samlexsolar®

A Division of Samlex America Inc.

SunCharger Portable Solar Panel

Models:
SC-05
SC-10

Owner's Manual

Please read this manual BEFORE operating the units.

OWNER'S MANUAL | Index

SECTION 1 | Safety Instructions

1.1 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR MODELS SC-05 AND SC-10 THAT SHALL BE FOLLOWED DURING INSTALLATION & MAINTENANCE.

THE FOLLOWING SYMBOLS WILL BE USED IN THIS MANUAL TO HIGHLIGHT SAFETY AND IMPORTANT INFORMATION:

WARNING!

Indicates possibility of physical harm to the user in case of non-compliance.

MISE EN GARDE!
Il y a une possibilité de faire du mal physique à l'utilisateur si les consignes de sécurités sont pas suivies

CAUTION!

Indique possibilité d'endommager le panneau solaire en cas de non-conformité.

ATTENTION!
Il y a une risque de faire des dégâts à l'équipement si l'utilisateur ne suit pas les instructions

INFO

Indicates useful supplemental information.

Please read these instructions BEFORE installing or operating the solar panel to prevent personal injury or damage to the solar panel.

WARNING!  **CAUTION!**

1. **WARNING!** To reduce risk of explosion, do not install in machinery space or in area in which ignition-protected equipment is required to be used.

2. **WARNING!** Observe the following when working with Lead Acid Batteries.
   - Batteries contain very corrosive diluted Sulphuric Acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes or clothing. Wear eye protection.
   - Batteries generate Hydrogen and Oxygen during charging resulting in evolution of explosive gas mixture. Care should be taken to ventilate the battery area and follow the battery manufacturer's recommendations.
   - Never smoke or allow a spark or flame near the batteries.
   - Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion. Always use insulated tools.

- Remove metal items like rings, bracelets and watches when working with batteries. Batteries can produce a short circuit current high enough to weld a ring or the like to metal and thus cause a severe burn.
- If you need to remove a battery, always remove the Ground terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.

3. **CAUTION!** Bare bullet type of terminal on the SAE Adapters (5, in Figs 2.3 and 2.4) will be carrying +12 VDC battery voltage when the Adapter is connected to the 12V battery. If this bare 12V live terminal touches the Negative terminal of the battery or any metal portion of the vehicle chassis (metal portion of vehicle chassis is connected to the battery Negative), direct short circuiting of the battery will occur and the fuse inside the Adapters will blow. Hence, ensure that the bare bullet type of terminal remains covered and insulated all the time with the help of the Protection Cover (6 in Figs 2.3 and 2.4). The Protection Cover should be removed only when the SAE Connector is mated with the SAE Connector on the solar panel wiring (4 in Figs 2.1 and 2.2).

4. **CAUTION!** Do not flex or bend the panel as this could cause damage to the PVC cells and the encapsulation layers.

5. **CAUTION!** Do not attempt to charge non-rechargeable batteries on the battery specifications. This SunCharger is meant only for 12V rechargeable Lead Acid batteries.

1. **MISE EN GARDE!** *Pour réduire le risque d'explosion, ne pas installer dans des machines ou dans la zone dans laquelle l'inflammation, l'équipement de protection est obligatoire.*

2. **MISE EN GARDE!** *Observer les points suivants lorsque vous travaillez avec des batteries plomb-acide.*
   - *Les batteries contiennent de très corrosif de l'acide sulfurique dilué comme électrolyte. Des précautions doivent être prises pour empêcher tout contact avec la peau, les yeux ou les vêtements. Porter des lunettes de protection.*
   - *Les batteries génèrent de l'hydrogène et de l'oxygène pendant la charge, ce qui entraîne l'évolution du mélange gazeux explosif. Des précautions doivent être prises pour ventiler la zone de la batterie et suivre les recommandations du fabricant de la batterie.*
   - *Ne jamais fumer ou permettre qu'une étincelle ou une flamme à proximité des batteries.*
   - *Procédez avec précaution pour réduire le risque de chute d'un outil métallique sur la batterie. Il pourrait déclencher ou court-circuit de la batterie ou d'autres pièces électriques et pourraient provoquer une explosion. Toujours utiliser des outils isolés.*
   - *Retirer les objets métalliques tels que bagues, bracelets et montres lors de travaux avec des batteries. Les batteries peuvent produire un courant de court-circuit suffisamment haut pour souder un anneau ou similaires à metal et donc provoquer des brûlures sévères.*
   - *Si vous avez besoin de retirer la batterie, retirez toujours la borne de masse de la batterie en premier. S'assurer que tous les accessoires sont off afin de ne pas provoquer une étincelle.*

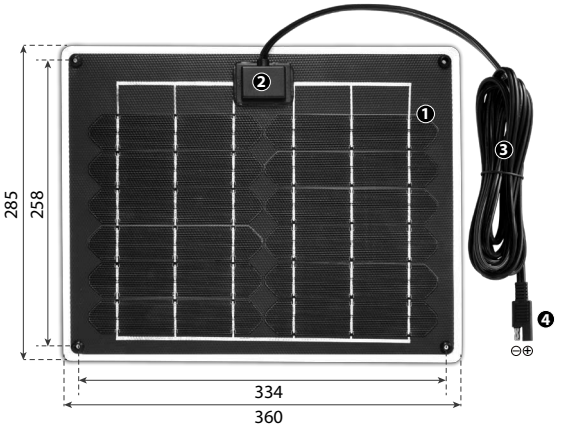
3. **ATTENTION!** *Le type de borne à nu sur les adaptateurs SAE (5, sur les figures 2.3 et 2.4) transportera une tension de batterie de +12 VCC lorsque l'adaptateur est connecté à la batterie 12V. Si ce terminal nu 12V live touche la borne négative de la pile ou une partie métallique du châssis du véhicule (partie métallique du châssis du véhicule est connecté à la borne négative de la batterie), court-circuit direct de la batterie va se produire et le fusible à l'intérieur de l'adaptateur. Par conséquent, s'assurer que le type de terminal bullet nu reste couvert et isolé tout le temps avec l'aide de la couvercle de protection (6 Figures 2.3 et 2.4). Le couvercle de protection doit être retiré uniquement lorsque le connecteur SAE est accouplé avec le connecteur SAE sur le câblage du panneau solaire (4 Figures 2.1 et 2.2).*

4. **ATTENTION!** *Ne pas plier ou tordre le groupe car cela pourrait causer des dommages aux cellules et le PVC l'encapsulation des couches.*

5. **ATTENTION!** *N'essayez pas de charger des piles non rechargeables sur les spécifications de la batterie. Cette SunCharger est destiné seulement pour 12V plomb-acide rechargeable batteries.*

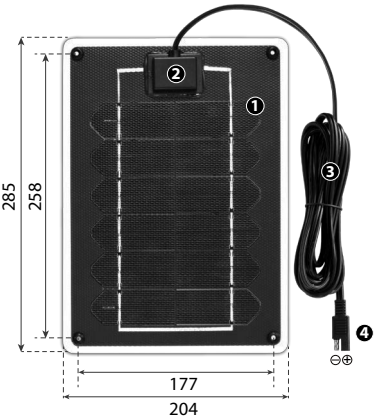
2. LAYOUT & DIMENSIONS

2.1 LAYOUT & DIMENSIONS OF PANELS



Dimensions are in mm
Overall Dimensions: 360 x 285 x 13.2

Fig 2.1 SC-10: Layout & Dimensions



Dimensions are in mm
Overall Dimensions: 285 x 204 x 13.2

Fig 2.2 SC-05: Layout & Dimensions

LEGEND for Fig 2.1 & 2.2

1. Solar cells - 24 cells in Series
2. Junction Box with internal Blocking Diode
3. Cable for battery connection: AWG#18, 10ft
4. SAE Connector: Bare male terminal is Negative. Female terminal is Positive.

2.2 LAYOUT & DIMENSIONS OF ADAPTERS

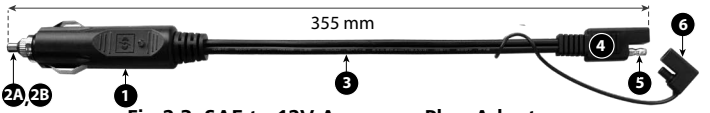


Fig 2.3 SAE to 12V Accessory Plug Adapter

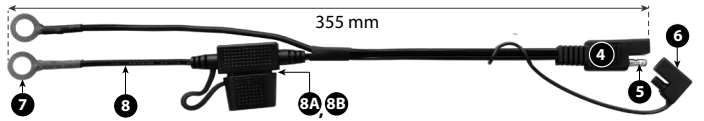


Fig 2.4 SAE to Ring Terminal Adapter

LEGEND for Fig 2.3 & 2.4

1. 12V Accessory Plug
2A. Positive tip of 12V Accessory Plug (Unscrew the tip to access the fuse)
2B. Fuse (inside the tip); 250V, 10A; 6.3mm x 30mm; Fast Blow; Glass
3. Wire, AWG#18
4. SAE Connector to mate with SAE Connector on the panel (4, Figs 2.1 & 2.2)
5. Bullet terminal (Positive)
6. Protection cover for SAE Terminal
7. Ring Terminals (for 5/6" Battery Stud)
8A. Fuse Holder for Mini Blade Fuse
8B. Mini Blade Fuse (10A, 32 VDC); Littel Fuse, 0297010 or equivalent

SECTION 3 | General Information

3.1 DESCRIPTION

SunChargers SC-05 and SC-10 are portable solar panels designed for float charging of 12V nominal rechargeable Lead Acid batteries like those used in cars, boats, RV's, motorcycles, All Terrain Vehicles (ATV) and Powered Water Crafts (PWC). These can also be used as DC power sources to charge small electronic devices like cell phones, iPods, iPhones, PDAs etc. The rechargeable batteries inside these small electronic devices are charged through their charging adapters.

The panel float charges the battery directly through built-in Blocking Diode (Forward Voltage Drop, Vf = 0.55V). External Charge Controller is not necessary (see Section 5.2)

3.2 SELF DISCHARGE AND TRICKLE CHARGING OF LEAD ACID BATTERIES UNDER STORAGE

3.2.1 Sulfation Due to Under Charging: A fully charged Lead Acid Battery comprises of (i) Positive Plates: Lead Dioxide, (ii) Negative Plates: Sponge Lead and (iii) Electrolyte: Mixture of 65% water and 35% Sulfuric Acid with Specific Gravity = 1.265 at 80°F. During discharging, electro-chemical reactions lead to: (i) At Positive Plates: Conversion of Lead Dioxide to soft Lead Sulfate crystals, (ii) At Negative Plates: Conversion of Sponge Lead to soft Lead Sulfate crystals and (iii) In Electrolyte: Conversion of portion of Sulfuric Acid to water leading to reduction in Specific Gravity (<1.1 for fully discharged condition). During re-charging, electrochemical reactions are reversed leading to: (i) At Positive Plates: Conversion of soft Lead Sulfate crystals to Lead Dioxide, (ii) At Negative Plates: Conversion of soft Lead Sulfate crystals to Sponge Lead and (iii) In Electrolyte: Conversion of portion of water to Sulfuric Acid leading to increase in Specific Gravity (1.265 for fully charged condition).

3.2.2 Effects of Sulfation: If Lead Acid battery remains undercharged over a long period of time, the soft Lead Sulfate crystals of the uncharged portion will get hardened and will be difficult to reconvert through normal charging (refer to Section 3.2.1 above regarding charging and discharging reactions). Further, these Lead Sulfate crystals are non-conducting and hence, introduce increased internal resistance in the battery. This increased internal resistance introduces internal voltage drop during charging and discharging. Internal voltage drop during charging results in overheating and undercharging and formation of more Lead Sulfate crystals. Internal voltage drop during discharging results in overheating of the battery and reduction in terminal voltage of the battery. Overall, this results in poor performance of the battery.

3.2.3 Self Discharge: Self discharge of Lead Acid Battery is the electrical Ampere Hour (Ah) capacity that is lost when the battery is not being charged and there is no load connected to it. i.e. sits idle in storage. Self-discharge is caused by electro-chemical processes within the battery and is equivalent to application of a small electrical load. For example, Lead Acid battery stored at 30°C / 86°F would self-discharge at around 1% of remaining capacity every day. Self-discharge increases with increase in temperature.

Self-discharge of the battery under long term storage will create condition equivalent to under charging and consequently, lead to sulfation as explained at Sections 3.2.1 and 3.2.2 above. To prevent this, the battery should be "Float Charged" as explained in Section 2.2.4.

3.2.4 Float Charging of Batteries under Long Term Storage: In order to prevent sulfation due to under charging as a result of self-discharge, Lead Acid battery under long term storage should be first fully charged and then left under continuous charge using a suitable "Float Charger" that will Float Charge the battery and provide low value of "Float Charge Current" of around 0.1% of the Ah capacity of the battery to compensate for self discharge. SC-05 and SC-10 SunCharger Solar Panels are designed to provide this "Float Charge Current" and thus, prevent sulfation. Please refer to Section 5.2 for more details.

CAUTION!

As explained at Section 3.3, "Float Charger" like SC-05 / SC-10 is designed to provide low current > 0.1% of the Ah capacity of the battery to maintain a fully charged battery under storage. This low current is designed to compensate for the self-discharge under storage. This low value of current will NOT be able to recharge a discharged battery. For re-charging of deeply discharged battery, a standard higher capacity, 3 or 4 Stage Charger should be used.

ATTENTION!

Comme expliqué à la Section 3.3, "flotter" Chargeur comme SC-05 / SC-10 est conçu pour fournir un courant faible > ; 0,1 % de la capacité de la batterie Ah pour maintenir une batterie complètement chargée en vertu de l'entreposage. Cette faible consommation est destiné à compenser l'auto-décharge en vertu de l'entreposage. Cette faible valeur du courant ne sera pas en mesure de recharger une batterie déchargée. Pour changer l'état de la batterie complètement déchargée, une plus grande capacité standard, 3 ou 4 Chargeur étape devrait être utilisé.

3.3 FEATURES

- Efficient Design and Superior Quality
  - Efficient mono-crystalline PV cells – 24 cells in series with Open Circuit Voltage V_{OC} of 15.3V
  - Direct float charging - additional Charge Controller is not required. Lower V_{OC} of 15.3V prevents over charging.
  - A Blocking Diode is built-in, thus preventing current from flowing back from the battery to the solar panel in darkness. Hence, the panels can be connected directly to the battery without using an external Blocking Diode. Forward Voltage Drop V_f of the Blocking Diode = 0.55V.
  - Top layer of clear, UV resistant Fluoropolymer material provides good light transmission and self healing of slight abrasions.
  - Sealed junction box (houses the Blocking Diode) has 10ft of UL listed, sunlight resistant output cable terminated with SAE Connector. 2 Adapter Cable Sets with SAE to Ring Terminals / 12V Accessory Plug have also been provided for convenient battery connection.
  - 12V batteries can be float charged directly without use of a Charge Controller.
  - Weatherproof - includes UV protection and protection from weather effects of -40°C to +85°C (-40°F to +185°F).

- Easy Installation
  - Slim-line and lightweight – No metal frame
  - 4 grommet finished holes in the 4 corners for fixing the panel
  - Output cable comes with SAE Connector. 2 Adapter Cable sets with SAE to Ring Terminals / 12V Accessory Plug have also been provided for convenient battery connection.

3.4 APPLICATIONS

These chargers can be used for the following:

- To float charge fully charged 12 VDC Lead Acid batteries during long term storage
- To compensate for battery drain due to low currents drawn by small instrumentation in vehicles. Electronics such as clocks, vehicle alarms etc add to the drain of the battery, even when the ignition is off.
- To charge small electronic devices like cell phones, iPods, iPhones, PDAs etc. These devices come with associated charging adapters that allow charging of their batteries through a 12 VDC power source. These charging adapters come with a 12V Accessory Plug for connecting to a DC power source through a 12V Power Outlet. As the Sun Charger comes with an Adapter Cable Set with a 12V Accessory Plug, a suitable adapter will be required to convert the 12V Accessory Plug of the SunCharger to a 12V Power Outlet (this adapter is not provided with the SunCharger).

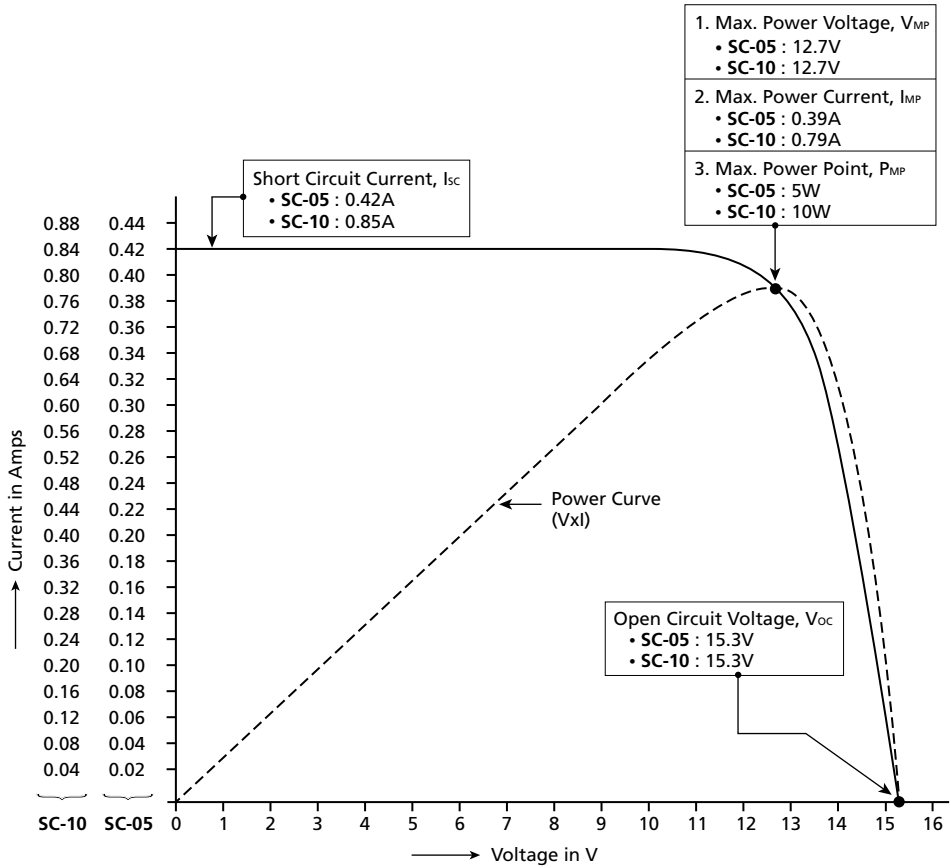
INFO

The 5W, SC-05 and 10W SC-10 panels are not large enough to power laptop computers.

SECTION 4 | Principles of Operation

4.1 ELECTRICAL OPERATING PARAMETERS OF SC-05 AND SC-10 PANELS

A solar panel can be considered as a current limited source of electrical power with a current (I) versus Voltage (V) relationship provided in I-V Curve. I-V Curves for SC-05 and SC-10 are shown in Fig 4.1 (NOTE: These panels have internal Blocking Diode with Forward Voltage Drop "V_f" = 0.55V when conducting).



NOTES: 1. Voltages shown are panel voltages measured before the Blocking Diode
2. Blocking Diode has Forward Voltage Drop "V_f" = 0.55V when conducting
3. When connected to battery, Panel Voltage = Battery Voltage + "V" of Blocking Diode
4. Open Circuit Voltage = Panel Voltage
5. Voltages shown are at Panel Temperature = 25°C. Apply Temperature Coefficient of Voltage = 0.29% per °C for other temperatures.

Fig 4.1 I-V Curves: SunChargers SC-05, SC-10

When exposed to the sun and without any load connected, the solar panels will generate an Open Circuit Voltage (**Voc**). As soon as a load is connected to the panel, the voltage at the load will drop and the value of the voltage at the load will be determined by the current (**I**) drawn by the load. Please note that at the Open Circuit Voltage Voc, the output current (**I**) is zero.

Electrical power (**P**) in Watts fed to the load = Voltage (**V**) X Current (**I**).

If the output of the panel is short circuited, the output current will be limited to the maximum current that the panel can provide. This Short Circuit Current is designated as **Isc**.

The maximum power **Pmp** is fed to the load when the operating point is near the knee of the curve as shown. At this operating point for maximum power output, the voltage is designated as **Vmp** and the current is designated as **Imp**.

Please note that for the portion of the curve between **Voc** to **Vmp**, the current drops at a faster rate. After that, the current is almost constant and equal to the Short Circuit Current **Isc**.

4.2 FACTORS AFFECTING VOLTAGE AND CURRENT OUTPUT OF A SOLAR PANEL

The following factors affect the voltage and current of a solar panel:

- The output voltage is not affected very much by the light conditions - under shaded / cloudy condition, the output voltage will not vary very much as compared to bright sunshine
- The output current is very sensitive to the intensity of light and will drop considerably under shaded or cloudy conditions
- Variation in temperature has a sizable effect on the output voltage – a Negative Voltage Temperature Coefficient results in increase in the voltage at lower temperature and decrease in the voltage at higher temperature. For SC-05 and SC-10, the Voltage Temperature Coefficient is -0.29% per ºC.
- Variation in temperature has negligible effect on the current output. Current Temperature Coefficient of SC-05 and SC-10 is +0.05% per ºC.
- The output current can increase by 25 % due to what is known as the "Edge of the Cloud Effect". As the sun moves between a hole in the clouds, the solar panel will see the full direct sunlight combined with the reflected sunlight from the clouds

4.3 BATTERY CHARGING USING A SOLAR PANEL DIRECTLY CONNECTED TO THE BATTERY

Refer to the I-V Curves of the panels at Fig 4.1.

When a battery is directly connected to the solar panel (without external Charge Controller), the voltage of the loaded panel will be equal to the initial battery voltage. At this point, the charging current (**I**) will be equal to the corresponding value of the initial battery voltage on the I-V Curve (Fig 4.1).

The current (**I**) fed from the panel will start charging the battery and the battery voltage will start rising. As the battery is always connected to the panel, the panel voltage will be the same as the battery voltage. It will be seen from the I-V curve (Fig 4.1) that as the battery voltage rises, the charging current will start reducing.

SECTION 4 | Principles of Operation

When a battery is fully charged, it will not require any further current for charging except the very low Float Charge Current of around 0.1% of the Ampere Hour (Ah) capacity of the battery. If a charging current higher than the self discharge current is continued to be fed to a fully charged battery, it will lead to damage to the battery due to overcharging resulting in overheating and loss of water due to excessive electrolysis (conversion of water to Oxygen and Hydrogen). In these panels, overcharging is prevented by limiting the maximum charging voltage to around 13.8 ± 0.5V at Float Current of around 0.1% of Ah capacity of the battery.

4.4 CHARGING A BATTERY BY A SOLAR PANEL USING A CHARGE CONTROLLER

For full scale charging of a battery from a solar panel, the output of the solar panel is required to be fed to the battery through a Charge Controller. The Charge Controller transforms the input power from the solar panel to regulated voltage and current necessary to safely charge the battery as per the required charging algorithm e.g. 2/3/4 Stage Charging Algorithm.

SECTION 5 | Installation & Operation

5.1 CONNECTING CABLES

5.1.1 The panel comes with 10 ft., AWG #18 cable (3, Figs 2.1 / 2.2) with SAE Connector (4, Figs 2.1/2.2). The following Adapter Cable Sets have been provided for battery connection:

a) SAE to 12V Accessory Plug Adapter (Fig 2.3)
b) SAE to Ring Terminal Adapter (Fig 2.4)

CAUTION!

Bare bullet type of terminal on the SAE Adapters (5 in Figs 2.3 and 2.4) will be carrying +12VDC battery voltage when the Adapter is connected to the 12V battery. If this bare 12V live terminal touches the Negative terminal of the battery or any metal portion of the vehicle chassis (metal portion of vehicle chassis is connected to the battery Negative), direct short circuiting of the battery will occur and the 10A Fuse inside the Adapter will blow. Hence, ensure that the bare bullet type of terminal remains covered and insulated all the time with the help of the Protection Cover (6 in Figs 2.3 and 2.4). The Protection Cover should be removed only when the SAE Connector is mated with the SAE Connector on the solar panel wiring (4 in Figs 2.1 and 2.2).

ATTENTION!

Bullet nu type de terminal sur l'adaptateurs SAE (5 Figures 2.3 et 2.4) fera l'alimentation +12 VCC Tension de batterie quand l'adaptateur est connecté à la batterie de 12 V. Si ce terminal nu 12V live touche la borne négative de la pile ou une partie métallique du châssis du véhicule (partie métallique du châssis du véhicule est connecté à la borne négative de la batterie), court-circuit direct de la batterie va se produire et le fusible 10A à l'intérieur de la carte va souffler. Par conséquent, s'assurer que le type de terminal bullet nu reste couvert et isolé tout le temps avec l'aide de la couvercle de protection (6 Figures 2.3 et 2.4). Le couvercle de protection doit être retiré uniquement lorsque le connecteur SAE est accouplé avec le connecteur SAE sur le câblage du panneau solaire (4 Figures 2.1 et 2.2).

5.2 CHARGING BATTERY FROM SOLAR PANEL DIRECTLY (WITHOUT USING CHARGE CONTROLLER)

Refer to the previous Section 3.2.4. SunChargers SC-05 and SC-10 are designed to float charge a "fully charged" 12V Lead Acid Battery under long term storage to compensate for self-discharge and thus, prevent sulfation due to under charging. For float charging Lead Acid Battery directly from a solar panel (Charge Controller is not used between the panel and the battery), the following considerations will be applicable:

a) A 3-Stage Charger should first be used to fully recharge the battery to be kept in long term storage. The battery will be fully recharged when the 3-Stage Charger enters Float Stage after completion of Bulk and Absorption Stages. Float Voltage of 12V Lead Acid Battery is normally 13.5 to 13.8VDC at 80°F / 26.7°C (Absorption and Float Voltages will require temperature compensation based on Voltage Temperature Coefficient of the battery which is around -24mV/°C for 12V battery). When in Float Stage, the battery will draw a very low current equal to around 0.1% of its Ampere Hour (Ah) Capacity at 80°F / 26.7°C to compensate for self-discharge (Self discharge increases with increase in battery temperature).

b) The Float Voltage of 12V battery at 80°F / 26.7°C should not exceed 13.4 to 13.8V. Higher Float Voltage will cause over-charging leading to boiling / over-heating /loss of water / damage to the battery

c) After the battery has been fully recharged, direct Solar Trickle Charger like SunCharger SC-05 / SC-10 should be used based on the following I-V Characteristics of the panel (Fig 4.1):

   i. The I-V Curve characteristics should be such that the panel voltage corresponding to the Float Stage Current of the battery (0.1% of Ah capacity of the battery at 80°F / 26.7°C) should be within the range of 13.5 to 13.8 VDC to prevent over-charging as described at (i) above.

   ii. The I-V Curve Characteristic should be such that for panel voltage of 13.4 to 13.8V, the panel current should be around 0.1% of its Ampere Hour (Ah) Capacity of the battery at 80°F / 26.7°C to compensate for self-discharge.

INFO

1. Specifications of the panel given in Section 6 are based on the Standard Test Condition (STC). The overall performance of the Solar Panel is dependent on a variety of conditions including season, orientation with direct sunlight, cloudy conditions, temperature, and shadowing. As a result, specified performance parameters will be affected by the above operating condition.

2. For safety against excessively high short circuit current flow from the battery to a short circuit in the cabling / panel itself, the following fuses have been provided:

- 10A Fuse in the tip of the 12V Accessory Plug provided with the SAE to 12V Accessory Plug Adapter Cable Set (Fig 2.3)
- 10A Fuse provided with SAE to Ring Terminal Adapter Cable Set (Fig 2.4)

5.3 PLACEMENT OF THE PANEL

- Securely place the solar panel facing the sun. Maximum power is generated when the top surface of the panel is oriented perpendicular to the sun. Hence, tilt the panel in such a way that it will be perpendicular to the strong midday sun, between 10 a.m. and 2 p.m. This will change with the seasons. In spring and in fall, a tilt between 40 and 45 degrees from the ground will suffice for most North American locations. A little less in the summer (about 20 - 30 degrees) and a little more in the winter (about 60 - 70 degrees from the ground).
- Use the 4 grommet finished holes in the corners for fixing the panel in the appropriate orientation
- Make sure that the panel is not shaded by shadows
- When using the panel in a vehicle, the panel may be placed on the dashboard and facing the sun as explained above

5.4 FLOAT CHARGING THE VEHICLE BATTERY THROUGH VEHICLE'S ON-BOARD 12V POWER OUTLET

When using the solar panel inside a vehicle, connect the 12V Accessory Plug provided with the Adapter Cable Set (1, Fig 2.3) to the 12V Power Outlet in the vehicle. Make sure that the plug is pushed in completely.

CAUTION!

In some vehicles, the 12V Power Outlet gets connected to the vehicle's starter battery only when the Ignition Switch is turned to the Accessories (ACC) position. In this case, the Ignition Switch will have to be turned to the Accessories (ACC) Position to enable trickle charging of the battery.

Please note that when the Ignition Switch is turned to the Accessories (ACC) position, power is available to the built-in accessories like radio, CD / DVD Player etc. Hence, please ensure that all these accessories are switched off to prevent drainage of the battery.

ATTENTION!

Dans certains véhicules, la prise de courant de 12 V n'est branchée à la batterie de démarrage du véhicule que lorsque le contacteur d'allumage est tourné en position ACC (ACC). Dans ce cas, le commutateur d'allumage devra être tourné à la position ACC (accessoires) pour permettre à la charge de la batterie.

Veuillez noter que lorsque le contact est mis à l'accessoires (ACC), l'alimentation est disponible pour les accessoires comme la radio, lecteur CD / DVD, etc. Par conséquent, veuillez vous assurer que tous les accessoires sont éteints pour prévenir le drainage de la batterie.

5.5 FLOAT CHARGING AN EXTERNAL BATTERY

When NOT used inside a vehicle, connection to the battery can be made using one of the following methods:

- Use SAE to Ring Terminal Adapter Cable Set (Fig 2.4). Then connect the Battery Ring Terminals to the battery ensuring correct polarity by matching the red tagged terminal which is Positive (+) to the Positive (+) terminal on the battery. Connect the black tagged Ring Terminal which is Negative (-) to the Negative (-) Terminal on the battery.

5.6 DIRECTLY POWERING SMALL ELECTRONICS DEVICES LIKE CELL PHONES, IPODS, IPHONES, PDAS, ETC.

Please use the following method for directly powering small electronics devices like cell phones, iPods, iPhones, PDAs etc. (As mentioned earlier, laptop computers are not included as the 5W, SC-05 and 10W, SC-10 solar panels are not large enough to power laptop computers):

- Use separate Adapter Cable (not provided) that has 12V Power Outlet on both the ends. Plug the 12V Accessory Plug of the solar panel (1, Fig 2.3) to the 12V Power Outlet of the Adapter Cable. Then connect the electronic device to the other 12V Power Outlet of the Adapter Cable.

SECTION 6 | Specifications

Model No.	SC-05	SC-10
Type of Cells	Monocrystalline	Monocrystalline
No. of Cells	24	24
Cell Size	78.0 x 14.8 mm	156.0 x 14.8 mm
Nominal Rated Power	5W ± 3%	10W ± 3%
Open Circuit Voltage, Voc	15.3 VDC	15.3 VDC
Maximum Power Voltage, V_{MP}	12.7 VDC	12.7 VDC
Short Circuit Current, I_{SC}	0.42 A	0.85 A
Maximum Power Current, I_{MP}	0.39 A	0.79 A
Cell Conversion Efficiency	18.43%	18.43%
Module Conversion Efficiency	8.60%	9.74%
Maximum System Voltage	600 VDC	600 VDC
Voltage Temperature Coefficient	-0.29% / °C	-0.29% / °C
Current Temperature Coefficient	+0.05% / °C	+0.05% / °C
Power Temperature Coefficient	-0.39% / °C	-0.39% / °C
Blocking Diode	30V, 1A, Vf = 0.55V	
Connecting Cable	• 10 ft, AWG #18, 105°C, 300V • 2-pin SAE Connector (Bare bullet is Negative)	
Operating Temperature	-40°C to +85°C / -40°F to +185°F	
Dimensions (Width x Height x Thickness)	204 x 285 x 13.2 mm; 8.03 x 11.22 x 0.52 in	360 x 285 x 13.2 mm; 14.11 x 11.22 x 0.52 in
Weights	0.44 Kg / 0.8 lb.	0.55 Kg / 1.2 lb.
Accessories Supplied	1. Adapter Cable Set for SAE to 12V Accessory Plug • 1 ft, AWG#18 cable • Mating 2-Pin SAE Connector (Bare bullet is Positive) for solar panel end and 12V Accessory Plug on the battery end • Fuse rating of fuse in the tip of the 12V Accessory Plug: 10A; 250V; 6.3 x 30 mm 2. Adapter Cable Set for SAE to Ring Terminals • 1 ft, AWG#18 cable • Mating 2-Pin SAE Connector (Bare bullet is Positive) for solar panel end and 2 Ring Terminals (for 5/16" stud) for battery end • Fuse Holder & Fuse near battery end: Fuse - Mini Blade, 32V/10A	

NOTES: 1. Specifications are at Standard Test Conditions (STC):
- Irradiance 1000W
- Module Temperature ..... +25°C
- AM 1.5

2. Specifications are subject to change without notice.

SECTION 7 | Warranty

2 YEAR LIMITED WARRANTY

SC-05 and SC-10 manufactured by Samlex America, Inc. (the "Warrantor") are warranted to be free from defects in workmanship and materials under normal use and service. The warranty period is 2 years for the United States and Canada, and is in effect from the date of purchase by the user (the "Purchaser").

Warranty outside of the United States and Canada is limited to 6 months. For a warranty claim, the Purchaser should contact the place of purchase to obtain a Return Authorization Number.

The defective part or unit should be returned at the Purchaser's expense to the authorized location. A written statement describing the nature of the defect, the date of purchase, the place of purchase, and the Purchaser's name, address and telephone number should also be included.

If upon the Warrantor's examination, the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense. (Contiguous US and Canada only).

No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. Warranty service shall be performed only by the Warrantor. Any attempt to remedy the defect by anyone other than the Warrantor shall render this warranty void. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion.

No other express warranty is hereby given and there are no warranties which extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.

There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any persons, or damage to person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof. The Warrantor assumes no liability for incidental or consequential damages of any kind.

Samlex America Inc. (the "Warrantor")

www.samlexamerica.com

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11023-SC-05-10-0618