X-90 Solar Charger

Patent pending

Portable Fast-Charge Solar Battery Charger

Features

- Maximum Power Point Tracking
  - Up to 30% more power
- Universal Charging Algorithm
  - Identifies battery chemistry automatically
- No User Input Required
- Fully Ruggedized Design
- Over Temperature Protection
- Wide-Range DC Input Capable
- 12V or 24V Solar Panel Input - No Minimum/Maximum Solar Panel Wattage
- Polarized SAE plug to connect to solar panel
- Extension input cable for use with other solar panels or DC sources
- Included "Y" adapter, to parallel multiple solar panels for maximum charge speed

Description

Supported batteries	Chemistry
BB-2590/U	Li-Ion
BB-590/U	NiCd
BB-390B/U	NiMH

The X-90 Solar Charger is a portable solar battery charger capable of charging a wide array of typical portable rechargeable batteries. The charger features advanced digital control, which enables automatic battery detection, maximum power point tracking (MPPT) of the solar panel, and value-added features such as a fixed DC input mode and a fixed DC output mode. The charger is able to operate from any solar panel configuration with $V_{open\ circuit} < 60V$. The charger directly plugs onto the top of the supported batteries, and the only wiring needed is the connection to the solar panel or DC source using a polarized SAE plug. The advanced charge controller minimizes charge time by charging two battery strings simultaneously, while monitoring critical parameters to ensure safety and reliability. The implementation of high-speed MPPT delivers maximum charging current, even in low light or poor weather conditions. The simple LED interface informs the user when the batteries have been completely charged, and if there are any fault conditions.

Absolute Maximum Ratings

	Parameters	Max.	Units
V_{in}	Input Voltage	65	V
V_o	Output Voltage	20	V
I_o	Output Current (Total)	6	A
T_A	Ambient Operating Temperature	60	°C
T_{STG}	Storage Temperature	85	°C

Table 1: Absolute Maximum Ratings

Recommended Operating Conditions

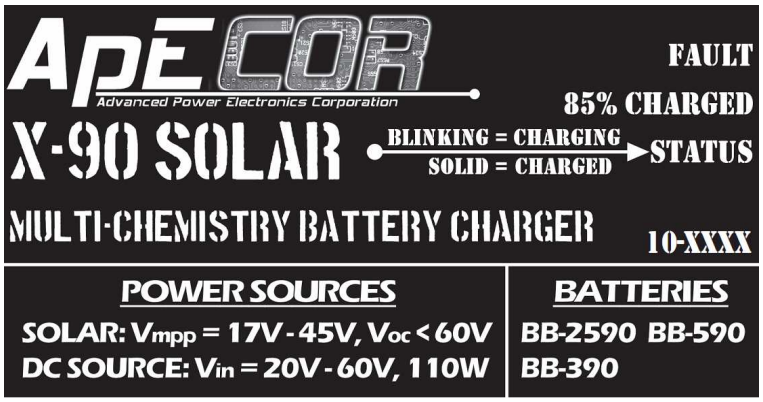
T_A=25˚C

	Parameters	Min.	Typ.	Max.	Units	Conditions
V_{in}	12V PV Panel Voltage	V_o+1V	20	28	V	(4)
	24V PV Panel Voltage	V_o+1V	40	56	V	(3)
	DC Input Voltage	20	-	60	V	
V_o	Output Voltage	10	-	20	V	
I_o	Output Current	0	-	6	A	
I_s	Self Consumption	-	55	-	mA	V_{in}=10V
		-	14	-	mA	V_{in}=65V
η	Converter Efficiency	-	96.1	-	%	V_{in}=40V, V_o=16V, I_o=6A (1,3)
		-	95.5	-	%	V_{in}=40V, V_o=13V, I_o=4A (2,3)
T_A	Ambient Operating Temperature	- 30	-	60	˚C	
T_{STG}	Storage Temperature	- 50	-	85	˚C	

Table 2: Electrical Characteristics

Notes:
(1) Charging a BB-2590/U Li-Ion battery with the rated max. charge current
(2) Charging a BB-390B/U NiMH or BB-590/U NiCd battery with the rated max. charge current
(3) Using a “24V” PV array
(4) Using a “12V” PV array

Label on Top of Charger



Red LED
Green LED 1
Green LED 2

LED Status Information

Red LED	Green LED 1	Green LED 2	Meaning	Action to take
Off	Off	Off	Ready to connect	Connect battery
Off	Off	Blinking	Charging	-
Off (1)	On (1)	Blinking (1)	Charging, battery is 85% full (1)	**Optional:** Disconnect battery and connect a lower charged battery. In the time it takes to charge the last 15%, the first 50% of an empty battery could be charged. (1)
Off	On	On	Finished charging	Disconnect battery
On	-	-	Fault, converter not running	Check connections, make sure that operation of converter is within the maximum ratings

Table 3: LED status information

Notes:
(1) Only applies when charging Li-Ion

Typical Charging Times

Battery	Chemistry	Capacity (Ah)	Max Charge Current	Solar Panel (Watts)	Typical Full Charge Time (Hours)
BB-2590	Li-Ion	14.4	3A/String	62	4.5
				2 X 48	3
BB-390	NiMH	9.8	2A/String	62	3
BB-590	NiCd	4.8	2A/String	62	1.5

Table 4: Typical Charging Times

Dimensions and Weight

	Parameters	Typ.	Units
L	Length	116.7	mm
		4.596	inch
W	Width	67.2	mm
		2.646	inch
H	Height	41	mm
		1.615	inch
W	Weight	0.54	kg
		1.2	lbs

Table 5: X-90 Dimensions and Weight

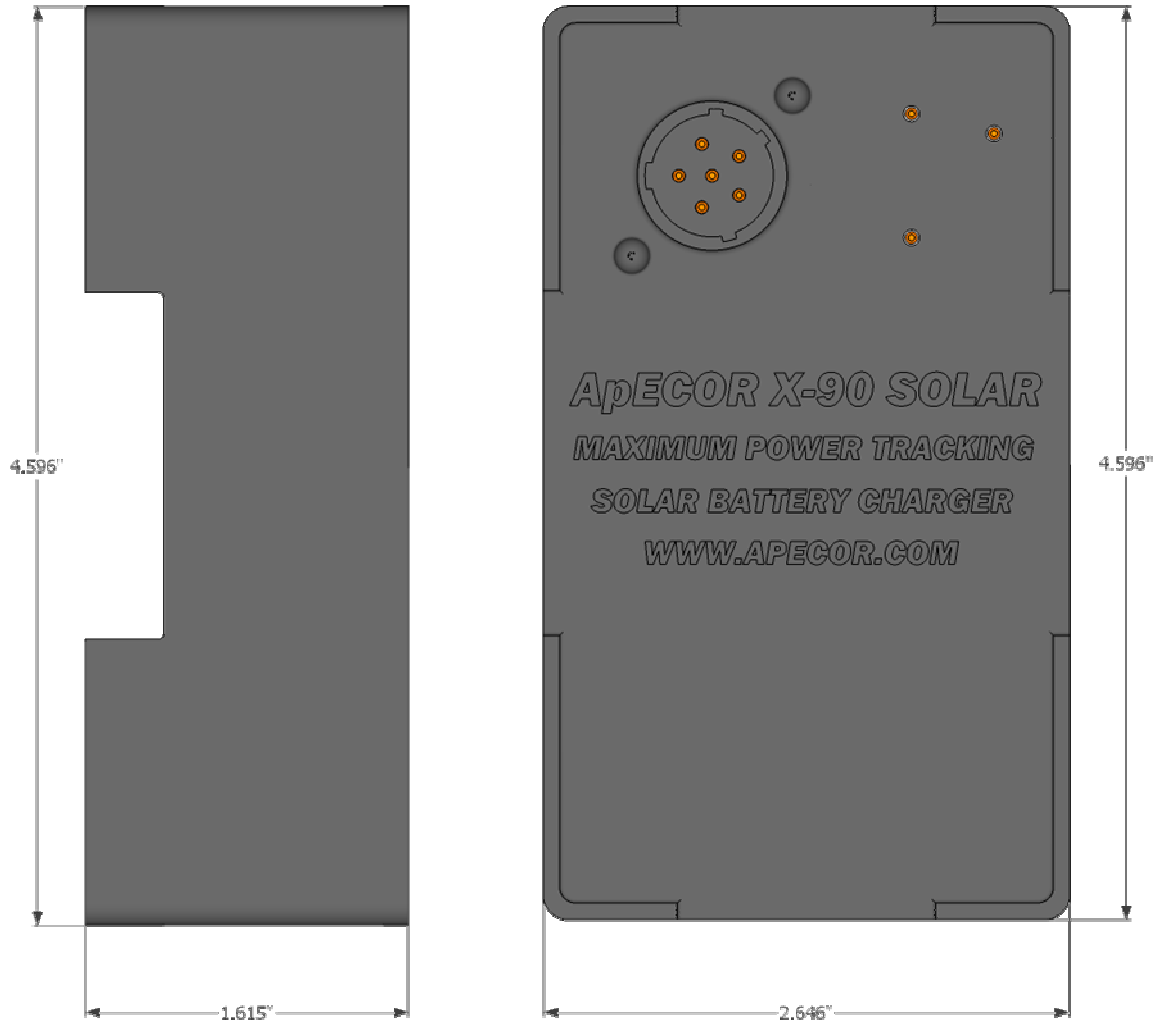


Figure 1: X-90 Dimensions (without cap)

Application Example

Figure 2: X-90 charging a Bren-Tronics BB2590/U using the Global Solar P3-62W/24V panel

Recommended Solar Panels

Use only “12V” or “24V” PV Arrays

Global Solar Energy, Inc.

- P3 - 62W/12V, P3 - 62W/24V
- P3 - 48W/12V, P3 - 48W/24V (Can use 2 in parallel with “Y” connector, for maximum charge speed)

Recommended Batteries

Mathews Associates, Inc.

- BB-2590/U, BB-390A/U, BB-590/U,

Bren-Tronics

- BB-2590/U, BB-390B/U, BB-590/U

Patco Electroncis, Inc.

- BB-2590/U

UltraLife Batteries

- UBBL02 (UBI-2590), UBBL10 (UBI-2590 SMBus)