

MPT_{Li} 40Amp Charge Controller Display Kit

Part#PVCM40D-MPT_{Li} & SEDM6-40



SunExplorer II MPT_{Li}™

Manufactured by: Atkinson Electronics, Inc.



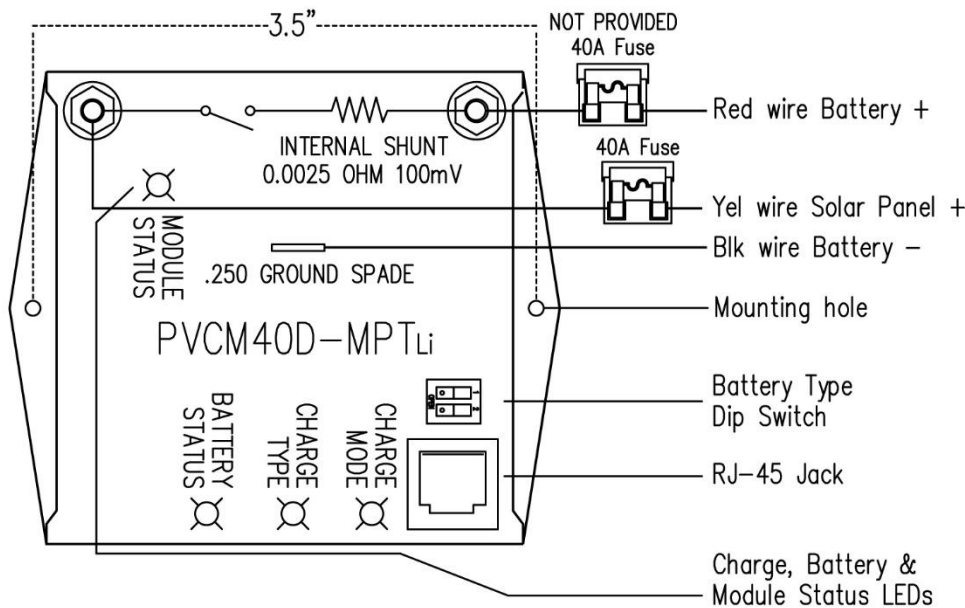
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Diagram

PVCM40DLi



Description

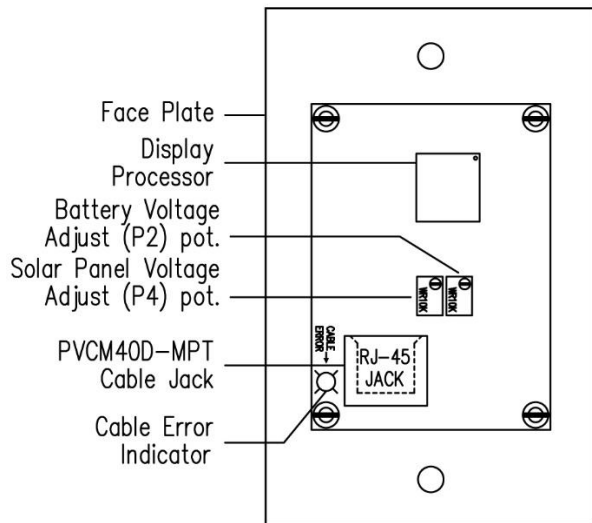
PVCM40D-MPTLi

- **Mounting Holes:** Accepts a #8 sheet metal or wood screws.
- **¼" Brass Bolt:** Connects to the + battery terminal wire.
- **¼" Brass Bolt:** Connects to the + solar (PV) panel wire.
- **¼" Push on Spade Connector:** Connects to the – battery terminal or wire.
- **Battery Type Dip Switch:** Select your battery type.
- **RJ-45 Jack:** Power and signal connection point for the SEDM6-40 display module. (Requires Cat5e patch cable).

Charge & Battery Status LED's: Charge mode LED indicates the charging stage. The charge type LED indicates the type of charge: soft, bulk, absorption, float, equalization boost. The Battery status LED indicates the level of charge: 6 levels from full to empty.

Diagram

SEDM6-40



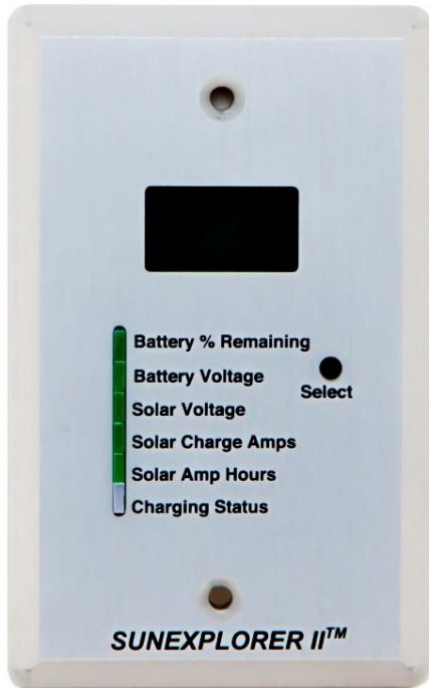
Description

SEDM6-40

- **Display Processor:** Microprocessor controls all display and read-out functions.
- **Battery Voltage Adjust P1:** Displays battery voltage adjustment potentiometer. *Set during step 2 of SEDM6-40 installation.*
- **Solar Voltage Adjust P2:** Displays solar voltage adjustment potentiometer. *Set during step 3 of SEDM6-40 installation*
- **RJ-45 Jack:** Power and signal connection point to PVC40D-MPT_{Li} charge controller module. *Requires Cat5e patch cable.*
- **Cable Error LED:** Lights when a crossover cable is connected.
- **3 Digit Backlit LCD Display:** Lights for 15 seconds every time the select button is pressed
- **Mode Select Button:** Allows user to change display read out, reset solar Amp hour accumulator, and lock display setting.
- **Selection Indicators:** Indicates which of 6 readings is displayed.

Kit Contents

SEDM6-40



PVCM40D-MPTLi



PVCM40D-MPTLi Description of Operation

The PVCM40D-MPTLi, micro-processor based, solar 5 stage charge controller connects solar panels to 12VDC storage batteries. PVCM40D-MPTLi performs 5 basic functions:

1. Monitors solar panels to know if it has enough solar voltage to start charging the battery(s), and when to adjust the PWM charge rates based on solar conditions.
2. Monitors the battery voltage to know when the battery(s) have completed the bulk and absorption charging stages and has entered the float stage.
3. It adjusts the PWM charge algorithms based on the varying load and solar conditions to maintain maximum charging current throughout the charging process.
4. It checks the available solar charge voltage every second to make sure there is sufficient charge voltage. If not, it suspends the charging routine until the solar voltage increases or drops below 5VDC at which point it enters night or End of Day routine (EOD).
5. It compensates for battery temperature and adjusts the charge thresholds voltages when mounted in the battery area.

SEDM6-40 Description of Operation

The SEDM6-40 display module serves as a remote digital readout for either the PVCM40D-MPT_{Li}, PVCM40D-MPT or PVCM40D charge controllers. The SEDM4-25 display module serves as a remote digital readout for the PVCM25D charge controller. **The display units and controllers are not interchangeable.** The PVCM40D-MPT_{Li} charge controller contains an internal solar current shunt, RJ-45 network jack and associated internal wiring to provide power and signals to the SEDM display unit through a standard computer network patch cable which plugs into the RJ-45 jack on the back of the SEDM. If the wrong configuration network cable, such as the crossover type, is used then the error LED on the back of the SEDM6-40 will light indicating that the wrong type cable has been plugged in for the display.

The SEDM6-40's normal display indication is battery percent remaining and its associated LED. The select button allows the user to turn on the displays backlight, advance to the next display setting, reset the solar Amp hour accumulator, force the PVCM40D-MPT_{Li} into a bulk charge routine to top off the battery voltage, lock display or current setting, or activate scroll mode (see page 16).

The SEDM6-40 will automatically switch back to the battery percent remaining display setting after 4 minutes unless the display setting lock is activated. The backlight will come on for 15 seconds any time the select button is pushed and will stay on continuously in scroll mode.

If a low battery voltage condition occurs, the display will automatically switch to the battery voltage setting and blink the display reading and battery voltage LED. If the user accesses other display settings while in this condition, they will be displayed for 5 seconds then switch back to battery voltage setting until the low battery voltage problem is corrected. Any accumulated values may be meaningless if the battery voltage remains below 10V as the minimum voltage for the SEDM6-40 to operate properly is 10VDC. The SEDM6-40 display will continue to accumulate Amp-hours, they won't be displayed without reverting back to the flashing battery voltage after 5 seconds.

If the charging Status LED is green, the user can scroll down to the charging status position and tell the charge controller to top-off the battery(s), provided there is sufficient PV voltage to do so. This is done by pressing the select button and holding it, this will cause the display to blink the 'FCH' 3 to 4 times telling the controller to go into charge mode. The LED color changes to red and the display indicates 'chr', then release the select button. The display will then alternate between solar charge Amps and battery voltage, switching every 10 seconds, (backlight will be on during the charging cycle), until the charge cycle is complete, in which the display then returns to battery percent remaining. You can exit display cycle by pressing the select button.



New Installation Instructions for PVC40D-MPTLi

1. Complete the installation of the solar panels following the solar panel manufacturer's instructions for panel mounting and wire size based on total wattage of the solar panels and the distance between panels and batteries. If the distance is less than 15 feet and the total solar panel charge Amps is 40 Amps or less, 8 AWG wire or larger is recommended. If the distance is greater than 15 feet use a 6 AWG wire. Reference the wire size recommendation chart.
2. Complete the installation of the optional display module and Cat5e cable run to the charge controller's mounting location. (Page 14)
3. Identify the polarity (positive and negative) on the wires used for the battery and solar panels. Wire the PVC40D according to the wiring diagram (page 13). Keep the solar panels covered with an opaque material until wiring and setup is complete.
4. Choose a location for the controller that is close to the battery location to minimize the voltage drop when charging. The recommended location should be away from moisture and heat sources and protected from weather.
5. Mount the PVC40D-MPTLi controller in or next to the battery box for the temperature compensation routine to work properly. Use two ½ inch #10 wood or sheet metal screws to mount the controller.
6. Using a ¼ in ring connectors connect the PVC40D's battery positive bolt to either an inline fuse holder or resettable circuit breaker then (with fuse removed or breaker tripped) connect it directly to the battery's positive post. See Appendix A for optional inline fuse or circuit breakers and sizing instructions.
7. Connect the 18 AWG black wire with ¼ inch push-on connector (supplied) to the battery's negative post, and push the ¼ inch connector on the PVC40D ground spade.
8. Using a ¼ in ring connectors connect the PVC40D's solar positive bolt to either an inline fuse holder or resettable circuit breaker then (with fuse removed or breaker tripped) connect it to the solar panels positive wire. The panel's negative wires directly to the battery's negative post.
9. Set the PVC40D's battery type DIP switch for your battery type. See diagram page 7, showing the switches positions for the four battery types.
10. Review all your connections to avoid any reverse polarity connections, which can cause damage to the controller, before installing the fuse or resetting the circuit breakers.



Installation Tips for PVCM40D-MPTLi

1. Exposed connections should be waterproofed. Grease or silicon will adequately protect connections such as splices or the network cable jack. Moisture causes un-protected connections to oxidize, making them highly resistive which will cause the controller to not work properly.
2. When wiring the solar panel into the battery system, adequate wire size must be used. An 8 AWG wire for short distances and a 6 AWG or larger wire for longer distances is recommended. If a smaller wire is used, the wire's resistance is higher which produces a higher voltage drop between battery(s) and solar panels and the battery(s) will not achieve full charge.

See WIRE SIZE RECOMMENDATION CHART for size verse distance. (Page 18)

3. When first powering your PVCM40D-MPTLi controller, make user you have selected to correct dip switch settings for your battery type. If you have flooded lead acid batteries, check the battery fluid level as directed by the battery manufacturer.
4. Install the PVCM40D-MPTLi in or next to the battery enclosure for the temperature compensation to work properly.

The recommended minimum total of solar panel watts for the PVCM40D-MPTLi to perform an equalization or conditioning of a flooded lead acid or Lifeline battery is 270 Watts. Three 90 Watt 12V panels with a minimum Imp of 5.0 Amps each or two 160 watt 12V panels with an Imp of 8.8 Amps each.



Recommended dielectric grease for **ALL** power connections between solar panels, PVCM40D-MPTLi charge controller and battery bank.

Brand : Ideal Noalox or Permatex

Google it!

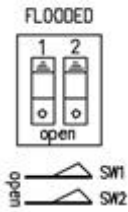
Charge Voltage Settings Based on Battery Type

| Battery Type | Flooded | Lifeline | AGM. | LiFePO4 |
|-----------------------|----------------|-----------------|-------------|----------------|
| Absorption voltage: | 14.4 VDC | 14.3 VDC | 14.3 VDC | 14.5 VDC |
| Float voltage: | 13.7 VDC | 13.4 VDC | 13.5 VDC | 13.6 VDC |
| Equalization voltage: | 15.0 VDC | N/A | N/A | N/A |
| Conditioning voltage: | N/A | 15.5 VDC ** | N/A | N/A |

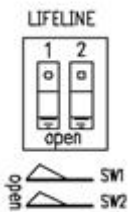
****LIFELINE® Battery's Technical Manual Rev. E Section 5.5 Conditioning, outlines the conditions that should have occurred before the battery(s) are to be conditioned, the conditioning recommendations as to the procedure, and how long and how often. Requires a minimum of 10+ Amps of total solar charging current.**



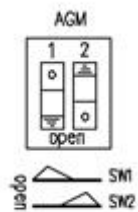
Battery Type Selection Switch



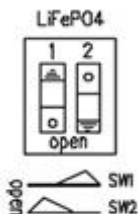
Flooded Lead Acid (wet) battery(s): Set both DIP switches (1 & 2) to the open position, then power the controller by connecting the black ground wire to the ground spade connector. Battery equalization automatically occurs when the battery voltage drops below 12.1VDC for the 3rd time in a 14 day period or once in a 28 day period. The controller blinks the charge type LED blue when the equalization flag has been set, and when conditions are met it then will run the equalization routine, turning the charge type LED on solid blue, to bring the internal cells of the battery to an equal state to reverse the effects of being discharged below 12.1VDC.



Lifeline[®] AGM battery: Set both DIP switches (1 & 2) to the closed position, then power the controller by connecting the black ground wire to the ground spade. Lifeline recommends using a minimum of a 3 stage charger to fully charge their batteries. The Lifeline setting uses a specific algorithm that follows Lifeline's charging recommendations. The Lifeline AGM batteries can be conditioned* (equalized) when the battery is showing symptoms of capacity loss due to extended time in a partial or low state of charge as a result of limited charging current. The PVC40D-MPTLi's Lifeline algorithm monitors the battery condition and will perform a conditioning charge, provided the following requirements and conditions are met: MINIMUM Imp of 12 Amps (3 x 90 watt or 2 x 160 watt solar panel(s)), and must complete a full charge cycle. Conditions to set conditioning flag which will cause the charge type LED to blink Blue are: Battery voltage drops below 12.1VDC or the controller fails to complete its charge cycle 3 times in a 14-21 day period. Conditioning will only once in a 21-28 day period. If solar panels don't produce 10+Amps of charging current during bulk charge, the conditioning routine is not activated, during that days charging routine. It will retry the following days charge routine.

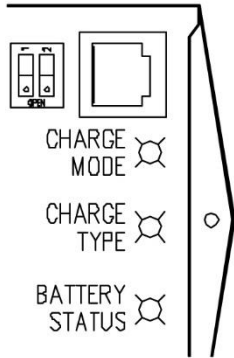


Other Brands of AGM batteries: Set DIP switch 1 to the closed position and switch 2 to the open position, then power the controller by connecting the black ground wire to the ground spade. This AGM algorithm is configured for most types of AGM batteries, requiring a minimum of 3 stage PWM charger with slightly lower charging voltage thresholds than those of Lifeline batteries. This setting does NOT perform any battery conditioning.



LiFePO₄: Set DIP switch 1 to the open position and switch 2 to the closed position, then power the controller by connecting the black ground wire to the PVC40D's ground spade. The LiFePO₄ battery algorithm is configured for 3 stage PWM w/ MPT. The Soft charge, equalization, manual and auto boost, and temperature compensation features have been turned off.

Battery Type Selection Switch



The PVCM40D-MPTLi's battery type selection dip switch is located left of the Cat5e jack for the SEDM6-40 display module.

The PVCM40D-MPTLi has four bi-color LEDs, one each for the three following conditions:

Charging Mode: Red, orange, green

Charge type: Red, magenta, blue

Battery level status: Red, orange, green

Power Up Initialization Routine

To power up the controller, insert the fuse into the battery wire fuse holder or switch on the circuit breaker. The controller cycles each LED thru its three colors:

| | |
|---|---------------------|
| Charge mode & battery status | Red, orange & green |
| Charge type | Red, blue & magenta |

The controller then checks its voltage inputs, the battery type DIP switches and looks for any flags. The controller then enters ready mode, re-reading the battery & solar panel voltages, if the solar voltage is less than 10VDC, it displays the battery status level by blinking the status LED once every 10 seconds:

| | |
|----------------|--------|
| Full | Green |
| Partial | Orange |
| Low | Red |

If the solar voltage is greater than 10VDC it turns on the LED to indicate battery level. If the battery voltage is less than 10.5VDC it blinks the battery status LED red and sets a soft charge flag, blinking the charge type LED red, and sets the battery equalization flag alternating between red and blue. The controller then determines if there is enough solar voltage to charge, if the voltage is less than the minimum voltage for charging, the charge mode LED remains off. Once the solar voltage reaches the minimum operational voltage it again checks the battery voltage to determine the absorption time, and checks for a soft charge flag. If the soft charge flag is set, then it enters the charge routine turning on the charge mode and type LEDs red to indicate it is in a soft/ bulk charge. If the soft charge flag was not set, then the charge mode LED will be lit red indicating it is in the bulk charge stage and the charge type LED will be off

Charging Mode LED Definitions

The charge mode LED indicates which of the three main PWM charge stages the controller is in:

| | |
|---------------------------------|------------|
| Bulk charge stage: | Lit red |
| Absorption charge stage: | Blinks red |
| Float charge stage: | Lit green |

If the charge mode LED is not lit, it means that there is not enough sun light to charge the battery, controller is in night mode

Charging Type LED Definitions

The charge type LED indicates the types of charge the controller is in:

Soft Charge - The LED is lit red.

- Soft charge is set when the battery voltage drops below 10.5VDC.
- Once battery voltage climbs above 11.5VDC it turns off.

Equalization Conditioning - The LED blinks blue.

- Equalization flag is set when the battery voltage drops below 12.1VDC three times in a 14 day period.
- It is continuously lit while in equalization mode.

Auto Boost - The LED blinks magenta when the auto boost flag is set.

- It is continuously lit during the bulk and absorption phase of the boost cycle. It turns off once the controller returns to float stage.

The charge type LED is not normally lit, if any of the above conditions occurs, it will then blink or light continuously, indicating the charge it's in.

While in the float charge stage, if the load currents exceeds the solar charge current and the controller can't maintain the float voltage, the charge mode LED will blink green. If the battery voltage drops below 13VDC for 5 minutes the controller sets its auto boost flag and blinks the charge type LED magenta. Once the load is reduced or the solar charge current increases and battery voltage returns to float voltage, the charge type LED turns on, until it completes the auto boost charge cycle.

Battery Status LED Definitions

The battery status LED indicates six levels of charge: full, high, medium, partial, low and empty.

| COLOR | POWER | BATTERY SOC | VDC |
|-----------------|---------|-------------|-------------------|
| Lit Green | Full | 100% | >12.8 |
| Blinking Green | High | 95 to 70% | 12.8 down to 12.4 |
| Lit Orange | Medium | 70 to 50% | 12.4 down to 12.1 |
| Blinking Orange | Partial | 50 to 30% | 12.1 down to 11.8 |
| Lit Red | Low | 30 to 10% | 11.8 down to 11.5 |
| Blinking Red | Empty | 0% | <11.5 |



Module Status LED Definitions

The Module status LED provides three functions indicated by the LED color and how it is blinking. Generally the module status LED will be a solid Green during the charging routines, indicating all is well with the control module.

GREEN BLINKING LED: If the LED is blinking green once every 10 seconds along with the battery status LED it indicates the controller is in night mode.

WARNING ORANGE LED:

Battery temperature warning when mounted in the same location as the battery:

1. High battery temp: $> 60^{\circ}\text{C}$, status LED blinks orange once every 10 seconds.
2. Low battery temp: $< 0^{\circ}\text{C}$, status LED blinks orange twice every 10 seconds.

Orange battery voltage warnings:

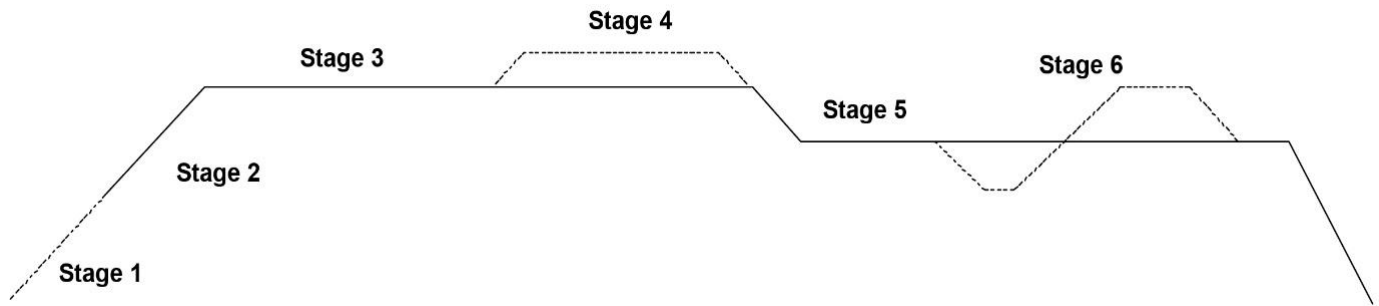
1. Low battery voltage $< \text{or} = 11.8\text{VDC}$, the status LED blinks orange three times every 10 seconds. The SunExplorer II display will also blink the battery voltage reading and LED when the battery voltage drops below 11.8VDC.
2. High battery voltage – battery voltage is greater than the controller's defined threshold voltage by 0.2VDC for more than 10 minutes while in the three charge routines, the status LED blinks orange four times every 10 seconds. *This warning can occur when the controller switches from the absorption to the float charge when the batteries do not have enough load to draw down the battery voltage. It also can occur when the trailer's shore charge/inverter is trying to charge the batteries when first plugged in, or a portable battery charge is used to charge the batteries.* This warning resolves itself when the battery voltage drops down to the voltage range the controller is trying to charge to.

FAULT RED BLINKING LED: If the module status LED blinks red it is indicating a fault condition. There are three conditions that cause a red status LED. The first two are related to the temperature sensor and Lithium-ion (LiFePO₄) batteries.

1. Shorted temperature sensor (lithium battery setting only,) status LED blinks red once every 5 seconds. The controller will not enter charge routine if the sensor is shorted.
2. Open temperature sensor (lithium battery setting only,) status LED blinks red twice every 5 seconds. The controller will not enter charge routine if the sensor is open.

Extreme over charge detected, MOSFET switches are shorted. All three LEDs will blink red, on for one second off for one second, and the module status LED is lit red continuously. This fault occurs when the MOSFET switches & driver section are turned off and the controller still reads a charging current going to the batteries indicating the MOSFETs are shorted. If this occurs the controller is not repairable and should be replaced.

Charging Stage Descriptions



Stage 1 - Soft Charge

When the batteries are discharged below 10.5VDC, the controller will softly ramp up the charge rate until the battery voltage reaches 10.5VDC at which point it will enter the bulk charge stage. (Battery status LED blinks red, charge type & charge mode LEDs will be lit red).

Stage 2 - Bulk Charge

Maximum charge current from solar panels is applied to the battery(s) until it reaches the absorption voltage threshold for your battery type selected on DIP switches 1&2. (Charge mode LED will be solid red).

Stage 3 - Absorption Charge

The battery voltage is maintained at a constant voltage using PWM technology to finish charging the battery(s) to 100% of charge.

The controller uses Multi Point Tracking (MPT) to compensate for changing loads and solar conditions to maintain constant charge rate. (Charge mode LED will blink red).

Stage 4 - Battery Equalization Charge

Battery equalization is only available for (wet) flooded lead acid battery(s). Battery equalization automatically occurs when the battery voltage has dropped below 12.1VDC for the third time within a 14 day period or once in a 28 day period. The controller blinks the charge type LED blue when the equalization flag is set, and will run the equalization routine once the conditions are met, to bring the internal cells of the battery to an equal state to reverse the loss of capacity due to being discharged below 12.1VDC.

| | |
|-----------------------------|----------------------------|
| Equalization Charge: | Charge Type LED Solid Blue |
| Bulk Charge: | Charge Mode LED Solid Red |
| Absorption Charge: | Blinking Red |

Charging Stage Descriptions Continued

Stage 4a – Lifeline Conditioning Charge

Lifeline batteries can be conditioned if the total Imp. from the solar panels is **greater than 10 Amps**. The PVC40D-MPTLi monitors the solar charge Amps during the Bulk charge stage, if 10+ Amps was detected it sets the 10 Amp Flag. The controller also monitors the battery voltage over a 14 to 21 day period, if the battery voltage drops below 12.1VDC three times in that period or fails to finish the absorption charge before end of day during that period it sets the conditioning flag. At the end of the 21 day period the controller must see 10+Amps of charge current during the bulk charge and complete the full charge cycle before it begins a conditioning cycle. If the panels don't produce 10+Amps during the bulk charge the conditioning charge is not activated that day and will try again during the next day's charging cycle. Conditioning will only occur once in a 21 - 28 day period.

Stage 5 - Float Charge

The batteries are fully charged at this point and are maintained at a safe voltage level. During the float charge the controller is constantly adjusting its PWM control to adjust for varying solar charging currents and trailer loads to maintain a float voltage of 13.5VDC for sealed/gel batteries and 13.7VDC for lead acid & AGM batteries.

Charge: Green

Stage 6 – Auto Boost Charge

The auto boost feature is as follows: The controller is in float charge, the trailer loads become greater than the solar charging current and the battery voltage is pulled below 13.0VDC for more than 5 minutes. The auto boost flag is set, when the loads are reduced to the point where the float charge returns the battery voltage back to float voltage, the controller then performs a shortened bulk/absorptions charge cycle restoring the battery(s) to 100% and then returns to the float charge. Charge type LED will blink magenta when auto boost flag is set and will on continuously during the charge cycle.

Stage 6a – Manual Boost Charge

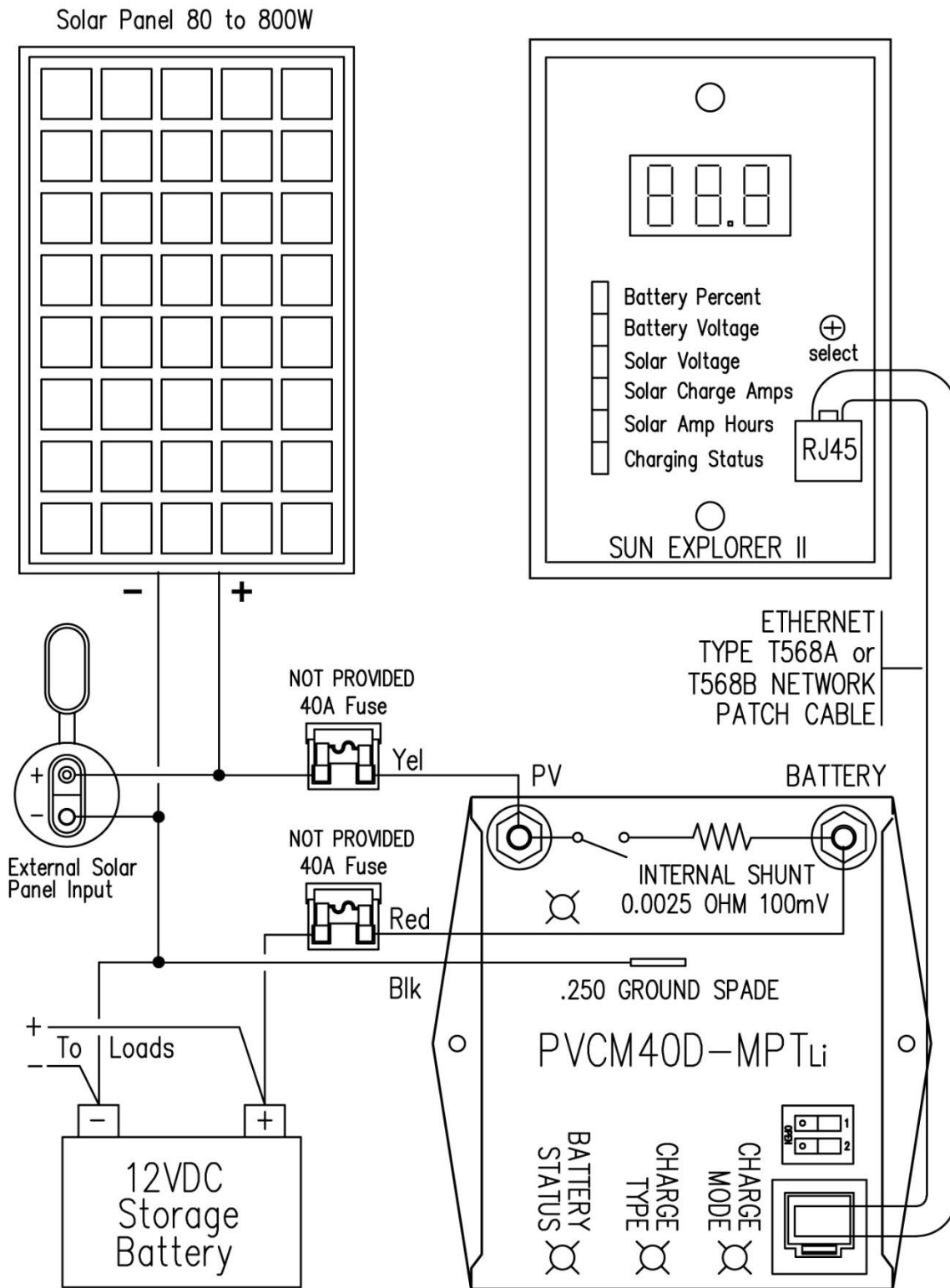
The PVC40D-MPTLi & SEDM6-40 provides the user, the ability to perform a manual boost charge, any time the controller is in the float charge stage when a SEDM6-40 display is used with the MPTLi controller.

The Manual boost feature is not available when using either PVC40 or SEDM4 displays.

To perform a manual boost charge, the charge controller must be in the float stage as indicated on the controller or the display's charge status LED is green. The operator uses the SEDM6-40 display's select button to scroll down to the charge status location, then presses and holds the select button until the green LED turns red. The PWM controller's charge mode LED changes from green to red and the charge type LED will light magenta in color. When the controller finishes the manual boost charge it returns to the float Stage and the displays charge status LED will turn green.



Wiring Diagram

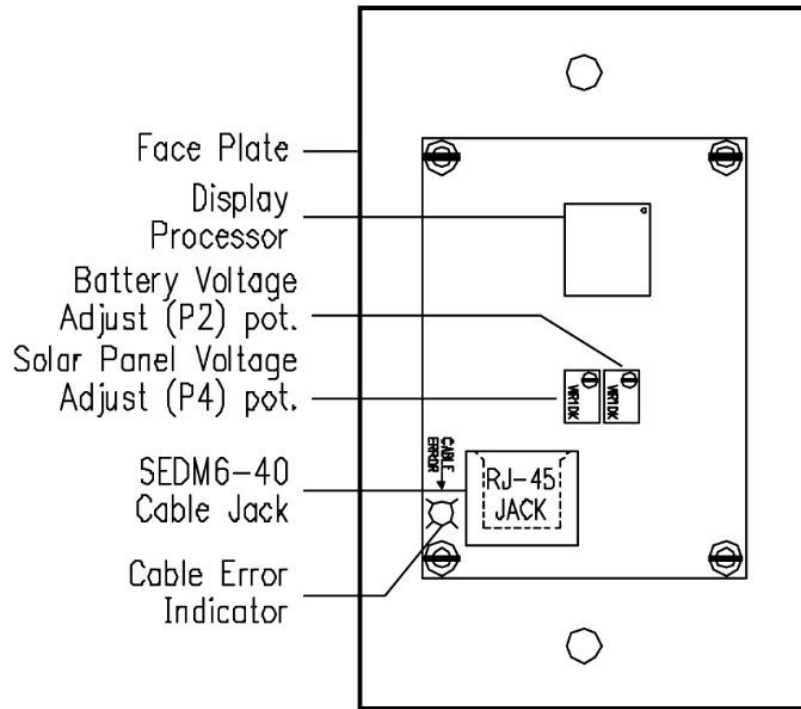


Installation Instructions for SEDM6-40

1. Complete the installation and test the operation of the PVCM40D-MPTLi charge control module.
2. Before mounting the SEDM6-40 module, plug in a short Cat5e network cable into both, the PVCM40D-MPTLi controller's RJ-45 jack and the SEDM6-40 display's RJ-45 jack and verify that all readings work properly.
3. Next measure your battery voltage at the battery with a volt meter, then calibrate the display's battery voltage reading by selecting the battery voltage setting on the display and then adjusting the P2 potentiometer on the back of the display +/- 1/4 turn on the adjustment pot so it reads correctly.
4. Next remove the fuse from the controller's PV in-line fuse holder and measure the voltage on the PV side of the fuse clip and ground. Re-insert the fuse and scroll down to the solar panel voltage reading on the display and adjust P4 potentiometric on the back of the display +/- 1/4 turn on the adjustment pot so it reads correctly.
5. Determine the mounting method to be used, surface-cutout or single electrical box ring.
6. For surface-cutout mounting, place the template (found on page 20 of this manual) over the desired mounting location and mark through the template the two mounting screw locations. Drill two pilot holes into the cabinet or mounting surface at the marked locations. Use a Phillips screw driver to drive the screws into the mounting surface before mounting the display module. Back out the screws, cut-out the template leaving the mounting screw areas and attach the template with the screws to the mounting surface. Draw around the template on the mounting surface marking through the template around the mounting screw tabs. Carefully cut out the marked area using a hole saw or rotary tool leaving the mounting screw areas.
7. For single gang electrical box ring mounting, use the ring as a templet and mark the area to be cut out. Carefully cut area for the mounting ring, mount the box securely and install optional conduit if desired.
8. Unplug the short network cable from both the controller and display. Next route or pull the display end of the network cable into the mounting area or electrical box, being careful not to damage the RJ-45 plug.
9. Plug the network cable into the controller's RJ-45 jack, then after pulling it through the cutout hole, plug it into the display's RJ-45 jack, the SEDM will power up turning on its backlight, and use the select button to scroll thru and to verify the readings. Push any excess Cat5e wire back into the hole and mount the display. Insert the screws through the front of the SEDM6-40 module and into the holes and tighten by hand with a Philips screwdriver to avoid damaging the SEDM6-40 display.
10. Use grease or silicone to cover the controller's end of the Cat5e network cable plug to avoid corrosion.



Battery Adjust Pot & Jack Locations



Installation Tips for SEDM6-40

1. When a network cable (up to 50 feet long), is used to connect the SEDM6-40 to the PVDCM40D-MPT_{Li} charge controller, it must be the straight through type or the display will not read properly. A cable error LED will light up brightly on the back of the meter if the wrong type of cable such as the crossover type is used.
2. The minimum solar charge current the SEDM6-40 will indicate is about 0.30 Amps. Below this value the SEDM6-40 will display "chr" if the PVCM40D-MPT_{Li} is passing solar charge current to the battery. The current display reading will indicate "0" if the controller is not in any of the charging stages.
3. The solar current shunt used in the PVCM40D-MPT_{Li} is rated for a maximum of 40 Amps. There are other displays and charge controllers in the SUNEXPLORER product line.
4. **The metal shavings left behind the display are causing damage and will no longer be covered under warranty.**

The SEDM6-40 display module serves as a remote digital readout for the PVCM40D, PVCM40D-MPT & PVCM40D-MPT_{Li} charge controller.

The display units and controllers ARE NOT interchangeable with other parts from other kits.



User Instructions for SEDM6-40

1. The power and signals to the SEDM6-40 display are supplied through the Cat5e network cable connecting the SEDM6-40 to a PVCM40D-MPTLi charge controller.
2. The SEDM6-40 will normally revert back to displaying the continuous battery percent remaining after approximately 4 minutes from any other reading.
3. Select button operation:
 - Tapping or pressing the select button activates the backlight for 15 seconds. Pressing the select button to advance, resets the 15 second timer.
 - Pressing for 1 second then releasing the button advances to the next reading.
 - From the battery voltage display only, pressing and holding the button will advance the display automatically through each of the readings.
 1. If the button is released before returning to the battery voltage display, the reading will remain in that position until the display times out (4 min).
 2. If the button is held through all readings then released after the battery voltage display, the SEDM6-40 will enter the scroll mode, advancing to the next reading every 3 seconds, indefinitely.
 3. Tapping the button exits the scroll mode.
 4. A low battery voltage condition will also exit the scroll mode.
 - Display lock mode is available for solar charge Amps and battery %.
 1. To lock display from timing out and reverting to battery % remaining, advance display to desired position then press and hold the button until the display flashes (approximately 3 seconds).
 2. Release button when the display stops flashing, it will remain indefinitely in that reading.
 3. Tapping button while the display is flashing prevents entering lock mode.
 4. Advancing to the next reading cancels the lock mode.
 5. Low battery voltage also cancels the lock mode.
 - Resetting the solar accumulated Amp hour reading to zero.
 1. Pressing and holding the button for approximately 6 seconds will reset the display value. The display starts flashing after 3 seconds, the reading goes to zero after 6 seconds and the display stops flashing.
 2. Releasing the button while the display is flashing cancels the reset. The display will stop flashing and retain its current value after several seconds.
 - Battery voltage top off-advance to charging status, display will indicate "Fch".
 1. Press and hold the select button the display will flash "Fch" once, telling the charge controller to enter the charge routine. When controller enters charge mode the displays green status LED turns RED and the display indicates 'chr', 3 second later display jumps to solar charge Amps and shows the charging current for 10 seconds, then to battery voltage showing the battery voltage, then it alternates between them until it exit the charge routing or the select button is pressed.
 2. Low battery voltage will cancel any user selections. The user can advance to any reading, but it will automatically return to the flashing low battery voltage display after 5 seconds.



Trouble Shooting Tips for PVCM40D-MPTLi

Problem: The PVCM modules charge and battery status LEDs are not lit, and there is sunlight on the PV panels.

Solution: *Verify the following check list:*

- ✓ The in-line fuse is good, circuit breaker has not tripped.
- ✓ The battery wire polarity - Red to PVCM's battery positive bolt and black to battery negative.
- ✓ The battery voltage at the controller is greater than 8VDC. Measure voltage between red and black wires with DC volt meter.
- ✓ The solar panel voltage is 16VDC or greater. Measure voltage between PV+ and black wires with DC volt meter. If ALL the above conditions are met, reset the controller by disconnecting the black wire for 10 seconds and then reconnecting black wire.

If the unit still does not wake up and enter bulk charge, contact our Customer Service Department @ 800.261.3602.

Problem: The PVCM module is always in night mode (Charge status LED OFF), and there is sunlight on the solar panels.

Solution: *Verify the following check list:*

- ✓ The solar panel voltage is greater than 16.5VDC for Lead acid or 17.5VDC for Lithium batteries by measuring the voltage between PV+ and black wires with DC volt meter.
- ✓ The solar panel wire polarity - positive connected to the controllers PV+ bolt and the negative wired to battery negative post.
- ✓ If you don't have a voltage, check for an open connection, if you have multiple panels, disconnect one at a time and measure its output voltage. ***It only takes one shorted panel to bring down the entire system.***
- ✓ If your panel wiring has an in-line fuse check to see if it is blown.
- ✓ If the above conditions are met, reset the controller by disconnecting the black wire for 10 seconds and then reconnecting the black wire.

Problem: The battery loads have been left on and the storage battery has discharged below 7VDC. The PVCM40D-MPTLi is not charging when the load or loads are turned off.

Solution: The PVCM40D-PWM needs at least 8VDC from the battery to operate properly. Use an AC battery charger to bring the battery voltage up above 8VDC. Once the battery voltage is above 8VDC and the solar panels are in direct sunlight, then disconnect AC battery charger and the PVCM40D-PWM will then function properly, and charging your battery(s). If there isn't enough daylight left to charge your battery(s) completely, we recommend allowing the AC battery charger to finish charging your battery(s).

Wire Size Recommendation Chart

Amp Verses Wire Gage

| CIRCUIT TYPE | CURRENT FLOW IN AMPS | | | | | | | | | | | | |
|------------------------------------|----------------------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 5A | 10A | 15A | 20A | 25A | 30A | 40A | 50A | 60A | 70A | 80A | 90A | 100A |
| Critical 3% VOLTAGE DROP | 16 AWG | 14 AWG | 14 AWG | 14 AWG | 12 AWG | 10 AWG | 10 AWG | 10 AWG | 10 AWG | 8 AWG | 8 AWG | 6 AWG | 4 AWG |
| 0 to 6 ft | 16 AWG | 14 AWG | 12 AWG | 12 AWG | 10 AWG | 8 AWG | 6 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 4 AWG | 4 AWG |
| 10 ft | 16 AWG | 14 AWG | 12 AWG | 10 AWG | 10 AWG | 8 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 2 AWG |
| 15 ft | 14 AWG | 12 AWG | 10 AWG | 10 AWG | 8 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 2 AWG | 2 AWG |
| 20 ft | 14 AWG | 10 AWG | 8 AWG | 8 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 2 AWG | 1 AWG | 1 AWG |
| 25 ft | 12 AWG | 10 AWG | 8 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 1 AWG | 0 AWG | 0 AWG |
| 30 ft | 10 AWG | 8 AWG | 6 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 0 AWG | 0 AWG | 2 0 AWG | 2 0 AWG |
| 40 ft | 10 AWG | 8 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 0 AWG | 0 AWG | 0 AWG | 2 0 AWG | 2 0 AWG |
| 50 ft | 10 AWG | 6 AWG | 4 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 0 AWG | 0 AWG | 2 0 AWG | 2 0 AWG | 3 0 AWG | 3 0 AWG |
| 60 ft | 8 AWG | 6 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 0 AWG | 0 AWG | 2 0 AWG | 3 0 AWG | 3 0 AWG | 4 0 AWG | 4 0 AWG |
| 70 ft | 8 AWG | 4 AWG | 2 AWG | 2 AWG | 1 AWG | 1 AWG | 0 AWG | 0 AWG | 3 0 AWG | 4 0 AWG | 4 0 AWG | | |
| 80 ft | 8 AWG | 2 AWG | 1 AWG | 1 AWG | 0 AWG | 0 AWG | 2 0 AWG | 3 0 AWG | 4 0 AWG | | | | |
| 90 ft | 4 AWG | 1 AWG | 0 AWG | 0 AWG | 2 0 AWG | 3 0 AWG | 4 0 AWG | | | | | | |
| 100 ft | 4 AWG | 1 AWG | 0 AWG | 2 0 AWG | 3 0 AWG | 4 0 AWG | | | | | | | |

CIRCUIT LENGTH



Specifications for PVC40D-MPTLi

| | |
|------------------|---|
| Size & Weight: | 3.0 x 4.0 x 1.0 inches, 8 ounces |
| Enclosure: | Epoxy potted in PVC plastic |
| Mounting: | 2 #10 x 0.5" L screws (not provided) |
| Power: | 8 to 15VDC from storage battery(s) |
| Current Draw: | 40Amps @ 25VDC Solar Panels Minimum wattage panel 80 watts Maximum wattage panels 725 watts |
| Solar Capacity: | 40Amps @ 25VDC Solar Panels Minimum wattage panel 80 watts Maximum wattage panels 800 watts |
| Bulk Absorption: | At room temperature (25°C/ 77°F) Flooded Lead Acid (wet) 14.4VDC Lifeline AGM 14.3VDC AGM 14.3VDC LiFePO4 14.5VDC Accuracy ± 0.1VDC |
| Float Voltage: | At room temperature (25°C/ 77°F) Flooded Lead Acid (wet) 13.7VDC Lifeline AGM 13.4VDC AGM 13.5VDC LiFePO4 13.6VDC Accuracy ± 0.1VDC |
| Current Draw: | Continuous - ≤ 7mA During charge - ≤ 25mA |
| LED Indication: | Charge status: bulk, absorption, float Charge type: soft charge, auto boost Battery equalization Battery state of charge: Green > 12.8VDC Blinking Green 12.4V up to 12.8VDC Orange 12.1V up to 12.4VDC Blinking Orange 11.8V up to 12.1VDC Red 11.5V up to 11.8VDC Blinking Red 11.5VDC |
| Voltage Drop: | 0.100VDC @ 40Amps |
| Internal Shunt: | 0.025Ω 100 millivolt 40Amps |
| Temperature: | -30 to 75°C18 |



Specifications for SEDM6-40

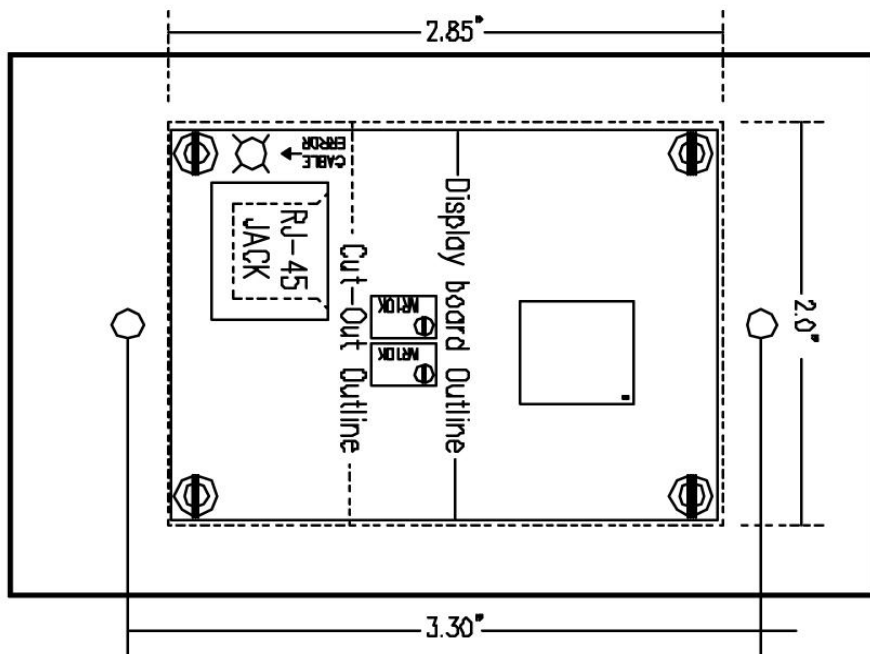
| | |
|----------------------|--|
| Size & Weight: | 2.75 x 4.5 x .75 inches, 5 ounces |
| Mounting: | Single gang electric box or surface mount |
| Power: | 12VDC from PVCM40D-MPTLi |
| Current Draw: | 15 mA normal mode 25 mA with back light on |
| Connection: | RJ-45 jack to T568A or T568B network Cat5e patch cable |
| Control: | Single select/ reset button |
| Display: | 3 digit LCD to 999 or 99.9 with decimal 0.35 inch character height |
| Battery Percent | Display: 12.8V = 100%, 12.1V = 50% 11.5V = 0%, 12V system |
| Battery Voltage: | Displays 0 to 25VDC |
| Low Battery Voltage: | Detects @ 11.8V |
| Solar Voltage: | Displays 0 to 25VDC |
| Current Display: | 0 to 50 solar charge Amps Below .3 Amps the display will indicate "chr" if the controller is charging |
| Amp Hours: | Displays 0 TO 999 accumulated |
| Charging Status: | LED OFF: Not charging, display indicates "n_c" Green LED: Float charge, display indicates "Fch" Red LED: Bulk/ absorption charge "bch/Ach" |
| Manual Boost: | Available only during float charging stage. Press and hold Select button while in charging status location will force PVCM40D-MPTLi into bulk charge mode. |
| Temperature: | 0 to 50°C |



Cleaning Tips

Do not spray water or cleaning solution directly to the face plate or LCD of the SEDM6-40. The liquid could run between the face plate and the LCD on to the circuitry on the SEDM6-40 circuit board causing damage to the electronics and **WILL VOID THE WARRANTY!**

Template for the SEDM6-40



Fuse/ Circuit Breaker Recommendations

When selecting the correct amperage rating for your in-line circuit breaker, first determine the maximum current output of your solar panel array by adding up the current at maximum Power (Imp) for each panel, then round up to the next standard amperage size.

Example: (3) 150watt panels, Imp = 8.5Amps ea. Total Imp. = 25.5Amps

Recommended fuse or circuit breaker size 30 Amps.

In-line Fuse examples (Resettable or Blade type)



Bussman Maxi in-line fuse holder

Part number: HHX (6 Awg wire)

Bussman Maxi Fuse

Available in 20, 25, 30, 35, 40 & 50 Amps

Part number: CB185-XX

XX= Amp rating



Bussman Resettable Circuit Breaker

Available in 20, 25, 30, 35, 40 & 50 Amps

XX=Amp rating



Automotive Audio Resettable Breaker

Available in 20, 30, 40 & 50 Amps

The fuse, fuse holder and circuit breakers are available at any of the major on-line retailers.



Limited Warranty

Atkinson Electronics, Inc. gives this express warranty (along with extended warranty endorsements, where applicable) in lieu of all other warranties, express or implied, including (without limitation), warranties of merchantability and fitness for a particular purpose. This constitutes Atkinson Electronics, Inc.'s sole warranty and obligation with regard to our products as well as the customer's sole remedy.

Atkinson Electronics, Inc. expressly disclaims all liability and responsibility for any special, indirect or consequential damages or any further loss of any kind whatsoever resulting from the use of our product. The customer's sole and exclusive remedy and the limit of Atkinson Electronics, Inc.'s liability for any loss whatsoever, shall not exceed the purchase price paid by the customer for the product to which a claim is made.

Countries or States that do not allow limitations of incidental or consequential damages or on how long an implied warranty lasts, the above limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from State to State or Country to Country.

All products manufactured by Atkinson Electronics, Inc. are warranted to be free from defects in material and workmanship in accordance with and subject to the following terms and conditions:

1. This warranty is limited to the original customer only. It cannot be transferred or assigned to third parties unless the intent to transfer to a third party is expressly indicated in a purchase order and/or warranty processing arrangements have been agreed upon in writing by Atkinson Electronics, Inc.
2. Atkinson Electronics, Inc. will correct any defects in material or workmanship which appear within two (2) years from the date of shipment by Atkinson Electronics, Inc. (or its authorized distributors) to the original customer. Atkinson Electronics, Inc. will repair or replace, at our option, any defective products, provided that our inspection discloses that such defects developed under normal and proper use. This warranty does not extend to goods subjected to misuse, neglect, accident or improper installation, or to maintenance or repair of products which have been altered or repaired by anyone except Atkinson Electronics, Inc., unless otherwise stated in writing. Atkinson Electronics, Inc. will correct any defects in material or workmanship of OEM products (designated as such in our catalog or web site) which appear within two (2) years from the product date code or from the factory invoice date, whichever is later.
3. An appropriate charge (25% of product list price) may be made for testing, repairs, replacement and shipping for a returned product which is not defective or found to be defective as the result of improper use, maintenance or neglect.
4. Atkinson Electronics, Inc. will not accept responsibility for any invoiced goods or services that are not covered by an Atkinson Electronics, Inc. written purchase order. Under no circumstances does Atkinson Electronics, Inc. agree to pay for labor or other related expenses associated with the troubleshooting and/or repair of our product without prior specific written authorization.
5. Information in our descriptive literature is based on product specifications that are current at the time of publication.

Product specifications, design and descriptive literature are subject to change as improvements are introduced. Although we announce changes as they occur, we cannot guarantee notification to every customer. Atkinson Electronics, Inc. warrants delivered products to conform to the most current specifications, design and descriptive literature. This warranty policy may be expanded or limited, for particular categories of products or customers, by information sheets published as deemed appropriate by Atkinson Electronics, Inc.





*Make sure **ALL** of your connections, from the solar panel to the battery, are coated in dielectric grease.*

Like Ideal Nolax or Permatex

