

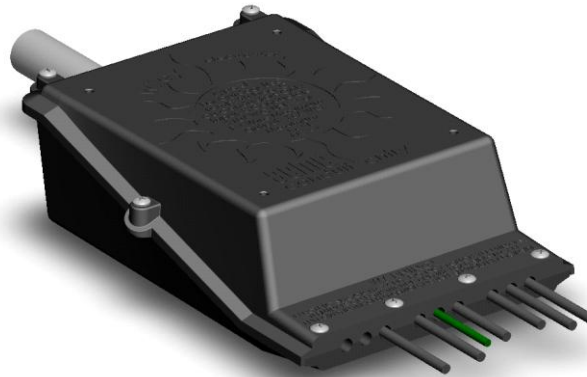


# Acme Conduit Entry

String Combiner/Pass-Through

FOR PHOTOVOLTAIC INSTALLATION

## Installation Manual



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Intertek  
4004188



# IMPORTANT SAFETY INSTRUCTIONS

This product has been designed and tested to international safety requirements to ensure your personal safety. Improper use may result in potential electric shock. To reduce the risk of personal injury, please read and follow all instructions and warnings in the installation manual.

## SAVE THESE INSTRUCTIONS

This manual contains important instructions for the Wiley Acme Conduit Entry string combiner/pass-through that shall be followed during installation and maintenance of the string combiner/pass-through.

### Warning:

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT SPECIFIED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

### Avertissement:

CES INSTRUCTIONS S'ADRESSENT À UN PERSONNEL QUALIFIÉ UNIQUEMENT. POUR RÉDUIRE LE RISQUE DE CHOC ÉLECTRIQUE, N'EFFECTUER AUCUN AUTRE DÉPANNAGE QUE CELUI INDIQUÉ DANS LA NOTICE D'EXPLOITATION À MOINS QUE VOUS NOUS SOYEZ QUALIFIÉ POUR LE FAIRE.

## Warning:

- All electrical installation must be done in accordance with the National Electrical Code ANSI/NFPA 70, local electrical codes and the requirements of the authority having jurisdiction.
- For installations in Canada all wiring methods must be in accordance with the Canadian Electrical Code, Part 1.
- To prevent the risk of electric shock, all wiring and connections must be performed by qualified personnel.
- Photovoltaic arrays when exposed to light create electrical energy that can be a potential electric shock hazard. Array should be covered before making connections.
- Do not exceed the maximum wire size specified in this manual. All wire sizes specified in this manual supersede the maximum allowable wire size specified on each individual field-wiring terminal.
- The terminals on both the lines and the load sides may be energized in the open position. Refer servicing to qualified service personnel.

**Read all of the instructions and warning labels on the combiner/pass-through enclosure before installation.**

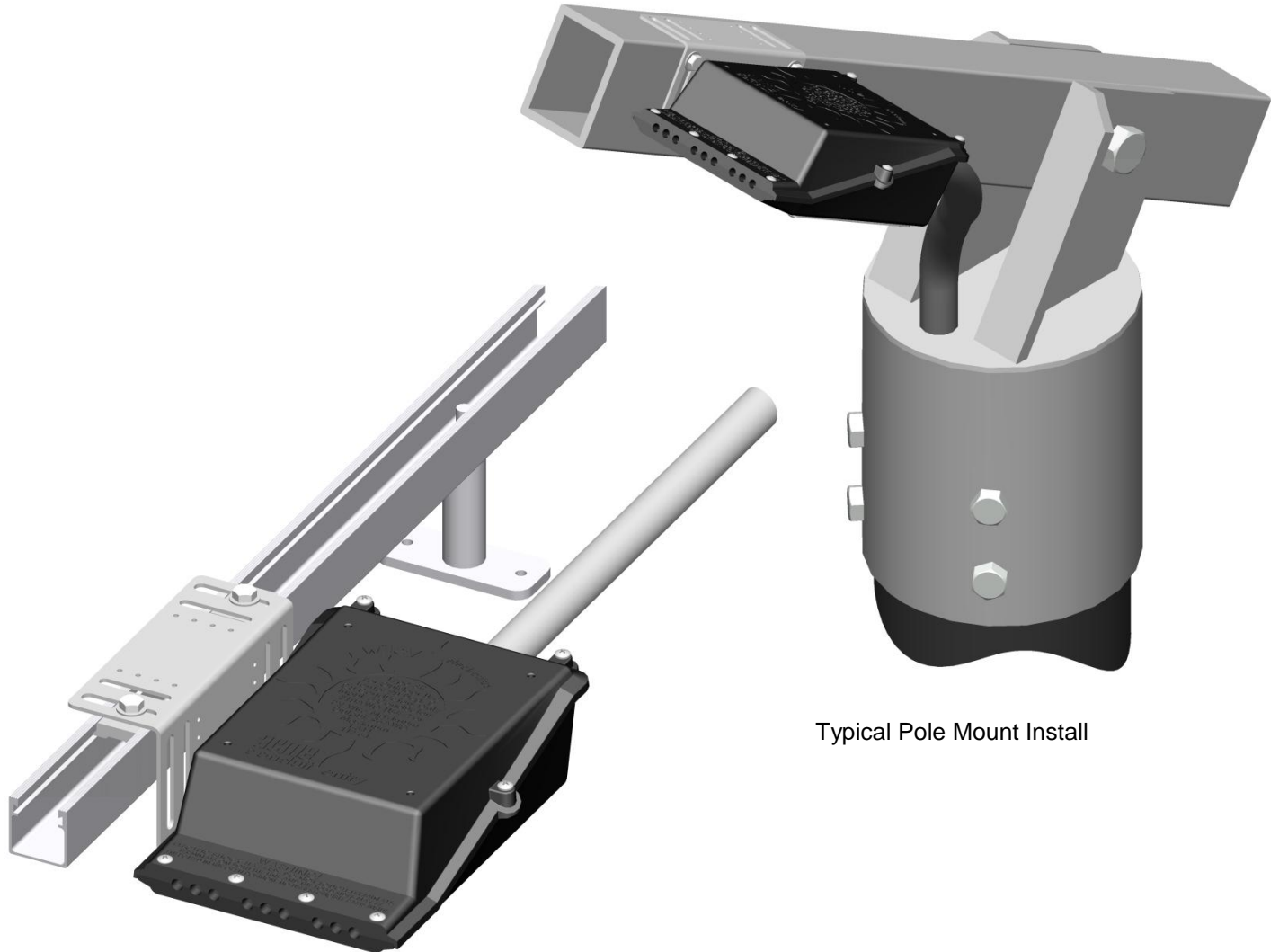
**SAVE THESE INSTRUCTIONS**

## Introduction

The Acme Conduit Entry (ACE) makes quick and simple transitions from PV array wire to conduit protected building wire. The conduit entry features a compact two-piece UV resistant enclosure that allows ample wiring space and is compatible with any conduit type. The unique wire entry seals the enclosure even if entry slots are unused. Wire transitions can easily be accomplished with any code compliant wiring components including butt splices, wire nuts (Fig. 8 & 9), or DIN rail-mount terminals (Fig.10 & 11). Convenient side and bottom entry points allow for easy conduit routing. The cover comes with captive screws for hassle-free assembly.

The conduit entry can also function as a string combiner (Fig. 12-17). When used as a string combiner, code constraints limit the wire size due to wire bending radius requirements. Refer to the section on wiring for details.

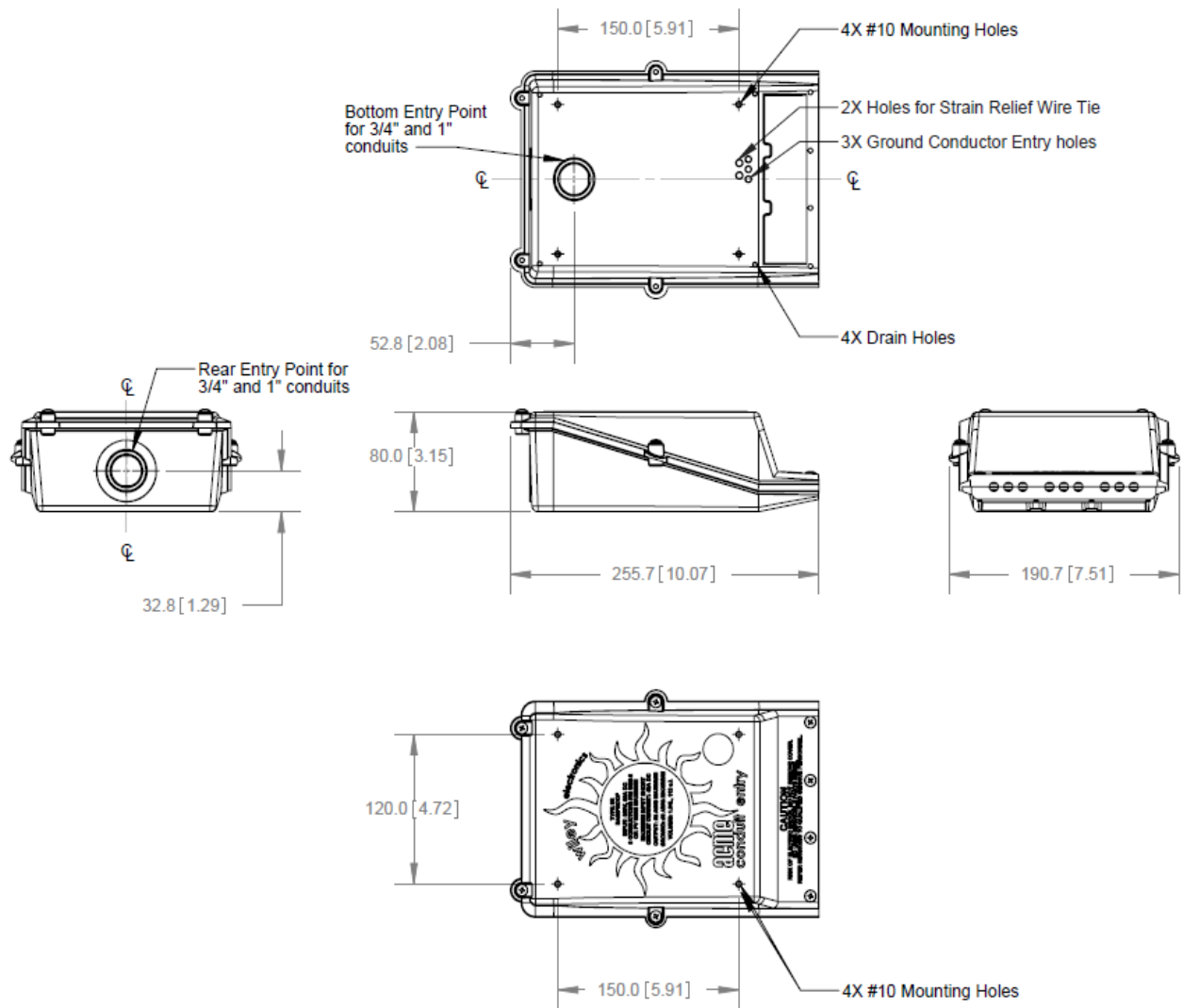
The ACE can be easily installed with any PV system making the installation, quicker, simpler and more aesthetically pleasing.



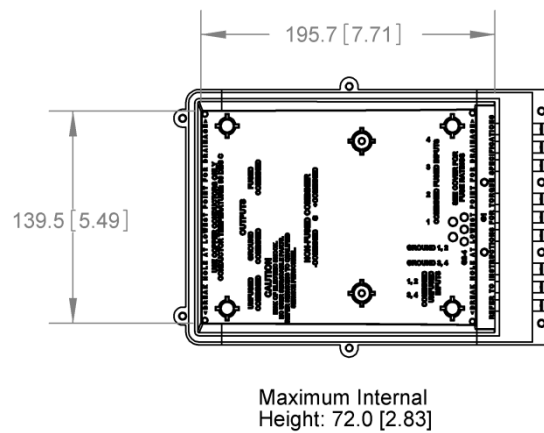
Typical Roof Mount Install

Typical Pole Mount Install

# Overall Dimensions Units are mm [inches]



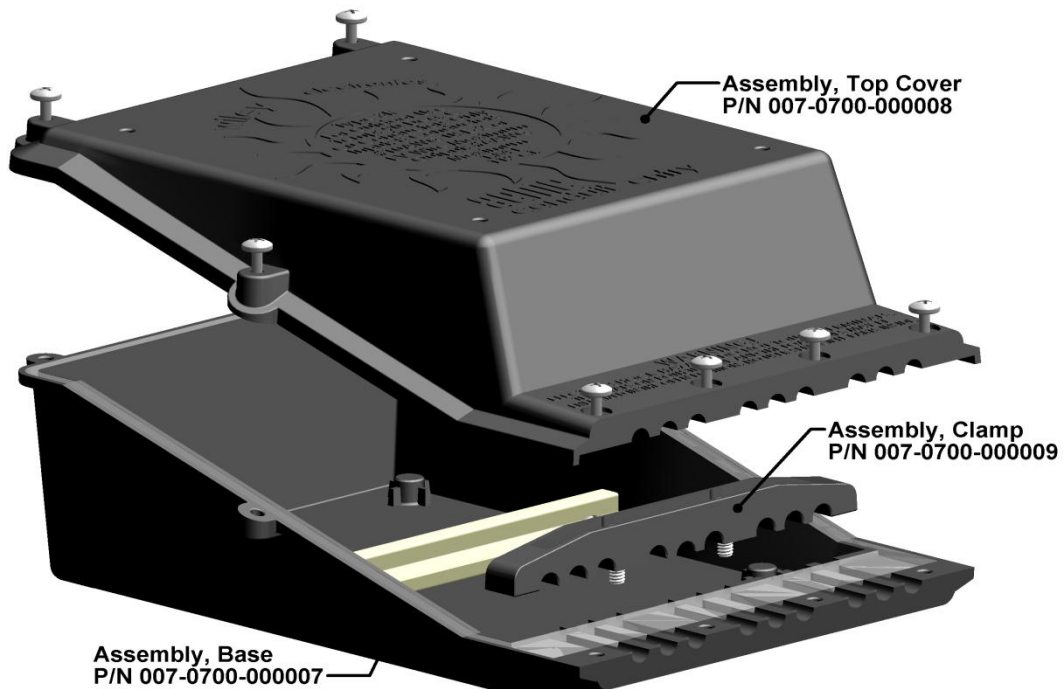
**Figure 1: Overall External Dimensions**



**Figure 2: Overall Internal Dimensions**

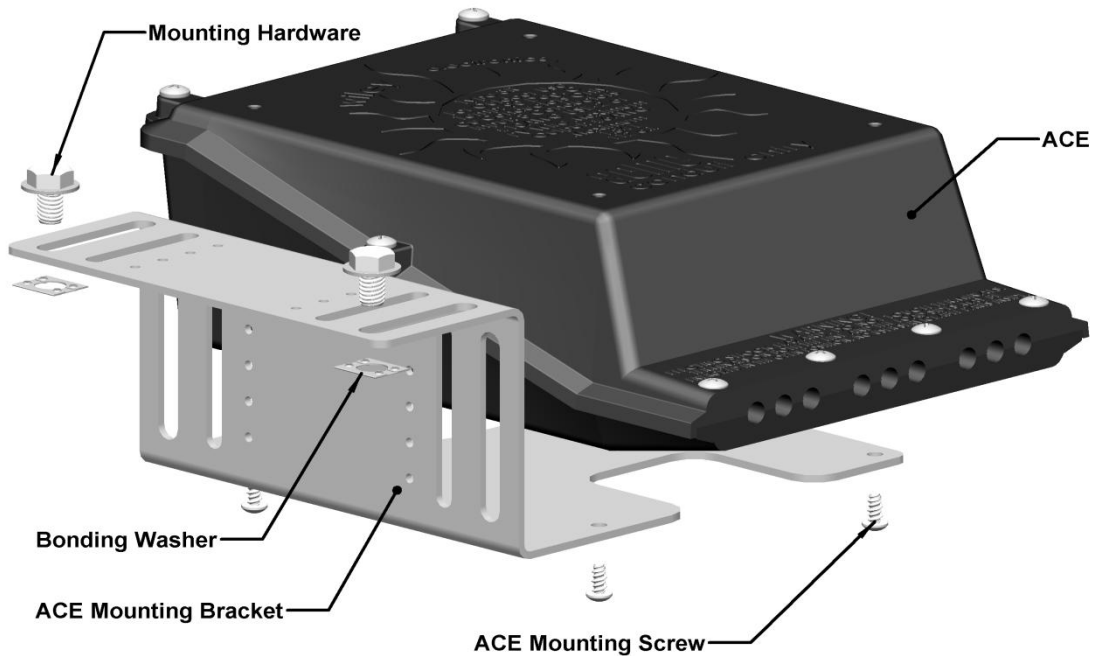
# Assembly

The ACE consists of three sub-assemblies: the Base, the Top Cover and the Clamp. The clamp functions as a strain relief and a wire guide. To ensure a proper seal, fasten all incoming wires securely using the clamp before assembling the top cover.



**Figure 3: ACE Assembly, Exploded View**

# Mounting



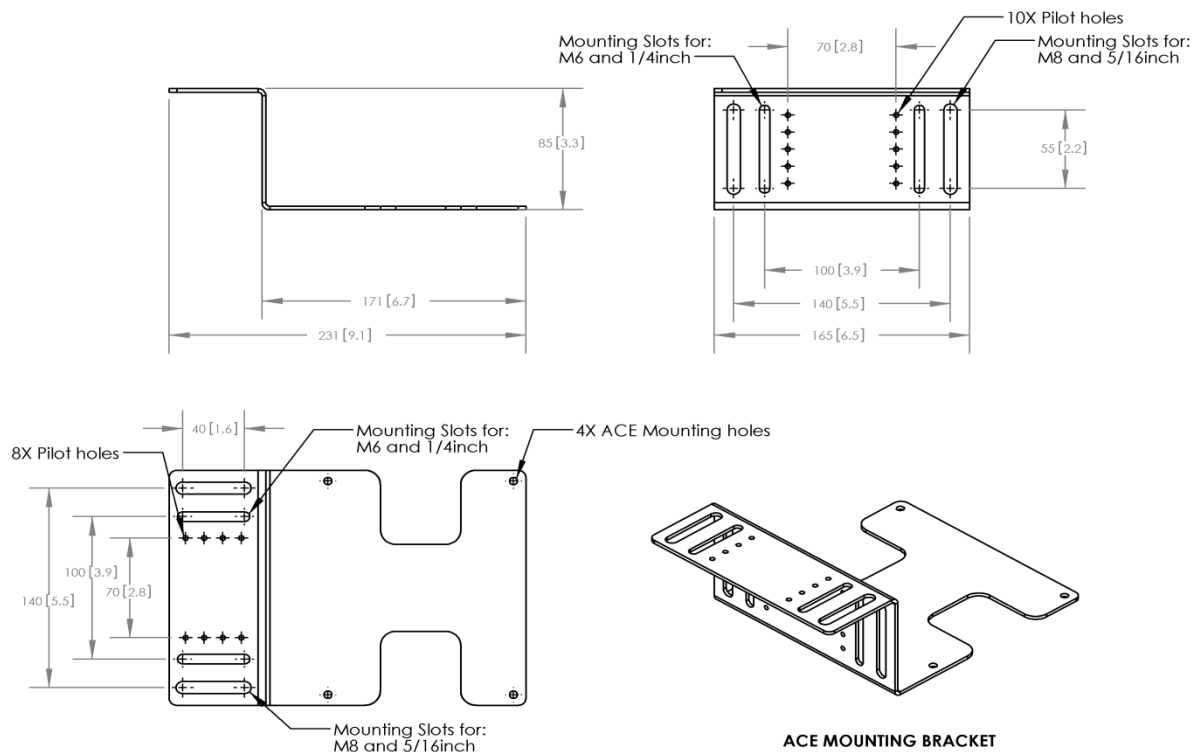
**Figure 4: ACE Mounting Bracket Assembly**

### Parts included with mounting bracket assembly:

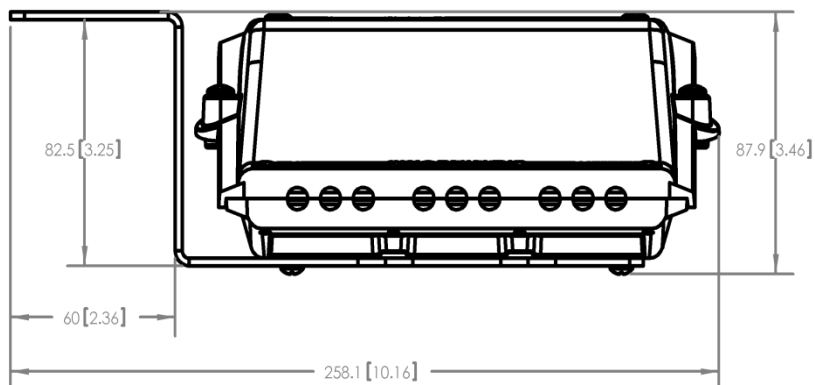
- 1X Mounting Bracket (Black or Clear anodize)
- 2X WEEB-9.5NL Bonding Washer (For use with M6-M10 or 1/4"-5/16" hardware)
- 4X ACE Mounting Screw

Note: Mounting hardware is not included as it is specific to module mounting structures.

### Mounting Bracket Dimensions Units are mm [inches]



**Figure 5: ACE Mounting Bracket Dimensions**



**Figure 6: ACE with Mounting Bracket Overall Dimensions**

The ACE can be installed in different locations with the versatile ACE Mounting Bracket. Mounting slots ranging from M6-M8 and 1/4 - 5/16inch allow for quick and easy installation on standard PV mounting equipment. Multiple pilot holes are also provided for mounting with other hardware sizes.

The ACE Mounting Bracket is made of lightweight, corrosion resistant anodized aluminum. Bonding washers are provided to electrically connect the ACE Mounting Bracket to the PV mounting structures, which must be connected to ground. Torque the mounting hardware to 20 N-m [15 ft-lb] to ensure proper bonding. To prevent the risk of personal injury, do not use star washers or other inferior bonding methods to ground the ACE Mounting Bracket.

When installing the ACE Mounting Bracket to locations other than the PV mounting structure, ground the mounting bracket in accordance to NEC requirements. Grounding lugs such as P/N WEEB-LUG-6.7, available BURNDY from should be used to attach the equipment ground conductor to the ACE Mounting Bracket.

The ACE is a TYPE 3R RAINIGHT enclosure that is rated for outdoor use. When connecting the ACE to conduit, a threaded conduit hub must be installed to ensure watertight connection at conduit entrances. When using rigid conduit, connect the hub to the conduit before connecting to the ACE enclosure. The conduit hubs used must comply with the Standard for Fittings for Conduit and Outlet Boxes, UL 514B.

To utilize either of the conduit entry points, use a spade bit to drill out the plastic within one of the marked entry points shown in figure 1. For easier and cleaner removal, use a hole saw. Use a 1 1/16" hole saw for 3/4-inch conduit hubs and 1 3/8" hole saw for 1-inch conduit hubs.

Moisture could possibly enter the enclosure if the ACE is improperly installed. Four drain holes are provided at the four corners to prevent water from accumulating within the enclosure. Determine the lowest corner after installation and open the drain hole at the lowest corner using a 3.2mm or 1/8inch diameter drill.

**NOTE:**

**All units that do not contain a fuse holder are not intended for connection to a battery.**



# Configurations

The ACE can be used as either a pass-through or a string combiner. The table below (Table. 1) shows the devices required for the different desired configurations.

ACE Configurations	ACE Part Number	Terminal Block	Terminal Block Internal Bus	Fuse Holder	Fuse Combiner Bus	Grounding Terminal
Pass-Through using Butt Splices/Wire Nuts	ACE-PT	N/A	N/A	N/A	N/A	Not required when DIN rail is removed
1-String Pass-through	ACE-1P	2	N/A	N/A	N/A	1
2-String Pass-through	ACE-2P	4	N/A	N/A	N/A	1
3-String Pass-through	ACE-3P	6	N/A	N/A	N/A	2
4-String Pass-through	ACE-4P	8	N/A	N/A	N/A	2
2-String Combiner	ACE-2C	2	N/A	Not required for 2- string combiner	N/A	1
2-String Fused Combiner	ACE-2CF	1	N/A	2	1X 2-Pole	1
3-String Combiner	ACE-3C	2	1X 2-Pole	3	1X 3-Pole	2
4-String Combiner	ACE-4C	2	1X 2-Pole	4	1X 4-Pole	2
1-String Combiner with 1 Ground Terminal	ACE-1C-1GND	1	N/A	1	N/A	1
2-String Combiner with 1 Ground Terminal	ACE-2C-1GND	2	1X 2-Pole	2	1X 2-Pole	1
3-String Combiner with 1 Ground Terminal	ACE-3C-1GND	3	2X 2-Pole	3	1X 3-Pole	1
4-String Combiner with 1 Ground Terminal	ACE-4C-1GND	4	3X 2-Pole	4	1X 4-Pole	1
3-String Dual Fuse Combiner	ACE-3C-DF	N/A	N/A	6	2X 3-Pole	1

**Table 1: ACE Configuration**

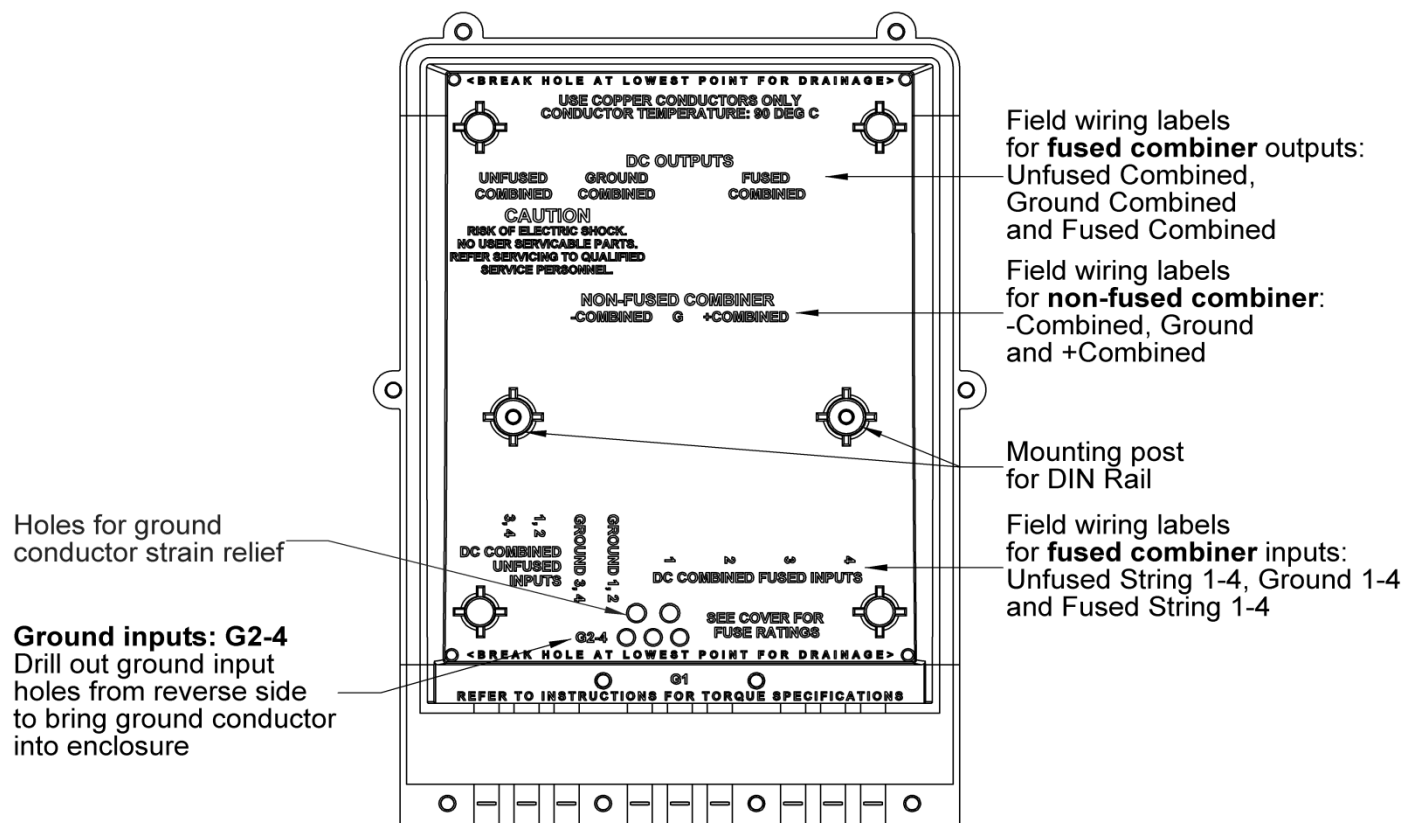
## Wiring Devices

Wiring Devices	Manufacturer	Type / Model	Maximum wire Size	Maximum Multi Wire Combination
Terminal Block	Wieland	WKN10	#6 AWG	2 X #10AWG
Fuse Holder	Ferraz Shawmut	USM1	#8 AWG	None
	Ferraz Shawmut	USGM1IHEL	#8 AWG	None
Grounding Terminal	Wieland	WKN16	#6 AWG	2 X #8 AWG
Combiner Bus Terminal	BURNDY	Combiner Bus	#6 AWG	None

**Table 2: Wiring Device Specifications**

All the wiring devices used in the ACE are 1000V DC rated. The ACE configurations are listed only for use with the above listed components. It is a violation against the listing when components are not installed by BURNDY.

## ACE Layout



**Figure 7: ACE Wiring Terminal Labels**

The ACE has multiple wiring functions that require different wiring devices. There are two sets of field wiring labels, one for the fused combiner and the other for the non-fused combiner. Figure 7 shows the two sets of labels.

The ACE has provisions for up to four ground conductors. The first ground conductor is brought into the enclosure via the center wire entry slot. The ground inputs G2-4 (fig.7) can be used for up to three additional ground conductors. When using the ground inputs G2-4, drill out the ground input holes and the strain relief holes. Securely fasten the ground conductors brought in via the ground inputs G2-4 to the enclosure using a wire tie and the strain relief holes. The strain relief holes will accommodate a wire tie with a width of up to 5 mm [0.196inch].

The information on fuses is located on the backside of the cover. Refer to the section on fuse sizing for details.

## Wiring

The ACE uses several wiring devices to accomplish the different wiring functions. The wiring devices have different wire strip lengths and tightening torque specifications. To ensure proper installation, refer to the specifications section for the wire strip lengths and tightening torque specifications for each wiring device.

When using splices or wire nuts, follow the manufactures instructions during installation. Ensure that the splices or wire nuts are compatible with the proper wire sizes. **Wire nuts or splices cannot be used in combiner application.**

Wire terminations may loosen due to improper installation. The clamp on the input side will prevent the wires from moving and possibly shorting to another wire. On the output side, a wire tie should be used to bundle the wires to prevent the wires from moving.

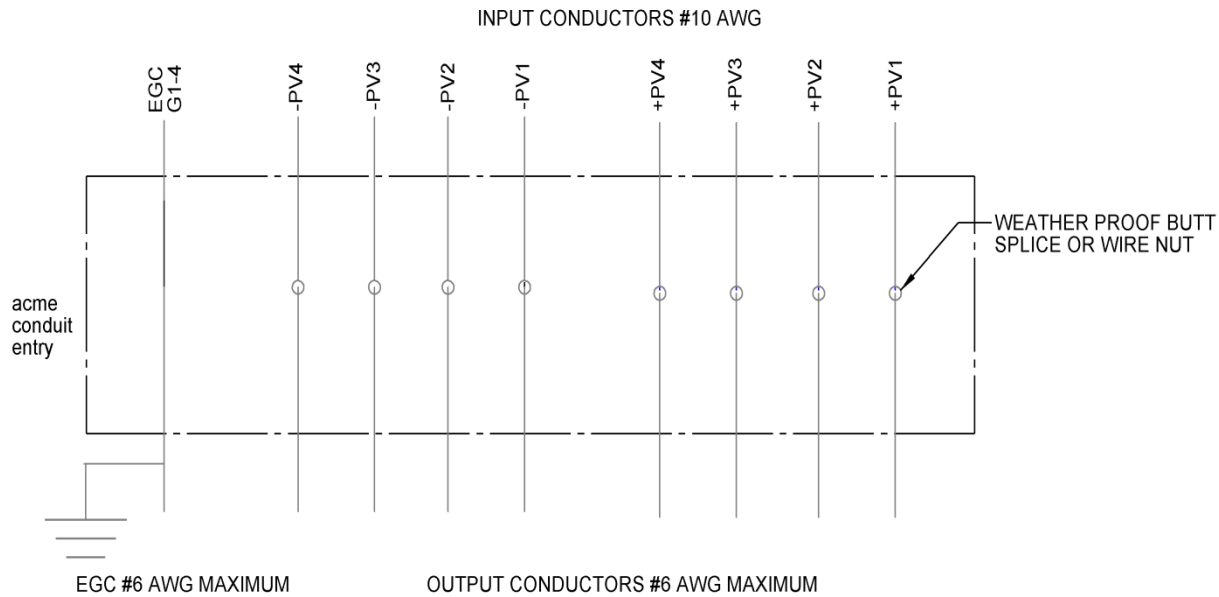
When the additional equipment ground conductors are required, bundle the additional ground conductors with a wire tie to the two strain relief holes provided. This will prevent the wires from loosening from the terminals.

**Warning: Do not exceed the maximum wire size specified in this manual. All wire sizes specified in this manual supersede the maximum allowable wire size specified on each individual field-wiring terminal. Refer to Table 2 for maximum wire sizes.**

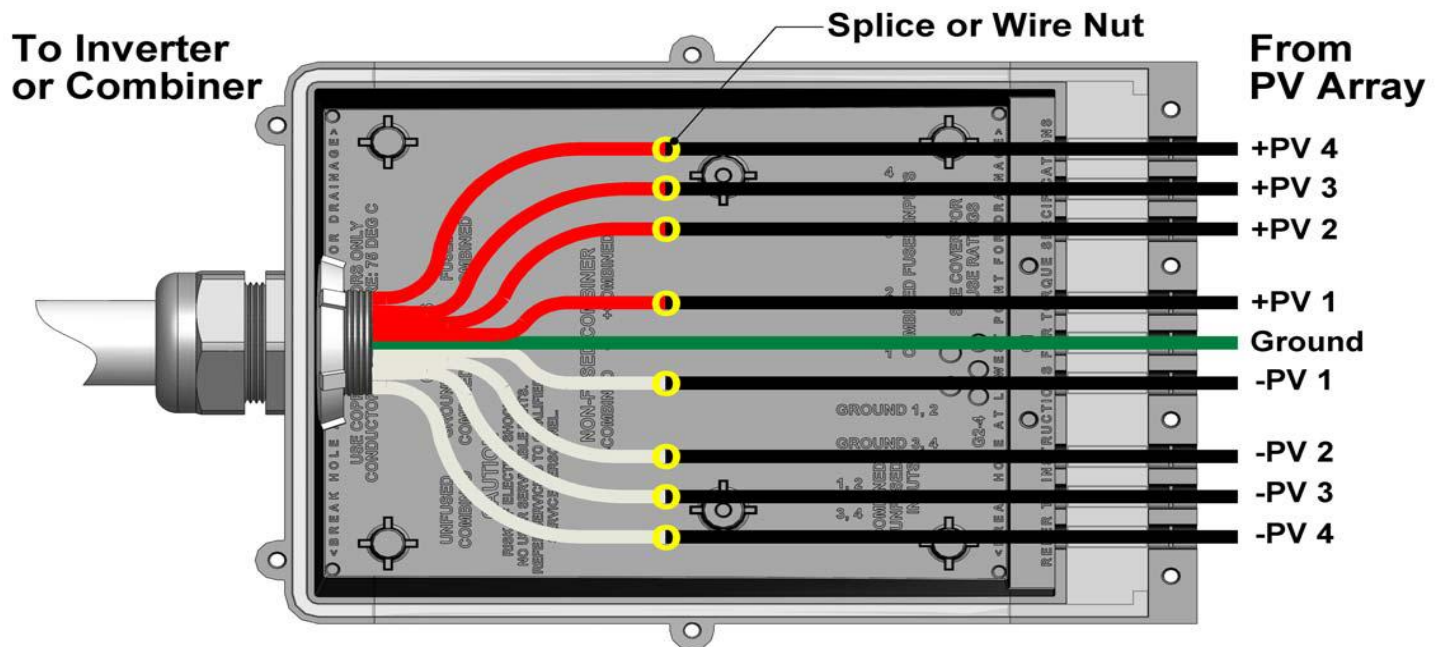
The following examples show the most common wiring configurations.

# Pass-through

## - Pass-through with splices/wire nuts (1-4 strings)

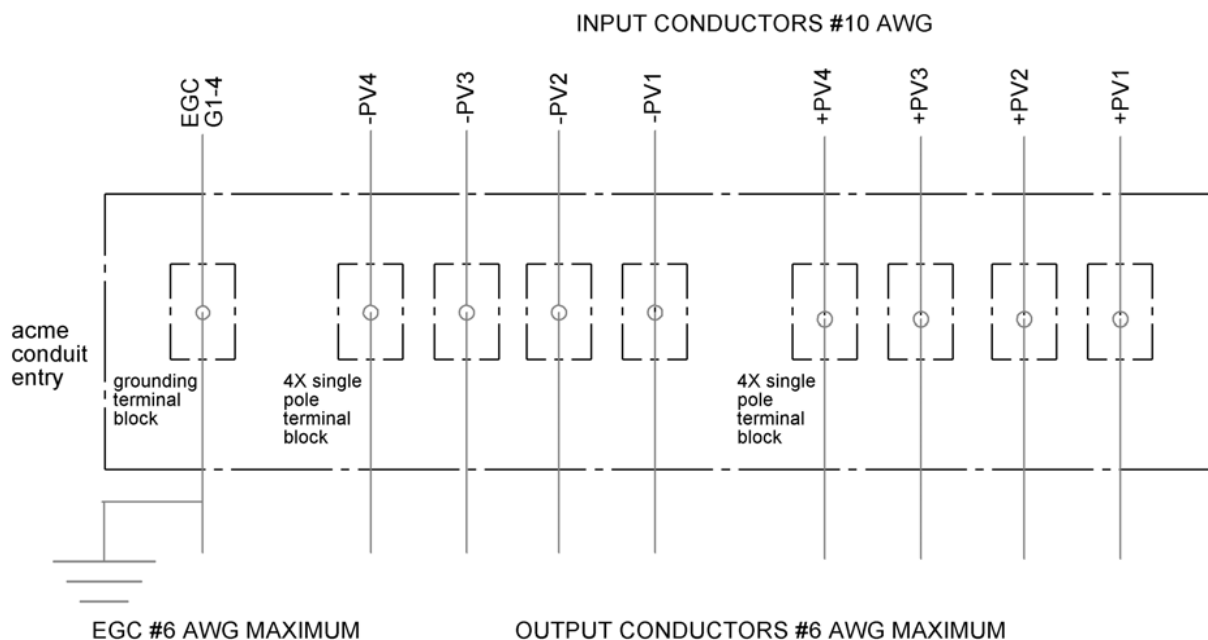


**Figure 8: Wiring Diagram – Pass-Through with Splices/Wire Nuts**

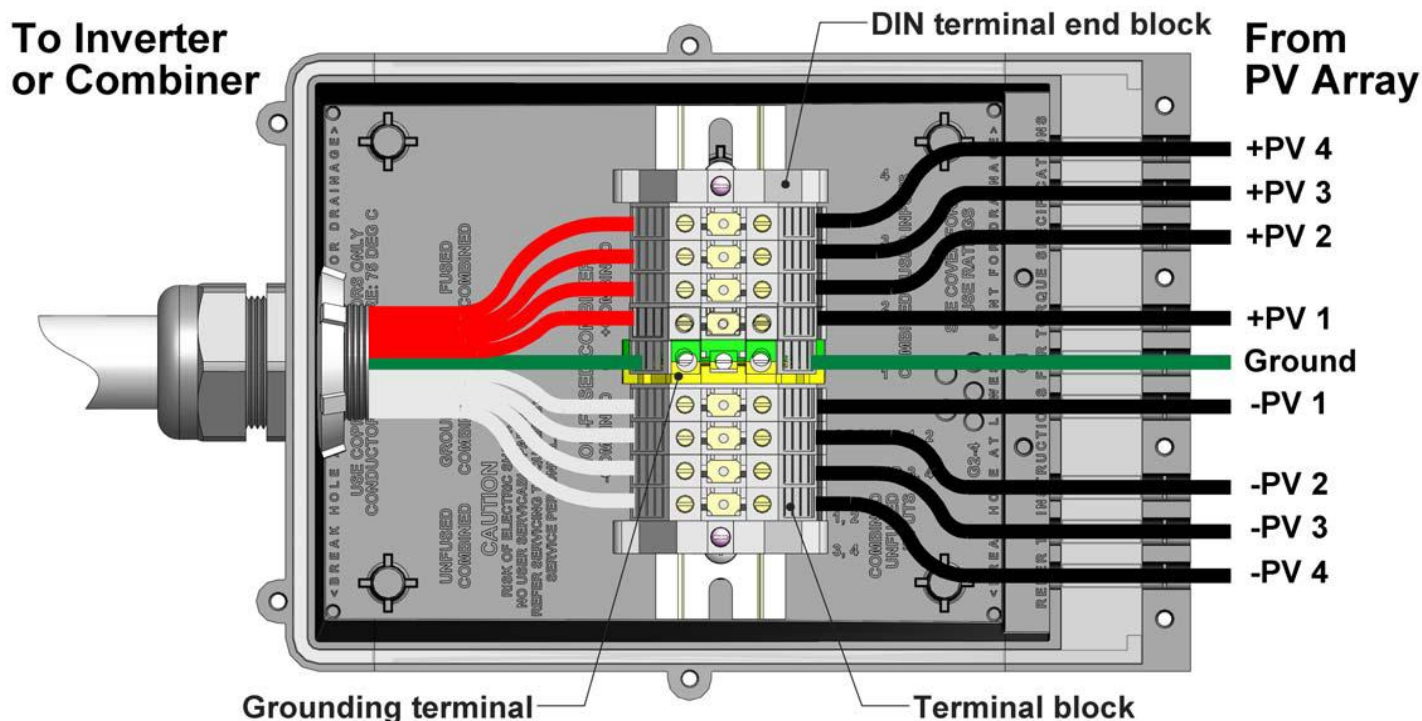


**Figure 9: Wiring Layout – Pass-Through with Splices/Wire Nuts**

- Pass-through with DIN rail-mount terminals (1-4 strings)



**Figure 10: Wiring Diagram – Pass-Through with DIN Rail-Mount Terminals**



**Figure 11: Wiring Layout – Pass-Through with DIN Rail-Mount Terminals**

When using the ACE in applications that require mounting components on DIN rail, the grounding terminal must be used to electrically connect the DIN rail to the equipment ground conductor.

# String Combiner

- Fused combiner with DIN rail-mount components, negative ground (3 or 4 strings)

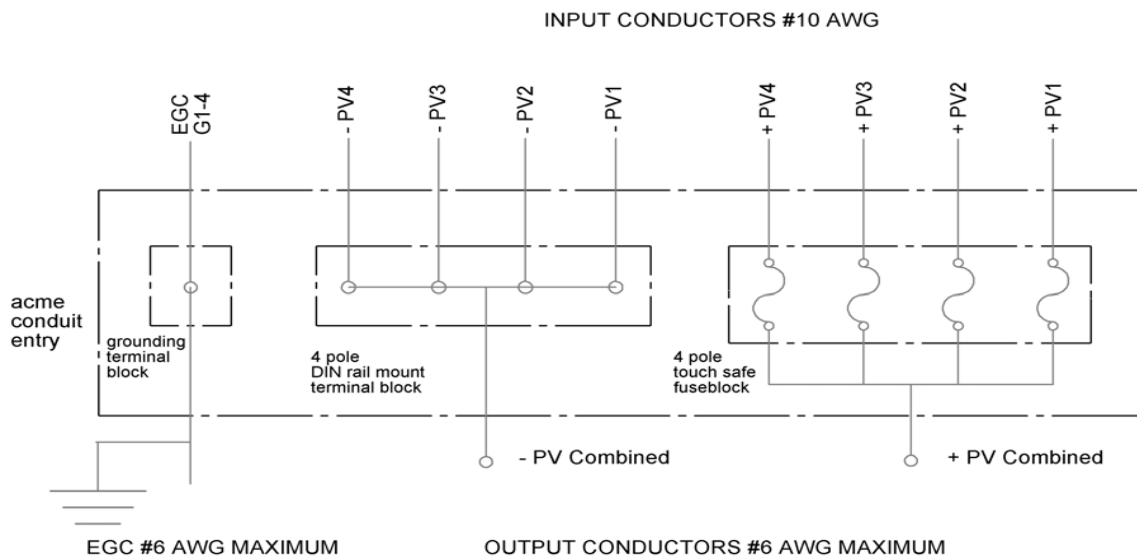


Figure 12: Wiring Diagram - Fused Combiner with DIN Rail-Mount Components, Negative Ground

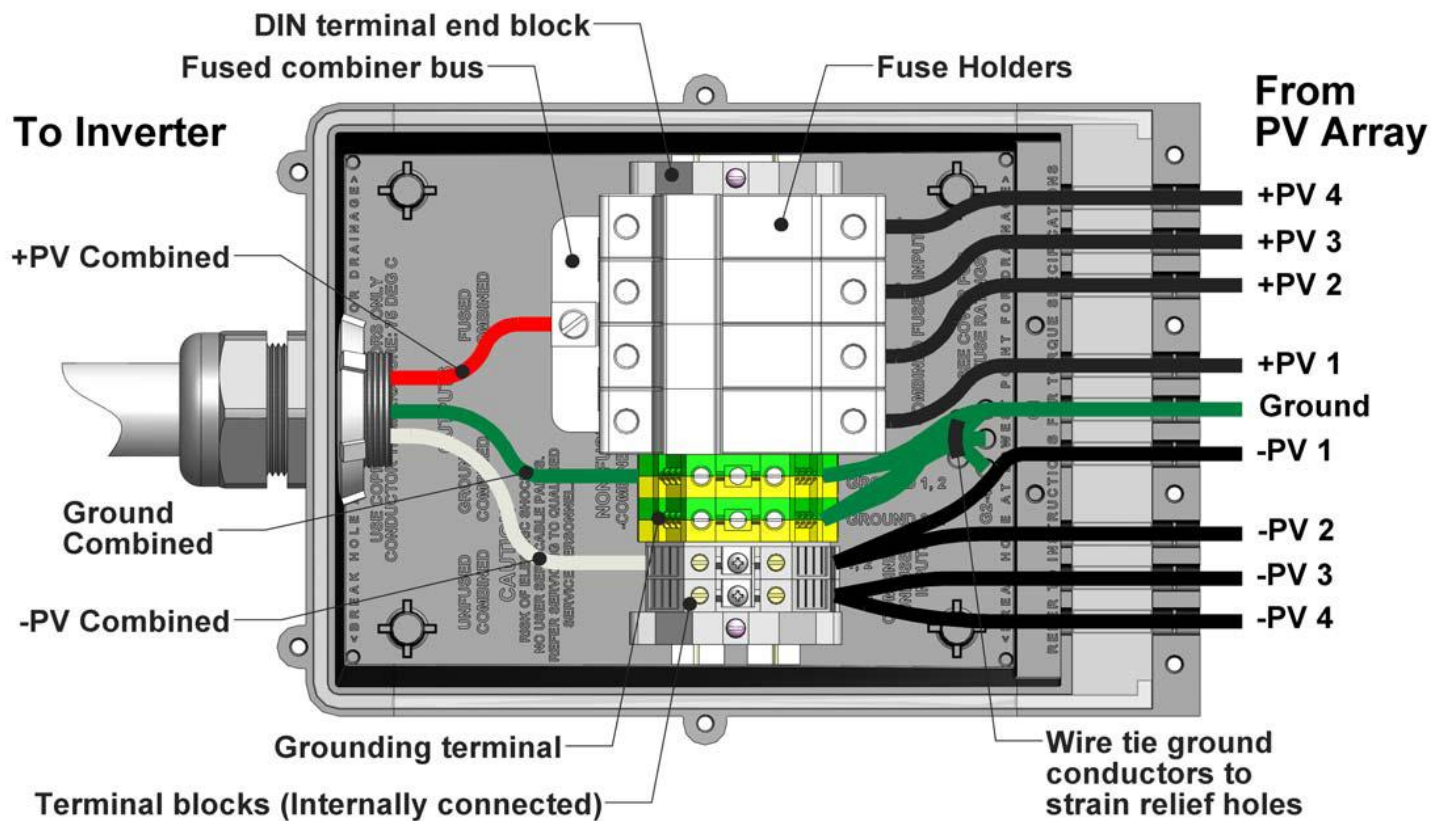
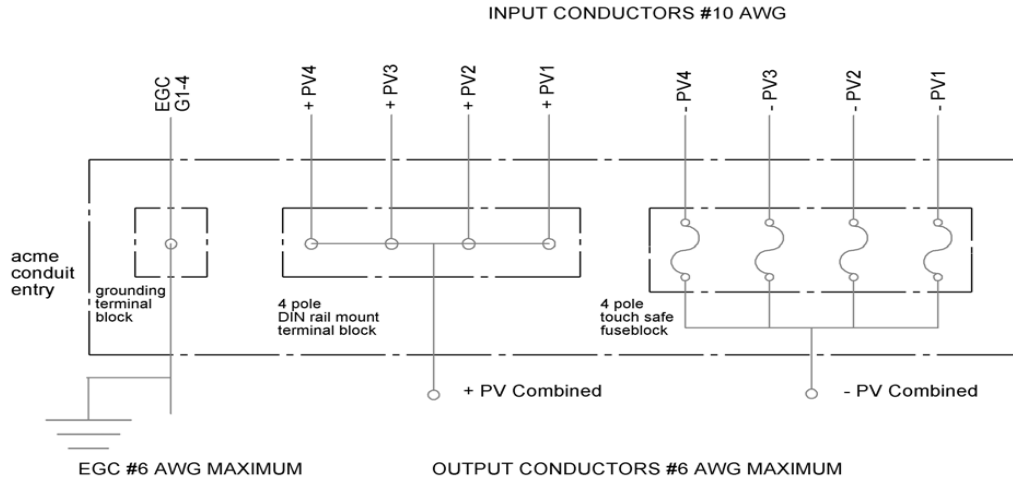


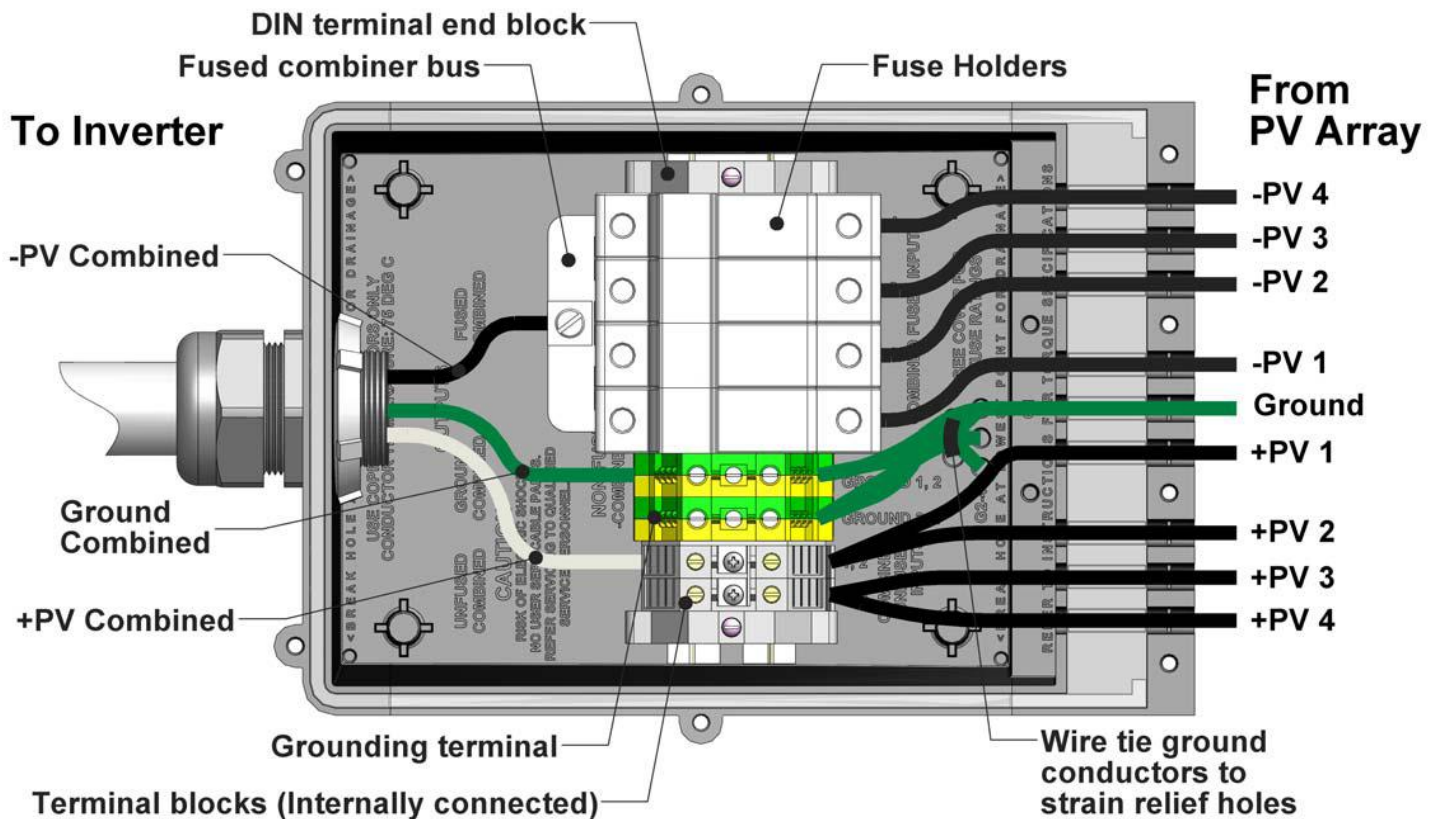
Figure 13: Wiring Layout - Fused Combiner with DIN Rail-Mount Components, Negative Ground



**- Fused combiner with DIN rail-mount components, positive ground (3 or 4 strings)**



**Figure 14: Wiring Diagram - Fused Combiner with DIN Rail Mount Components, Positive Ground**



**Figure 15: Wiring Layout - Fused Combiner with DIN Rail Mount Components, Positive Ground**

The ACE provides grounding terminals that can accommodate up to four ground conductors. If more than one ground conductor is used, drill out the required ground conductor entry holes to accommodate the additional ground conductors.



- Two-string combiner with DIN rail-mount components, negative or positive ground

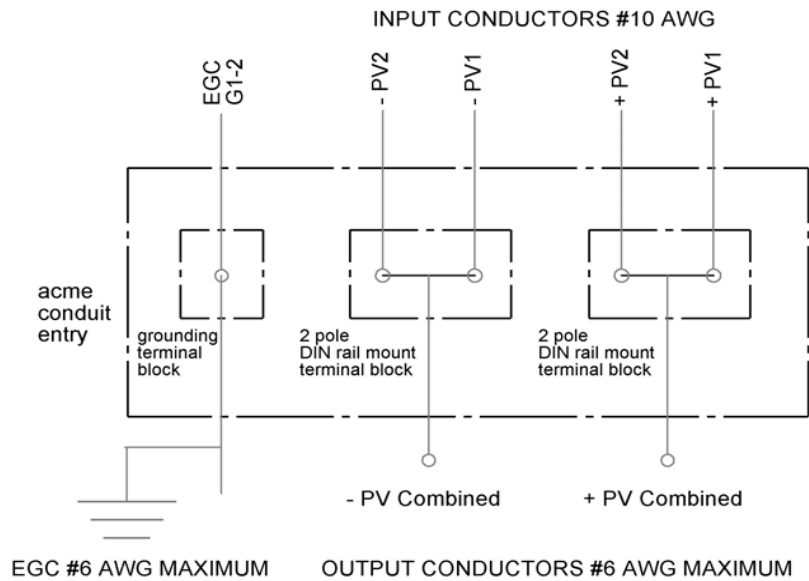


Figure 16: Wiring Diagram –Two-String Combiner with DIN Rail-Mount Components

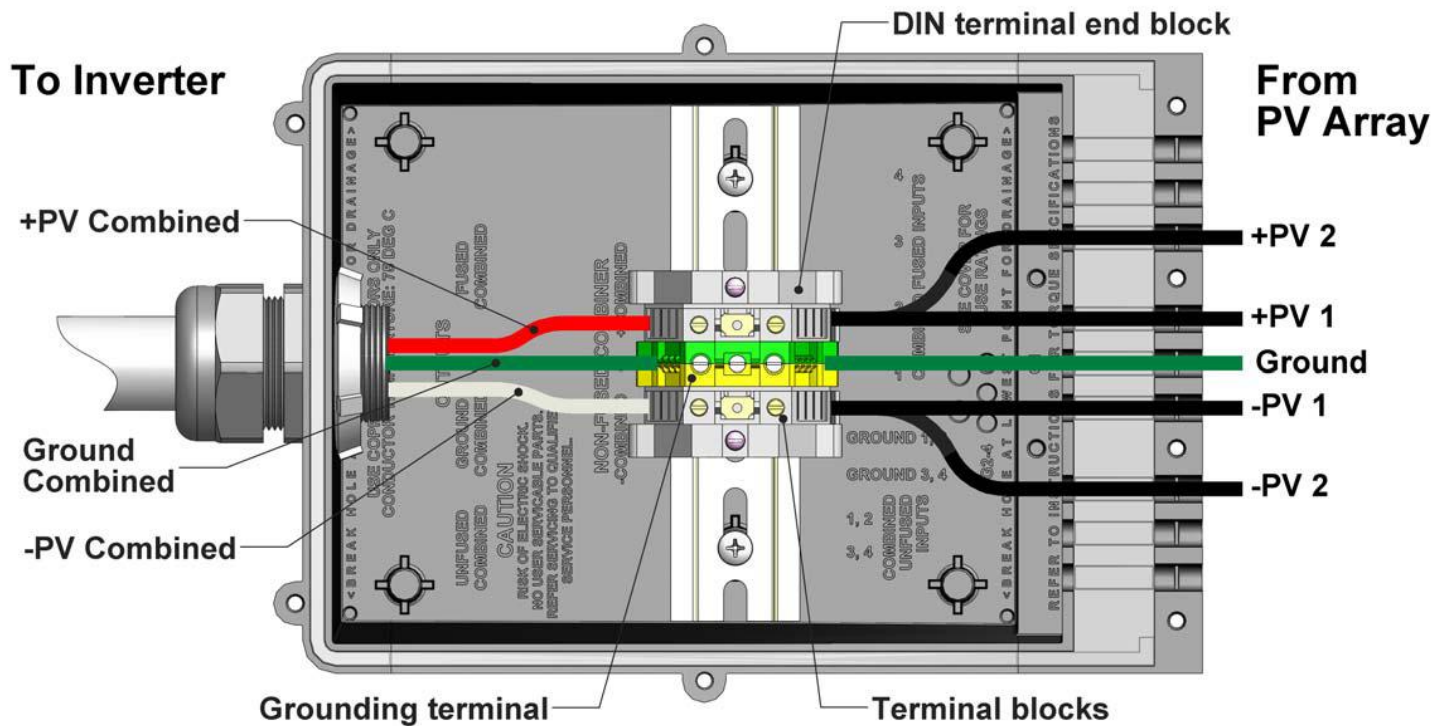


Figure 17: Wiring Layout – Two -String Combiner with DIN Rail Mount Components

- Two-string fused combiner with DIN rail-mount components, negative ground

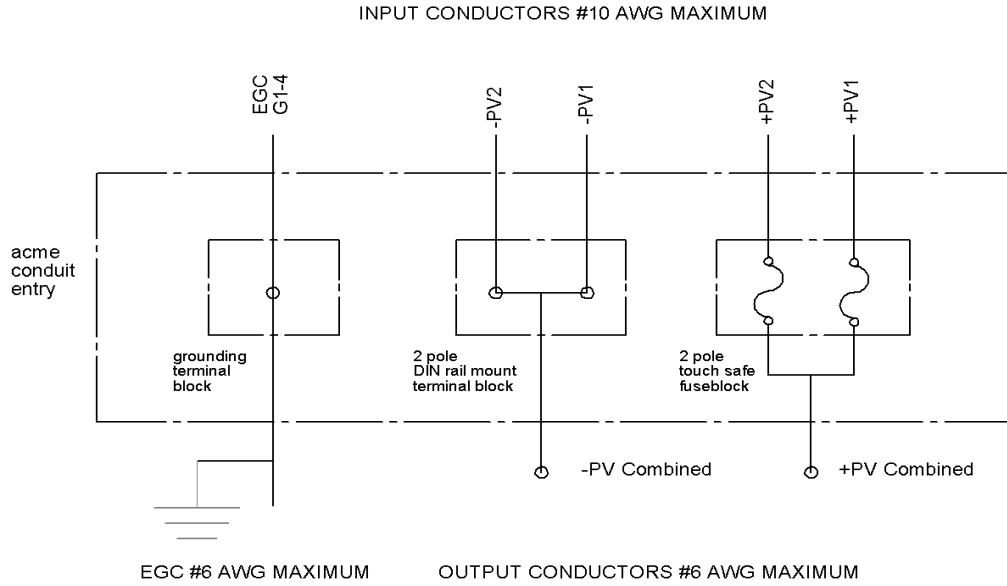


Figure 18: Wiring Diagram –Two-String Fused Combiner with DIN Rail-Mount Components

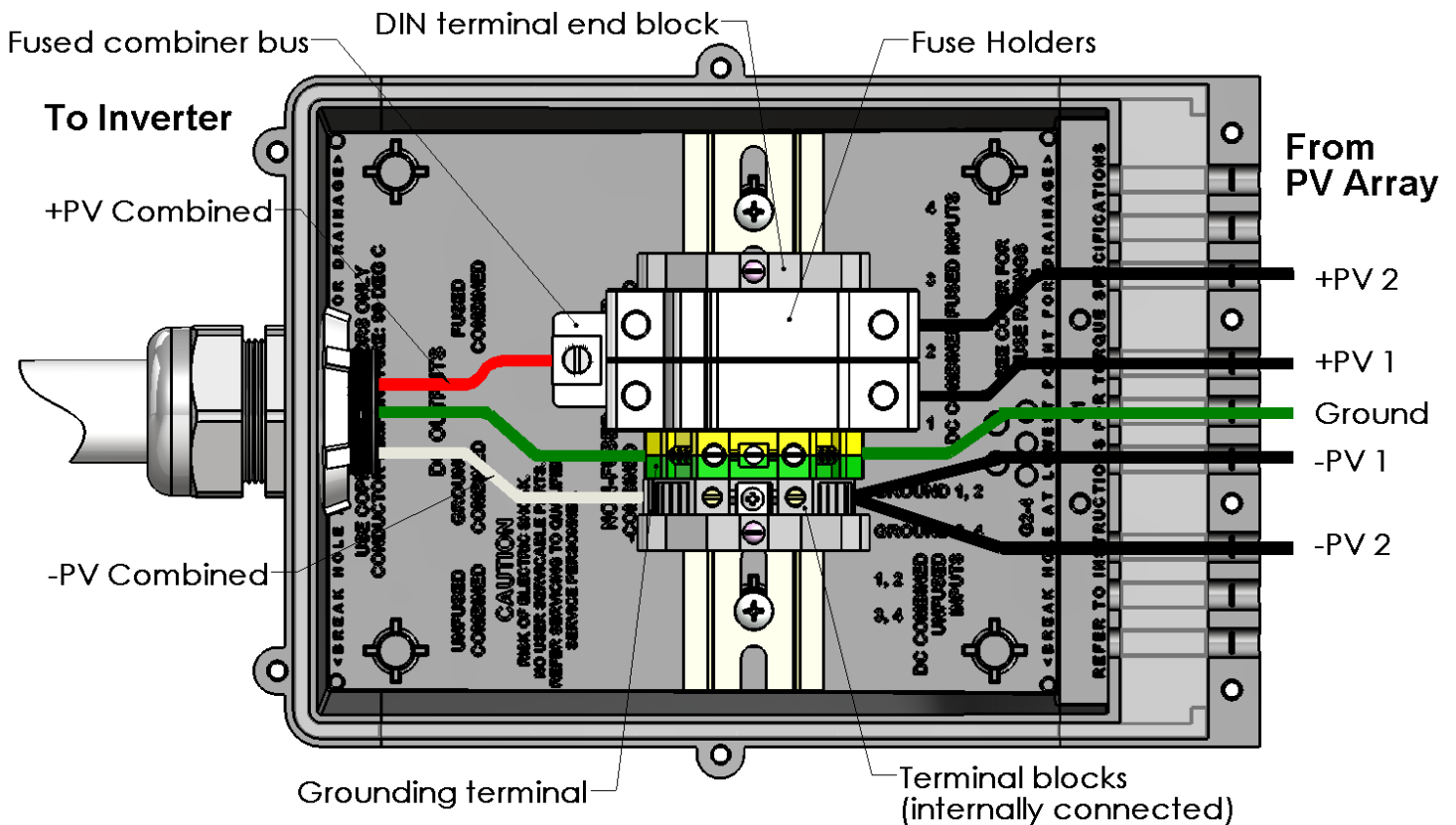


Figure 19: Wiring Layout – Two -String Fused Combiner with DIN Rail Mount Components

# Fuse Sizing

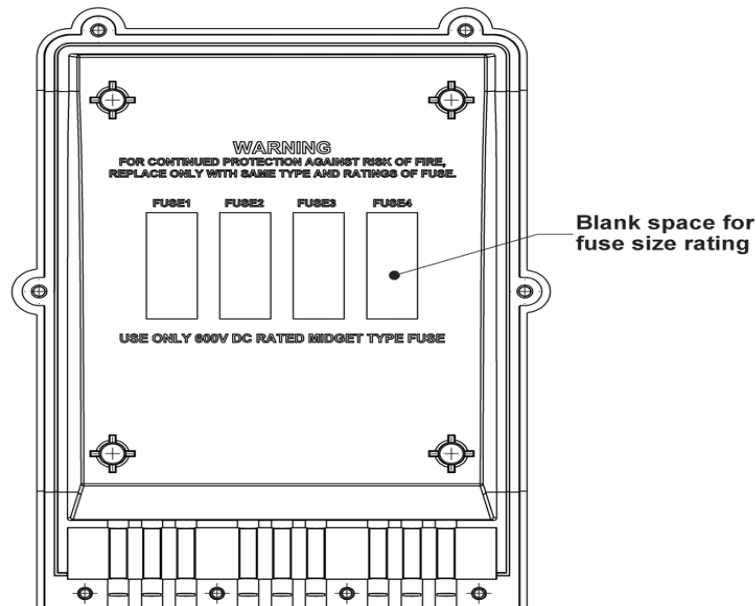
Fuses are used for over-current protection to prevent fire or damage to equipment. Selecting the appropriate size fuse for the circuit will allow current passage during normal operation and quick interruption during a short circuit or overload condition. Sizing a fuse that is too small will interrupt current passage during normal operation, while sizing a fuse that is too large will not provide protecting to the circuit during a short or overload condition. For PV systems, sizing of fuses are determined by the electrical rating of PV modules and the National Electric Code (NEC) requirements. Consult your PV module manufacturer to determine the appropriate size fuse.

## Warning

- **Never open a fuse holder when it is under load. Arcing will occur causing damage to fuse holder. Always disconnect from the load before opening fuse holder.**
- **Wiring must have sufficient ampacity for the selected fuse. Size wires according to NEC requirements.**
- **THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT SPECIFIED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.**

## AVERTISSEMENT

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**Figure 20: ACE Fuse Rating Location**

Mark the fuse size in blank space provided using permanent white marker.

# Specifications

Maximum Input Voltage	1000V DC
Maximum Input Current	60A DC Continuous
Maximum Input Short Circuit Current*	48A DC
Maximum photovoltaic source voltage	1000V DC
Range of operating photovoltaic source voltage	0 – 1000V DC
Maximum output fault current*	48A
Input Wire Insulation Diameter Range	5.0 - 6.8mm [0.20 - 0.27in]
Maximum number of input conductor slots	9
Maximum number of PV strings	4
Maximum number of combined strings	4
Equipment Ground Conductor Diameter range	4.0 - 6.8mm [0.16 - 0.27in]
Acceptable Conduit sizes	19.05mm, 25.4mm [0.75in, 1.0in]
Internal Volume	1840cm <sup>3</sup> [112in <sup>3</sup> ]
Conduit Entry Points	Side and Bottom, 3/4" and 1"
Minimum Fuse Holder Tightening Torque	2.5 N-m [22 in-lb] for #18-8 AWG wires
Minimum Combiner Bus Tightening Torque	4.0 N-m [35 in-lb] for #14-6 AWG wires
Minimum Terminal Block Tightening Torque	2.0 N-m [18 in-lb] for #14-6 AWG wires
Minimum Grounding Terminal Tightening Torque	3.0 N-m [26 in-lb] for #10-6 AWG wires
Fuse Holder Wire Strip Length	12mm [0.47in]
Combiner Bus Terminal Wire Strip Length	12mm [0.47in]
Terminal Block Wire Strip Length	10mm [0.39in]
Grounding Terminal Wire Strip Length	14mm [0.55in]
Fuse Type	Midget 10 X 38mm, 1000V DC

\*Note: Maximum input short circuit current is equal to the maximum output fault current. Acme Conduit Entry box produces no power.

**Table 3: Specifications**

**Customer Service Department**  
 7 Aviation Park Drive  
 Londonderry, NH 03053  
 1-800-346-4175  
 1-603-647-5299 (International)