40 Amp Display Kit

Part#PVCM40D & SEDM6-40

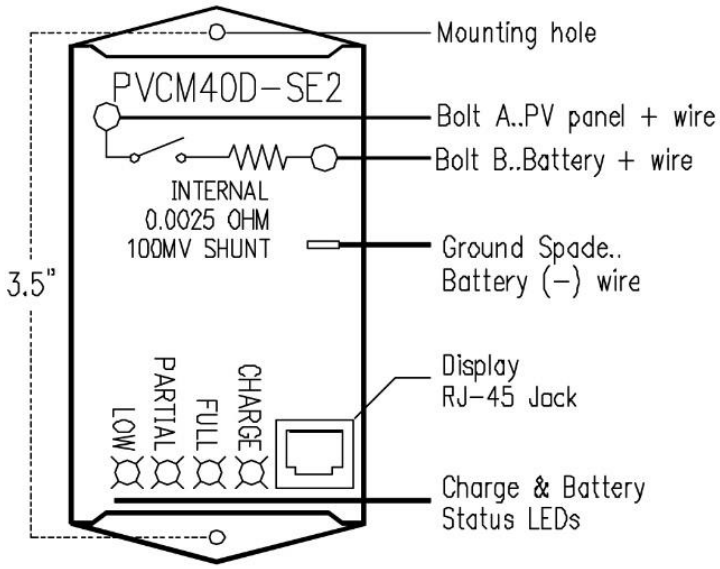
SUNEXPLORER II™

Manufactured by: Atkinson Electronics, Inc.

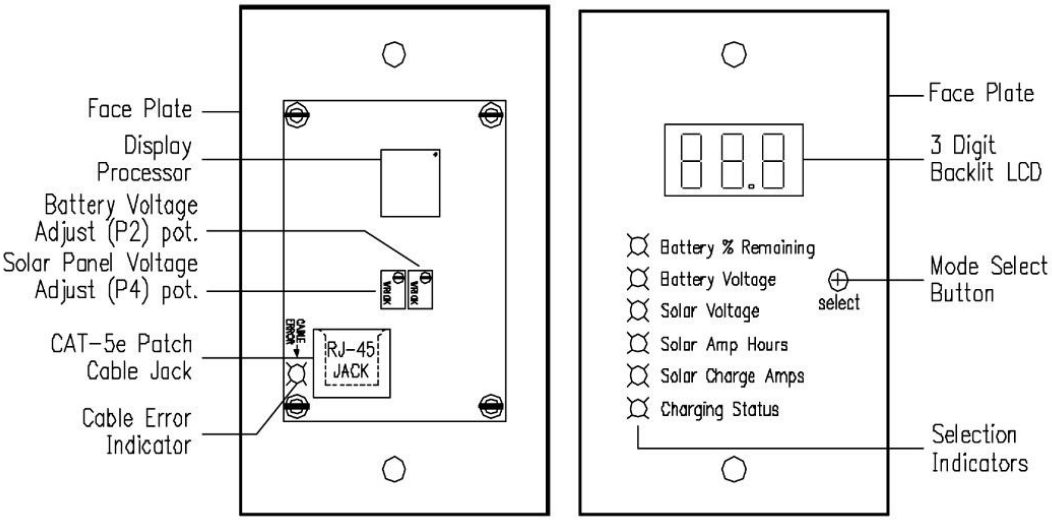
Table of Contents

Features

PVCM40D



SEDM6-40



Description

PVCM40D

- **MOUNTING HOLES:** Accepts a #8 sheet metal or wood screws.
- **BOLT A 0.25”x 20:** Connects to the + wire of the PV panel.
- **BOLT B 0.25”x 20:** Connects to the + battery terminal or wire.
- **SPADE 0.25”:** Connects to the – battery terminal or wire.
- **RJ-45 JACK:** Power & signal connection point for the SEDM6-40 display module. *Requires Cat-5 patch cable*.
- **CHARGE & BATTERY STATUS LED’S:** Red LED indicates when charging. Battery charge level LED’s indicate:
  - ✓ Full – Green
  - ✓ Partial – Yellow
  - ✓ Low – Blinking Orange

SEDM6-40

- **DISPLAY PROCESSOR:** Microprocessor controls all display and read-out functions.
- **RJ-45 JACK:** Power & signal connection point to attach to the PVCM40D charge controller module. *Requires CAT-5 patch cable*.
- **BATTERY VOLTAGE ADJUST P2:** Displays battery voltage adjustment potentiometer. *Set during step 2 of SEDM6-40 installation*
- **SOLAR VOLTAGE ADJUST P4:** Displays solar voltage adjustment potentiometer. *Set during step 3 of SEDM6-40 installation.*
- **MODE SELECT BUTTON:** Allows user to change display read out adjustment potentiometer. *Reset solar hour accumulation and perform a battery top off charge.*

Kit Contents

SEDM6-40

PVCM40D

PVCM40D Description of Operation

The PVCM40D micro-processor based photo-voltaic (PV) charge controller connects PV panel to 12V or 24VDC storage batteries. PVCM40D determines which mode to operate in, 12V or 24V, by measuring both battery and PV charge voltages. PVCM40D performs five basic functions:

1. Senses when the battery is fully charged and disconnects the PV charge current to avoid over-charging the battery.
2. Resumes charging the battery when the battery voltage has dropped sufficiently to accept additional charge current.
3. Checks the availability of PV charge current, by cycling the relay every 4 minutes. If there is insufficient charge current available, it will disconnect the battery to prevent discharge through the PV panels at night.
4. Compensates for battery temperature and adjusts the charge threshold voltages when mounted in battery case.
5. Accepts a charge command from the display unit to enter the charge routine to top off the battery. If the PV charge current is insufficient, it exits the charge routine to prevent battery discharge through the PV panels.

SEDM6-40 Description of Operation

The SEDM6-40 display module serves as a remote digital readout for the PVCM40D charge controller. ***The PVDM4-LC display module serves as a remote digital readout for the PVCM25D charge controller, the display units and controllers ARE NOT interchangeable.*** The PVCM40D charge controller contains an internal 0.0025 ohm solar current shunt, RJ-45 display jack and associated internal wiring to provide power and signals to the SEDM6-40 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 proper cable needs to be plugged in for the display to work properly.

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 display's backlight, advance to the next display setting, reset the solar Amp hour accumulator, force the PVCM40D into a charge routine to top off the battery voltage, lock display or current setting, or activate scroll mode (see User Instructions). 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.

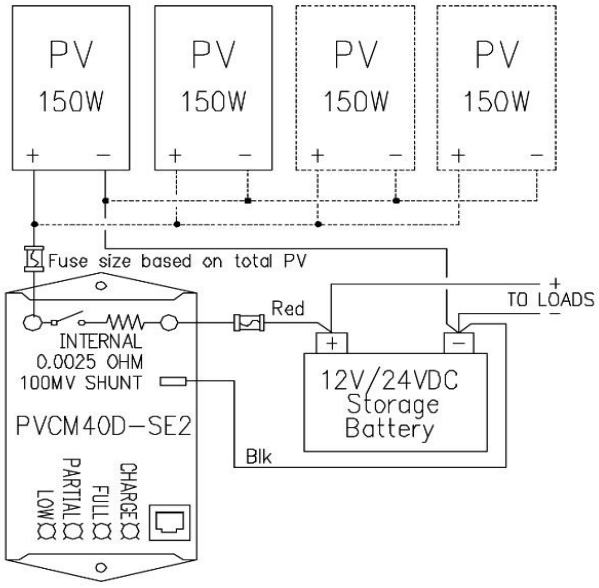
When a low battery voltage condition occurs, the display will automatically switch to the battery voltage setting (if not already there) and blink the display reading and battery voltage LED. If the user accesses other display settings while in this condition, they will be displayed for 5 seconds then 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 11V as the minimum voltage for the SEDM6-40 to operate properly is 11.0VDC. The SEDM6-40 display will continue to accumulate Amp-hours, they just won't be displayed without reverting back to the flashing battery voltage after 5 seconds. The battery voltage signal tells the SEDM6-40 module what battery system voltage it is: 12V or 24V.

When the charging status LED is not lit, the user can scroll down to the charging status position that lights the LED green. The user can force the charge controller to top off the battery voltage, provided there is sufficient PV voltage to do so. By pressing the select button and holding, it will cause the display to blink the 'n_c' 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, at which time the display then returns to battery percent remaining. You can exit display cycle by pressing the Select button.

Installation Instructions for PVCM40D

1. Complete the mounting installation of the Photo Voltaic Panel(s), verify and label the + PV wire and - PV wire by measuring the PV voltage with sun light applied to panel(s), if not already labeled. Now cover panel(s) with its shipping box(es) to prevent PV panel output from being shorted during the routing of the PV wiring to the location where the PVCM40D is to be mounted.
2. If the PVCM40D is to be mounted somewhere other than next to the storage batteries, a pair of wires (1 red, 1 black) may have to be pulled to the PVCM40D's mounting location from the battery compartment. See “Suggested Minimum Wire Gauge” on page 6 for recommended wire size.
3. Mount the PVCM40D with screws (not provided). Do not remove the tape covering the RJ-45 jack until you are installing the SEDM6-40 remote display unit.
4. Now, with the PV panel(s) covered and the pair of battery wires not connected to the battery, it is time to connect the PVCM40D wires.
5. First connect together the PV (-) negative wire, the battery (-) negative and an 18 AWG black wire using a wire nut or butt splice (not provided). Next connect the PV + wire with 0.25” ring connector to the PVCM40D's PV (+) bolt. Next connect the Battery (+) wire with 0.25" ring connector to the PVCM40D's Bat (+) Bolt. Next crimp a 0.25"push-on connecter on the 18 AWG wire and connect to the Ground spade on the PVCM40D.
6. Now at the battery box, measure your battery voltage and note the voltage for the next step. Next connect the black (-) wire to the (-) negative of the Battery. Next connect the red (+) wire to the (+) positive of the battery.
7. The PVCM40D will power up, orange LED will light, then will blink or switch to either yellow or green depending on the battery voltage. (Orange blinks below 11.3V, yellow between 11.3V to 13.4V, green above 13.4VDC.)
8. Next remove the box(es) from the PV panel(s). If panel(s) are in the sun light the PVCM40D will sense the PV voltage (>16V+) and turn on the charge relay, charging the storage battery(s). As the Battery voltage comes up, the yellow LED will switch to green LED @ 13.4V. When the battery voltage reaches 14.2V, the PVCM40D will stop charging the Battery(s) until it is ready to accept a charge again by either the battery falling below 12.7V @ 70° F, or an ample load is applied to drop the battery voltage. (See PVCM40D specifications for temperature reset voltages for charging on/off points.)
9. Replace the box(es) over the PV panel while the PVCM40D is charging and watch for the red charge LED and relay to turn off. (Note: depending where you are in the charge cycle it could be 4 minutes. The Charge controller only looks at the PV voltage once every 4 minutes.)
10. Seal all connections with electrical tape and NoALOX™ grease or silicone.

Hookup Diagram for PVCM40D



Installation Tips for PVCM40D

1. Exposed connections should be waterproofed. Grease or silicon will adequately protect connections such as splices or the network cable jack. Clip blue jumper wire for sealed batteries (AGM/Gel Cell) to change threshold voltages.
2. When wiring the PV panel into the battery system, adequate wire size must be used. 10 AWG or larger wire is recommended. If smaller wire is used, the battery may not achieve full charge or overheat and cause damage. If running 700w of PV panel, the recommended wire size is 6 AWG.

   Suggested Minimum Wire Gauge and Fuse Size

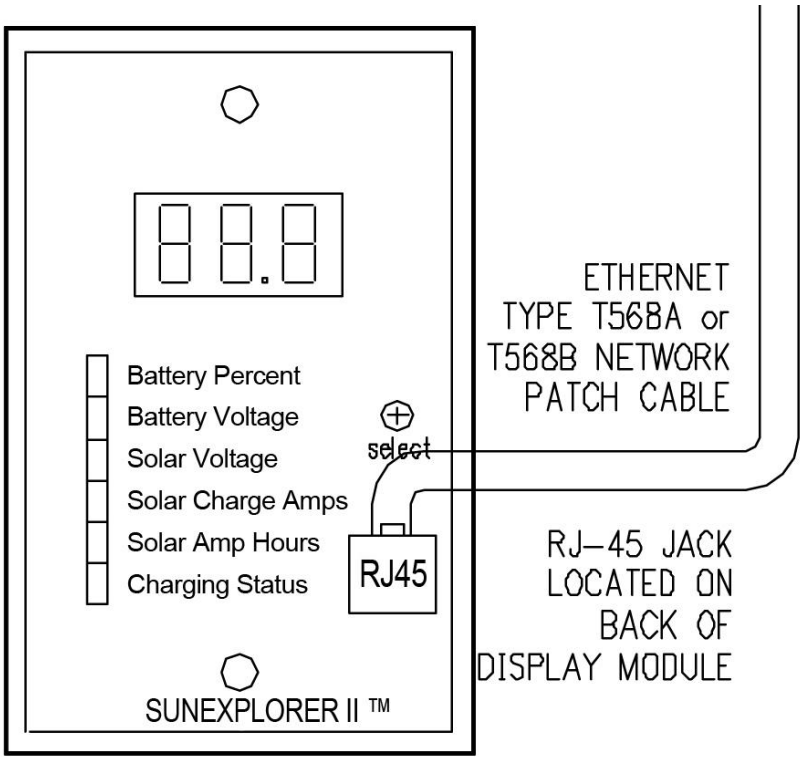
   - 300 Watts of Solar Panels #10 Gauge Wire 25 Amp Fuse
   - 450 Watts of Solar Panels #8 Gauge Wire 35Amp Fuse
   - 600 Watts of Solar Panels #6 Gauge Wire 40Amp Fuse
   - 700 Watts Max of Solar Panels #4/6 Gauge Wire 50 Amp Fuse

3. Check the battery fluid level and add distilled water as specified by the battery manufacturer.
4. Install the PVCM40D in the battery enclosure for the temperature compensation to work properly.

Installation Instructions for SEDM6-40

1. Complete the installation and test the operation of the PVCM40D charge control module.
2. Plug in the network cable into both the PVCM40D charge controller and SEDM6-40 display module. Verify that all the readings work properly. Calibrate the battery voltage & solar Panel voltage readings by first measuring the battery voltage & solar panel voltage with an accurate digital voltmeter. Adjust the SEDM6-40's battery voltage reading to match by adjusting the (P2) potentiometer (less than 1/4 turn), on the back of the SEDM6-40 module. Adjust the SEDM6-40's solar panel voltage reading to match by adjusting the (P4) potentiometer (less than 1/4 turn), on the back of the SEDM6-40 module. (See diagram to the right.) Unplug the network cable on both ends.
3. Determine the mounting method to be used, surface-cutout or single gang electrical box ring.
4. For surface-cutout mounting, place the template (found on page 16 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 power drill to drive screws into the mounting surface before mounting the display module. Back out the screws, cut-out the template leaving the mounting screw tabs 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 saber saw or router leaving the mounting screw tabs.
5. Plug the network cable into the RJ-45 jack, after pulling it through the cutout hole. Insert the screws through the front of the module and into the holes and tighten by hand with a screwdriver***. USING A POWER DRILL TO DRIVE IN THE SCREWS THROUGH THE SEDM6-40 MODULE WILL VOID THE WARRANTY BY DAMAGING THE SEDM6-40 MODULE!!!***
6. For single gang electrical box mounting, mount the box securely and install conduit (at least 3/4 in. EMT) as desired. Route or pull the display end of the network cable into the electrical box being careful not to damage the RJ-45 plug. Plug the network cable into the back of the SEDM6-40 module and mount the module with 6-32 screws into the tabs of the single gang box. Hand tighten the screws to avoid damaging the SEDM6-40 module.
7. Now plug the charge controller end of the network cable into its RJ-45 jack and verify that the display is working properly. Use grease or silicone to cover the controller side of the network cable plug to avoid corrosion and fill the end of conduit.

Hookup Diagram for SEDM6-40



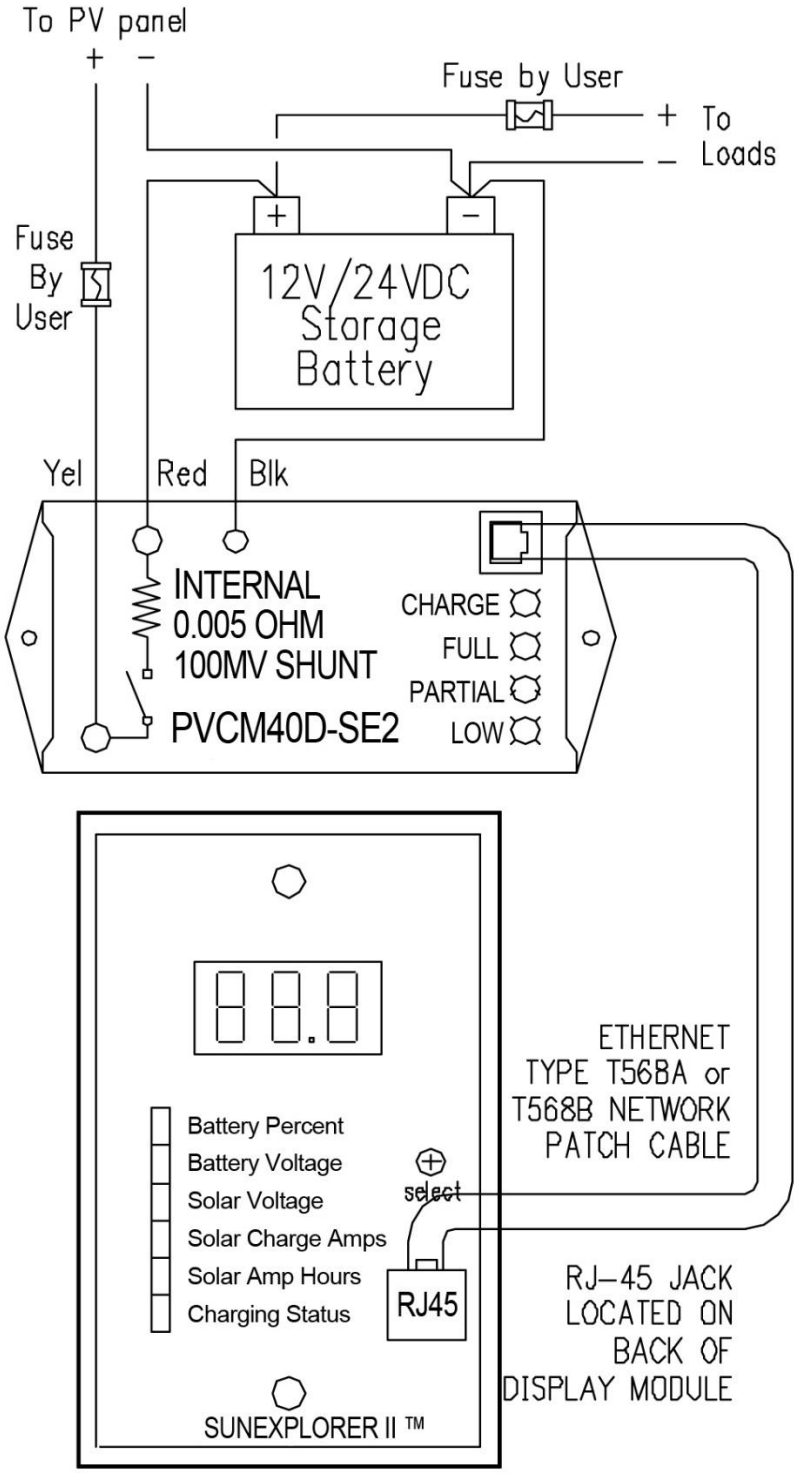
Installation Tips for SEDM6-40

1. When a network cable (up to 50 feet long), is used to connect the SEDM6-40 to the PVCM40D charge controller, it must be the same “straight through” type or the display will not read properly. A “cable error” LED may light up 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 0.3 Amps. Below this value the SEDM6-40 will display “chr” if the PVCM40D is passing solar charge current to the battery. The current display will indicate “0" if the controller is not charging.

3. The solar current shunt used in the PVCM40D in this kit is for a maximum of 40 Amps. There are other meters and charge controllers in the SUNEXPLORER product line. ***The SEDM6-40 display module serves as a remote digital readout for the PVCM40D charge controller. The display units and controllers ARE NOT interchangeable with other parts from other kits.***

Hook Up Diagram



User Instructions for SEDM6-40

1. The power and signals to the SEDM6-40 display are supplied through the CAT-5 network cable connecting the SEDM6-40 to a PVCM40D 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:
   a. “Tapping” or pressing the “select” button activates the backlight for 15 seconds. Pressing the select button to advance, resets the 15 second timer.
   b. Pressing for 1 sec. then releasing the button advances to the next reading.
   c. 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.
   d. 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” the button while the display is flashing prevents entering the lock mode.
      4) Advancing to the next reading (see par. 3b) cancels the lock mode.
      5) Low battery voltage also cancels the lock mode.
   e. 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.
   f. Battery voltage top off - advance to charging status, display will indicate ‘n_c’.
      1) Press and hold the select button the display will flash ‘n_c’ 4 times, 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 exits the charge routing or the select button is pressed.

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

Problem: Module does not click on with sunlight on the PV panels.

Solution: Verify that the battery voltage is less than 12.7V (or 25.4V on a 24V system) and that the open PV voltage is greater than 16V (or 32V on a 24v system). If the battery voltage is at or above 12.7V and PV voltage is above 16VDC, apply additional load to drop the battery voltage below 12.7VDC. If the PV voltage is below 16VDC, check to see if the Solar panel has direct sunlight:
To work properly there cannot be any shadows from trees, buildings, etc.

Problem: Module clicks every four minutes.

Solution: This is the normal operating sequence.

Problem: Module is constantly clicking on & off. Battery voltage is less than 12.7VDC and PV voltage is greater than 16VDC.

Solution: Check the Battery voltage on the battery posts to see if it is fluctuating up & down or remaining steady.

When the voltage on the post is fluctuating between 12.7VDC and the solar panel voltage the battery may have a bad cell, **have the battery tested.**

When the voltage is steady, then check voltage on the battery cables. If it is fluctuating up and down, c**lean the connections** between battery post and battery cables.

When the voltage is steady, check the voltage on the battery buss bar inside the trailer, inspect for water damage or oxidation which can cause a high resistance between controller and battery. **Clean and grease connections** with **NoALOX™.**

When the voltage is steady at the buss bar, then check the voltage at the charge controller connections (Bat+ Bolt and 0.25": spade), if fluctuating at the connector, you could have some oxidation in the connections. **Replace connectors and re-test**.

When the PVCM40D is still clicking 20-30 times a minute, after replacing the connection (Bat + bolt) between the controller and the Positive Buss Bar, We recommend connecting the controllers Bat + bolt to the battery using a 10 gage wire to rule out a hidden connection that could be causing the problem.

The PVCM40D controller monitors battery and solar voltage to know when to charge the battery and when to stop charging. If the voltage is fluctuating between 12.7VDC and 14.2VDC, 99% of the time it is a bad connection between the controller and the battery.

Trouble Shooting Tips for PVCM40D

Problem: The PVCM40D charge controller enters the charge routine every 10 to 15 minutes and only charges for 3 to 4 minutes.

Solution: The PVCM40D is working normally. The PVCM40D monitors both the Battery voltage and PV voltage, when the trailers loads draw the battery down below 12.7VDC the controller beings a new charge cycle. If the PV panel is putting out its maximum charge current it may only take 3 to 5 minutes to bring the battery voltage up to the 14.2VDC cutout point. The timing may vary based on the loads and output from the PV panels.

Problem: The battery loads has been left on and the storage battery has discharged below 9V DC. The PV system is not charging when the load is turned off.

Solution: The PVCM40D needs at least 9VDC from the battery to operate properly. Place panel in direct sunlight and jumper the battery & PV bolts for a 30 minutes, thus bypassing the charge controller allowing the battery voltage to rise to at least 9VDC. Disconnecting the jumper will allow the PVCM40D to charge the battery up to normal levels.

Recommended grease for all power connections between photo-voltaic panels, SunExplorer's charge controller and battery bank.

Brand: IDEAL No ALOX 0.5oz
Available at most hardware stores.

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***!

Recommendation for cleaning SEDM6-40: apply water or cleaning solution to a soft cloth and spot clean the face plate as needed.

Specifications for PVCM40D

Size & Weight:	2.1 x 4.0 x 1.3 inches, 6 ounces
Enclosure:	Epoxy potted in PVC plastic
Mounting:	2 #8 x .75” L screws
Power:	6 to 30VDC from storage battery
Load Capacity:	40 Amps @ 28VDC (Minimum is 20 watt panel)

Temperature compensation:

Battery Thresholds:	Flooded	AGM/Gel
Below0°C	On @ 13.3V	On @ 13.1V
	Off @ 15.0V	Off @ 14.5V
Between 0-5°C	On @ 13.3V	On @ 13.0V
	Off @ 14.8V	Off @ 14.3V
Between 5-10°C	On @ 13.1V	On @ 12.9V
	Off @ 14.6V	Off @ 14.1V
Between 10-15°C	On @ 12.9V	On @ 12.9V
	Off @ 14.4V	Off @ 14.1V
Between 15-30°C	On @ 12.7V	On @ 12.8V
	Off @ 14.2V	Off @ 14.0V
Between 30-35°C	On @ 12.7V	On @ 12.8V
	Off @ 14.0V	Off @ 13.9V
Between 35-40°C	On @ 12.6V	On @ 12.7V
	Off @ 13.8V	Off @ 13.8V
Between 40-45°C	On @ 12.6V	On @ 12.6V
	Off @ 13.6V	Off @ 13.7V

Double above threshold values for 24VDC systems.

Battery Percent Remaining:	12.8V = 100%, 12.55V = 75%, 12.4V = 50% 11.75V = 25%, 10.5V = 0%
Low Battery:	Detects low battery @ 11.8V
Battery Type:	Wet, AGM, Sealed/ Gel (default is wet battery)
Temp Sensors:	LM335T PT (Required for temperature compensation) Available in 96” or 192” wire lengths
Temperature Compensation:	24mV/°C .13mV/°F
Solar Voltage:	Display range 0 to 25.0VDC
Solar Charge:	Display range 0 to 35.0 Amps
Solar Amp Hours:	Display 0 to 999 accumulated
Solar Charge Status:	7th LED position not lit – not charging – night mode Red LED: Bulk charging stage Green LED: Floating charging stage Orange LED: Equalization charging stage
Temperature:	-10 to 55°C/ -14 to 131° F ..

Specifications for SEDM6-40

Size & Weight:	2.75 x 4.5 x .75 inches, 3 ounces
Mounting:	Single - gang electric box or surface mount with cutout
Power:	12 or 24VDC from PVCM40D
Current Draw:	15 mA normal mode 35 mA with back light on
Connection:	RJ-45 jack to T568A or T568B network Cat-5 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%, 11.8V = 50%, 10.8V = 0%, 12V system 25.6V = 100%, 23.6V = 50%, 21.6V = 0%, 24V system
Battery Voltage:	Displays 0 to 60VDC
Low Battery Voltage:	Detects @ 11.0V & 22.0V for 12V & 24V systems
Solar Voltage:	Displays 0 to 60VDC
Current:	0 to 50 Solar Charge Amps
Display:	Below .3 Amps the display will indicate “chr” if the controller is charging
Amp Hours:	Displays 0 TO 999 accumulated
Charging Status:	6th LED position not lit - not charging Green LED - not charging, display indicates “n_c” * Press and Hold Select Button while in charging status location will force PVCM40D into charge mode. Red LED - Charging display indicates “chr”
Temperature:	0 to 50°C

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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.
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