SunLink PV System Disconnect with Arc Fault Detection Installation and Operations Manual

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SunLink's Arc Fault Combiner Boxes are the professional solar installer's choice for combining PV Arrays and complying with the new Arc Fault Protection requirements in the National Electrical Code. These boxes include:

- Compliance with the stringent UL1741 and UL1699B safety listing for continuous rated current operation at 50°C.
- Installation friendly TYPE 4 watertight enclosure for vertical or horizontal mounting.
- Simple, clean and solid construction for years of service.

SAVE THESE INSTRUCTIONS - This manual provides important instructions for the Arc Fault Series Combiner Boxes that shall be followed during installation and maintenance. The Arc Fault Series Combiner Boxes are designed and tested to stringent international safety requirements. However, as with all electrical equipment, specific safety practices must be followed. To reduce the risk of injury, carefully read this instruction booklet in its entirety before installing, wiring, or using this product in any way.

1.1. Disclaimer of Liability
The installation techniques, handling and use of this product are beyond company control. Therefore, SunLink Corporation does not assume responsibility for loss, damage or expense resulting from improper installation, handling or use of this product.

1.2. Listing Information
This product meets or exceeds the requirements set forth by Underwriters Laboratories for components used with PV Modules. This UL Standard is UL1741 for accessories used with inverters. This product is also certified for Arc Fault Detection and Interruption per UL Standard 1699B.

1.3. Limited Warranty
Combiner box limited warranties are for 1 year for materials and workmanship unless otherwise indicated.

Important Safety Instructions
There are NO user-serviceable parts in this enclosure. Modifying this product in any way will void the manufactures warranty.

- **WARNING:** PV modules pass direct current (DC) when the module is under load. Direct current will arc across gaps and may cause injury or death if improper connection or disconnection is made. Do not connect or disconnect wires to the combiner box when current from the modules or an external source is present.
- **WARNING:** Voltage is present in open circuit conditions. Photovoltaic modules create voltage anytime light is present.
- **CAUTION:** For continued protection against risk of fire, replace fuses with only 600VDC / 1000V rated, max. 20A fuses.
- Make connections in combiner box prior to connecting modules. To work on the combiner box after the modules are connected, cover all modules in the PV array with an opaque cloth or material.
- All US installations must be performed in compliance with the National Electrical Code (NEC), ANSI/NFPA 70 and any applicable local codes.
- All Canadian installations must be done in compliance Canadian Electrical Code, Part I
- No GFDI included in the combiner boxes
- Installation, maintenance & servicing should be performed only by authorized personnel.
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Use insulated tools to reduce your risk of electric shock.
- Do not install or handle the combiner box if it is wet.
- Maximum 95% humidity during use.
- Contact SunLink Corporation if the combiner box enclosure is damaged or its contents are compromised.
- Storage temperature: -50ºC - +85 ºC
Positive Ground Configuration

The Homerun™ Series Combiner Boxes may be installed for use with positive grounded solar arrays, as required for example with certain SunPower™ solar modules. If used in a positive ground configuration substitute the word “negative” for every instance of the word “positive” below and substitute the word “positive” for every instance of the word “negative” below.

Loss of Power

In the event that the combiner box loses power, for example if there is a power outage from the grid that is supplying power to the combiner box, the arc fault detector will reset itself. It is therefore necessary to investigate any arc faults that are detected promptly and certainly before the next grid outage.

Disconnecting Means

During installation a disconnecting means must be provided to unplug or disconnect all AC power to this device.
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<th>12-0520</th>
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<td>DC Maximum Continuous DC Current (A)</td>
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<td>AC Maximum Voltage (VAC)</td>
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<td>DC Output Wire Size (AWG)</td>
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<td>AC Input Wire Size</td>
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<td>AC Output Wire Size</td>
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<td>Terminal Temperature Rating</td>
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<td>75°C</td>
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<td>Operating Temperature</td>
<td>-35°C to 50°C</td>
<td>-35°C to 50°C</td>
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<td>NEMA Rating</td>
<td>NEMA 4</td>
<td>NEMA 4</td>
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<tr>
<td>Maximum # of Fused Inputs for this Family</td>
<td>8</td>
<td>3</td>
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<tr>
<td>Switch Position</td>
<td>0 = OFF, 1 = ON</td>
<td>0 = OFF, 1 = ON</td>
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<tr>
<td>Enclosure Exterior Dimensions</td>
<td>12”x12”x6”</td>
<td>12”x12”x6”</td>
</tr>
<tr>
<td>Weight</td>
<td>15 lbs.</td>
<td>14 lbs.</td>
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Mounting Overview

A. The enclosure ships with a small bag containing sealing washers (Sagninaw p/n 102686) these must be used to preserve the NEMA 4 rating of the enclosure.
B. Install the enclosure using the enclosure mounting holes only. Drilling holes in the back plate is not recommended and shall void the product warranty. Use a Zinc or Stainless steel MS or #10 fastener through the enclosure mounting holes, place the sealing washer on the inside of the enclosure with the rubber side down.
C. Place in desired location and use the appropriate hardware to mount the combiner box.
D. The combiner box may be mounted vertically (door opens out) or horizontally (door opens up).
E. Place the box in areas out of continuous water flow and extreme temperature.
F. Do not mount the box such that the switch handle is blocked or difficult to operate. Please refer to the enclosure installation manual for additional mounting instructions.

Step 1 – Choose your Connectors

A. The use of UL514B or equivalent conduit fittings is required to maintain the TYPE 4 (or 4X) rating of the enclosure.
B. Installation of fittings must comply with UL50 for USA installations to maintain TYPE 4 (or 4x) rating of the enclosure.

Step 2 – Install Connectors

**Metallic Conduit**

A. Place connector through hole with the o-ring on the outside of the enclosure.
B. Screw on and tighten the locknut. Next screw on the Grounding Bushing, rotate to desired location and tighten set screws.

**Non-Metallic Conduit**

A. Place connector through with the o-ring on the outside of the enclosure.
B. Screw on and tighten the locknut.
C. Screw Insulated or plastic bushing onto connector threads to protect conductors from damage.
D. Grounding Bushings are not used with non-metallic conduit.

Equivalent connectors from other manufactures may be used as long as they satisfy citations in this section.
Grounding Overview

A. A ground bar has been provided for the convenience of combining several grounds into one larger ground wire.
B. Please refer to NEC Article 690 on grounding PV arrays for specific requirements.
C. Combiner box models with metallic enclosures have factory installed ground wires or straps to bond the enclosure body and door. *Note: Do not connect any ground wires to enclosure body bonding location or to door bonding location.*

Step 1 – Install Grounding

**Grounding With Metallic Conduit**
A. When installing metallic conduit grounding bushings must be used, refer to section 6.3.1 for installation.
B. A continuous ground conductor must go through the lay-in lug on the grounding bushing with the insulation stripped back on either side of the lay-in lug set screw.
*Note: Bonding of the Grounding Bushings must comply with the NEC for USA installations.*

**Grounding With Non-Metallic Conduit**
A. When installing non-metallic conduit the grounding conductor is terminated at the ground bar.

Step 2 – Select Fuses

A. Please consult the module manufacturer and/or rating label to select the appropriate fuse size.
B. Please consult NEC Article 690 for more information.
C. A maximum of a 20 Amp fuse may be used with this product.

Step 3 - Wiring

*NOTE: USE COPPER OR ALUMINUM CONDUCTORS SUITABLE FOR AT LEAST 75°C.*

A. Insert positive DC input conductor from the source circuit into the Touch Safe fuse holder and tighten to torque specifications as listed on pages 2 and 3. At least one source circuit must be connected to the left most fuse holder in the combiner box, otherwise the Arc Fault Detector will be bypassed and the combiner box may not function as intended.
B. Insert negative DC input conductor from the source circuit into the negative fuse holder or negative terminal block and tighten to torque specifications as listed on pages 2 and 3.
C. Insert DC output conductors into the output terminal block and secure to the torque requirements as listed on pages 2 and 3.
D. Insert AC conductors into the terminals of the AC contactor and secure to the torque requirements as listed on pages 2 and 3.
E. The power supply in the combiner box requires 120 or 240VAC input, terminate AC power directly to power supply terminals.
F. Make sure all connections are tight, secure and safe for many years of operation.
G. **DO NOT INSTALL FUSES!**
Step 4 – Ensure Proper Ventilation
A. Maintain a minimum clearance of 1” on all 4 sides of the enclosure.

Step 5 – Check Your Work
BEFORE INSTALLING FUSES, complete these simple time-saving checks. Note: A multimeter is needed to verify the installation process.

Check that the multimeter is capable or reading the maximum string voltage and maximum string current before proceeding.
A. Measure Voltage (Voc)
   a. Place the multimeter in DC voltage mode.
   b. Check the open circuit positive voltage (Voc) from each individual solar array string to the negative string.
   c. Ensure each Voc is the proper polarity (this means the meter reads a positive DC voltage) and within the intended range.
   d. Voc does not vary much with irradiance and temperature conditions.
B. Check the DC current from each individual string (fuse holder) to ground and verify that no current is flowing to ground.
   a. If current is present, locate and repair any ground faults.

Step 6 – Insert Fuses
A. Insert fuses into fuse holders and secure it in the closed position.

Step 7 – Conduct Final Inspection
A. Check the DC voltage from the negative to positive inputs.
B. Ensure voltage is the proper polarity and within the desired voltage range.
C. Double check that all conduit penetrations are properly sealed against water and pest intrusion.
D. Close and secure the enclosure door.
E. Inspect enclosure for any physical damage that may have occurred during installation, apply protective coating to any exposed metal or areas where powder coating has been damaged, remove any metal shavings from enclosure produced from conduit installation.

Ongoing Operation
A. The disconnect switch may be used to disconnect the combiner box from current coming from other parts of the array and/or to disconnect the voltage and current of the combiner box from an inverter or other equipment that is downstream of the combiner box.
B. To operate the switch simply rotate the handle 90 degrees, the switch contacts will be open if the switch handle is pointing to the off position.
C. Always place the switch of every combiner box that is connected to an inverter in the off position before servicing the inverter.
D. The fuse holders are not load break rated, and may cause damage or injury if opened under load.
E. There are no other operable parts in the combiner box other than the disconnect switch, fuse holders and Santon ADU reset button.
Arc-Fault Detection Unit (ADU) Operation

A. An arc fault occurs when loose or corroded connections make intermittent contact and cause sparking or arcing between the connections. This translates into heat, which will break down the insulation of the wire and in most cases is the trigger for an electrical fire. By detecting arc faults and resolving the cause at an early stage, fire and a lot of damage can be prevented.

B. When the ADU detects an arc fault, the visual arc fault indicator will illuminate and the contactor in the combiner box will open, effectively turning off the inverter that is connected to the combiner box.

C. As soon as the problem causing the arc fault has been resolved, the ADU needs to be reset. To reset the ADU use press the reset button. If the problem hasn’t been resolved correctly and an arc fault still exists the arc fault indicator will immediately light up again.

WARNING: This is the end of the Installation and Operation Manual, the following section is service and maintenance instructions. Service instructions are for qualified service personnel ONLY.
SunLink PV System Disconnect with Arc Fault Detection Service and Maintenance Instructions

Service and Maintenance Instructions
A. Read the Notices and Safety Precautions on pages 1-2 for important safety information before performing any maintenance or service.
B. Please use protective safety equipment and disconnect all sources of supply before working on this product.
C. The only serviceable components in the PV System Disconnect are the fuses and the arc fault detector.
   a. Before changing a fuse(s) check the system for problems and make repairs as needed.
   b. Then go through Steps 5 on page 7 before installing a new fuse(s).
D. **WARNING:** - For Continued Protection against risk of fire, replace fuses with same type and rating of fuse (600V DC rated, MAX 20A Midget fuses).
E. If the combiner box has a disconnect switch it must be switched ten times in a row, once a year, with the system off, to clean contacts.
F. Mechanical aspects of the switch handle should be checked for dirt on an annual basis.
G. No more than 3x the force of normal operation should be applied to the switch. If switch does not operate within this capacity, check for blockage or obstruction.
H. Every 6 months inspect and re-torque the field installed wire connections.
I. Inspect enclosure for any physical damage that may have occurred during installation, apply protective coating to any exposed metal or areas where powder coating has been damaged.
Wiring Diagram for 12-0518
Wiring Diagram for 12-0520