Solar Home System

User Manual

This manual aims at explaining the function, installation and using method, maintenance of the 50 W solar systems. In order to connect all the parts of the system safely, such as: Solar module, power box, battery, charge controller and DC saving fluorescent lamp etc. Please read and understand this manual detailedly and then start installing. Moreover, while installing, users must install gradually according to the description of the manual strictly.

1. Safety Instructions

1.1 Refer installation and servicing to qualified service personnel. High voltage is present inside unit. Incorrect installation or use may result in risk of electric shock or fire. No user serviceable parts in this unit.

1.2 Remove all sources of power, photovoltaic and battery before servicing or installing.

1.3 WARNING - RISK OF EXPLOSIVE GASES

a) Working in the vicinity of lead-acid batteries is dangerous. Batteries produce explosive gasses during normal battery operation.
b) To reduce risk of battery explosion, follow these instructions and those published by battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery.

1.4 PERSONAL PRECAUTIONS

a) Someone should be within range of your voice or close enough to come to your aid when you work near a lead acid battery.
b) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
c) Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.
d) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.
e) NEVER smoke or allow a spark or flame in vicinity of battery.
f) Be extra cautious to reduce risk of dropping metal tool onto battery. It might spark or short circuit battery or other electrical part that may cause explosion.
g) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short circuit current high enough to weld a ring or the like to metal, causing a severe burn.

1.5 PREPARING TO CHARGE

a) Never charge a frozen battery.

b) Be sure battery is mounted in a well ventilated compartment.

1.6 CHARGER LOCATION & INSTALLATION

a) Controller employs components that tend to produce arcs or sparks. NEVER install in battery compartment or in the presence of explosive gases.

b) Protect all wiring from physical damage, vibration and excessive heat.

c) Insure that the controller is properly setup for the battery being charged.

d) Do not expose controller to rain or snow.

e) Insure all terminating connections are clean and tight to prevent arcing and overheating.

f) Charging system must be properly installed as described in these instructions prior to operation.

g) Do not connect to a PV array capable of producing greater than 24 amps of short circuit current @ 25 °C.

1.7 Use the scope

This SHS050 is applicable to the family usually power supply, such as the saving lamp, the direct current radio the small power of etc. solar cell outside, other equipments(such as: Power box, battery) under the condition of have no protection measure, can install only indoors.

2. Specifications

2.1 General Specifications

Product name: FS-SHS50W

Product Description: Solar Home System

Products list of the solar home system

Item	Name	specification	QTY
1	Solar Module (50Wp±5%)	18V,50Wp	1
2	Solar Panel Mounting Frame (Pole)	2.5m	1
3	Battery (Sealed Lead Acid)	12V/65Ah	1
4	Battery and Power supply box	430*220*320mm	1
5	Charge Controller for Solar PV	12V/6A	1
6	Compact Fluorescent Lamps (CFL)	12V/11W	1
7	Cable of Lamp	5m*2.5mm2	1
8	Cable of solar module	15m*2.5mm2	1
9	User Manual		1

2.2 Solar Charge Controller CA06-2

Please read the charge controller manual carefully taking special note of the safety and Usage recommendations at the end. The manual gives important recommendations for installing, using and programming as well as a troubleshooting guide for potential problems with the controller.

WARNING :Do not use over 72W loads forever.

It is a new CA controller; you will own a state-of-the art device which was developed according to the latest available technical standards. It comes with a number of outstanding features, such as:

- 3 LEDs for a clear, readable display of the state of charge
- 16 mm^2 connector clamps
- Temperature compensation
- Electronic protection without fuses

This manual gives important recommendations for installing, using and configuration as well as remedies in case of problems with the controller. Read it carefully in your own interest. Please take note of the safety and usage recommendations at the end of this manual.

Description of Functions

- The charge controller protects the battery from being overcharged by the solar array and from being deeply discharged by the loads. The charging takes place through multiple stages which include automatic adaptation to the ambient temperature for optimal charging of the battery.
- The controller is intended for use at 12 V system voltages.
- The charge controller has a number of safety and display functions.

Mounting and Connecting

The controller is intended for indoor use only. Protect it from direct sunlight and place it in a dry environment. Never install it in humid rooms (like bathrooms).

The controller measures the ambient temperature to determine the charging voltage. Controller and battery must be installed in the same room.

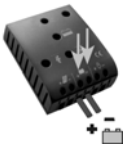
The controller warms up during operation, and should therefore be installed on a non flammable surface only.

REMARK: Connect the controller by following the steps described below to avoid installation faults.

When mounting the controller with screws, make sure to use screws that suit the attachment material (use screws with 4 mm shaft and max. 8 mm head diameter, no counter sunk). Keep in mind that the screws also have to carry the force applied by the wiring.

Make sure that the ventilator slits on the sides are unobstructed.

A DIN Rail mounting plate is available as an accessory (CX-DR2). This allows mounting the controller on a standard 35mm DIN rail. Place the controller on the mounting plate, and use the screws supplied with the mounting plate to fix it to the controller.



Connect the wires leading to the battery with correct polarity. To avoid any voltage on the wires, first connect the controller, then the battery. Keep in mind the recommended wire length (min. 30 to max approx. 100 cm) and the wire size:
CA06-2: min. 2.5 mm^2

WARNING: If the battery is connected with reverse polarity, the charge controller will also give the wrong polarity on the load terminals. Never connect loads in this situation!

Connect the wires leading to the solar array with correct polarity. To avoid any voltage on the wires, first connect the controller, then the solar array. Keep in mind the recommended wire size:
CA06-2: min. 2.5 mm^2

REMARK: place positive and negative wires leading to the solar generator close to each other to minimize electromagnetic effects.

Connect the wires leading to the loads with correct polarity. To avoid any voltage on the wires, first connect the wire to the load, then to the controller. Keep in mind the recommended wire size:
CA06-2: min. 2.5 mm^2

Starting up the Controller

System Voltage

The controller is intended for use at 12 V system voltage.

Battery Type

The controller does not generate an equalization charge, and is therefore suitable for use with lead acid batteries with liquid electrolyte (vented battery) and lead acid batteries with solid electrolyte ('gel' or 'fleece' type).

Recommendations for Use

The controller warms up slightly during normal operation.

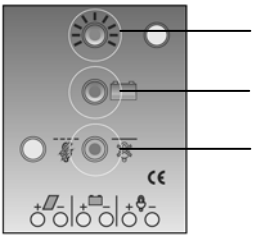
The controller does not need any maintenance or service. Remove dust with a dry tissue.

It is important that the battery gets fully charged frequently (at least monthly). Otherwise the battery will be permanently damaged.

A battery can only be fully charged if not too much energy is drawn during charging. Keep that in mind, especially if you install additional loads.

Display Functions in normal operation

The controller is equipped with 3 LEDs for display of the operating status.



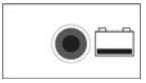
In normal operation mode, the controller displays the charging status, the status of battery voltage and the status of the load output.

Charge display

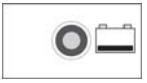
Solar array does not supply electricity
(LED off)

Solar array does supply electricity
(LED on)

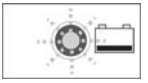
Battery voltage display



Battery voltage>12V
(LED off)



Battery voltage<12V
(LED on)

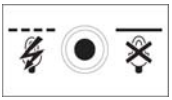


Battery voltage<11.7V
(LED flashing)

When the battery voltage is indicated as low, it is recommended to use the remaining energy economically. The charge controller will subsequently switch off the load.

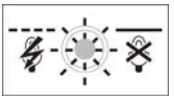
Load status display

In case of deep discharge or overload/short-circuit, the load output is switched off. This is indicated by:



Normal operation
(LED off)

Low voltage disconnect
(LED on)



Overload or Short-circuit of load (LED flashing)

Low Voltage Disconnect Function (LVD)

The controller is equipped with a low voltage disconnection function to protect the battery against a deep discharge: This function is controlled by the voltage, and automatically switches off the load output at a battery voltage lower than 11.5 V.

As soon as the battery reaches a voltage of 12.5V the load output is switched on again.

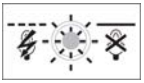
Safety Features

The controller is protected against wrong installation or use:

	At the solar terminal	**At the solar terminal**	**At the load terminal**
Battery connected with correct polarity	Unrestricted.	Normal operation	Unrestricted
Battery connected with wrong polarity	Unrestricted	Yes, if only the battery is connected.	Unrestricted
Reverse polarity	Unrestricted	Yes, if only the battery is connected.	Load output is protected. Loads might be damaged.
Short circuit	Unrestricted	Unrestricted **CAUTION:** Battery must be protected by fuse.	Unrestricted
Over current	No protection	--------	Controller switches off.
No connection	Unrestricted	Unrestricted	Unrestricted
Reverse Current	Unrestricted	--------	--------
Over voltage	Varistor 56 V, 2.3 J	Max. 30 V	No protection
Under voltage	Normal operation	Controller switches off load terminal.	Controller switches off load terminal.

WARNING: The combination of different error conditions may cause damage to the controller. Always remove an error before you continue connecting the controller!

Error Description

Error	Display	Reason	Remedy
Loads are not supplied		Battery is low (LED on)	Load will reconnect as soon as battery is recharged.
		Overcurrent/ Short circuit of loads (LED flashing)	Switch off all loads. Remove short circuit. Controller will switch on load automatically after max 1 minute.
Battery is empty again after a short time		Battery has low capacity (LED on)	Change battery
Battery is not being charged during the day		Solar array faulty or wrong polarity (LED off)	Remove faulty connection/reverse polarity

General Safety and Usage Recommendations

Intended Use

The charge controller is intended exclusively for use in photovoltaic systems with 12 V nominal voltage, and in conjunction with vented or sealed (VRLA) lead acid batteries only.

Safety Recommendations

- Batteries store a large amount of energy. Never short circuit a battery under any circumstances. We recommend connecting a fuse (slow acting type) directly to the battery.
- Batteries can produce flammable gases. Avoid making sparks, using fire or any naked flame under any circumstances. Make sure that the battery room is ventilated.
- Avoid touching or short circuiting wires or terminals. Be aware that the voltages on specific terminals or wires can be up to double the battery voltage. Use isolated tools, stand on dry ground and keep your hands dry.
- Keep children away from batteries and the charge controller.
- Please observe the safety recommendations of the battery manufacturer. If in doubt, consult your dealer or installer.

Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person,

Mounting and Connecting Mounting and Connecting

Nominal voltage	12 V
Boost voltage	14.5 V
Float voltage	13.7 V (25° C)
Load disconnect voltage	11.5 V voltage controlled (25° C)
Load reconnect voltage	12.5 V
Temperature compensation	-4 mV/cell*K
Max. solar panel current	CA06-2: 6 A at 50° C ambient temperature
Max. load current	CA06-2: 6 A at 50° C ambient temperature
Dimensions	81 x 100 x 37 mm (w x h x d)
Weight	180 grms
Max. wire size	16 mm^2 (AWG #6)

Nominal voltage	12 V
Self consumption	<4 mA
Ambient temperature range	-40 to + 50 ° C
Case protection	IP 22

2.3 Electrical Box

Model	FS-SHS50W
System Voltage	12V
Charge controller	12V、6A
Battery	12V、65Ah
Module Power	50Wp
PV Input	1
12VDC Output	3
9VDC Output	1
Switch	3

2.4 Solar Module

Solar module is a device that converts radio technology to DC electricity. Each module is made of 36 pieces cells. Normally, the design life of solar module is more than 20 years. We adopt FS-PV50W solar module in this system, the main parameter is as follows:

Standard condition: （AM1.5）Radiant intensity=1000W/m^2,Temperature=25℃			
Working Temperature	50℃	Peak power	50W±5%
Tem. coefficient of short circuit	2.0mA/℃	Open-circuit Voltage	21.6V±5%
Tem. coefficient of open circuit	-78mV/℃	Max Voltage	17.2V±5%
Filling gene	70%	Short circuit current	3.3A±5%
Windward pressure	2400Pa	Max current	2.9A±5%
Insulated Voltage	≥600V	Weight	6Kg
Installing aperture	Φ5.5	Exterior dimension	807×519×35

2.5 Battery

Battery is the energy storing device. The batteries we adopt is maintenance-free lead acid battery. The character is high reliability, long life and so on. In addition, the following is also its character:

Maintenance-free;

Wide working temperature（-35～45℃）;

Long using life;

Blast proof

Small inner resistance;

Small self discharging;

The main parameter is as follow

Model	Rated Voltage（V）	Capacity (Ah)	Dimension（mm）			Weight (Kg)
			Length	Width	Height	
12V65Ah	12	65.0	350	166	179	21

2.6 Cable

The function of cable is to connect all the parts of this system together. The working temperature of the cable is -20~+50℃. It includes:

Cable of PV Solar

Cable of Lamp

PV module to controller	2.5mm²	15m
Controller to battery	2.5mm²	0.35m
Controller to lamps	1.5mm²	5M

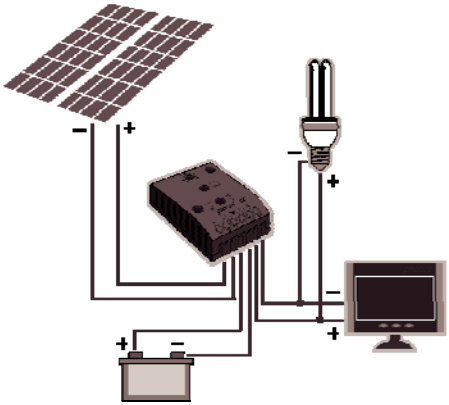
2.7 Energy-saving Lamp

Model	12V11W	
Rated Power	11W	
Rated Voltage	12V	
Rated Current	650mA	
Rated Lum	550Lm（50Lm/W）	

2.8 Bracket

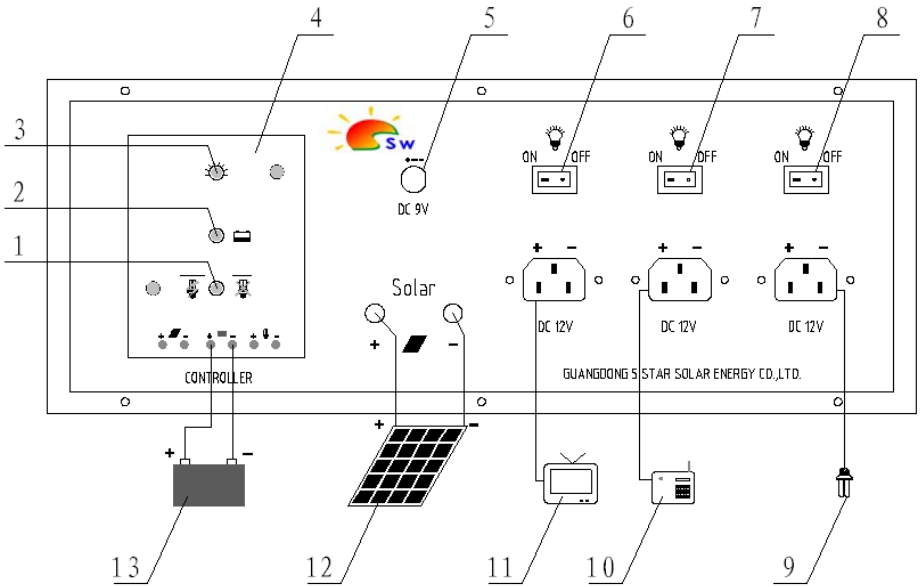
The function of bracket is supporting solar modules. It is made of galvanization steel tube which the diameter is 48mm.The thickness is 1.5mm, the length is 2.5m．Bracket includes tray and pole.

3. Principle of Operation



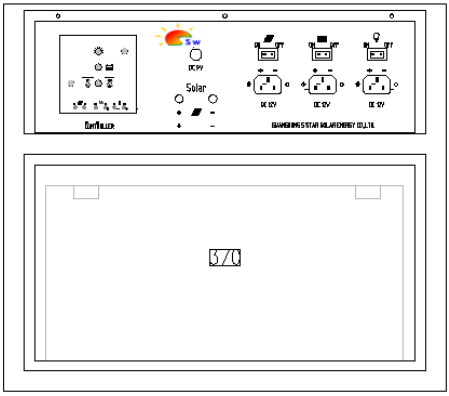
Exposing the solar module to sunlight directly, the solar module can transform the sunlight to
electricity and store it in the battery trough charge controller. The electricity then can be supplied to 12V loads, such as DC compact fluorescent lamp and DC TV, through controller.

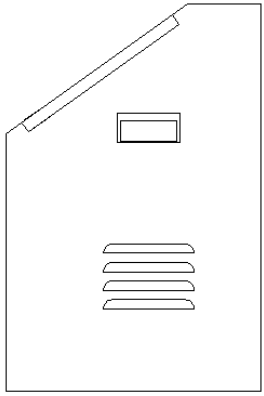
4. Diagram of PV Control



1. Load Status Indicator
2. Battery Status Indicator
3. Charging Indicator
4. Solar Charge Controller
5.9V Load Output
6.7.8. DC load Switch
9. Load - DC Compact Fluorescent Lamp
10. Load – DC VCD
11. Load - DC TV
12. Solar PV Panel
13. Battery

5. Specification of Electrical Box





6. Installation of SHS050

After disconnecting the packing, please read this manual carefully and operate the system according to the instruction. It is good for extending the life of equipment, especially the battery. At the same time,

it can also lessen some unnecessary loss.

6.1 Check the equipments and accessories

1) Check and amount all the accessories of FS-SHS50W to confirm whether they are all right. (Refer to the products list)
2) Whether all the accessories are in good condition. In the transportation there may be some broken components, If these components are used in the system, it may affect the system.

6.2 Installation and connection of system

6.2.1 Installation of bracket and solar panels

Bracket is made up of two parts: pole and tray.

Installing step:

1) Tamp the pole into the ground
2) Insert the tray on the top of pole and rivet it with screw.
3) Rivet the panel on the bracket with screw.

Attention:

● The azimuth angle of the bracket bottom should be just south. The obliquity of the solar module is 60° ;(in accordance with local latitude)
● Because of the heavy wind, each junction should be connected hard.
● It is not allowed to sustain other objects with the bracket. It is also not allowed to climb the bracket.

6.2.2 Placement of power box

Except for the special protector, it is not allowed to put the power box outside.

Attention:

● It is not allowed to put power box in the environment with combustible gas;
● Power box must be put in dry environment;
● It should be put far away from water;
● be sure that animals and children can not touch it;

● It should be taken and put slowly;
● In order to watch the condition of system, power box should be put in the place where is easy to watch;
● In order to connect other accessories (solar panels, battery, DC lamps, TV set and so on), power box should be put in a moderate position.
● Be more careful when install and transport the batteries.
● If the storage period of battery exceed 6 months, it should be charging maintained. The storing place should be dry, clean and ventilate.

6.2.3 Connect solar to power box

！Before connecting the cable, please confirm that the load switch of power box is located in “OFF/0N” position. ！It is strictly not allowed to connect positive and navigate of solar module in reverse;

！After connection, cable should be put in the place where is not easy to touch.

Please confirm the distance from solar bracket to power box. The length of cable is 15 meters. We use 2.5mm^2×15m cable to connect solar module to power box. First open the junction box at the back of solar module, and then insert it in the hole. After connected two cables, screw down the waterproof connection and cover the junction box.

Attention:

● While connecting, cover the solar module of put it in a poor light;
● There may be spark when connecting, users must be careful!
● Cable can be an aerial cable. If it is put under the ground, it should be put into a protecting cannula.

6.2.4 Connect load to the power box

At the faceplate of power box, there are three 12VDC lamps or DC TV output port and one 9VDC radiogram output port. Connect DC lamps or DC TV and radiogram to the corresponding socket. The length of cable is 6 meters, please consider best putting position.

After the above steps, the installation of SHS-50 has been finished.

7. Operating method of FS-SHS050

SHS-50 is the system which can be used easily. Power box is the core of the system. Because that charge controller, battery, switch and all the ports are installed in the box.

7.1 Charge for battery

After confirming the veracity of the system installation, connect the solar cable to the relevant socket on the power box, then it can charge for battery. At this time, the green LED indicator of charge controller is lightening. This cable can be connected with power box all the time.

8. Maintenance

The FS-SHS050 has no movable parts, not easy damage, it support also very simple, but periodical maintenance also is must of, otherwise may affect the normal usage, even shorten the service life.

8.1 When the solar PV module obliquity over 60 degrees, all dusts can be sweep by the rain water flush but, however compare in the sandstorm big and rarely seen region of rain water, should usually the clearance dust, keep the solar PV module surface of clean, in order to prevent the influence generates electricity the quantity. Sweep can wipe to the dust, had better flush with the clear water, and then wipe the stem with the clean dish cloth.

Attention:

Wipe to try with the causticity melting agent or hard things absolutely not to.

8.2 Periodically check the tight and solid degree of all gearing parts, in order to prevent was knocking down by the breeze or the animal dint outside etc.

8.3 Meet the excrescent weather of hail, strong breeze, rain-storm...etc., should adopt the protection measure in time.

8.4 Usually check the storage battery to refresh to turn on electricity the circumstance, at any time observe the electrode or connect whether line decay or get in touch with the bad place or not.

8.5 The detection contain excrescent circumstance should check, maintain immediately.

9. Malfunction the analysis

Please read the charge controller manual