

SPC-10



SWITCHING SOLAR BATTERY CHARGER 10A 12/24V

INDEX

First of all	pag 3
Installation of the battery charger	pag 3
Connections and signallings of SPC10.....	pag 3
POWER ON	pag 3
SPECIAL CONDITIONS	pag 4
DIODES and SENSORS CABLING SCHEME.....	pag 5
CHARACTERISTIC	pag 6
Address	pag 6

FEATURES:

- Microcontroller design
- PWM system charge
- Mosfet technology
- 10A Load in continuous mode
- Up 10A panel current
- Implemented light sensor control
- Implemented light sensor
- Light sensor available with panel or photoresistor
- 12 / 24V mode autodetect
- Remote programmer interface
- Battery recharging with temperature compensation
- Low battery control
- Overtemperature protection
- Overload protection
- Professional package
- Easy connection
- High reliability
- Surface mounting technology

First of all

Remove carefully the packages which protect the **SPC10** and verify the integrity of each part.

Installation of the battery charger

Choose the more suitable place for the battery charger positioning, doing as follows:

- Avoid humid places.
- Do not expose it to direct sun radiation.
- Install it in a place which is easily accessible, well airy and without pushes and vibrations.
- Predispose the n. 4 holes for the fixing of **SPC10** using opportune screws.

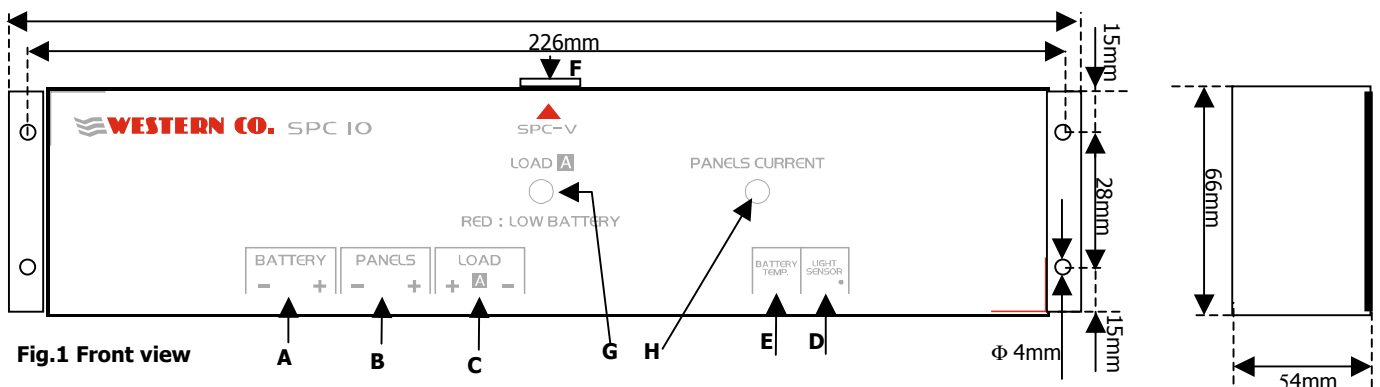


Fig.1 Front view

Connections and signalings of SPC10

In the fig.1 you can see the battery charger's circuit; please, pay attention on what is written on it.

- A** : N°2 screws for connecting BATTERIES
- B** : N°2 screws for connecting PHOTOVOLTAIC PANELS
- C** : N°2 screws for connecting LOADS
- D** : N°2 screws for connecting LIGHT SENSOR
- E** : N°2 screws for connecting BATTERY TEMPERATURE SENSOR
- F** : N°1 connector for programmer SPC-V (optional)
- G** : bicoloured LED (GREEN/RED) for LOADS CONDITION
- H** : GREEN LED monitoring current produced from the panels

POWER ON

Before switching on the **SPC10**, you have to connect exactly all the parts which are necessary to its right working, trying not to make mistakes.

- Prearrange the **E** temperature sensor (if necessary) on the batteries, and verify (using a proper cement) that there is a sufficient thermic exchange between batteries and sensor.
- Connect the battery with two suitable cables which have to be as short as possible, respecting the polarities that you can see in the figure. 1 **A**.

- At this point the **SPC10** will begin to work and the LED called **LOAD A** will make one or two red flashings; this to show that the system works at 12 or 24V (battery voltage).
- After having verified the correctness of all the previous operations, connect the solar panels respecting the given polarities. **DO NOT INVERT THE POLARITIES, SINCE THE BATTERIES ARE CONNECTED AND SO THEY COULD GO IN SHORT-CIRCUIT.** If the insolation conditions are sufficient, the green recharge LED **H** (Panel Current) will lighten more or less intensely according to the current that is required to the battery charger by the batteries and the loads. Connect the load **LOAD A** respecting the polarities. If the conditions are right, the loads will activate immediately and the relative LED **G** will be green. The possible red colour of the LED **G**, means that the batteries have not such a charge to allow the loads activation; in this case the battery charger will restore them as soon as the batteries will reach the min. charge level for the proper use.
- Connect the light sensor **D** (if necessary). If you use the sensor given with the equipment, you have not to respect the polarities on the two connectors; while if you prefer to use the solar panels, you have to take a positive pole from a panel which is on the mountain side of the blocking diode (on the 12V connection), connecting it to the light sensor connector marked by the point; and then bringing only an additional wire from the panel; do not worry as regards the connector that remains free.
- Done this, if there are the right insolation conditions, the LED **LOAD A** will turn off to show that the loads have been switched off and, as soon as it will be night or dark, the battery charger will re-activate both the LED and the loads, until the sun comes back.
- The power off of the loads in these conditions may happen owing to the following reasons:**
 - 1) With programmer SPCV at the end of calculation of the TIMER. If the night conditions persist, the system will wait the daylight, before to re-activate the normal functions.
 - 2) Intervention of the light sensor which reveals the daylight.
 - 3) Intervention of the battery charger owing to low batteries voltage (**LOAD A** becomes of red colour).

	DESCRIPTION	FUNCTION
A)	BATTERY + BATT - BATT	Screws for connection of the battery + Positive (red) - Negative (black)
B)	PANELS +PAN - PAN	Screws for connection panel/panels + Positive (red) - Negative (black)
C)	LOADS + LOAD A - LOAD A	Screws for connection of the LOADS + Positive (red) - Negative (black)
D)	LIGHT SENSOR	Screws for connection light sensor (photoresistor). Screw marked with (°) to use the panel as light sensor, taking the positive pole on the mountain side of the blocking diode, in the panel with 12V connection. Leaving these two connectors unconnected, the loads will be always on.
E)	TEMPERATURE	Screws for the connection of the battery temperature sensor.
G)	LOAD A RED: LOW BATTERY	LED for the control of the load's condition: LED off : LOAD Off - light sensor: lighted. Green LED : LOAD On - light sensor: in the dark or not present. Red LED : LOAD Off for discharged batteries condition. During the POWER ON : Green LED - 1 lightning : AUTODETECT tension 12V Green LED - 2 lightnings : AUTODETECT tension 24V
H)	PANELS CURRENT	LED for displaying current supplied by the panel/panels. The current is proportional to the LED luminosity.
I)	SPC-V	Optional connection for programmer SPC-V.

SPECIAL CONDITIONS

During the POWER ON and during the normal working, the battery charger can meet some particular conditions, that is:

A) POWER ON

1) The batteries are discharged (under the values of min. threshold)

As previously described, the battery charger can operate either at 12V or 24V recognising automatically the voltage levels. Obviously, during the power on, the batteries have to be perfectly charged, since if a 24V battery is left discharged, when you power on the SPC10, the system reveals a very low voltage value (ex.: 12V) and, obviously, it would mistake this value for a 12V battery, with all its consequences.

If, during the system's power on, the battery voltage is under 8,5V, the SPC10 will indicate the non-autodetect with a lighting of the red LED **LOAD A**.

B) Normal working

1) Minimum insolation for a very long time, batteries: discharged

In this case, the battery charger continues to work correctly until a min. voltage of 3,6V and it is able to restart correctly as soon as the proper insolation conditions come back.

Obviously, with this kind of voltage values the loads are non-utilisable (see table next page).

This condition is indicated by a lightning of red colour of the LED **LOAD A**.

If in these conditions the battery goes under 3,6V the battery charger turns off losing its programmings and it is no more able to restart correctly owing to the conditions we have seen at the point **A**). In this case it is necessary the external intervention to restore the right conditions.

Notes : It is not possible to establish how long the batteries can resist with this kind of conditions, since for each application they are dimensioned in a specific way.

However, we underline that in systems correctly dimensioned, these conditions should not verify.

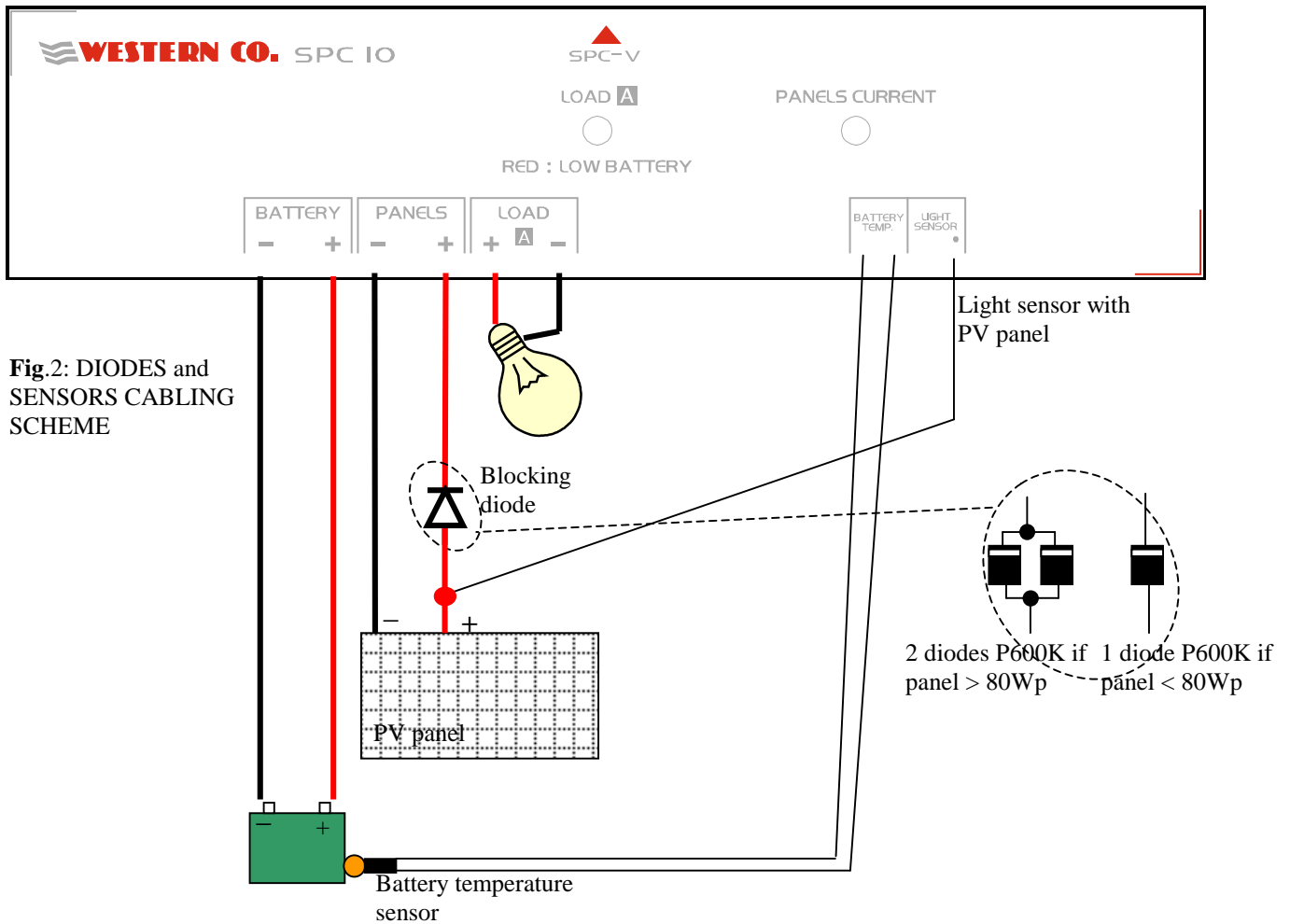


Fig.2: DIODES and SENSORS CABLING SCHEME

NOTE:

ALWAYS insert the temperature sensor (supplied) in correspondent terminal blocks (no polarity) and put it as nearest as possible to the batteries.

ALWAYS insert the blocking diode (P600K or equivalent) between the + pole of panel and SPC10 + panel terminal block. The already cabled diodes inside the panel's junction box have got a DIFFERENT function from that of blocking diode and so insert the blocking diode IN ANY CASE.

During cabling put the Silver side of blocking diode (P600K or equivalent) toward the SPC10 electronic equipment (see fig. 2).

CHARACTERISTIC	SYM.	CONDITION	MIN.	TYP.	MAX.	UNIT
DC Power Supply (12/24V lead Battery)						
Operating Voltage	V _{BD}	12V mode	3.6	12	15	V
Operating Current	I _{DD}	24V mode no load, no panels (12/24V)	3.6 12	24 20	30 25	V mA
Voltage Panels						
	V _{PAN}	12V mode	0	17,2	21	V
		24V mode	0	35,4	42	V
Current Panels						
	I _{PAN}	12/24V mode	0	9	10	A
Power Panels						
	P _{PAN}	12V mode	-	150	160	W
		24V mode	-	300	320	W
Low Battery Voltage Threshold						
	V _{LB}	min. time 1 sec. 12V mode	<10,96	<11.16	<11,36	V
		min. time 1 sec. 24V mode	<21,92	<22.32	<22,72	V
Current Load						
	V _{LD}	continuous mode	0	8	10	A
End Low Battery Voltage Threshold						
	V _{ELB}	12V mode	>13.0	>13.2	>13.4	V
		24V mode	>26.0	>26.4	>26.8	V
Power Load						
	P _L	12V mode	--	120	150	W
		24V mode		240	300	W
Recharging Voltage						
	V _{CH}	Battery Temperature 25°C ±2°C	13,8	14,1	14,4	V
Efficiency						
	h	12V mode	86	95	98	%
		24V mode	85	94	97	%
Voltage Compensation of Temperature						
	V _{Tadj}	¹ T _{BATT} >=-8°C <=60°C	-	-20	-	mV/°C
Autodetect-mode Voltage threshold						
	V _{THM}	²	15,9	16	16,1	V
Peak Current Load						
	V _P	max. time 120 ms.; T = 25°C	-	-	70	A
Light Sensor threshold (for On Load)						
	V _{THLS}	with panel sensor		<0,5		V
	R _{THLS}	with photoresistor sensor		>150		KOhm
Operating Ambient Temperature						
	T _A		-10	-	60	°C
Conductor size						
	-	³	-	≥4	-	mm ²
	-	⁴	-	<1,5	-	mm ²
Supervision of the system						
		Microprocessor				
Recharge system						
		Advanced Switching with algorithm to obtain the max. of the panel's power				
Commutation system						
		Mosfet				
Implemented protections						
		Internal temperature Short on the loads High and lasting absorption of the loads Limitation to fast and high absorptions Limitation on the panel's input voltage				
Special signalling						
		Lighting red LED : slow Battery voltage gone under 8V auto-restoring				
		Lighting red LED: fast Battery voltage gone under 5V, manual restoring				
Container						
		Metallic				

¹ - Regulation effected through step of 6°C.

² - If V_{BATT}<V_{THM} 12V mode, if V_{BATT}>V_{THM} 24V mode.

³ - For connections among Battery, Panel and load.

⁴ - For connections between battery temperature sensor and light sensor.

Recapito:

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