumulative historic values over the live of the solar charger.

2. Installation

The display connects to the display terminal on the front of the solar charger. The display terminal is located behind the plastic cover with the text: "display option".

To install the SmartSolar Control display do the following:

1. Remove the two screws of the plastic cover. Keep the screws, they are needed again when securing the display.
2. Remove the plastic cover. The display terminal is now exposed.
3. Remove the two plastic plugs on either side of the display plug.
4. Remove the paper backing of the double sided tape on the back of the display.
5. Insert the display into the plug and make sure it has been inserted all the way in.
6. Screw the display down by using the two screws that were used for the plastic cover.



How and where to connect the SmartSolar Control display



If the display is used as a temporary display, it is not necessary to use the tape and to screw down the display into the solar charger.

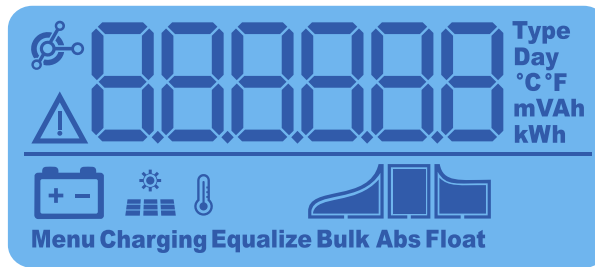


The display is hot-swappable, this means that the display can be plugged in or removed while the solar charger is operating.

3. Operation

The LCD screen displays the following information:

- A number reading.
- The unit of the reading: V, A, W, kWh, h or °C/°F.
- The type of reading: battery, PV or temperature.
- State: charge and charge stage indication.
- Connection indicator and warning indicator.



Full LCD readout

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
A	b	c	d	E	F	9	H	I	J	K	L	̄	n	O	P	9	r
S	T	U	V	W	X	Y	Z	0	1	2	3	4	5	6	7	8	9
S	t	U	u	W	X	Y	Z	0	1	2	3	4	5	6	7	8	9

The digits used to represent letters and numbers

The buttons on the front of the display are used to navigate through the solar charger readings and are used when making solar controller and display settings. They have the following functions:

Button	Action
	Cancel or Back
	Select or Conform
	Go to next or previous item or Increase or decrease value

3.1. Status menu




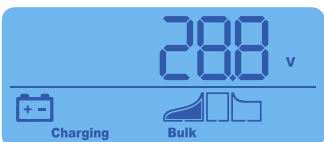


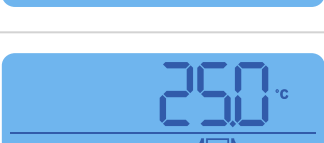
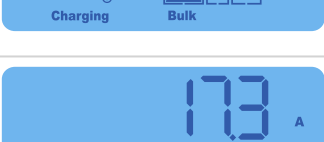
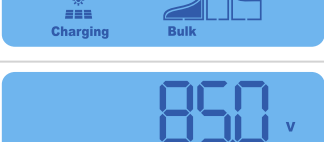
This menu shows the live solar charger readings. The SmartSolar Control display always starts up in this menu.

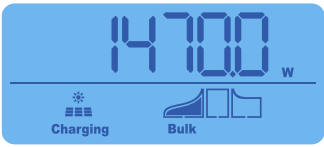
Press the - and + button to cycle through all menu items.

Press the - button to see the live data of the solar charger. Each time the - button is pressed, the next parameter will be displayed.





If the + and - button is pressed at the same time for 4 seconds, the auto scroll mode will be activated. The display will continuously cycle through each menu item every 5 seconds. To stop the auto scroll mode, briefly press the "-" or the "+" button.

These menu items will be displayed in order of appearance as indicated in below table:




LCD display	Menu item	Description and notes
	Battery voltage and charge current when no PV is present	The first number indicates the battery voltage (V), the second number indicates the battery charge current (A).
	Battery voltage and charge current when PV is present	
	Battery charge current	Charge stage: Bulk, Absorption, Float or off.
	Battery voltage	Charge stage: Bulk, Absorption, Float or off.
	Battery charge power	Charge stage: Bulk, Absorption, Float or off.
	Battery temperature	The temperature is shown or A special message is shown: • "---" = No sensor information • "Err" = Invalid sensor data
	Solar charger temperature	The temperature is shown or A special message is shown: • "---" = No sensor information • "Err" = Invalid sensor data
	PV current	Solar array output current
	PV voltage	Solar array output voltage

LCD display	Menu item	Description and notes
	PV power	Solar array output power

In addition to above menu items, the following menu items will appear when special conditions occur:

LCD display	Menu item	Description and notes
	Warning message	"Inf" together with a number is displayed. This number refers to an error code, see solar charger manual for the meaning of this code.
	Error message	"Err" together with a number is displayed. This number refers to an error code, see solar charger manual for the meaning of this code.
	Remote operation	"remote" is displayed.
	BMS operation	"bms" is displayed.

The charge stage and if PV is active is indicated by the bottom line of the display:

LCD display	Description	Notes
	Bulk charge stage	The first charge stage, the battery is between 0 and 80% state of charge.
	Absorption charge stage	The middle charge stage, the battery is between 80% and 100% state of charge.
	Float charge stage	The last charge stage, the battery 100% state of charge.

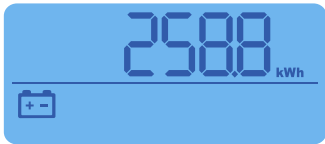

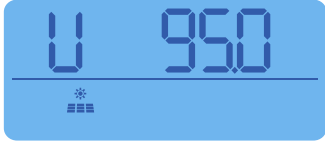






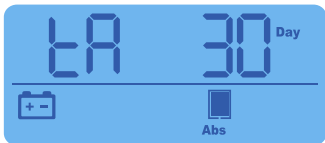
3.2. History menu

The history menu shows both the daily and overall solar charger history data. It shows items such as solar yield, battery voltages, time spend in each charge stage and past errors.




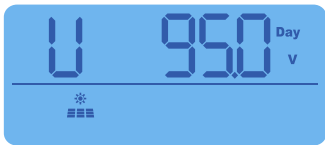
To enter and read out the historical menu:

- Press the SELECT button, while in the status menu.
- A scrolling text will be visible.
- Press the + or – button to navigate through the history items.
- When arriving at the desired history item, press the SELECT button to see the value of that item.
- If an item contains multiple values, Press + or – button to browse the various values within that item.
For the daily items it is possible to scroll back to 30 days ago (data becomes available over time), a brief popup shows the day number.
- To go back to the main history menu, press the SETUP button.
- To go back to the status menu, press the SETUP button again.

All available history menu items are listed in below table, in the order they appear when scrolling through the items.

Scrolling text	LCD	Description
YIELD TOTAL		The cumulative PV yield since the last history reset.
LAST ERROR		The last 4 errors since the last history reset. Only available if there actually were any error(s): <ul style="list-style-type: none"> • E0 - Total error 0 (most recent) • E1 - Total error 2 (shown when available) • E2 - Total error 3 (shown when available) • E3 - Total error 4 (shown when available)
PANEL VOLTAGE MAXIMUM		The maximum PV voltage since the last history reset.
BATTERY VOLTAGE MAXIMUM		The maximum battery voltage since the last history reset.
YIELD		The daily PV yield, available for each day for the past 30 days.
BATTERY VOLTAGE MAXIMUM		The daily maximum battery voltage, available for each day for the past 30 days.
BATTERY VOLTAGE MINIMUM		The daily minimum battery voltage, available for each day for the past 30 days.
LAST ERROR		The last 4 daily errors. Only available if there actually were any error(s): <ul style="list-style-type: none"> • E0 - Total error 0 (most recent) • E1 - Total error 2 (shown when available) • E2 - Total error 3 (shown when available) • E3 - Total error 3 (shown when available)
TIME BULK		Daily time spent in bulk charge stage or in ESS, in minutes, available for each day for the past 30 days. *
TIME ABSORPTION		Daily time spent in absorption charger stage, in minutes, available for each day for the past 30 days. *


* When the charger is not active (night time) the bulk, absorption and float icons will be shown as in the table above. When the charger is active only one icon will be shown: the icon corresponding to the actual charge state.

Scrolling text	LCD	Description
TIME FLOAT		Daily time spent in float charge stage, in minutes, available for each day for the past 30 days. *
MAXIMUM POWER		The daily maximum PV power, available for each day for the past 30 days.
BATTERY CURRENT MAXIMUM		The daily maximum battery current, available for each day for the past 30 days.
PANEL VOLTAGE MAXIMUM		The daily maximum PV current, available for each day for the past 30 days.

* When the charger is not active (night time) the bulk, absorption and float icons will be shown as in the table above. When the charger is active only one icon will be shown: the icon corresponding to the actual charge state.

3.3. Setup menu


In the settings menu the solar charger and SmartSolar Control settings can be viewed and/or changed.



Do not change settings unless you know what they are and what the effect of changing these setting can be. Incorrect settings may cause system problems including damage to batteries. When in doubt, seek advice from an experienced Victron Energy installer, dealer or distributor.



To navigate the settings menu:

- Press the SETUP button for 3 seconds to enter the setup menu.
- The display will show the text “Menu” and the first menu item is shown via a scrolling text.
- Navigate to the desired setting by pressing the - or + button.
- Once arrived at the desired setting press the SELECT button to view the value the setting has been set to.
- To modify this setting press the SELECT button again, the value will now blink.
- Press the - or + button to choose the desired value.
- Press SELECT to confirm the change, the value will stop blinking, and the change is made final.
- Navigate to the next menu item, or press SETUP to return to the setup menu.
- To leave the setup menu, press the SETUP button.




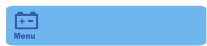








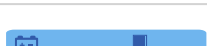




Any settings change via the display or the VictronConnect App will override the rotary switch setting. Turning the rotary switch will override settings made with the display or via the VictronConnect App.







All available settings are indicated in below table, in the order they appear when scrolling through the menu, together with a basic description and notes for each setting. For the full description of the solar charger settings refer to the solar charger manual.

Number	Scrolling text	LCD	Description and notes
01	POWER ON OFF		This setting turns the charger in the solar charger ON or OFF.
02	MAXIMUM CHARGER CURRENT		Sets the maximum charge current (A).

Number	Scrolling text	LCD	Description and notes
03	BATTERY VOLTAGE		Sets the system voltage 12, 24, 36 or 48V.
04	CHARGE ALGORITHM		<p>Sets the charge algorithm.</p> <p>A preset charge algorithm has been selected via the rotary switch. This setting toggles between the preset algorithm or a USER defined algorithm.</p> <p>Only when the USER algorithm has been selected, the charge settings in the remainder of the setup menu can be changed.</p>
05	ABSORPTION VOLTAGE		<p>Sets the absorption voltage (V).</p> <p>This setting can only be changed when the charge algorithm has been set to USER in setting 4.</p>
06	FLOAT VOLTAGE		<p>Sets the float voltage (V).</p> <p>This setting can only be changed when the charge algorithm has been set to USER in setting 4.</p>
08	EQUALIZATION VOLTAGE		<p>Sets the equalization voltage (V).</p> <p>This setting can only be changed when the charge algorithm has been set to USER in setting 4.</p>
09	AUTOMATIC EQUALIZATION		<p>Sets if an automatic equalization should take place and how often this should be. Set to OFF 0 (default) or a number between 1 (every day) and 250 (once every 250 days).</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Do not equalize charge Gel, AGM, VRLA or lithium batteries. Equalization can cause damage to the battery if the battery is not suitable for an equalization charge. Always check with the battery manufacturer prior to enabling equalization. </div>
10	MANUAL EQUALIZATION		<p>Initiates a manual equalization (START, STOP).</p> <p>Only perform a manual equalisation during absorption or float charge stage, and when there is sufficient sunlight.</p> <p>Press SELECT: the text START will blink, press SELECT again to start equalisation.</p> <p>The manual equalise duration is 1 hour.</p> <p>To terminate the equalisation mode prematurely, enter the setup menu and navigate to setup item 10, press SELECT: the text STOP will blink, press SELECT again to stop equalisation.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Do not equalize charge Gel, AGM, VRLA or lithium batteries. Equalization can cause damage to the battery if the battery is not suitable for an equalization charge. Always check with the battery manufacturer prior to enabling equalization. </div>
11	RELAY MODE		<p>Sets the relay function:</p> <ul style="list-style-type: none"> • 0 - Relay always off. • 1 - High PV voltage, see setup items 16 and 17. • 2 - High internal temperature solar charger, above 85°C. • 3 - Battery voltage too low, see setup items 12 and 13. • 4 - Equalization active. • 5 - Error condition present. • 6 - Low internal temperature solar charger, below - 20°C. • 7 - High battery voltage, see setup items 14 and 15. • 8 - Solar charger in float or storage charge stage. • 9 - Daylight detection, solar array irradiation. • 10 - Load control. The relay switches according to load control mode, see setting 35.

Number	Scrolling text	LCD	Description and notes
12	RELAY LOW VOLTAGE		Sets the low battery voltage alarm activation level (V)
13	RELAY CLEAR LOW VOLTAGE		Sets the low battery voltage alarm clear level (V).
14	RELAY HIGH VOLTAGE		Sets the high battery voltage alarm activation level (V).
15	RELAY CLEAR HIGH VOLTAGE		Sets the high battery voltage alarm clear level (V).
16	RELAY HIGH PANEL VOLTAGE		Sets the high PV voltage alarm activation level (V).
17	RELAY CLEAR HIGH PANEL VOLTAGE		Sets the high PV voltage alarm clear level (V).
18	RELAY MINIMUM CLOSED TIME		Sets the relay minimum closed time (minutes).
20	TEMPERATURE COMPENSATION		<p>Sets the temperature charge voltage compensation factor ($^{\circ}\text{C}/\text{mV}$ or $^{\circ}\text{F}/\text{mV}$). This is the value per cell. A 12V lead acid battery has 4 cells.</p> <p>A setting of 0 disables the temperature compensation. Temperature compensated charging is not required for lithium batteries.</p> <p>This setting can only be changed when the charge algorithm has been set to USER in setting 4.</p>
21	TAIL CURRENT		Sets the tail current (A).
23	MAXIMUM ABSORPTION TIME		Sets maximum absorption time (h).
28	REBULK OFFSET VOLTAGE		Sets the re-bulk offset voltage (V). This voltage is subtracted from setting 6.
29	LOW TEMPERATURE CHARGE CURRENT		Sets the low temperature charge current (A) for when the temperature drops below 5°C or the temperature as set in setting 30 (A).
30	LOW TEMPERATURE LEVEL		Sets low temperature level at which charging has to stop ($^{\circ}\text{C}$ or $^{\circ}\text{F}$).
31	BMS PRESENT		<p>Sets if BMS is present (Y or N).</p> <p>This setting is automatically set to Y when a compatible BMS is detected.</p> <p>To revert the solar charger to normal operation (without BMS) set manually to N. For example if the charger is moved to another location where a BMS is not needed.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  Do not set to Y when a BMS is connected to the solar charger's remote on/off terminal. </div>

Number	Scrolling text	LCD	Description and notes
35	LOAD MODE		<p>Sets the load control mode the relay (setting 11, value 10) or the VE.Direct port (setting 58, value 4) is using to control a load:</p> <ul style="list-style-type: none"> • 0 - Load output always off • 1 - Batterylife algorithm (default) • 2 - Conventional algorithm 1 (off 22.2V, on 26.2V)* • 3 - Conventional algorithm 2 (off 23.6V, on 28.0V)* • 4 - Load output always on • 5 - User defined algorithm 1 (off 20.0V, on 28.0V)* • 6 - User defined algorithm 2 (off 20.0V, on 28.0V)* <p>* Settings are for 24V systems, for 12V systems divide by 2, for 24V systems multiply by 2.</p>
36	LOAD LOW VOLTAGE		Sets the load low voltage (V).
37	LOAD HIGH VOLTAGE		Sets the load high voltage (V).
40	MAXIMUM EQUALIZATION TIME		Sets the maximum automatic equalization time (h).
41	EQUALIZATION AUTO STOP		Sets if the equalization should stop when the equalization voltage (setting 8) has been reached (Y or N).
42	EQUALIZATION CURRENT PERCENTAGE		<p>Sets the equalization current as a percentage (%) of the maximum charge current setting entered in setting 2.</p> <p>This setting can only be changed when the charge algorithm has been set to USER in setting 4.</p>
49	BACKLIGHT INTENSITY		Sets the display's back light intensity level (1to10).
50	BACKLIGHT ALWAYS ON		<p>Sets when the back light should turn off after the last keypress:</p> <ul style="list-style-type: none"> • ON - Back light is always on. • OFF - Back light turns off 60 seconds after the last keypress. • AUTO - Back light is only on when the solar charger is charging.
51	SCROLL SPEED		Sets the scroll speed (1 to 5).
57	RX MODE		<p>Sets the VE.Direct port RX pin mode:</p> <ul style="list-style-type: none"> • 0 - The VE.Direct port is used for on/off control by an external device, such as a BMS. It is an option to connect a BMS to the VE.Direct port, (instead of connecting the BMS to the remote on/off terminal). A VE.Direct non-inverting remote on/off cable is needed. • 1 - No function. • 2 or 3 - The RX pin is used to de-energize the relay. An AND function can be created if the relay function (setting 10) has been set to value 10 and the load control options (setting 35) remain valid. Both the load control and the RX pin must be high (value 2) or low (value 3) to energize the relay.

Number	Scrolling text	LCD	Description and notes
58	TX MODE		<p>Sets the VE.Direct port TX pin mode:</p> <ul style="list-style-type: none"> • 0 - Normal VE.Direct communication(default). For example to communicate with a Color Control panel (VE.Direct cable needed) • 1 - Pulse every 0.01kWh • 2 - Light dimming control (pwm normal). A VE.Direct TX digital output cable is needed • 3 - Light dimming control (pwm inverted) A VE.Direct TX digital output cable is needed. • 4 - Load control mode: the TX pin switches according to the load control mode (setting 35), see note. A VE.Direct TX digital output cable is needed to interface to a logic level load control port.
61	SOFTWARE VERSION		Displays the firmware version of the solar charger.
62	RESTORE DEFAULTS		<p>Resets all settings to default.</p> <p>Press SELECT: the text "RESET" will blink, press SELECT again to reset to original factory settings. The charger will re-boot. The history data will not be affected.</p>
63	CLEAR HISTORY		<p>Resets all historic data.</p> <p>Press SELECT: the text "CLEAR" will blink, press SELECT again to erase the history data. Note that this takes a few seconds to complete.</p>
64	LOCK SETUP		Locks settings (Y or N).
67	TEMPERATURE UNIT		Sets the temperature unit to °C or °F (CELC or FAHR)

4. Troubleshooting and Support

Consult this chapter in case of unexpected behaviour or if you suspect a product fault.

The correct troubleshooting and support process is to first consult the common issues as described in this chapter.

Should this fail to resolve the issue, contact the point of purchase for technical support. If the point of purchase is unknown, refer to the [Victron Energy Support webpage](#).

4.1. The display does not power up

The display does not power up. The screen is blank and the back-light is off.

The display is powered from the solar charger. The solar charger is powered from either the battery or the PV array. If the PV voltage and the battery voltage are both below 6V, the display will not power up.

It could also be that the LCD display is not properly inserted into the socket on the solar charger.

4.2. The display segments are faint or missing

The screen is blank or faint, but the back-light is still operational.

This may be due to low ambient temperature. If the ambient temperature is below -10°C (14°F), the LCD segments can become faint. Below -20°C (-4°F) the LCD-segments can become invisible.

During charging the LCD-display will warm up, and the LCD segments will become visible again.

4.3. Display keeps scrolling through different menu items

The display is in "auto scroll mode". In this mode the display will continuously cycle through each live data menu item every 5 seconds.

To stop the auto scroll mode, briefly press the "-" or the "+" button.

4.4. Settings locked

If the setup menu is locked settings can only be viewed but not changed.

To unlock the settings menu see the instruction in the [Setup menu \[7\]](#) chapter.

5. Warranty

This product has a 5-year limited warranty. This limited warranty covers defects in materials and workmanship in this product and lasts for five years from the date of original purchase of this product. To claim warranty the customer must return the product together with the receipt of purchase to the point of purchase. This limited warranty does not cover damage, deterioration or malfunction resulting from alteration, modification, improper or unreasonable use or misuse, neglect, exposure to excess moisture, fire, improper packing, lightning, power surges, or other acts of nature. This limited warranty does not cover damage, deterioration or malfunction resulting from repairs attempted by anyone unauthorized by Victron Energy to make such repairs. Non-compliance with the instructions in this manual will render the warranty void. Victron Energy is not liable for any consequential damages arising from the use of this product. The maximum liability of Victron Energy under this limited warranty shall not exceed the actual purchase price of the product.

6. Specifications

Technical specifications	
Installation type	Inserts into the display port on the front of a solar charger.
Suitability	Suitable for the Victron Energy 150V and 250V BlueSolar and SmartSolar MPPT solar charger range that are equipped with a display port.
Display port connector	RS232 9 pin pinout
Dimensions (w x l x h)	116mm x 50mm x 25mm
Weight	66g



SmartSolar Control front view



SmartSolar Control back view