ARCCOM Installation and Operations Manual



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IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

INSTRUCTIONS IMPORTANTES **CONCERNANT LA SÉCURITÉ**

Before installing or using the ARCCOM String Combiner Box, please read all instructions and caution markings in this manual as well as on the string combiner, on the PV modules and PV inverter or Charge Controller.

This manual contains important instructions that shall be followed during installation and operation of ARCCOM String Combiner Boxes. To reduce the risk of electrical shock and to ensure the safe installation and operation of the combiner, the following safety symbols are used to indicate dangerous conditions and important safety instructions.

CONSERVER CES INSTRUCTIONS. CETTE NOTICE CONTIENT DES INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ.





Could Injure Personnel or Damage Equipment



Instructions for Qualified **Personnel Only**



Positive Connection Point Symbol



Negative **Connection Point** Symbol



Ground Connection **Point Symbol**



DC Electrical Connection **Point Symbol**

All electrical installations, including the wiring method, shall be performed in accordance with all local and national electrical codes, including NFPA 70 and the Canadian Electric Code Part 1.

WARNING - The ARCCOM fused string combiner contains no user serviceable parts. For maintenance, please contact Solectria Renewables or an authorized installer by visiting http://solectria.com/ or by calling +1-978-683-9700.

WARNING - Disconnect all PV modules or follow your site specific instructions when connecting the array. PV arrays produce electrical energy when exposed to light and could create a hazardous condition.



AVERTISSEMENT – Couper Toutes Les Sources d'alimentation Avant Le Dépannage.

WARNING – Connection of the ARCCOM String Combiner Box to PV modules as well as PV inverter to the electric utility grid must be performed only by qualified personnel.

WARNING – The ARCCOM String Combiner Box is designed to be used with a negatively grounded PV system only. Use with positively grounded systems is prohibited.

1.0 Product Overview

The ARCCOM is a commercial disconnecting fused string combiner designed for combining multiple strings of photovoltaic (PV) modules for connection to an inverter. In a large PV array, each string of PV modules must be fused before being paralleled and connected to an inverter. The ARCCOM String Combiner is available with 8, 12, 16, or 24 source inputs and each source circuit is designed to utilize a fuse that is rated at least 156% of the short circuit current rating of the respective PV string source circuit. The fuse value for any source circuit should not exceed the PV module fuse rating. The ARCCOM combiner box is rated for a maximum voltage of 1000VDC. It is acceptable to use in systems where the maximum array voltage is 600VDC. Fusing is provided for positive ungrounded conductors only.

1.1 Switch Operation

The ARCCOM contains a user-operable switch that operates a DC contactor. Control power must be available to the combiner box for the contactor to close when the switch is set to the ON position. When the switch is in the ON position and control power is available, the circuit is closed between the ungrounded source conductors and the ungrounded output conductor(s). In the OFF position, the circuit is open between the ungrounded source conductors and the ungrounded output conductor(s). The contactor is fully load-break rated and can be safely operated under normal operating conditions when installation is per this guide and all warnings and ratings are observed.

1.2 Inverter Compatibility

The ARCCOM combiner box has been tested and is fully compatible with the following Solectria three-phase central inverters: PVI 50-100KW Series, SGI 225-500PE Series, SGI 500XT, and SGI 500-750XTM. Use with other inverter manufacturers' inverters is not permitted. Other inverters have not been tested and Solectria will not guarantee compatibility with, or recommend the use of, the ARCCOM box with these other inverters.

2.0 Ratings Table

MODEL	ARCCOM-8	ARCCOM-12	ARCCOM-16	ARCCOM-24
Number of Fused Inputs	8	12	16	24
Maximum Input Voltage (VDC)	1000	1000	1000	1000
Maximum Continuous DC Current (ADC)	96	144	192	288
Fuse Range Ratings (A)	4A – 15A	4A – 15A	4A – 15A	4A – 15A
Fuse Size Provided	15A	15A	15A	15A
Control Power Requirements per Unit	100VAC – 277VAC @ 0.06A Max or 22VDC – 25.2VDC @ 0.32A Max	100VAC – 277VAC @ 0.06A Max or 22VDC – 25.2VDC @ 0.32A Max	100VAC – 277VAC @ 0.06A Max or 22VDC – 25.2VDC @ 0.32A Max	100VAC – 277VAC @ 0.06A Max or 22VDC – 25.2VDC @ 0.32A Max
Type Rating	4	4	4	4
Ambient Operating Temperature	-40°F to +122°F (-40°C to +50°C)			
Weight	42lbs (18.5kg)	42lbs (18.5kg)	43lbs (18.5kg)	44lbs (18.5kg)
Dimensions	20in. x 24in. x 7in. (508 x 610 x 178mm)	20in. x 24in. x 7in. (508 x 610 x 178mm)	20in. x 24in. x 7in. (508 x 610 x 178mm)	20in. x 24in. x 7in. (508 x 610 x 178mm)

3.0 Installation

WARNING – These installation instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any installation unless you are qualified to do so.

WARNING – This manual contains important instructions for all ARCCOM models that shall be followed during installation of the String Combiner Box.

The necessary steps to installing the ARCCOM are unpacking, inspecting, mounting, conduit installation, wiring, testing, and commissioning.

3.1 Unpacking and Inspection

The ARCCOMs are thoroughly inspected and rigorously tested before they are shipped. Even though the units are delivered in cardboard packaging, it is possible that the units may become damaged during shipment. Inspect the combiner thoroughly after it is unpackaged. If damage is noticed, document the damage with digital photos and immediately report the damage to the shipping company. If there is any question about potential shipping damage, contact Solectria Renewables. If it is determined that the unit must be returned, an RMA number must be obtained from Solectria Renewables prior to returning the unit. Take care not to set the combiner on a gravel roof or floor that might scratch the paint.

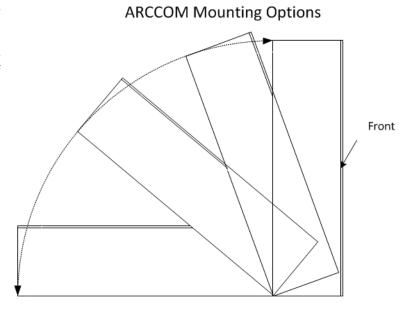
3.2 Mounting

The ARCCOM enclosure is Type 4 rated and will maintain the rating with appropriate installation methods. The ARCCOM box should not be installed with the door angled downward at any angle. See mounting option graphic for further understanding.

Be sure to verify load capacity of the mounting area. Mount the combiner using the mounting holes provided.

Install the combiner in an accessible location following NEC codes for enclosure and switch clearances and proximity to other equipment.

Although not required, the combiner and fuses will stay coolest if the combiner is located in shade or partial shade from the array, roof equipment vault, walk-up or other equipment on the roof.



Vertical, Angled, or Horizontal Mounting

3.3 Install Conduits

The use of UL514B or equivalent conduit fittings and UL50 installation methods are required to maintain the Type 4 rating of the enclosure. Failure to follow these standards may result in water intrusion into the unit through conduit connections and may void the warranty.

Output conduits and source circuit conduits must be installed on the bottom. A small conduit entry area is available on the left side for control wiring.

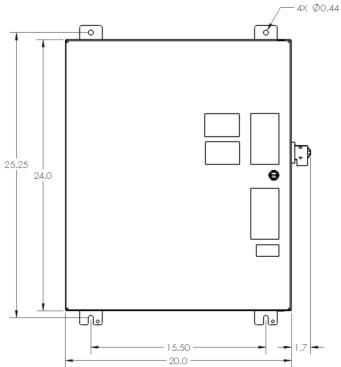


Figure 1 - ARCCOM Dimensions

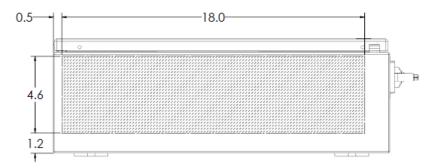


Figure 2 – Conduit Entry Locations, Bottom (Based on vertical mounting)



Figure 3 – Conduit Entry Locations, Left Side (Based on vertical mounting)

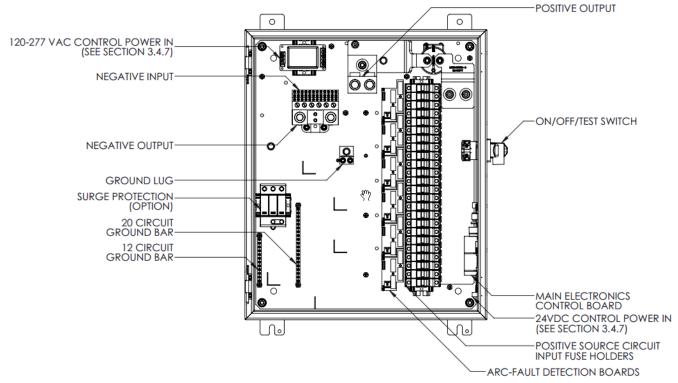


Figure 4 - Internal View (24 Fuse Position Model Shown)

3.4 Wiring

The ARCCOM must use copper source circuit conductors only. For the PV output circuit feeders, either copper or aluminum conductors may be used, although due to terminal size restrictions, aluminum wiring may not be an option in all cases. As with any aluminum wiring, follow best industry practices to ensure a reliable connection; thoroughly clean the conductor just prior to making the electrical connection and use an oxide inhibitor to prevent the formation of aluminum oxide.

All conductor terminations are rated for 90°C.

All wiring must be in accordance with local and national electrical codes.

3.4.1 Remove Fuses



WARNING – Removing fuses from a live circuit may create dangerous arc-flash and shock hazards.

- 1. Confirm that the switch is in the OFF position.
- 2. Remove each fuse from the touch-safe fuse holder for each source circuit. Store the fuses for later reinstallation.

3.4.2 Guard Removal



WARNING – Removing the plastic guard exposes the installer to dangerous voltage and shock hazards.

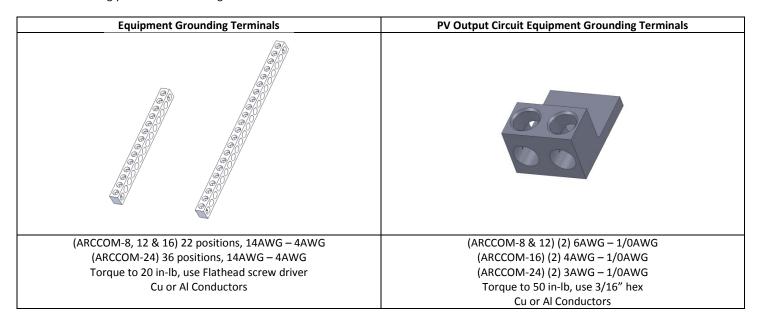


WARNING – Remove all fuses before proceeding with Sections 3.4.2 through 3.4.7.

- 1. Hold the plastic guard.
- 2. Loosen the screw using a screwdriver.
- 3. Gently remove plastic guard and store for reinstallation.
- 4. Leave the screw in place for reinstallation of the plastic guard.

3.4.3 Grounding

See NEC Article 250 and 690 for grounding requirements. A ground bar has been provided for Equipment Grounding Conductors (EGCs). Torque each EGC accordingly. The ARCCOM String Combiner Box EGC terminal should be used to connect the enclosure to the inverter EGC circuit.



3.4.4 Source Conductors

See NEC Articles 310 and 690 for proper source circuit conductor sizing. Note that the conductor size ranges given here and on the labels in the product are the overall allowed ranges that fit in the terminals but the minimum size conductor that can be used must be determined using NEC and is likely larger than the minimum shown in the ranges.

Acceptable ARCCOM source circuit conductor inputs are restricted to copper for both the ungrounded and grounded source circuit inputs.

Positive Source Conductors	Negative Source Conductors
(1) 12AWG – 8AWG	12AWG – 8AWG
(2) 14AWG – 10AWG	Torque to 20 in-lb, use Flathead screw driver
Torque to 25 in-lb, use Phillips screw driver	90°C Terminations, Cu Conductors Only
90°C Terminations, Cu Conductors Only	

Connect the positive ungrounded source circuit conductors to the touch safe fuse holders, one conductor per fuse holder; torque each source circuit conductor as described above. Route all ungrounded source circuit conductors such that the installation is neat and orderly.

Connect the negative grounded source circuit conductors to the grounded source circuit terminal block, one conductor per screw terminal; torque each grounded source circuit conductor as described above. Route all grounded source circuit conductors such that the installation is neat and orderly.

3.4.5 PV Output Circuit Conductors for Standard Lugs

See NEC Articles 310 and 690 for proper output conductor sizing. Solectria Renewables provides output lugs as standard with each ARCCOM String Combiner Box unit. The use of these lugs is required and changing the lugs in the field will void the warranty.

For terminating crimp lugs, see the option on the next page.

NOTE: Solectria requires a backup wrench to hold exterior of lug while tightening center screw to reach the required torque value of 375in-lb. Failure to do so will result in damage to the insulated negative terminal support and will not be covered under warranty. See image to the right.



Picture 1 – Output Lug with Backup Wrench

Positive Output Conductors, Standard Lugs	Negative Output Conductors, Standard Lugs
Torque to 375 in-lb, use 1/2" Hex 90°C Terminations, Cu or Al Conductors	Torque to 375 in-lb, use 3/8" Hex 90°C Terminations, Cu or Al Conductors

	Single Conductor		Two Parallel Conductors	
Number of Fused Inputs	Copper Conductors	Aluminum Conductors	Copper Conductors	Aluminum Conductors
8	1AWG - 600kcmil	1/0AWG - 600kcmil	1/0AWG - 600kcmil	1/0AWG - 600kcmil
12	3/0AWG - 600kcmil	4/0AWG - 600kcmil	1/0AWG - 600kcmil	1/0AWG - 600kcmil
16	250kcmil - 600kcmil	350kcmil - 600kcmil	1/0AWG - 600kcmil	1/0AWG - 600kcmil
24	500kcmil - 600kcmil	Not Allowed	3/0AWG - 600kcmil	4/0AWG - 600kcmil

3.4.6 PV Output Circuit Conductors for Crimp Lug Option

See NEC Articles 310 and 690 for proper output conductor sizing. With this option, Solectria Renewables provides stud plates with 3/8in studs for compression lugs for both positive and negative output. This option must be ordered from the factory at the time of the ARCCOM order.

NOTE: Solectria requires a back-up wrench to hold the negative terminal block while tightening the nut on the stud for the crimp lug to reach the required torque value of 280in-lb. Failure to do so will result in damage to the insulated negative terminal support and will not be covered under warranty. See images below.

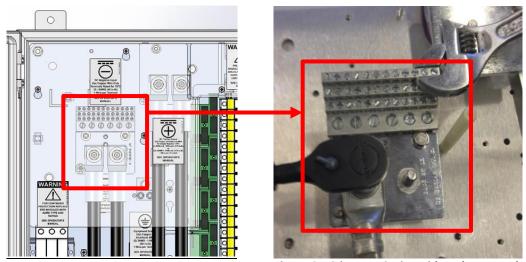
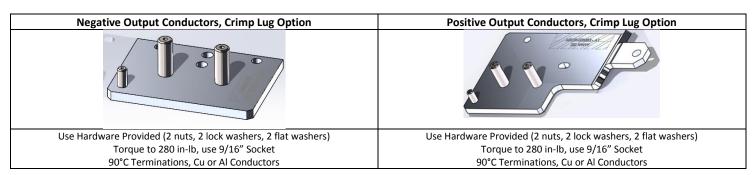


Figure 5 - Crimp Lug Option Location

Picture 2 - Crimp Lug Option with Backup Wrench



	Single Conductor		Two Parallel Conductors	
Number of Fused Inputs	Copper Conductors	Aluminum Conductors	Copper Conductors	Aluminum Conductors
8	1AWG - 500kcmil	1/0AWG - 500kcmil	1/0AWG - 500kcmil	1/0AWG - 500kcmil
12	3/0AWG - 500kcmil	4/0AWG - 500kcmil	1/0AWG - 500kcmil	1/0AWG - 500kcmil
16	250kcmil - 500kcmil	350kcmil - 500kcmil	1/0AWG - 500kcmil	1/0AWG - 500kcmil
24	500kcmil	Not Allowed	3/0AWG - 500kcmil	4/0AWG - 500kcmil

NOTE: When only a single conductor is used, the left position should be used so that the lug works with the turn-preventer stud.

No compression lugs are provided with the ARCCOM String Combiner Box unit. The lugs must conform to the specifications given in the table below:

Lug Type	Hole Size	Plating	Max. Tongue Width
Single Hole	3/8in	Tin Plated	1.25in

NOTE: Use Panduit series lugs LCA, LCAN, LAA, or equivalent lugs from other manufacturers.

NOTE: Only use lugs with aluminum conductors that are explicitly listed for use with aluminum conductors.

For the hardware on the crimp lug option, use the following stack-up: Stud on positive or negative output plate, crimp lug, 1 flat washer, 1 lock washer, and 1 nut (Negative Output shown).

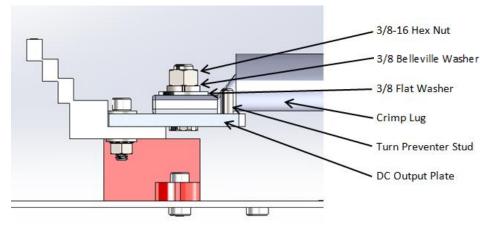


Figure 6 - Compression Lug Hardware Stack-up

3.4.7 Control Power

NOTE: Control power from an external source is required for the proper operation of the ARCCOM String Combiner Box.

Control power from an external source is required for the proper operation of the ARCCOM String Combiner Box. The control power may be supplied *either* as a 120, 240 or 277VAC circuit *or* as a 24VDC circuit. Control power is not available from the inverter.

Control Power Requirements				
Nominal Voltage Minimum Voltage Maximum Voltage Nominal Cu				Nominal Current
AC Control Power	120, 240 or 277VAC	100VAC	277VAC	0.06A
DC Control Power	24VDC	22VDC	25.2VDC	0.32A

NOTE: When control power is removed during normal operation, the DC contactor will open, isolating the PV source circuit conductors from the PV output circuit conductors. In this manner, the control power can be used as a way to remotely control the output of ARCCOM String Combiner boxes.

WARNING – Do not connect both AC and DC sources of control power, as this may cause an unsafe condition, cause damage to the unit and will void the warranty.

AC Control Power

For AC control power, connect a 120, 240 or 277AVC circuit to the power supply located in the upper-left corner of the ARCCOM String Combiner Box. The circuit should be dedicated to one or more ARCCOM units and should not power other loads. The circuit may be protected at 15A or 20A. Connect the circuit as shown below, with one wire to the "N" terminal and one wire to the "L" terminal.



Picture 3 - AC Control Power Terminals

AC Control Power Terminals

14AWG – 12AWG (3.5in-lb); small flathead screwdriver, size 1/8" One Wire per Terminal

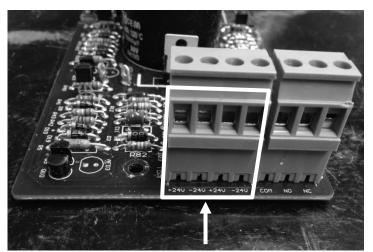
DC Control Power

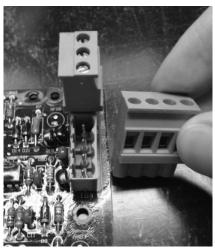
ARCCOM units can also be powered from a 24VDC circuit, such as a fire alarm panel, a building automation system or a dedicated power supply. For DC control power, connect a 24VDC circuit to the main electronics board located in the lower-right corner of the ARCCOM String Combiner Box and disconnect the 2 position connector from the main electronics board. The circuit should be dedicated to one or more ARCCOM units and should not power other loads. For easier access, remove the four position connector and connect the circuit as shown below. Reinstall the connector with the wires facing away from the board.

NOTE: Failure to disconnect the 2 position connector when using 24VDC control power may result in damage to the unit.

The ARCCOM main electronics board 24VDC control power input terminals provide 2 sets of power connections, which allow several ARCCOM combiner boxes to receive control power in a parallel "daisy-chain" configuration when fed from an external 24VDC source.

NOTE: The minimum DC voltage must be maintained at all times at each ARCCOM unit. Pay close attention to the voltage drop when using 24VDC control power.



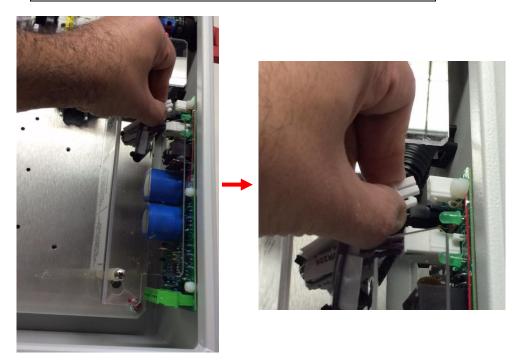


Picture 4 - Main Electronics Board DC Control Power

DC Control Power Terminals

20AWG – 10AWG (4in-lb); small flathead screwdriver, size 1/8".

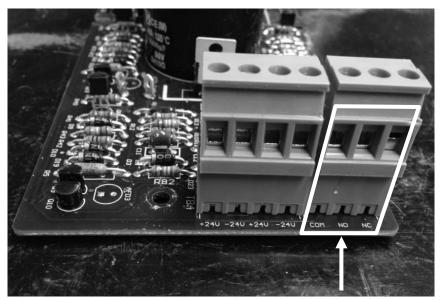
One Wire per Terminal



Picture 5 - Disconnect the 2 Position Connector When Using 24VDC Control Power

3.4.8 Alarm Contacts

For the convenience of the user, a dry contact terminal is provided to allow for optional status monitoring of the ARCCOM String Combiner Box. The monitoring is available for use in either a normally closed (NC) or normally open (NO) configuration. Creating a single NC loop would allow a signal to be applied and indicate an open contactor in the system when the signal is broken from either a manual turn off or an arc-fault condition.



Picture 5 - Alarm Contacts

Alarm Contacts

NO/NC dry contact; 30VDC, 5A max. 20AWG – 10AWG (4 in-lb); small flathead screwdriver, size 1/8" One Wire per Terminal

3.4.9 Final Steps

WARNING – Verify the proper polarity of each source conductor. Polarity reversal can lead to dangerous arc-flash conditions capable of harming personnel and equipment.



WARNING – Check the String Combiner Box for tools and ensure the unit is clean and orderly.

- 1. Verify all connections meet the requirements of this Installation and Operations Guide.
- 2. Reinstall the plastic guard.
- 3. Install all fuses.
- 4. Close the string combiner door.

4.0 Operating Instructions



WARNING – Do not operate the switch with the String Combiner Box door open.

The ARCCOM contains a user-operable switch. When this switch handle is in the OFF position, the circuit is open between the ungrounded source conductors and the ungrounded output conductor(s). Under normal operation, when the switch is in the ON position, the circuit is closed between the ungrounded source conductors and the ungrounded output conductor(s). See Figure 7 below.

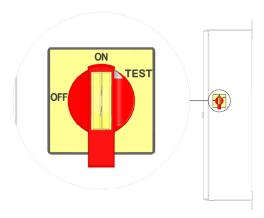


Figure 7 - ON/OFF/TEST Switch

4.1 User Test Procedure

The ARCCOM combiner box should be tested once per month for proper operation. To test please follow the steps below:

- 1. Make sure the ARCCOM box is powered and in the ON position for a minimum of 30 seconds prior to performing test.
- 2. Rotate the DC switch to the TEST position and hold it in that position momentarily.
- 3. Listen for the audible alarm. If alarm does not sound start back at step 1 after confirming there is power to the ARCCOM box.
- 4. An audible alarm indicates proper functionality. Turn switch to the OFF position and wait 30 seconds.
- 5. Turn switch to the ON position to reset the system.

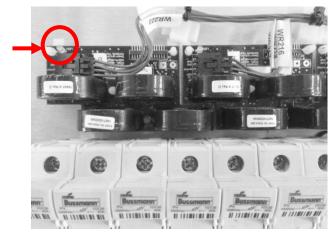
NOTE: The ARCCOM switch must be in the OFF position for at least 30 seconds to properly reset the AFDI circuitry.

5.0 Arc Detection

The ARCCOM includes series Arc Fault Detection and Interruption (AFDI) capabilities. The arc fault detection is recognized to UL 1699B. When the AFDI circuitry detects a series arc, the integrated DC contactor will open. This ceases the flow of current in the PV output circuit. The combiner will indicate a fault condition by an audible alarm and by LED indicators visible inside the unit.

Additionally the sensing boards which the positive source circuit conductors pass through are equipped with a green LED light. Each board monitors up to 4 strings at one time for the presence of an arc. Should a fault occur the board that identified the fault will display a solid green LED light in addition to sounding the audible alarm. During normal operation the sensing boards' LED lights will blink, indicating the system is working properly to detect an arc fault.

-)	A blinking green light means system is working properly to detect an arc fault.	
	A solid green light means an arc fault has been detected and the system needs attention.	
0	No light means there is an issue with the power reaching the sensing board or power is off.	



Picture 6 - Arc Sensing Boards and LED Indicators

WARNING – When an arc is detected, inspect PV wiring connected to the affected combiner box to search for damage and repair the root cause.

ARCCOM AFDI Reset Procedure

- 1. Turn switch to the OFF position and wait 30 seconds for the system to discharge.
- 2. Inspect PV circuits for fault and make necessary repairs.
- 3. Turn switch to the ON position.

NOTE: The ARCCOM switch must be in the OFF position for at least 30 seconds to properly reset the AFDI circuitry.

6.0 Warranty and RMA Instructions

For all warranty information, please visit: http://solectria.com/support/documentation/warranty-information/grid-tied-inverter-warranty-letter/

7.0 Appendices

7.1 Appendix A – ARCCOM Datasheet

Please visit: http://solectria.com/support/documentation/string-combiners/arccom-afdi-compliant-string-combiners/

7.2 Appendix B - Contact Information

Solectria—A Yaskawa Company 360 Merrimack Street Building 9, 2nd floor Lawrence, Massachusetts 01843

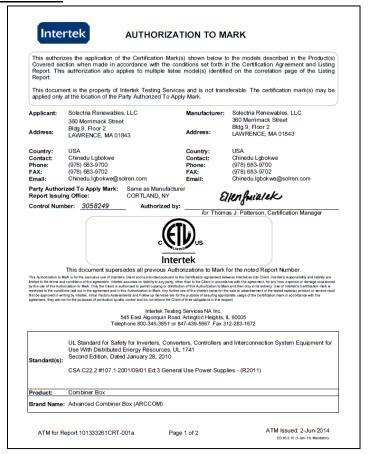
Tel: 978.683.9700 Fax: 978.683.9702

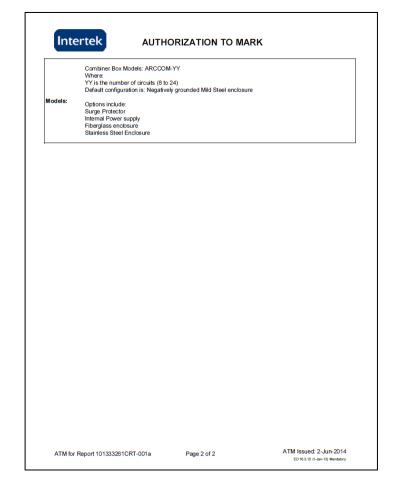
Sales/General Info: inverters@solectria.com
Customer Support: service@solectria.com
Website: www.solectria.com

7.3 Appendix C – Authorized Distributors

See website for complete and updated listing: http://solectria.com/products/string-combiners/arccom/

8.0 UL1741/CSA Certification Letter







QIDC2.E357921 Photovoltaic DC Arc-fault Circuit Protection - Component

Page Bottom

Photovoltaic DC Arc-fault Circuit Protection - Component

See General Information for Photovoltaic DC Arc-fault Circuit Protection - Component

SENSATA TECHNOLOGIES

E357921

529 PLEASANT ST PO BOX 2964 ATTLEBORO, MA 02703 USA

Photovoltaic dc arc-fault detector module, Type 1, Cat. No. PVAF- R-X-YY-Z-AA-BBB.

Photovoltaic dc arc-fault detector module, Type 1, Cat. No. PVAF-TX-AABCC-xxx.

Marking: Company name, catalog designation and the Recognized Component Mark Last Updated on 2014-01-16

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