

EXELTECH



Exeltech PVAC Module

Installation & User's Guide

Revision 1.17

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS!

This manual contains important installation, maintenance, and user instructions for the Exeltech PVAC Modules that shall be followed during installation and maintenance of the Inverter. Failure to follow these instructions could lead to serious injury or death, or damage to equipment or property.

SAFETY SYMBOLS USED IN THIS MANUAL

SYMBOL	ASSOCIATED TERM	WHAT IT MEANS
	WARNING!	Calls attention to a potentially hazardous situation, which if not avoided, could lead to death or serious injury, and/or damage to equipment and property.
	CAUTION!	Indicates a potentially dangerous situation that may result in minor or moderate injury. May also be used to alert against unsafe practices.
	WARNING!	References information pertaining to voltages in or around the unit that are capable of causing injury or death.
	NOTE!	Designates important information required for proper installation, maintenance, and/or operation of your Exeltech AC Module Grid-tie inverter.

IMPORTANT!

FAILURE TO HEED THESE SYMBOLS AND THE DOCUMENTATION THEY REFERENCE COULD RESULT IN DEATH OR SERIOUS INJURY, OR DAMAGE TO YOUR INVERTER(S) OR OTHER PROPERTY.

FCC COMPLIANCE STATEMENT – EXELTECH PVAC MODULE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- (1) This device may not cause harmful interference, and;
- (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.










CAUTION! Alterations or modifications to the equipment not expressly approved and authorized in writing by Exeltech may cause unexpected or hazardous operation of the equipment that may void the equipment warranty and/or invalidate user's authorization to operate this equipment.

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CAUTIONS and WARNINGS

Before installing or using the PVAC Modules, read all instructions, cautions, and warnings in this Manual and on the equipment, the PV array, and in this Installation Guide.

	<p>WARNING! Hazardous voltages are present inside AC Modules and within circuits that connect to the AC Modules. Contact with high voltage may cause death or serious injury. To prevent electrical shock, always disconnect all power to unit(s) prior to servicing, and NEVER operate this equipment with the covers removed.</p>
	<p>CAUTION! Risk of electrical shock. Do not remove inverter cover. No installer, user or operator serviceable parts exist inside. Refer all service to a factory service technician or qualified service personnel.</p>
	<p>NOTE! PVAC Modules are bonded to protective earth (safety ground) through the utility ground. <u>No other ground connection is needed.</u> The utility ground connection must be established prior to operating the units. The ground wire at the service entry should be #14 AWG copper or larger, or sized as appropriate within your local jurisdiction electrical code. If uncertain, check with your local code enforcement office for their requirements. Input and output circuits are isolated from the enclosure, and system grounding, when required by the National Electric Code Sections 690.41, 690.42, and 690.43, are the responsibility of the installer. AC output neutral is not bonded to ground within the AC Module.</p>
	<p>NOTE! For domestic US installations, all electrical work must be done in compliance with local electrical codes and the NFPA 70 National Electrical Code.</p>
	<p>NOTE! Contact your electric utility company before connecting PVAC Modules to the commercial electrical grid. Connections to the utility grid must be made only by qualified personnel.</p>
	<p>NOTE! PVAC Modules are provided with fixed trip limits and shall not be aggregated above 30 kW on a single Point of Common Connection.</p>
	<p>NOTE! Do not connect PVAC Modules into any AC circuit containing ground-fault protective devices. Ground-fault protection devices are not designed for back-fed power and may be damaged.</p>

USER'S GUIDE

PVAC Module Grid-Tie Inverter has been designed for many years of trouble free service. Once installed, there are no user serviceable parts inside. Please do not remove the covers or attempt to perform any service unless you are fully qualified to do so.

PVAC Modules operate silently, with no moving parts. If you suspect a PVAC Module is not operating properly, please contact your installing dealer or other qualified service personnel for assistance.

The “HelioSentry[®]” is the monitoring system for your PV system. It displays various operating data for each PVAC Module in your system. The HelioSentry[®] is 802.11g “Wi-Fi” compatible. It will allow the user to monitor and commission the PV array via a home computer or laptop PC. See the HelioSentry[®] User’s Manual for additional information.

NEED-TO-KNOW TERMS

- AC - Alternating current
- DC – Direct Current
- PV – Photovoltaic
- AC Module – DC to AC inverter circuitry(black box mounted on the rear of the PVAC Module)
- PVAC Module – Otherwise known as an AC solar panel
- Array – A group of PVAC Modules

PRODUCT OVERVIEW

Exeltech’s PVAC Module is a solar panel that produces utility-ready AC power that can be either consumed on the premise or fed back into the electric utility network. Standard solar panels produce DC power and require a central inverter to convert DC to AC. When more power is generated than consumed, you will have what is referred to “net metering”, where your electric meter will actually spin backwards and you may receive monetary or other credit for the power fed into the utility grid.

HelioSentry[®] is a trademark of Exeltech, Fort Worth, Texas

AC MODULE INVERTER MECHANICAL SPECIFICATIONS

Dimensions	5.9" (150 mm) x 6.3" (160 mm) x 1.5" (39 mm)
Weight	2.2 lbs (1 kg)
Cooling	Natural Convection
Enclosure	NEMA 4X
Connection	Insulation Displacement

AC MODULE INVERTER ELECTRICAL SPECIFICATIONS

Nominal Output Voltage (AC)	120VAC
Nominal Output Frequency	60 Hz
Maximum Input Source Backfeed Current To Input Source	1.8A
Output Power Factor Rating	Greater than 0.99
Operating Voltage Range (AC)	106-132V
AC Operating Frequency Range	59.3 Hz – 60.5 Hz
Maximum Continuous Output Current (AC)	1.8A
Maximum Continuous Output Power (AC)	216 Watts
Current Total Harmonic Distortion (THD)	Less than 5%
Maximum Output Fault Current (AC) And Duration	1 A for 0.1 second
Maximum Output Overcurrent Protection	20 A
Utility Interconnection Voltage & Frequency Trip Limits & Trip Times	Meets UL 1741 and IEEE 1547
Trip Limit And Trip Time Accuracy	±2%
Operating Temperature Range	-40°C to +70°C
Output power temperature derating and maximum full power operating ambient temperature	212 watts out @ 50°C Derated by the PV above 50°C
CEC and Peak Inverter Efficiency	94.5% CEC, 95.8% peak efficiency
Idle Power Consumption (night time)	0 watts

Table 1: Voltage Trip Settings

Voltage Trip Settings			
Voltage at Point of Common Coupling		Maximum Trip Time⁽¹⁾	
<u>Assuming 120V Base</u>	<u>% of Nominal Voltage</u>	<u># of Cycles⁽²⁾</u>	<u>Seconds</u>
Less than 60 Volts	Less than 50%	10 Cycles	0.16 Seconds
Greater than or equal to 60 Volts but less than 106 Volts	Greater than or equal to 88% but less than or equal to 110%	120 Cycles	2 Seconds
Greater than or equal to 106 Volts but less than or equal to 132 Volts	Greater than or equal to 88% but less than or equal to 110%	Normal Operation	
Greater than 132 Volts but less than or equal to 144 Volts	Greater than 110% but less than or equal to 120%	60 Cycles	1 Second
Greater than 144 Volts	Greater than 120%	10 Cycles	0.16 Seconds

¹ "Maximum Trip time" refers to the time between the onset of the abnormal condition and the time the Inverter ceases to generate power.

² Assuming 60 Hz Nominal.

Table 2. Frequency Trip Settings

Frequency Trip Settings		
Generating Facility Rating	Frequency Range⁽¹⁾	Maximum Trip Time⁽²⁾
Less than or equal to 30 kW	Less than 59.3 Hz	10 Cycles (16.67 milliseconds max)
	Greater than 60.5 Hz	10 Cycles (16.67 milliseconds max)

¹ Assuming 60 Hz nominal frequency.

² "Maximum Trip time" refers to the time between the onset of the abnormal condition and the time the Inverter ceases to generate power.

PVAC MODULE AGENCY COMPLIANCES

ETL Certified to UL 1741 Safety Standard for Utility Interactive Inverters
 IEEE 1547 and 1547.1 Safety Standard for Utility Interactive Inverters
 IEEE 929 Recommended Practice for Utility Interface of Photovoltaic (PV) Systems
 IEEE 519 Harmonic Standard
 Surge - ANSI C62.41 Level B2 (stand-alone), or C62.41 Level C1 with optional HelioSentry®
 FCC – Meets or Exceeds Title 47 CFR, Part 15, Class B Interference Requirements

PV MODULE ELECTRICAL SPECIFICATIONS

Maximum Power (P _{Max})	240 Watts
Maximum Voltage (V _{mp})	48.6 Volts
Maximum Power Current (I _{mp})	4.95 Amps
Open Circuit Voltage (V _{oc})	59.5 Volts
Short Circuit Current (I _{sc})	5.28 Amps
PV Module Efficiency	14.2%

PV MODULE MECHANICAL SPECIFICATIONS

Dimensions (Width – Length – Height)	41.9" (1065 mm) x 62.8" (1596 mm) x 2" (50.8 mm)
Weight	49.6 lbs (22.5kg)
Frame Structure (Material, Corners)	Aluminum, Clear Anodized
Front Side	Anti-Reflective Textured Tempered Glass
Front Glass Thickness	0.125" (3.175mm)
Encapsulant	EVA
Back Sheet	TPT

PV MODULE AGENCY COMPLIANCES

UL - 1703 – Safety Standard for Photovoltaic, 35AY
 TÜV - Spec 931/2.572.9, ID: 0000007045
 IEC 61215
 CE

DESCRIPTION OF OPERATION

PVAC Modules are connected internally to the direct current (“DC”) output of a photovoltaic module (“PV panel”). They convert the DC into utility-ready alternating current (“AC”) suitable for connection to the commercial power grid. In the event the utility power fails, the PVAC Modules will cease producing power as required by the UL 1741 Safety Standard. When utility power is restored, PVAC Modules wait slightly more than five minutes as required by UL 1741 before they commence generating power again.

PVAC Modules operate totally independently of each other. You may start with one PVAC Module, then add more to your system as time and budget allow.

PVAC Modules are designed to connect to a 120V AC, 60 Hz dedicated branch circuit. If 240V AC operation is desired, two separate “home run” cables and circuits are needed. Connect equal numbers of PVAC Modules from Line 1 to Neutral, and from Line 2 to Neutral to maintain a balanced circuit. You may start with just one PVAC Module connected L1-N. For optimum circuit balance, the next PVAC Module should be connected L2-N.

PVAC modules are more robust than standard DC solar panels. PVAC modules eliminate most of the issues associated with ordinary DC “string” inverter systems:

- PVAC modules are much easier to install.
- Lower cost to install.
- Far less prone to shading and other problems experienced by string inverter topologies.
- No DC wiring calculations needed.
- Eliminate all DC hardware (wiring, central DC to AC inverters, DC disconnects...)

WARRANTY

Solar Warranty Periods:

- 25 year limited manufacturer warranty on PV Module
 - 10 years @ 90% power output
 - 25 years @ 80%power output
- 20 year limited manufacturer’s warranty on AC Module

The above stated warranty does not apply to products which have failed due to improper installation, misuse, alteration, unauthorized repair or modification, or acts of God.

Purchaser is responsible for transportation and handling costs of the equipment to and from the distributor or dealer for warranty replacement or repair.

The above warranty does not include incidental or consequential damages and Exeltech disclaims any liability for any such damages. All implied warranties, if any, are limited in duration to the above stated warranty period. Some states and provinces do not allow the exclusion or limitation of incidental or consequential damages or a duration for an implied warranty, so the above limitations may not apply to you. All liability is limited to the original purchase price of the PVAC Module.

Figure-1: PVAC Module ID Locations



STEP I **INSTALLING THE PV RACKING SYSTEM**


NOTE:
REFER TO THE PV RACKING INSTALLATION MANUAL FOR ALL MOUNTING INSTRUCTIONS AND CALCULATIONS. THE MANUAL IS LOCATED IN THE RACKING SYSTEM PACKING.


SELECTING A MOUNTING LOCATION


When choosing your PV mounting location:

- Choose a location with minimal shading. An ideal solar array location will have little to no shade from 9:00am to 3:00pm.
- Exeltech PVAC modules will generate energy no matter what direction they are mounted. For optimal energy production, mount the PV modules on a southerly facing area of roof top. East and West sloping roofs are also acceptable. A north facing roof is not recommended.
- Array tilt. Follow the slope of your roof.

- Commercial rack systems are recommended for flat roof tops. Commercial rack systems are designed with specific tilts for your location.
- Choose a location near your utility interface (AC breaker panel). Remember, the maximum Home Run cable is 100 ft. in length. Verify that the distance from your utility interface to the farthest AC module is less than 100 feet.
- The PVAC Module may be mounted in any orientation. (See Figure 2)
- The location selected must comply with the National Electric Code and your local safety and building codes.
- Verify the roof is in good condition before mounting the PV rack system.

	<p>NOTE! The installer is solely responsible for:</p> <ol style="list-style-type: none"> 1) Complying with all applicable local or national building codes, including any that may supersede this manual; 2) Ensuring that the roof, its rafters, connections, and other structural support members can support the array under all code-level loading conditions; 3) Using only those parts supplied with the mounting kits for mounting and attachment of the PVAC Modules to the rack frames; 4) Ensuring that lag screws have adequate pull-out strength and shear capacities as installed (See rack installation manual for details); 5) Maintaining the waterproof integrity of the roof, including selection of appropriate flashing; 6) Ensuring safe installation of all electrical aspects of the PVAC Module array; and 7) Ensuring correct and appropriate design parameters are used in determining the design loading used for design of the specific installation. Parameters such as snow loading, wind speed, exposure and topographic factors should be confirmed with a local building official or licensed professional engineer (see rack installation manual).
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	<p>WARNING! Do not install PVAC Modules in areas where flammable materials or explosive vapors may exist.</p>
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	<p>NOTE! Follow all national local electrical codes when selecting a mounting location. Consult the NFPA 70 National Electrical Code for requirements.</p>
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STEP II


INSTALLING THE PVAC MODULES ONTO THE RACKING SYSTEM

- When the mounting rack is fully secured to your roof, you are ready to install PVAC Modules.
- Refer to the rack installation manual for details on mounting the modules to the rack system.

ORIENTATION AND CLEARANCES

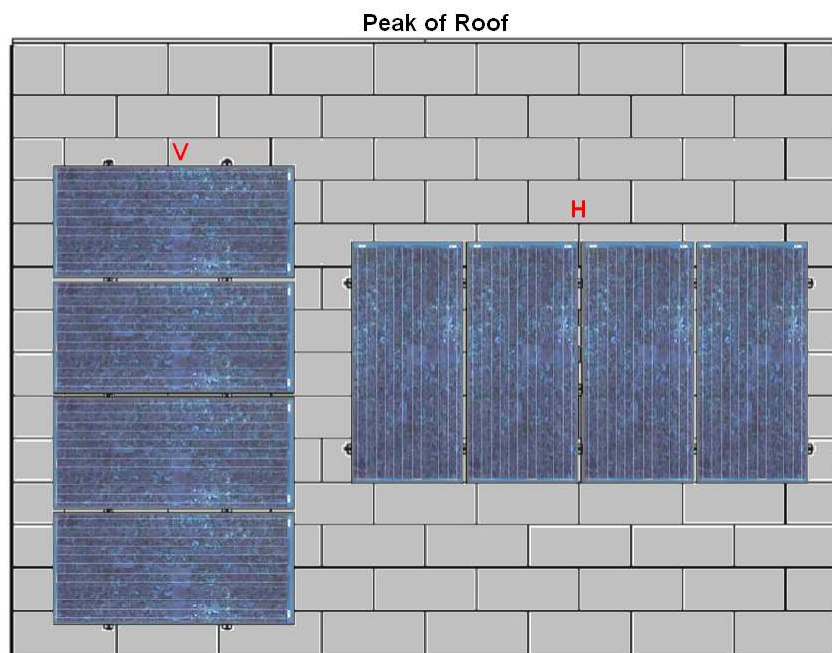
PVAC Modules must be mounted in a manner that allows airflow under the PV panels.

	<p>NOTE! PVAC Modules are convectively cooled. No fan or other mechanical means is provided to move the air. Do not block the air flow path.</p> <p>NOTE! Minimum clearance distances must be observed if your PVAC Module inverter system is to operate at maximum rated output in hot weather.</p> <p>NOTE! Any mounting location that restricts airflow may cause excessive heating in the AC Module, causing reduced output. Do not mount the PV panel flush to any surface.</p>
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	<p>NOTE! Do not remove the leads or cable grips from the PVAC Module inverter enclosure. Use only the cables and connectors provided.</p>
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When properly installed, PVAC Modules will resemble the layouts in Figure 5V or 5H. PVAC Modules may be mounted either vertically (Figure 5, Illustration 'V') or horizontally (Figure 5, Illustration 'H') with respect to the roof.

Figure 2: Module Orientation



STEP III

WIRING YOUR PVAC MODULES



CAUTION! Utility connection of this unit must be performed by a licensed electrician or other qualified personnel. Read these instructions completely before proceeding with installation.

If you do not understand the instructions or steps required herein, seek assistance from qualified personnel.

Additional information required for installation may be found in the National Fire Protection Association Publication NFPA70, known as the National Electrical Code., any state building codes, and any applicable local codes.

The following instructions are intended to be used in conjunction with PVAC Module Installation Figures on the following pages. To ensure a safe, reliable installation, please comply with the instructions as specified, and in the order presented.



CAUTION! Ensure AC conductors have no voltage present. Open all AC circuit breakers and verify zero volts are present before proceeding!



NOTE! Use only the fasteners provided to mount the PVAC Modules. Use of any other hardware is not recommended and may lead to unsafe operation of your PVAC Modules.



NOTE! For exterior installations where conduit may be used, weather-tight conduit fittings complying with requirements in the “Standard for Fittings for Conduit and Outlet Boxes, UL 514B”, must be used. In such event, install conduit couplings as required by your local Electrical Code.



WARNING! Before proceeding, ensure the steps below have been performed:
Disconnect AC Power from any point of attachment prior to connecting PVAC Modules.



CAUTION! To reduce the risk of fire, connect only to a dedicated circuit provided with 20 amperes maximum branch-circuit over-current protection in accordance with the National Electrical Code, ANSI/NFPA 70.



WARNING! To reduce the risk of fire, do not connect to an AC load center “circuit breaker panel” having multi-wire branch circuits connected.



CAUTION! DO NOT CONNECT MORE THAN 10 PVAC MODULES TO ONE CIRCUIT! IF YOU WISH TO INSTALL MORE THAN 10 PVAC MODULES, USE SEPARATE HOME RUN CABLES FOR UP TO 10 MORE MODULES PER CIRCUIT. REFER TO FIGURE 3.



CAUTION! Do not exceed the amperage rating of the circuit box to which the PVAC Modules are connected. Consult the National Electric Code or your local Code Safety Inspector for the applicable rules and regulations in your area.

Up to 10 PVAC modules may be connected to a single home run cable. Each HelioSentry® is equipped with inputs for two home run cables (LINE-1 and LINE-2). Up to 20 PVAC modules may be connected to one HelioSentry®.

Each LINE must use separate dedicated conductors from each system to the AC disconnect panel. At that point, each LINE AC output must have its own AC 20 ampere disconnect breaker.



NOTE! The combined output power of multiple inverters may not exceed the service rating of the circuits to which the inverters are connected. Consult ANSI/NFPA 70: The National Electrical Code for guidance.



WARNING! These units are provided with fixed trip limits and shall not be aggregated above 30 kW on a single Point of Common Connection.

CABLING

PVAC Module installation kits are provided with UL-approved, sunlight resistant, 3-conductor cable for connection purposes to utility power. This cable is rated for exterior use without conduit. Do not substitute Romex® or any other conductor for this cable.

Cable lengths in Table 3 give less than 5% voltage drop for runs of up to 150 feet for various numbers of AC Modules. If longer distances are involved, increase conductor gauge and/or decrease in the number of PVAC Modules per conductor as required. Consult the National Electric Code or other authoritative sources for appropriate wire size for your installation.

Table 3 – Cable Lengths

<p>Cable Length up to 100': Max of 10 PVAC Modules connected in parallel. Cable Length 100' to 125': Max 8 PVAC Modules connected in parallel. Cable Length 125' to 150': Max 6 PVAC Modules connected in parallel.</p>

Cable lengths exceeding 150' are not recommended.

To avoid difficulty, keep conductor runs from your PVAC Modules to the service entry as short as possible. Long cable runs from the PVAC Modules may cause PVAC Modules to “see” higher voltage than is actually present, leading to occasional shutdown of one or more units in the circuit due to a perceived (but not real) abnormal utility voltage condition. Cable lengths longer than 150' are not recommended. It's advisable to keep your total cable length less than 100' if possible.

Cable should be secured to each PVAC Module frame with two or more cable clips

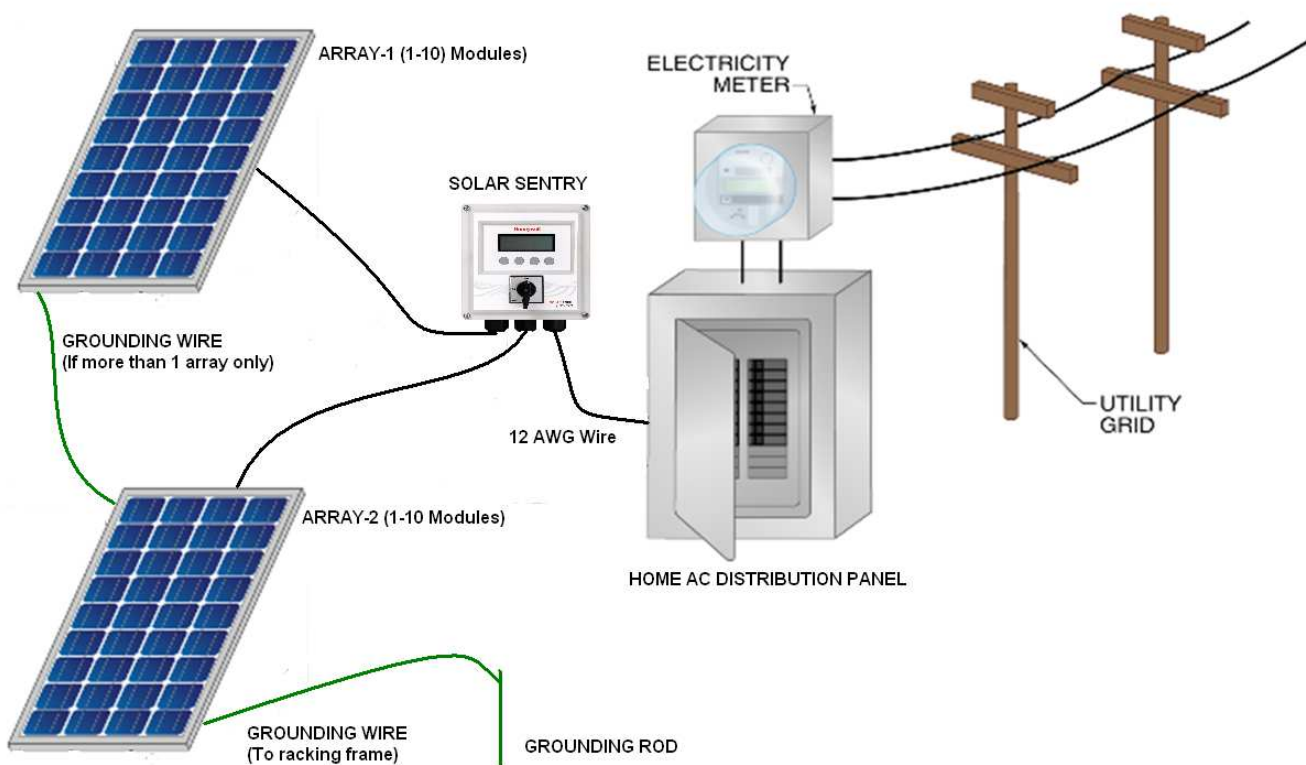
The BLACK insulated conductor in the cable is the “LINE” connection. The WHITE insulated conductor is “Neutral”. The GREEN insulated conductor is protective earth ground. The neutral conductor must be bonded to earth ground at your service entry. See Figure-4.

Secure the Home Run cable from the last PVAC Module. Your local building codes may require that this cable be in conduit. Though the cable supplied is UL-rated for outdoor use without conduit, your local codes override any instructions in this Manual.

Penetrating your roof or wall with this cable will likely require a metal conduit to meet your local electrical codes. It is the installer's responsibility to ensure all national and local codes are observed in the installation of this system.

Do not allow the Home Run cable to rest loosely on the roof. Use cable clips to secure the cable across the backs of the PVAC Module frames. Additional hardware (not supplied) may be necessary for additional cable as required by your local building codes.

FIGURE 3: Basic PVAC Module Wiring Diagram



PVAC CONNECTOR & HOME RUN CABLE DESCRIPTION

- The “Home Run” cable is custom-designed for use with the PVAC Module connector.
- Up to 10 AC Modules can be connected to each home run cable.
- Wire configuration: See Figures 4 and 5.
 - The black wire is “Line”
 - The green wire is “Ground”
 - The white wire is “Neutral”

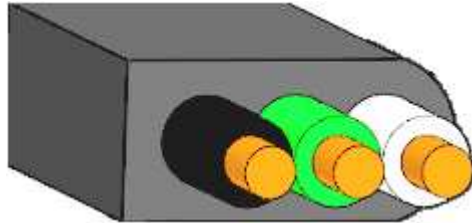


Figure 4: Home Run Cable (End View)

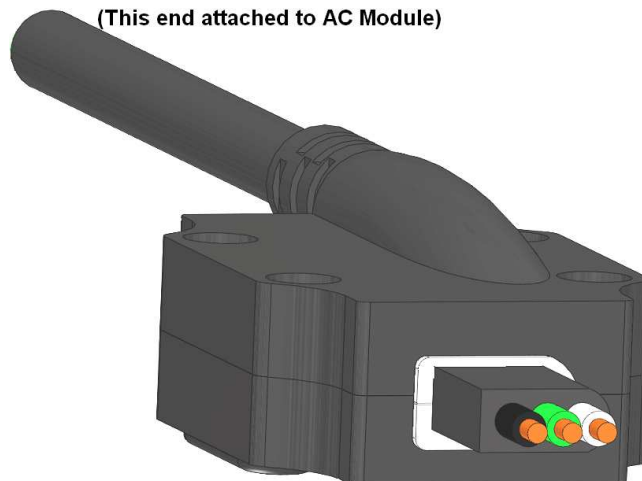


Figure 5: Home Run Cable with PVAC Module Connector Attached (note orientation of “pigtail”)

HOME RUN WIRING PROCEDURE:

1. Unroll home run cable. Verify the wire length is adequate to reach all modules and the HelioSentry®.
2. Attach the PVAC quick connectors to the home run wire. See steps 1-10 below. Space the connections evenly across the modules.
3. Secure the home run cable to the rack system. See rack system manual for details. The recommendation is to secure the cable so that the connectors are located underneath the modules for protection from the elements.
4. Run the home run cable to the HelioSentry®. Follow all NEC requirements. Conduit may be necessary in certain states.
5. Following the steps in the HelioSentry® Installation Manual, connect the home run wire to the HelioSentry®.
6. Follow all NEC requirements to terminate the opposite end of the home run wire.

ATTACHING THE PVAC CONNECTOR TO THE HOME RUN CABLE:

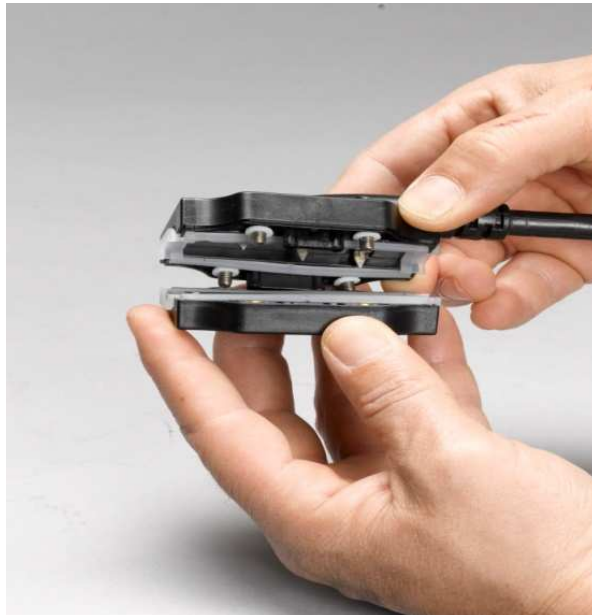


CAUTION! Failure to secure the Home Run cable as required could cause fraying of the insulation or other problems, resulting in a potentially hazardous condition with exposed wiring.

STEP 1: Loosen the screws from the connector.



STEP 2: Separate upper and lower sections of connector.



STEP 3: Inspect silicone gasket.



STEP 4: Reseat silicon gaskets back into both sections of connector.



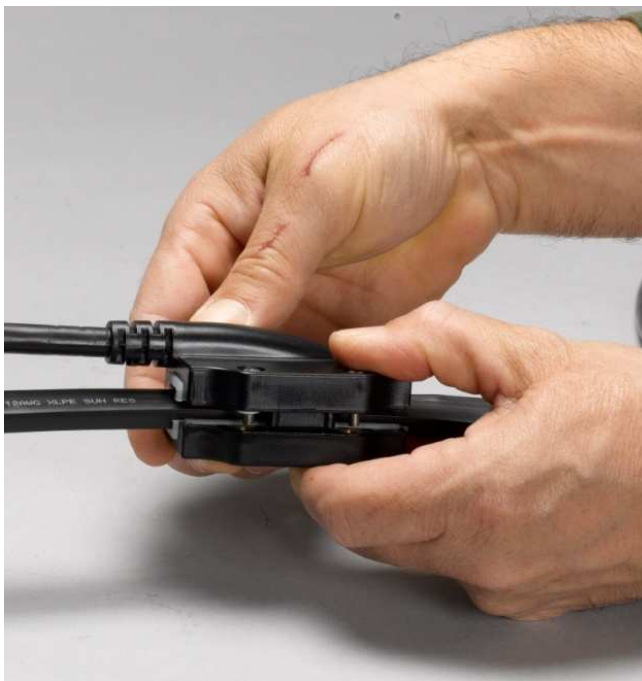
STEP 5: Verify AC wire-to-connector orientation.



STEP 6: Locate and place lower half of connector onto AC wire.



STEP 7: Align upper and lower halves of connector. Before securing connector, verify alignment by observing to ensure connector 'teeth' penetrate the outer jacket. Visually verify the teeth will not miss any wire. Secure by pressing the two sections together evenly.



STEP 8: Evenly screw upper and lower sections together with screw driver.

- Hold the AC wire in place.
- Use an 'X' pattern of opposite corners when tightening.
- Tighten screws snug and uniformly. Torque to 8-9 inch-lbs. **Do not over-tighten.**



STEP 9: Verify the screws are tightened correctly by inspecting both sides of connector. Upper and lower sides of connector should be firmly seated against each other. If not, tighten screws as necessary. See examples below.

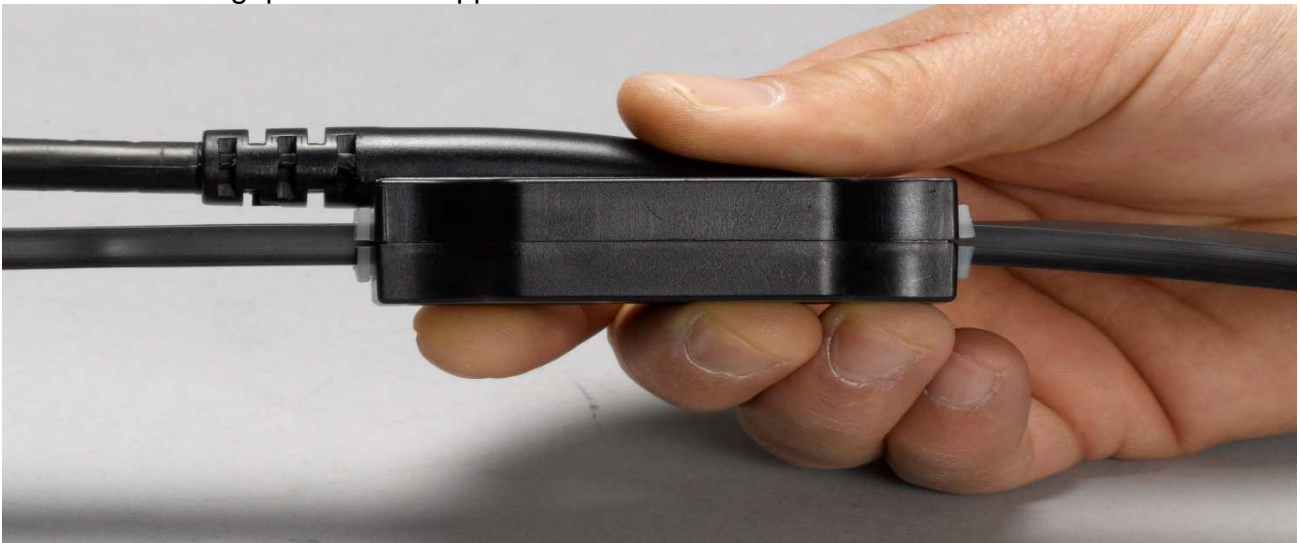
WRONG: Note the gap between upper and lower sections



WRONG: Gap on one end of connector



CORRECT: No gaps between upper and lower sections of connector



STEP 10: Verify all connectors are have the same orientation (connector pigtails are facing the same way).



WARNING: FAILURE TO VERIFY PROPER CONNECTOR ORIENTATION WILL CAUSE DAMAGE TO THE HELIOSENTRY® DATA MONITOR!

This completes the installation of your PVAC Module(s). The system is now ready for the commissioning steps. Figure 4 is a representative wiring diagram of your system.

STEP IV

GROUNDING THE PV RACK



CAUTION! Failure to install the grounding system as specified herein may result in hazardous operation of your PVAC Module. See Figure 2.



NOTE! Your state and/or local building codes may supersede the grounding requirements contained in this manual. It is the installer's sole responsibility to ensure full compliance with all applicable electrical codes in your area.

- PV frames must be safety grounded using 12 AWG or 10AWG solid copper grounding. See Rack installation manual for details.
- Installation of the grounding electrode ("ground rod").
- Connecting a grounding electrode conductor ("ground wire") from the ground rod to the PV mounting frame;
- Attaching the ground wire to the PV mounting frame with the hardware supplied in your PV rack mounting kit.
- Install a ground rod in accordance with your local electrical code. This may be a copper-clad rod of ½" to ¾" diameter, and six to ten feet long. Consult your local electrical code for the appropriate size and location for a ground rod.
- Install the grounding electrode clamp ("ground clamp") over the top of the ground rod. Electrical codes typically require this to be a one-piece agency-approved compression connector. ("Agency-approved" means Nationally Recognized Testing Laboratories such as ETL, UL, CSA, TUV, and others.
- The grounding electrode conductor ("ground wire") for this system shall be 12 AWG copper (or larger), or 10 AWG. We recommend copper for this application because of its ease of availability.
- You will need ground wire of sufficient length to reach from the ground rod to the attachment point on the PV rack. Ensure you have adequate ground wire. Splices in ground wire are not permitted by the National Electric Code.
- Clamp the free end of the ground wire to the ground rod using a ground clamp. Follow all manufacturers' instructions for attachment and clamping of a ground wire to the ground rod. Torque to its manufacturer's specification.
- Route the free end of the ground wire in accordance with your applicable building codes. It will follow a path from the ground rod to the PV rack clamp. Secure grounding wire as required by your local building codes.
- At the PV rack, allow sufficient ground wire to easily attach the free end of the ground wire to the grounding lug supplied with your PV rack kit.
- Tighten the ground wire compression screw to 12 inch-lbs.
- Cut off excess ground wire that extends more than 1 inch beyond the ground lug.



NOTE! We recommend you periodically check all PV mounting and grounding hardware for tightness and integrity.

GROUNDING OF MULTIPLE PVAC RACKING SYSTEMS



Required: 12 AWG (or larger) copper ground wire.

After installing a second or subsequent PV rack, install one PV rack ground lug in the existing PV rack as shown in Figure 3.

Install one PV rack grounding lug on the newly installed PV mounting rack. Cut a length of ground wire of sufficient length to span the distance between the old and new ground lugs, plus three inches to allow for contraction of the ground wire in cold weather.

Insert an end of the ground wire in one PV rack ground lug. Insert the remaining end of the ground wire in the other lug. Tighten both ground lug compression screws to 12 inch-lbs.

Repeat the above steps for subsequent PV rack mounts.

	<p>NOTE! All hardware supplied with your PV mounting rack is stainless steel. Do not replace this hardware with plated or non-stainless materials.</p>
	<p>NOTE! PVAC Modules are equipped with an internal ground approved to UL safety standards. The internal ground connects the AC Module chassis to a safety earth ground through the utility ground.</p> <p><u>No other grounds to the AC Module are necessary or required.</u></p> <p>Only the PV AC module frames and rack system require ground connections.</p>


MOUNTING THE HELIOSENTRY®:


Follow instructions in the HelioSentry® Installation Manual.


WIRING THE HELIOSENTRY® TO YOUR AC PANEL (BREAKER BOX)

Follow instructions in the HelioSentry® Installation Manual.

STEP V
ACTIVATING YOUR PVAC MODULE INVERTER SYSTEM

	WARNING! Obtain full inspection approval from your local electrical inspector or other Authority Having Jurisdiction over electrical wiring inspections before activating the inverter.
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	CAUTION! Do not connect the PVAC Modules to generator-based power systems! Doing so may cause serious damage to the generator, the PVAC Modules, or both.
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	NOTE! Safety standards applicable at the time of manufacture of the PVAC Modules mandate a minimum five-minute delay after fully activating the inverter(s) before power is produced. Inverters must be connected to the utility grid before any power will be generated. PVAC Modules will <u>NOT</u> generate power as stand-alone units.
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SEE HELIOSENTRY® USERS MANUAL FOR DETAILED INSTRUCTIONS

1. Flip the AC breaker to the 'ON' position.
2. Turn the HelioSentry® AC disconnect switch to the 'ON' position.
3. Wait at least 5 minutes. Power production will commence five minutes after connection is established to the utility grid, provided there is sufficient power available from the photovoltaic modules. This five-minute delay is a required safety feature by UL 1741 and cannot be changed.
4. Verify each panel is reporting to the HelioSentry® by scrolling through the screens on the LCD display. See the HelioSentry® Users Manual for detailed instructions on how to maneuver through the different display screens.
5. Proceed to the Troubleshooting section if any AC modules do not show up on the Sentry screen.

STEP VI
TROUBLESHOOTING

	PVAC Modules contain no user serviceable parts. All troubleshooting must be performed by qualified service personnel only.	
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	WARNING!	Failure to turn the off the breaker(s) in your AC panel and the AC disconnect on the front of the HelioSentry® BEFORE servicing the AC modules can cause serious injury and/or death.
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After the AC disconnect switch has been turned to the on position for at least 5 minutes, verify power generation of each module via the LCD screen on the front of the HelioSentry®.


Each PVAC module ID should appear in the order they were detected by the monitoring system.

- If any of the AC modules do not appear on the Sentry screen:
 - Verify there is enough visible daylight outside. Solar modules will not report to the Sentry during night time hours.
 - Verify and record the module IDs of the modules that are reporting to the sentry.
 - Turn the off the breaker(s) in your AC panel and the AC disconnect on the front of the HelioSentry® **BEFORE** servicing the AC modules.

 - Using the proper safety precautions, locate the module(s) that are not reporting. Use the recorded module IDs as a reference.
 - In most cases, improper wire connections are the cause of failing power outputs from modules. Inspect and re-seat the quick-connector of the modules that are not reporting, verifying proper alignment and orientation of the connector and wire.
 - After reseating the connectors follow the module activation sequence.

SERVICE GUIDE

	PVAC Modules contain no user serviceable parts. All troubleshooting and service work must be performed by qualified service personnel only.
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	CAUTION! Some of the components inside the PVAC Module will store a high-voltage charge for several minutes after DC and AC power is removed. Take all necessary precautions to avoid coming into contact with any of the PVAC Module internal components when exchanging a unit.
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PVAC Modules are designed to be field-replaceable by qualified service personnel. In the unlikely event of failure of an AC Module:

AC MODULE REPLACEMENT PROCEDURE:

- 1) Disconnect all utility AC power from your PVAC Module system by opening the circuit breaker connected to that circuit.
- 2) Turn the AC disconnect knob to the 'OFF' position.
- 3) Lock-out the AC disconnect knob to prevent unauthorized energizing of the circuit. With a voltmeter or similar test device, verify all power has been removed from your PVAC Module system.
- 4) If work is being done during the day, cover the PV with an opaque cloth or other material to block the sun from reaching the surface of the PV before removing the AC Module from the enclosure. High-voltage circuits will remain active without utility AC power present, and will pose a safety hazard if proper precautions are not observed.
- 5) Loosen the clamps holding the suspect PVAC Module to the racking.

- 6) Lift the PV module up.
- 7) While supporting the PV module, loosen and remove the four screws holding the corners of the AC Module to the enclosure on the PV.
- 8) Grasp the AC Module by the sides of the finned heat sink and pull the AC Module from the enclosure base, noting the location of the internal AC interface connector.
- 9) Place the old AC Module to one side. Note the location of the internal AC interface connector.
- 10) Insert the new AC Module into the enclosure, making sure to align the AC interface connector on the AC Module printed circuit board with the AC interface connector in the enclosure. Press firmly. The lid should seat completely on the base of the enclosure. Make sure the o-ring gasket remains in place.
- 11) Replace the four screws located at the corners of the AC Module enclosure. Torque to 20 inch-pounds. DO NOT OVERTIGHTEN.
- 12) Reinstall the PV module onto the rack.
- 13) Verify that all hardware is tight per the installation instructions.
- 14) Restore AC power to the PVAC Module system. Follow the steps outlined in "Commissioning Your System".

This completes the replacement of an existing AC Module.

SAFETY COMPLIANCE STATEMENT – EXELTECH PVAC MODULES

Exeltech PVAC Modules comply with the following safety and related standards:

Title 47 CFR, Part 15, Subparts A and B of the United States Federal Communications Commission Rules and Regulations.

ANSI C62.41 IEEE Standards for Surge Protection.

UL1741 Standards for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.

UL1703 Standards for Photovoltaic Modules.

IEEE 519 International Standards for Harmonic Limits.

IEEE 929 International Standards for safety of linemen, customers, and utility equipment. Also sets power quality ranges and anti-islanding requirements.

LIST OF ILLUSTRATIONS

- Figure 1 PVAC Module ID # Locations
- Figure 2 Module Orientation
- Figure 3 Basic PVAC Module Wiring Diagram
- Figure 4 Home Run Cable (End View)
- Figure 5 Home Run Cable with Connector (End View)
- Step 1 Loosening the Connector Screws
- Step 2 Separating Upper and Lower Connector Sections
- Step 3 Inspecting the Silicone Gasket
- Step 4 Reseating Silicone Gasket
- Step 5 Verifying Connector Orientation
- Step 6 Installing Lower Connector Half
- Step 7 Aligning Connector Halves
- Step 8 Attaching Connector Halves
- Step 9a Example Illustration: Incorrectly Tightened Screws
- Step 9b Example Illustration: Incorrectly Assembled Connector
- Step 9c Example Illustration: Correctly Assembled Connector
- Step 10 Example Illustration: Multiple Connectors on Home Run Cable