

PROPRIETARY DESIGN  
WITH MOTION SENSOR  
COMPATIBILITY

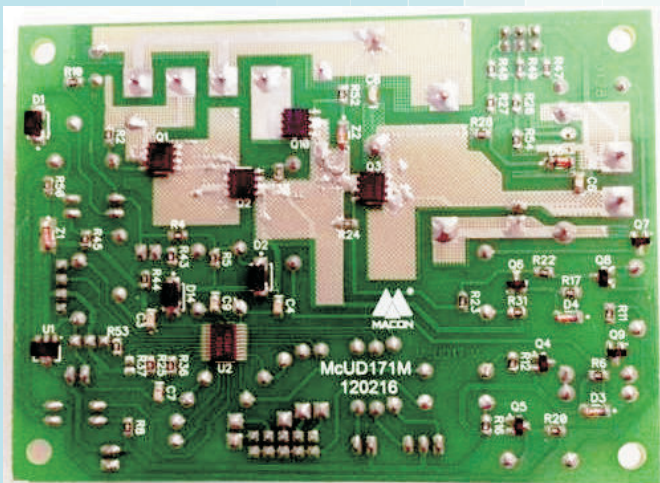
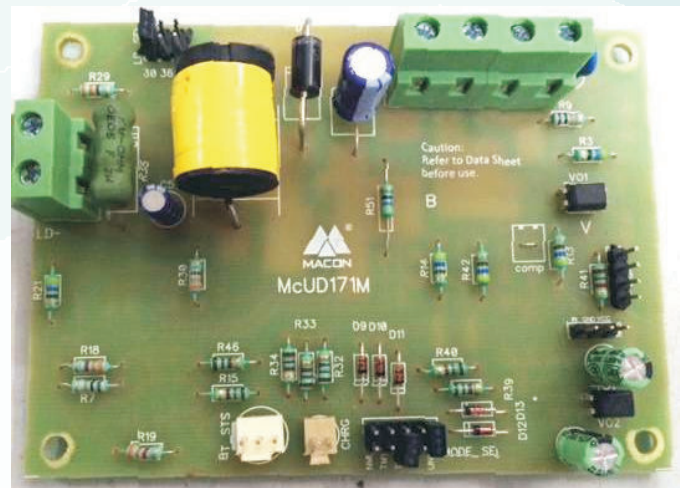


AN ISO 9001-2008 CERTIFIED COMPANY

## McUD171M

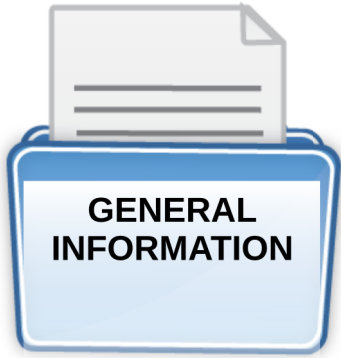
**MICROCONTROLLER BASED  
Solar Dusk To Dawn PWM Charge Controller  
with Built-in Multi load LED Driver and  
Multiple Auto Dimming / Shut-down options  
Compatible with Motion Sensor**

- ◆ Auto Dusk to Dawn Operation
- ◆ Built-in High Efficiency LED Driver
- ◆ User Selectable Output Load 24W/30W/36W/40W
- ◆ User Selectable Multiple Dimming And Timing Options
- ◆ Supports 200Wp panel Input
- ◆ Microcontroller Based Design
- ◆ Fuse-less Design with Electronic Protection
- ◆ Ultra Low Loss Series PWM Regulation
- ◆ Temperature Compensation (optional)
- ◆ Software options for Lead Acid, Lithium Ion, LiFePO4 Battery
- ◆ Full Protections Against Reverse Connection, Over Load/Short circuit
- ◆ Equalization mode possible to be used for Lead Acid batteries to reclaim lost capacity.



### *Introducing for the first time:*

*Motion sensor input can be directly fed to this controller. Motion sensor detects the motion of human being when in the predetermined periphery. If the lamp is in dim mode when such a motion is detected, it will automatically switch to full bright mode till the motion is there followed by a delay of one minute. This feature is useful for general power saving and also for security purpose. The controller comes with preinstalled software for entire operation. On-board provision is made to supply the power to the motion sensor and to accept the signal from motion sensor. The controller works in its normal operations, if no sensor is used. Motion sensor can be added as and when needed.*



**McUD171M** is an automatic dusk to dawn controller designed with the latest state-of-art Microcontroller based technology for providing highly accurate, easy and economical solution to the OEMs making Solar LED street lights.

It is unique to be able to drive any load right from 24W to 40W with simple links provided. If you have different types of solar street lights requirement like 24W, 30W, 36W or 40W the same controller can be used by simple link provided on board. Also, it can be configured by OEM to make it operate in any of the modes below-

1. Plain dusk to dawn operation with constant illumination throughout the night.
2. Selectable automatic switch over to dimming mode after programmable (factory set) two timer delays of 4 hours and 6 hours.
3. Selectable automatic shut down after programmable (factory set) delay timings of 4 hours or 6 hours
4. Automatic dimming to 50% of full illumination after the selected delay time.
5. **Unique program profile on UNQ pin: First 5 hours full light, next 5 hours 30% light, remaining hours till dawn it is full light. Practically, very useful and saves the power to reduce panel and battery capacity for a given autonomy.**

*Any other delay or dimming can be set as per user needs subject to MOQ.*

**Additional Features:**

**\*NO BATTERY PROTECTION:** *The controller comes with unique No-Battery protection. If only panel is connected without battery, the entire circuitry is disabled. This is useful at the time of installation where panels and housings are installed first and batteries are fitted later, or battery is to be replaced.*

**\*EQUALIZATION MODE:** *For Lead Acid batteries, equalization can be carried out for reclaiming the lost capacity of battery over many cycles of discharges.*

*Remove temp-comp pin on the board and charge the battery to 15V for one hour. This over charge should be done strictly under manual supervision as extended duration of over charge may damage the battery. It is intended only for lead acid batteries. Please refer to equalization details from our TELLMEMORE section.*

**\*FUSE LESS DESIGN:** *Reverse polarity for battery and panel provided by Microcontroller and there is no fuse on-board for ease of operation. If battery is connected in reverse direction, entire circuit is disabled. No need to replace fuse on board.*

**\*During instances of lightening in monsoon, it does not switch off instantly.. It has time delay of 10 sec for switching off the lights. So you get uninterrupted light even during lightening at night.**

**\*The controller is given conformal coating for protections against ambient hazards like high humidity or polluted air.**

Since the single kit can be used for normal dusk to dawn operation or with delayed off or with delayed dimming to drive not only one type of load but 4 different ones, you save on the inventory. It is truly universal kit of its kind available.



## TECHNICAL SPECIFICATIONS

### CONTROLS AND INDICATORS:

**CHARGING:** Green LED.

Turns on when panel voltage is more than 13V to indicate positive charging, It starts flickering when battery is charged and goes in PWM mode of absorption.

**BAT STATUS :** BICOLOUR LED.

- Turns Red when battery reaches LVD and disconnects the load. (BAT LOW)
- RED turns on and off if battery voltage is between LVD and LVR. (BAT RESERVE)
- Turns Green when battery is HEALTHY (between LVR and HVD)
- Alternates Red and Green when battery >HVP Load is disconnected. Charging is disabled. (Relimate connectors are provided for above indicators so that indicators can be fitted anywhere in the housing)

**4-WAY+ 2WAY TERMINAL :**

On board connector marked PV+, PV-, BT+, BT- (4WAY) and LD+ and LD- (2WAY) to make connections to respective inputs and outputs.

Note: LD+ and LD- are load terminals which here are to be connected to power LED cluster in fixture directly. The output is SMPS suitable to drive with constant current upto 4 Amax drive irrespective of battery voltage between HVD and LVD thereby maintaining the constant illumination from fixture. The LED drive current is automatically set to desired value as per requirement with links provided on kit. (See page4)

**USER ACCESSIBLE SETTINGS:**

**6WAY 2PIN :** For Mode selection, see CUSTOMIZATION page 6.

**3-WAY 2-PIN :** For Load selection, see CUSTOMIZATION page 6.

### SALIENT FEATURES

SYSTEM:	12V Nominal		
CAPACITY:	Input Panel 200Wmax		
	Output 24,30,36,40W Selectable on board		
REGULATION:	Ultra Low Loss, Series, PWM		
OUTPUT VOLTAGE DROP:	<100mV at 4A (OVD)		
INPUT VOLTAGE DROP:	<350mV at 15A (IVD)		
VOLTAGE SETTINGS	SMF 12V	Li ION 11.1V	LFEP04 12.8V
LOW VOLTAGE DISCONNECT:	10.8	9.6	11.2
LOW VOLTAGE RECONNECT:	12.2	11.4	13.2
HIGH VOLTAGE DISCONNECT:	14.4	12.6	14.4
HIGH VOLTAGE RECONNECT:	14.1	12.3	13.8
HIGH VOLTAGE PROTECTION:	15.2	13.5	15
DUSK_SENSE	Panel Voltage <1.5V		
DAWN_SENSE	Panel Voltage > 3.5V		
PROTECTIONS:	Short Circuit/Overload		
	Reverse Battery and Panel		
	Reverse flow of current from Battery to Panel during night		
	Lightening		
APPLICATION;	In Fixture Use Only		
OPERATING TEMP RANGE;	0 to 50° C		
DIMENSIONS:	110L X 80W X 30H mm		

### MOTION SENSOR TERMINALS:

**3WAY CONNECTOR “MS”** has two pins marked GND and VCC which supplies 5V DC to the motion sensor unit McMS, Pin marked 'IN' accepts digital input to activate bright mode during dim operation for 30 sec after motion is stopped.

Motion sensor unit can be had separately if needed. Please refer to data sheet of our motion sensor McMS for more details on page 7 at the end of this brochure.





- ★ Only Technically skilled person should make connections to the controller.
- ★ Controller uses sensitive devices on board. Due precaution should be taken while handling it.
- ★ No soldering/desoldering should be done on board.

#### CONNECTORS AND INDICATORS

- Only 6 terminals are available to make connections to the unit.
- **PV+** : Solar panel positive. Panel capacity should not exceed 200Wp/12V nominal. Open circuit voltage Voc should not exceed 30V. Vmax of panel should not be less than 15V.
- **PV-** : Solar panel negative.
- **BT+** : Battery positive. Battery should be nominal 12V. Default software for charge/discharge mode is meant for Lead Acid Tubular/SMF type with temperature compensation.
- **BT-** : Battery negative.
- **LD+** : Positive side of power LED cluster. Power LEDs used are supposed to be of Vf in the range of 3V to 3.5V. Depending upon the wattage required, the number of LEDs should be used . (See recommended LED configuration below.)
- **LD-** : Negative of power LED cluster.
- **Relimate connectors are provided for indicator LEDs , BT\_STS and CHRGR . These cables can be connected to indicator LEDs placed in your housing.**
- *IMP: USE RATED CAPACITY CABLES FOR CONNECTIONS TO PANEL, BATTERY AND LOAD TO AVOID CABLE DROP AND ERRONEOUS OPERATION. CONTROLLER SENSES THE VOLTAGES AT TERMINALS ON BOARD AND NOT AT BATTERY, PANEL OR LOAD.*

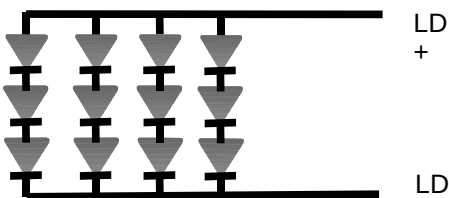
#### IMPORTANT PRECAUTIONS:

It is recommended to follow these instructions while making connections or disconnecting the controller.

- Select the pin at Load\_Select connector for required wattage.
- Select the pin/pins at Mode select connector to have desired dimming operation or normal mode as described in CUSTOMIZATION
- Confirm that power LEDs are configured as recommended here. Controller will not work if configuration is different.
- Make connections to battery first with proper polarity. If battery voltage is above LVR, battery status indicator will turn Green. If load is connected, it will be on. If Bat status shows Red or flickering Red, battery needs charging. If no indicator is on, battery must have been connected in reverse direction.
- Now connect the panel with proper polarity. If its voltage is >13V, CHRGR indicator will turn on. And after 10sec, the load will be off. If panel voltage is not above 13 but it is above DAWN\_SENSE, load will be off after 10sec though CHRGR indicator will not be on.
- If you are using dimming mode, you can have rough visual idea of its dimming. Use NML pin only and see the light output.. Now remove NML pin and put it on DIM, light output will be half.
- Although recommended sequence for connections is panel last and for disconnection panel is first, for practical installation, it is always reversed.
- If panel is connected without battery, no indications on board will be on. You can now connect battery. Depending upon the status of Panel and Battery voltages, respective indicators will be on.
- If battery is removed while panel is still connected, indicators will turn off within 10sec.
- It is always advisable to connect the battery when no indications are on (even when panel is connected). This ensures that controller is in disabled mode and only if battery is properly connected, indications will be on. Reverse connection of battery will result in no indications also. The controller is fully protected.
- Connections to panel, battery and load must have properly rated copper cables and all connections should be firm and free of dust.
- You should not fiddle with components or tracks on the controller board.
- You should handle the controller with utmost care as it houses static charge sensitive devices.
- The controller board should be mounted in the housing such that 4 spacers of at least 6mm height should be used to mount. There should be clear distance of 6mm between board bottom and housing.

#### Recommended LED load configuration:

(Forward voltage of LED: 2.7V to 3.5V)







**You can check the performance of controller with the procedure outlined below.**

**Components needed to carry out these tests are Digital Multimeter, Dual Output (Independent) Variable Power Supply (CVCC) with volt/ampere display, Electronic load, 1.5 sq mm cable lengths for connections, DSO to see waveforms (not needed for routine check)**

#### **COLD TESTS:**

- > First connect the cables to BT+ and BT- securely to the respective terminals of power supply.
- > Gradually increase the supply such that voltage is LVR. BT\_STS will turn Green. Reduce the voltage slightly and BT\_STS will show Green plus flickering Red both together. Reduce voltage further to LVD, BT\_STS will now be fully Red.
- > Increase voltage slightly, BT\_STS will show flickering Red only. This completes LVR and LVD check.
- > Increase voltage to more than HVP, BT\_STS will alternately turn Red and Green. This indicates the system is disabled and voltage will not be available to the load.
- > Switch off the supply and now connect with other pair of cables PV+ and PV- to respective terminals of other part of power supply.
- > Put battery voltage to LVR and gradually increase voltage to PV terminals. Battery voltage will track the PV voltage when PV voltage is more than 12.6V. CHRG indicator will now turn on. Increase PV till battery voltage reaches HVD. Now CHRG will turn on and off alternately. This will continue till voltage is HVP. Afterwards, system is disabled.

#### **LOAD TESTS:**

- > Above tests in the same sequence can be carried with load connected to the controller.
- > If electronic DC load is not available, connect your assembled power LED cluster to respective terminals of LD output. Confirm the LEDs are configured in recommended format as shown on page 4.
- > Depending upon the load used, select LD\_SEL pin to match output current.
- > Put the link on NML or TM1 or TM2 or UNQ on MODE\_SEL connector.
- > Keep battery voltage to at least LVR and panel voltage to 0. Load will be on. You can check the output current of battery. *Please note this is not the actual current passing through the power LED cluster. This is the battery current at the instantaneous battery voltage. If battery voltage is increased, this current will be reduced and vice-a-versa. This indicates the proper working of SMPS driver.*
- > If you connect a precision current meter in series with LED load, the current indicated will be constant even if battery voltage is varied up and down.
- > Remove link and put it on DIM. Load current indicated will be half of previous reading.
- > UNQ or TM1/TM2 operations can be checked only in real time environment.
- > When battery voltage is above LVR and load is on, increase panel voltage gradually to slightly above 3.5V. Wait for 10 sec and load will be off. Now gradually reduce panel voltage to slightly less than 1.5V and load will be on again in 1 sec. This completes DUSK\_SENSE and DAWN\_SENSE settings.



## EASY SELECTION TABLE (MODE\_SELECT):

You can select how controller should work in different dimming options. Two short links are provided with each unit for this operation. Depending upon your requirement, these two pins or single one need to be used. You should strictly adhere to the table given below to select any one mode out of 8 modes mentioned. Erroneous or extra connections other than suggested at these pins will result in unpredictable performance.

SR NO	NML	TM1	TM2	DIM	UNQ	RESULT
1						100 % LIGHT FROM DUSK TO DAWN
2	NC		NC	NC	NC	FIRST 4 HOURS FULL LIGHT THEN OFF
3	NC		NC		NC	FIRST 4 HOURS FULL LIGHT THEN 50% LIGHT TILL DAWN
4	NC			NC	NC	FIRST 6 HOURS FULL LIGHT THEN OFF
5	NC				NC	FIRST 6 HOURS FULL LIGHT THEN 50% LIGHT TILL DAWN
6	NC	NC	NC	NC		FIRST 5 HOURS FULL LIGHT, NEXT 5 HOURS 30% LIGHT, THEN FULL LIGHT TILL DAWN <b>(RECOMMENDED)</b>
<b>LEGENDS USED</b>						
						DON'T CARE
						PIN CONNECTED
					NC	NO CONNECTION

## EASY SELECTION TABLE (LOAD\_SELECT):

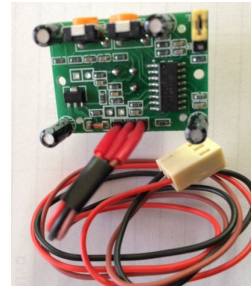
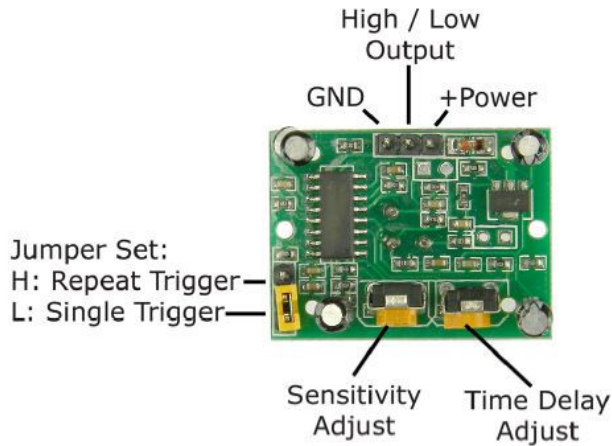
You can select the output drive current of the controller depending upon the load requirement. (The power LEDs MUST be configured in the format mentioned on page 4 of this brochure. No other configuration is permitted.)

**Please note  
USING MORE THAN ONE  
PIN AT LOAD\_SELECT MAY  
RESULT IN IRREPARABLE  
DAMAGE.**

SR NO	30	36	40	RESULT
1	NC	NC	NC	24W OPERATION
2		NC	NC	30W OPERATION
3	NC		NC	36W OPERATION
4	NC	NC		40W OPERATION
<b>LEGENDS USED</b>				
				SHORT LINK USED
			NC	NO LINK



## Motion Sensor Add\_On Module



**McMS** is available as add\_on module for connecting to the main charge controller unit.

It comes with 3 way relimate connector to be directly plugged in the main unit which has 3-way base provided exclusively for this module.

The main charge controller is preinstalled with the software for its operation in UNIQ mode.

Required supply for this module is provided by main controller.

### Technical Specifications:

- Operating voltage: 5 to 15V
- Quiescent current: 50uA
- Level output: 3.3V Hi, 0V Lo
- Block time: 5sec
- Sensor Angle : 110 °
- Board dimensions: 32x24mm
- Lens Dia: 23mm
- Operating temp: -15 to 70°C

### Precautions:

- Although the module has user accessible settings like, selection of single pulse or multiple pulse, delay time and sensitivity, it has been configured optimally to be compatible with the software installed on the main controller unit. And we strongly recommend not to disturb the factory settings done.
- Fiddling with the settings will result in unpredictable working.

### Instructions for use:

- The module is electrostatically sensitive. Only technically competent person should handle it.
- It is provided with relimate cable with standard length of 12”.
- It directly fits into connector marked MS on the main controller. Power is provided to the module and signal is received from the module from the same connector.
- The module needs about 60 sec to stabilize for operation. During this initialization, it will toggle output for 3 times. Once stabilized, it will go into normal mode of working.
- Module has dual probe sensor placed at rectangular window. If movement is along this length, the sensitivity is excellent. Place the module such that movement is along its length.i.e human movement should be parallel to its length for best results.
- If the movement is facing the sensor, or from its width, sensitivity is reduced.
- In the optimal direction, sense distance is 5 to 7 mtr.
- Avoid direct sunlight or heavy winds on the module which will result in malfunction.
- Please note, it works in UNIQ MODE only (default setting). Please ask for operation in other mode.