PV CHARGE & LIGHTING CONTROLLER W/ Motion Sensor 40 Amp PVLC-40MD

FEATURES

- **PV charge & lighting controller - waterproof**
- **Micro-controller for digital accuracy and reliability**
- **Fully automatic operation on 12/24V DC systems**
- **Automatic dusk and dawn lighting control**
- **Motion Sensor activated lighting control.**
- **Will handle up to 40 Amps @ 28VDC from PV panels and lighting loads up to 40 Amps**
- **Built-in temperature compensation for PV charging**
- **LED indication of solar charge & lighting control**
- **Pulse action reduces battery sulfation**

APPLICATIONS

- **Photo Voltaic charge and lighting controller for: security lighting, roadside rest rooms, etc.**

OPERATION

The PVLC-40MD Charge controller monitors both the battery and PV panel voltage, if PV panels have sufficient voltage for charge, and if the battery bank requires charging. When charging the PVLC-40MD cycles the charge relay every 4 minutes to re-verify open circuit PV charge voltage to avoid discharging the batteries through the PV panels when low light conditions occur. The charge re-connection time is varied by the micro-processor to optimally reduce the charge rate for nearly or fully charged batteries. The PVLC-40MD internal temperature compensation adjusts the charge threshold voltages for optimum charge of the battery bank based on temperatures between 0°C to 45°C. For a complete chart PVLC-40MD Temperature Thresholds section next page.

The PVLC-40MD Lighting controller monitors the motion sensor, PV panel voltage and battery voltage and initiates the "light-on" cycle when either the motion sensor has been activated or a dusk voltage threshold has been reached for dusk to dawn operation. The relay remains energized until either the time selection is reached, the PV voltage indicates dawn, or the battery voltage drops below 11.3V DC for 5 continuous minutes. If the lighting relay drops out on low battery voltage or is below 12V at dusk, it will not re-energize until the battery has been charged up to 12.4V DC.

The PVLC-40MD has ten lighting settings (See PVLC-40MD switch - lighting adjustments for timing selections). There is OFF, 4 night only settings, Dusk to Dawn setting, and 4 anytime settings. Selecting (5) "Dusk to Dawn" on the timing switch causes the lights to turn on at dusk and remain on until dawn (subject to the low battery voltage cutout). The PVLC-40MD also can have an optional 5 or 10 minute max lighting time within a 30 minute period. By clipping either the White (5 min) or Gray (10min) jumpers this activates the max lighting routine.

SPECIFICATIONS

SIZE/WEIGHT:	3.3"W x 5.5"L x 1.65"H
ENCLOSURE:	Epoxy potted in PVC plastic
MOUNTING:	Two 1/2" #8 screws (required)
POWER:	9.5 to 35 V DC from storage battery
LOAD CAPACITY:	40 Amps @ 28V DC (NO contact)
CONNECTIONS:	1/4" Bolt Connectors Ring Connector Molex #BCL814PL 1/4" Spade Battery Negative (-)
FLOODED BATTERY PV CHARGE:	On @ 12.7V DC, Off @ 14.2V DC @ Room temperature 15-30°C
GEL CELL BATTERY PV CHARGE:	*Blue Jumper Clipped* On @ 12.4V DC, Off @ 13.9V DC
TIMING RANGE SWITCH: (10 Settings)	4 After Dusk Settings (1-4 minutes) 1 All Night, 1 Off - no lighting 4 Anytime Settings (1-4 minutes)
TEMPERATURE COMPENSATION:	0.040V/°C for 12V systems
CURRENT DRAW:	Continuous - ≤ 5.3mA During charge mode 60mA Nominal, During lighting mode 60mA Nominal, Both charge & light mode 120mA
LED INDICATION:	Red Charging Mode Yellow Lighting Cycle 'on'
MINIMUMS:	9.5V DC battery for PV charge 11.3V DC battery for lighting relay PV Charge Current - 80mA Open PV - 16V (12V system)
TEMPERATURE:	-30 to 75°C
RELAY LIFE:	100 million mechanical operations
MOTION SENSOR:	Honeywell - IS-215T N.C. contact 8.5ma current draw continuous

Double the 12V system values for 24V system values

ORDERING INFORMATION

PVLC-40MD - **P**hoto-**V**oltaic charge & **L**ighting **C**ontroller module W/ motion detector input.

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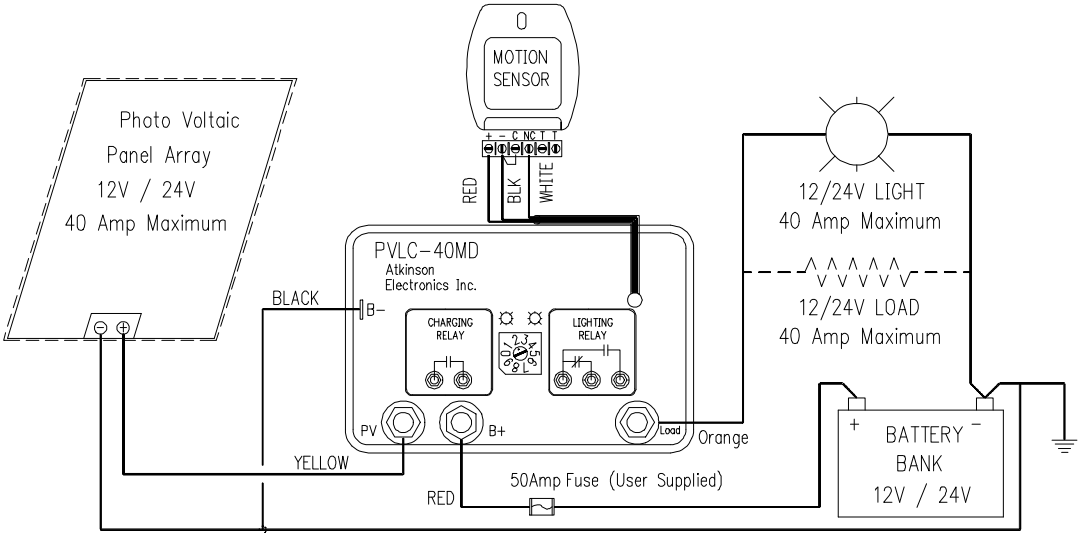
PVLC-40 TEMPERATURE THRESHOLDS

Below	0°C	-	On @ 13.3V, Off @ 15.0V
Between	0-5°C	-	On @ 13.3V, Off @ 14.8V
Between	5-10°C	-	On @ 13.1V, Off @ 14.6V
Between	10-15°C	-	On @ 12.9V, Off @ 14.4V
Between	15-30°C	-	On @ 12.7V, Off @ 14.2V
Between	30-35°C	-	On @ 12.7V, Off @ 14.0V
Between	35-40°C	-	On @ 12.6V, Off @ 13.8V
Between	40-45°C	-	On @ 12.6V, Off @ 13.6V
Above	45°C	-	On @ 12.6V, Off @ 13.4V

PVLC-40 SWITCH - LIGHTING ADJUSTMENTS

Pos. "0"	-	Off
Pos. "1"	-	On for 1 min after sensor activation - night
Pos. "2"	-	On for 2 mins after sensor activation
Pos. "3"	-	On for 3 mins after sensor activation
Pos. "4"	-	On for 4 mins after sensor activation
Pos. "5"	-	On from dusk to dawn
Pos. "6"	-	On for 1 min after sensor activation - anytime
Pos. "7"	-	On for 2 mins after sensor activation
Pos. "8"	-	On for 3 mins after sensor activation
Pos. "9"	-	On for 4 mins after sensor activation

WIRING DIAGRAM - LIGHTING CONTROL APPLICATION

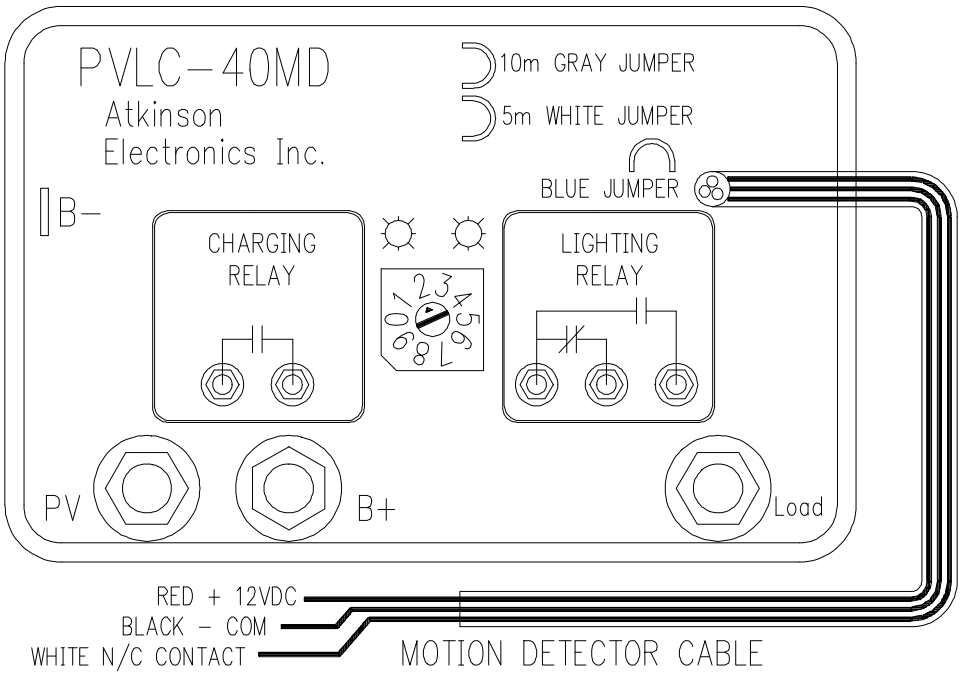


INSTALLATION AND STARTUP INSTRUCTIONS

1. Connect the PV panel and lighting load negative wires to the negative battery post. Connect the PVLC-40MD Red (+) wire to the Battery positive post and the PVLC-40MD Yellow wire to the PV panel + wire. Connect the Motion sensor to the PVLC-40MD using the 3 wire 18awg cable, red to (+), black to (-), White to (NC), Jumper between (-) and other (C).
2. Adjust the desired time range on the switch per PVLC-40MD switch lighting options.
3. Now connect the PVLC-40MD Black wire to the battery negative terminal to power up the PVLC-40MD. Verify that the initial battery voltage is greater than 11.3V or 22.6V, and PV voltage is greater than 16V or 32V.
4. Twelve seconds after power up, the charge relay (red LED) will click the number of times per the switch position with **"0" being 10**. If the switch did not get set to the desired position, disconnect the PVLC-40MD's negative battery wire and reset switch to desired lighting operation and timing range. Reconnect the PVLC-40MD's negative battery wire and verify the desired timing range. If the open circuit PV voltage is above 16V (32V) and the battery voltage is below the "turn on" threshold (12.7VDC), then the PV charge relay will energize, charging the battery. Every 4 minutes the PV relay will drop-out momentarily to test for the presence of adequate PV charge sunlight.
5. To test the lighting function, wave your hand in front of the motion sensor. If lighting set for night only then disconnect the PV Yellow wire, wave your hand in front of the motion sensor, the lighting relay (yellow LED) will turn on the lighting load.
6. Now disconnect the PVLC-40MD black wire and reconnect the yellow PV wire, and then reconnect the black wire.
7. Mount the PVLC-40MD securely with screws and coat the switch with silicone to insure that the entire module is waterproof. Waterproof the electrical connections with silicone or grease.

Note: The PVLC-40MD is powered by either the battery or PV voltage, which ever is greater. The charge relay is only powered from the PV voltage and the lighting relay is only power by the battery voltage. If there is insufficient PV voltage when powering up the PVLC-40MD, the charge relay will only click once after a 12 second delay. If there is sufficient PV voltage(>16V/32V), then after a 12 second delay the PV relay will click out the switch position with "0" being 10 clicks, it then checks the Battery voltage, if its below the "turn on" threshold, the charge relay energizes after a delay of 5 seconds. If battery voltage is above the turn on threshold, then it will wait until it drops below the threshold.

PVLC-15MD WIRE IDENTIFICATION DIAGRAM



TROUBLESHOOTING TIPS

Problem - Module doesn't click on charge relay and there is sunlight on the PV panels.
Solution - Verify that the battery voltage is less than 12.70V (or 25.4V on a 24V DC system) for temperatures between 15-35°C (see Temperature Threshold setting previous page) and that the open PV voltage is greater than 16V or (32V). If both conditions are met, wait for the 4 minute delay period to cycle.
- Try resetting the PVLC-40MD by disconnecting the Black wire for 10 seconds and then reconnecting it, PVLC-40MD will go thru it's startup routine and click out the switch settings, then to normal operation.

Problem - Module clicks every several minute .
Solution - This is the normal operating sequence.

Problem - Module charges for a few seconds then shuts off for 4 minutes.
Solution - The Batteries are fully charged and the charge current was at maximum output, verify battery voltage is greater than 14.2VDC. It may also mean that the Batteries have a poor connection or a bad cell with high internal resistance.

Problem - Module switches on for 1 or 2 minutes and then is off for a much longer period of time.
Solution - This is also normal if the battery is at or nearly fully charged and the PV charge current is at or near maximum.

Problem - The battery load has been left on and the storage battery has discharged below 8V DC. The PV system is not charging when the load is turned off.
Solution - The PVLC-40MD needs at least 9.5V DC from the battery to operate properly. Place the panel in direct sunlight and jumper the red and yellow wires for a few minutes, thus bypassing the charge controller allowing the battery voltage to rise to at least 8V DC. Disconnecting the jumper will allow the PVLC-40 to charge the battery up to normal levels.

Problem - The module is set for lighting control and at dusk fails to turn on lights.
Solution - The PVLC-40MD checks the battery voltage at dusk to see if batteries are greater than 12V (or 24V) DC, sufficient to run lights. If not, it locks out lighting relay until the solar panels have charged battery above 12V DC (24V DC).

Problem - The motion detector does not indicated movement after power up.
Solution - The motion detector has a 30 to 45 second delay before sensing movement.