

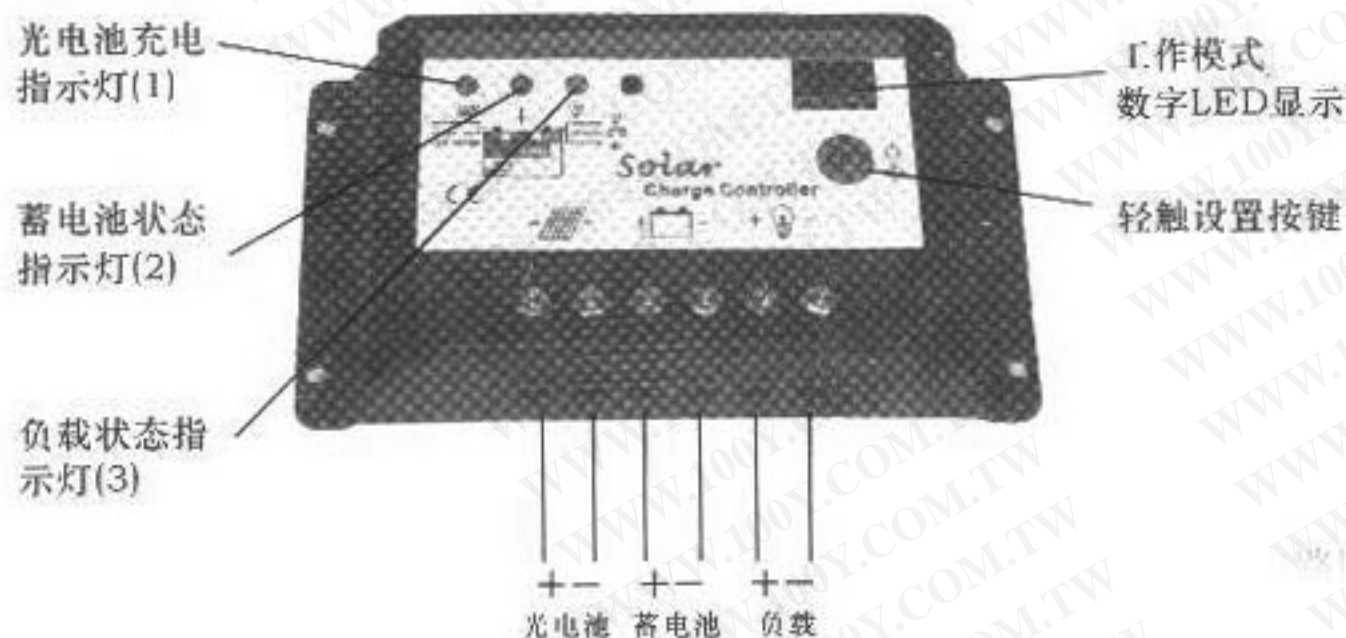
# 太阳能电源控制器

## 使用说明书

### ■ 主要特点:

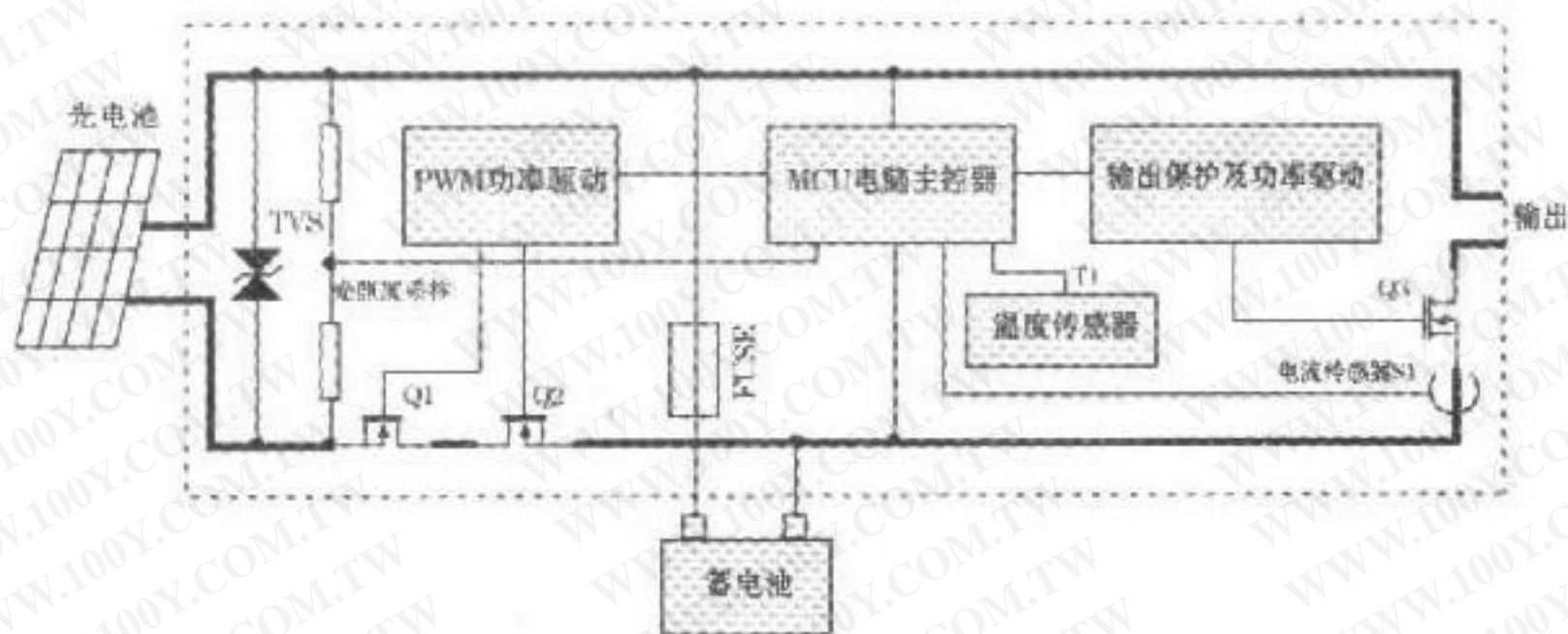
- 1、使用了单片机和专用软件,采用了基于专家控制系统的专用软件,实现了智能优化 SOC 控制。
- 2、温度补偿采用了外置温度传感器,较内置温度传感器控制精度更高。
- 3、具有过充、过放、电子短路、过载保护、独特的防反接保护等全自动控制;以上保护均不损坏任何部件,不烧保险。
- 4、采用了串联式 PWM 充电主电路,使充电回路的电压损失较使用二极管的充电电路降低近一半,充电效率较非 PWM 高 3%-6%,增加了用电时间;过放恢复的提升充电,正常的直充,浮充自动控制方式使系统有更长的使用寿命;同时具有高精度温度补偿。
- 5、直观的 LED 发光管指示当前电瓶状态,让用户了解使用状况。
- 6、所有控制全部采用工业级芯片,能在寒冷、高温、潮湿环境运行自如。同时使用了晶振定时控制,定时控制精确。
- 7、使用了更直观的双 LED 数码管显示设置,一键式操作即可完成所有设置,定时时间与数码管显示数字一一对应,显示更直观。
- 8、利用先进电源技术,大大提高单位面积的有效功率,结构更紧凑。
- 9、采用大口径、大间隔接线端子,可安装最大 6mm<sup>2</sup> 导线,导线间隔 9.5 mm,增强了绝缘性能及安装可靠性,不易滑丝。

### ■ 控制器面板图:



## ■ 系统说明:

本控制器专为太阳能直流供电系统、太阳能直流路灯系统设计，并使用了专用电脑芯片的智能化控制器。采用一键式轻触开关，完成所有操作及设置。具有短路、过载、独特的防反接保护，充满、过放自动关断、恢复等全功能保护措施，详细的充电指示、蓄电池状态、负载及各种故障指示。本控制器通过电脑芯片对蓄电池的端电压、放电电流、环境温度等涉及蓄电池容量的参数进行采样，通过专用控制模型计算，实现符合蓄电池特性的放电率、温度补偿修正的高效、高准确率控制，并采用了高效 PWM 蓄电池的充电模式，保证蓄电池工作在最佳的状态，大大延长蓄电池的使用寿命。具有多种工作模式、输出模式选择，满足用户各种需要。



## ■ 安装及使用:

1. 控制器的固定要牢靠。  
外形尺寸: 133 X 70(mm)  
安装孔尺寸: 126 X 50(mm)
2. 导线的准备: 建议使用多股铜芯绝缘导线。先确定导线长度, 在保证安装位置的情况下, 尽可能减少连线长度, 以减少电损耗。按照不大于  $4\text{A}/\text{mm}^2$  的电流密度选择铜导线截面积, 将控制器一侧的接线头剥去 5mm 的绝缘。
3. 先连接控制器上蓄电池的接线端子, 再将另外的端头连至蓄电池上, 注意+, 一极, 不要反接。如果连接正确, 指示灯(2)应亮, 可按按键来检查。否则, 需检查连接对否。如发生反接, 不会烧保险及损坏控制器任何部件。保险丝只作为控制器本身内部电路损坏短路的最终保护。
4. 连接光电池导线, 先连接控制器上光电池的接线端子, 再将另外的端头连至光电池上, 注意+, 一极, 不要反接, 如果有阳光, 充电指示灯应亮。否则, 需检查连接对否。
5. 负载连接, 将负载的连线接入控制器上的负载输出端, 注意+, 一极, 不要反接, 以免烧坏用电器。

## ■使用说明:

**充电及超压指示:**当系统连接正常,且有阳光照射到光电池板时,充电指示灯(1)为绿色常亮,表示系统充电电路正常;当充电指示灯(1)出现绿色快速闪烁时,说明系统过电压,处理见故障处理内容;充电过程使用了PWM方式,如果发生过放动作,充电先要达到提升充电电压,并保持30分钟,而后降到直充电压,保持30分钟,以激活蓄电池,避免硫化结晶,最后降到浮充电压,并保持浮充电压。如果没有发生过放,将不会有提升充电方式,以防蓄电池失水。这些自动控制过程将使蓄电池达到最佳充电效果并保证或延长其使用寿命。

**蓄电池状态指示:**蓄电池电压在正常范围时,状态指示灯(2)为绿色常亮;充满后状态指示灯为绿色慢闪;当电池电压降低到欠压时状态指示灯变成橙黄色;当蓄电池电压继续降低到过放电压时,状态指示灯(2)变为红色,此时控制器将自动关闭输出,提醒用户及时补充电能。当电池电压恢复到正常工作范围内时,将自动使能输出开通动作,状态指示灯(2)变为绿色;

**负载指示:**当负载开通时,负载指示灯(3)常亮。如果负载电流超过了控制器1.25倍的额定电流60秒时,或负载电流超过了控制器1.5倍的额定电流5秒时,指示灯(3)为红色慢闪,表示过载,控制器将关闭输出。当负载或负载侧出现短路故障时,控制器将立即关闭输出,指示灯(3)快闪。出现上述现象时,用户应当仔细检查负载连接情况。断开有故障的负载后,按一次按键,10秒后恢复正常工作,或等到第二天可以正常工作。在工作模式为通用控制器状态,按一次按键清除过载或短路指示,再次按键恢复输出。

## ■工作模式设置:

**设置方法:**按下开关设置按钮持续5秒,模式(MODE)显示数字LED闪烁,松开按钮,每按一次转换一个数字,直到LED显示的数字对上用户从表中所选用的模式对应的数字即停止按键,等到LED数字不闪烁即完成设置。每按一次按钮,LED数字点亮,可观察到设置的值。

**纯光控:**当没有阳光时,光强降到启动点,控制器延时10分钟确认启动信号后,开通负载,负载开始工作;当有阳光时,光强升到启动点以上,控制器延时10分钟确认关闭输出信号后关闭输出,负载停止工作。

**光控+延时方式:**启动过程同前。当负载工作到设定的时间就关闭负载,时间设定见下表。

**通用控制器方式:**此方式仅取消光控、时控功能、输出延时以及相关的功能,保留其它所有功能,作为一般的通用控制器使用。

**调试方式:**用于系统调试使用,与纯光控模式相同,只取消了判断光信号控制输出的10min延时,保留其它所有功能。有光信号即关断负载端输出,无光信号即接通负载端输出,方便安装调试时检查系统安装的正确性。

**输出模式说明:**输出模式与LED数码管显示的设置模式是一一对应的详细对应关系见下表。

## ■工作模式设置表:

输出模式对应LED显示		输出模式对应LED显示		输出模式对应LED显示		输出模式对应LED显示	
光控开+光控关	0	光控开+5小时延时关	5	光控开+10小时延时关	10	光控开+15小时延时关	15
光控开+1小时延时关	1	光控开+6小时延时关	6	光控开+11小时延时关	11	通用控制器模式	16
光控开+2小时延时关	2	光控开+7小时延时关	7	光控开+12小时延时关	12	调试模式	17
光控开+3小时延时关	3	光控开+8小时延时关	8	光控开+13小时延时关	13		
光控开+4小时延时关	4	光控开+9小时延时关	9	光控开+14小时延时关	14		

## ■ 常见故障现象及处理方法:

在出现下列现象时,请按照下述方法进行检查:

现象	解决方法
当有阳光直射光电池组件时,绿色充电指示灯(1)不亮:	请检查光电池电源两端接线是否正确,接触是否可靠;
充电指示灯(1)快闪:	系统电压超压。蓄电池开路,检查蓄电池是否连接可靠;或充电电路损坏;
负载指示灯(3)亮,但无输出:	请检查用电器具是否连接正确、可靠;
负载指示灯(3)快闪而且无输出:	输出有短路,请检查输出线路,移除所有负载后,按一下开关按钮,30秒后控制器恢复正常输出;
负载指示灯(3)慢闪,且无输出	负载功率超过额定功率,请减少用电设备,按一下按钮,30秒后控制器恢复输出
状态指示灯(2)为红色,且无输出:	蓄电池过放,充足电后自动恢复使用;

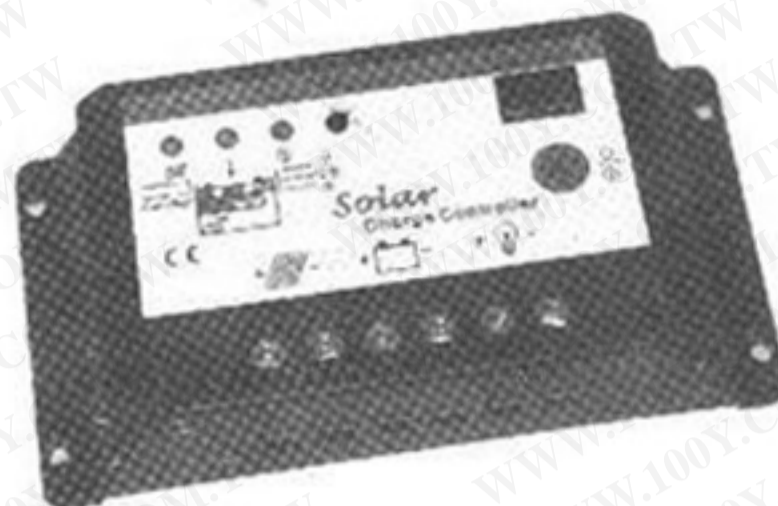
## ■ 技术指标

型号	10I	20I
额定充电电流	10A	20A
额定负载电流	10A	20A
系统电压	□12V; □24V/12V AUTO;	
过载、短路保护	1.25倍额定电流60秒,1.5倍额定电流5秒时过载保护动作, ≥3倍额定电流短路保护动作	
空载损耗	≤6 mA	
充电回路压降	不大于0.26V	
放电回路压降	不大于0.15V	
超压保护	17V, ×2/24V;	
工作温度	工业级: -35℃至+55℃;	
提升充电电压	14.6V; ×2/24V; (维持时间: 30min) (仅当出现过放电时调用)	
直充充电电压	14.4V; ×2/24V; (维持时间: 30min)	
浮充	13.6V; ×2/24V; (维持时间: 直至降到充电返回电压动作)	
充电返回电压	13.2v; ×2/24V;	
温度补偿	-5mv/°C/2V (提升、直充、浮充、充电返回电压补偿);	
欠压电压	12.0V; ×2/24V;	
过放电压	11.1V 放电率补偿修正的初始过放电压(空载电压); ×2/24V;	
过放返回电压	12.6V; ×2/24V;	
控制方式	充电为PWM脉宽调制	

注: 本公司保留变动的权利, 恕不通知。

# INSTRUCTION MANUAL

-----For solar charge controller



## RATINGS (12V or 12/24V auto work)

- 10I 12V or 12/24V auto-work, 10Amp  
20I 12V or 12/24V auto-work, 20Amp

**NOTES:** For use with solar panels only

## TECHNICAL INFORMATION

	12Volt	24Volt
Rated solar input	10A/20A	10A/20A
Rated load	10A/20A	10A/20A
25% Current overload	1 min.	1 min.
Load disconnect	11.1V	22.2V
Load reconnect	12.6V	25.20V
Equalization voltage(30 minutes)	14.6v	29.2v
Boost voltage(30 minutes)	14.4v	28.8v
Float voltage	13.6v	27.2v
Temp Comp.(mV/°C)	-30mV	-60mV
Terminals	For wire sizes to 6mm <sup>2</sup>	
Temperature:	-35°C to +55°C	

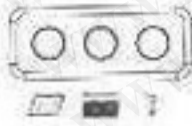
*Note: for 12V system only, for 24v, use 2X)*

## QUICK START INSTRUCTIONS

This section provides a brief overview of how to get started using the controller. However, please review the entire manual to ensure best performance and years of trouble-free service.

1. Mount the controller to a vertical surface. Allow space above and below the controller for air flow.
2. Make sure the PV and load currents will not exceed the ratings of the controller being installed.
3. It is recommended that the connections be made in order from 1 to 6. (see the following

## LED INDICATOR



Green ON when solar is charging battery  
Green blink when the system over voltage



Green ON when battery level in the right range  
Green slowly flashing when battery level full  
Yellow ON when battery level low  
Red ON when loads cut off



Red ON when the output is on.  
Red slowly flashing when its over load  
(the load amps is 1.25 times of rated current for 60 seconds, or the load  
amps is 1.5 times of rated current for 5 seconds)  
Red blink when the load is short-circuit.

Please note:

the output will cut off once there is over load or short circuit. Disconnect all the equipment and reconnect, and press the button, the controller will resume to work after 10 seconds, or wait for it to work the next day.

## TROUBLESHOOTING



1. Charging LED indicator is off when it is daytime
  - a. The green Charging LED should be on if its day time.
  - b. Check that the proper battery type has been selected.
  - c. Check that all wire connections in the system are correct and tight. Check the polarity(+ and -) of the connections
  - d. Measure the PV array open-circuit voltage and confirm it is within normal limits. If the voltage is low or zero, check the connections at the PV array itself. Disconnect the PV from the controller when working on the PV array.
  - e. Measure the PV voltage and the battery voltage at the controller terminals. If the voltage at the terminals is the same(within a few tenths of volts) the PV array is charging the battery. If the PV voltage is close to the open circuit voltage of the panels and the battery voltage is low, the controller is not charging the batteries and may be damaged.
2. Charging LED indicator is blinking
  - a. First check the operating conditions to confirm that the voltage is higher than specifications. Consider the temperature compensation of the controller's PWM setpoint. For example, at 0°C the controller will regulate at about 15.0 volts
  - b. Check that all wire connections in the system are correct and tight.
3. Load LED indicator is blinking, or flashing or on red(load not operating properly)
  - a. Check that the load is turned on. Check that no system fuses are defective.
  - b. Check connections to the load, and other controller and battery connections. Make sure voltage drops in the system wires are not too high.
  - c. If the LED indicator is blinking and no output, check if the load is short-circuit. Disconnect

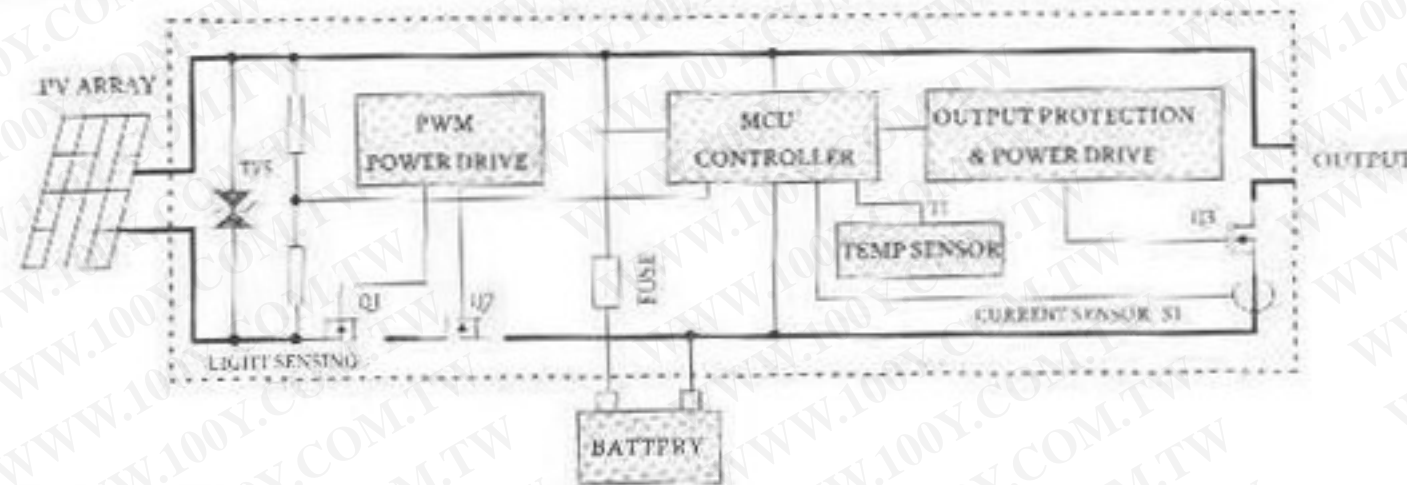
- the load, and press the switch button, the controller will return to work after 30 seconds.
- d. If the LED indicator is flashing and no output, check if the load is over the rated power. Reduce the load, and press the switch button, the controller will return to work after 30 seconds.

## INSPECTION AND MAINTENANCE

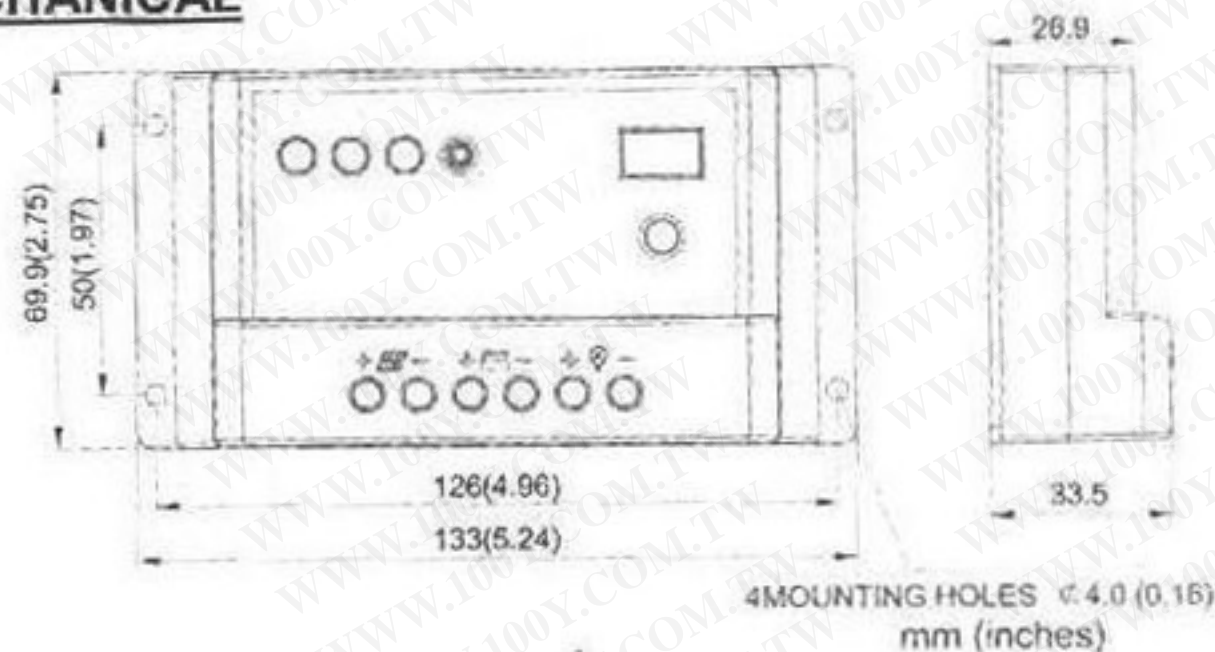
The following inspections and maintenance tasks are recommended at least once per year for best controller performance

1. Confirm that the correct battery type has been selected.
2. Confirm that the current levels of the solar array and load do not exceed the controller ratings.
3. Tighten all the terminals. Inspect for loose, broken, or burnt wire connections. Be certain no loose strands of wire are touching other terminals
4. Press the TEST button(number: 16 or 17) to verify the lights are working
5. Check that the controller is securely mounted in a clean environment. Inspect for dirt, insects and corrosion.
6. Check the air flow around the controller is not blocked.
7. Protect from sun and rain. Confirm that water is not collecting under the cover
8. Check that the controller functions and LED indicators are correct for the system conditions at that time.
9. Make sure the PV array is clean and clear of debris and snow. Confirm the array is oriented correctly for the installation location.

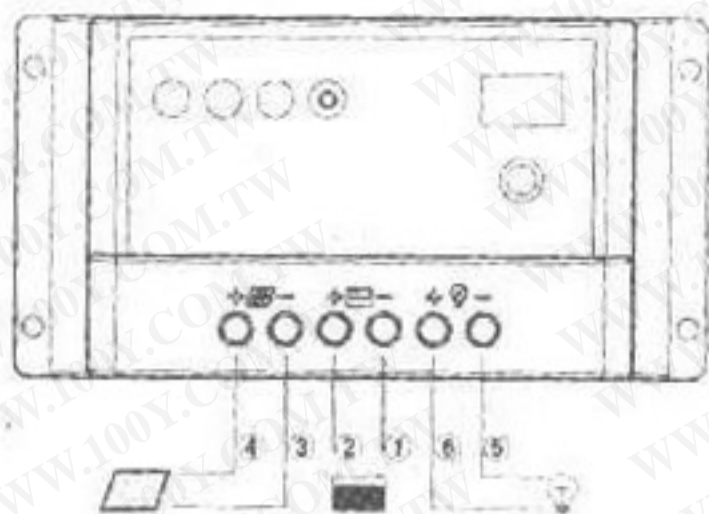
## SYSTEM MAIN CIRCUIT DIAGRAM



## MECHANICAL



picture)



- Use with 12V or 24V batteries only
- Use with 12V or 24V systems only

4. Connect the **BATTERY** first. Use care that bare wires do not touch the metal case of the controller.
5. Connect the **SOLAR**(PV array) next. The green LED indicator will light if sunlight is present.
6. Connect the **LIGHT** last. If the red LED indicator lights, the battery capacity is low and should be charged before completing the system installation
7. Press the **BUTTON** as 16 or 17 to verify the system connecting.

## LIGHTING CONTROL OPTIONS



8. Press the power switch for 5 seconds, and select the desired **LIGHTING CONTROL** option. The LED is on, which confirmed you have selected the right one.
9. The controller requires 10 minutes of continuous transition values before it starts to work. These constraints avoid false transitions due to lightning or dark storm clouds.
10. 10 minutes off before the controller start to work.
11. A brief description follows below:

Number 0	Dusk-to-Dawn, light is on all light
Number 1	Light is turn on after sundown for 1 hour
Number 2	Light is turn on after sundown for 2 hours
Number 3	Light is turn on after sundown for 3 hours
Number 4	Light is turn on after sundown for 4 hours
Number 5	Light is turn on after sundown for 5 hours
Number 6	Light is turn on after sundown for 6 hours
Number 7	Light is turn on after sundown for 7 hours
Number 8	Light is turn on after sundown for 8 hours
Number 9	Light is turn on after sundown for 9 hours
Number 10	Light is turn on after sundown for 10 hours
Number 11	Light is turn on after sundown for 11 hours
Number 12	Light is turn on after sundown for 12 hours
Number 13	Light is turn on after sundown for 13 hours
Number 14	Light is turn on after sundown for 14 hours
Number 15	Light is turn on after sundown for 15 hours
Number 16	Lights remain turned off, ON/OFF mode
Number 17	Test mode, lights on after it detects no light, lights off after it detects light.