

IMPORTANT SAFETY INSTRUCTION

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

SAVE THESE INSTRUCTIONS - This manual contains important instructions for Solar Combiner Boxes that shall be followed during installation and maintenance for the CCB Series.

WARNING

PV modules produce 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

To avoid the risk of fire or electric shock, this product should be installed, inspected, and maintained by a qualified electrician only, in accordance with all electrical codes.

1.0 OVERVIEW

Cover all modules in the PV array with dark, opaque material before making electrical connections to the combiner box from the panels. All U.S. installations must be performed in compliance with the National Electrical Code (NEC), ANSI/NFPA 70 and applicable local codes. Cooper Crouse-Hinds Combiner Boxes comply with the National Electrical Code.

All Canadian installations shall conform to Canadian Electrical Code Part I. Installation should be performed only by authorized personnel.

WARNING

To avoid the risk of electric shock, remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.

The combiner boxes comply with UL1741 safety listing for continuous rated current operation at 50°C.

2.0 INTRODUCTION

(PLEASE SAVE THESE INSTRUCTIONS)

This manual provides important instructions for the Cooper Crouse-Hinds (CCH) Combiner Boxes and shall be followed during installation and maintenance. The CCH Combiner Boxes are designed and tested to stringent 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.

2.1. DISCLAIMER OF LIABILITY

The installation techniques, handling and use of this product are beyond company control. Therefore, Cooper Crouse-Hinds does not assume responsibility for loss, damage or expense resulting from improper installation, handling or use of this product.

2.2. LISTING INFORMATION

This product meets or exceeds the requirements set forth by Underwriters Laboratories (UL) for components used with PV Modules. This UL Standard is UL1741 for accessories used with inverters.

2.3. LIMITED WARRANTY

Combiner box limited warranties are for 1 year for materials and workmanship.

WARNING

Use insulated tools to reduce your risk of electric shock. Do not install or handle the combiner box if it is wet. Contact Cooper Crouse-Hinds at solarsolutions@CooperIndustries.com if the combiner box enclosure is damaged or its contents are compromised.

3.0 IMPORTANT SAFETY INSTRUCTIONS

There are no user-serviceable parts in this enclosure, other than the fuses. Do not alter any portion of this product; otherwise, the warranty will be invalidated. Storage temperature: - 60°C to +85°C

4.0 ELECTRICAL CHARACTERISTICS

The combiner box electrical ratings are indicated on Table 2, see page 4.

5.0 COMBINER BOX MOUNTING

VENTILATION CONSIDERATION

Maintain a minimum clearance of 1" on all 4 sides of the enclosure.

Install the enclosure using the 4 external enclosure mounting tabs only. Drilling holes in the back plate is not recommended and shall void the product warranty. Place in desired location on a sturdy frame and use the appropriate hardware to mount the combiner box.

The steel combiner box may be mounted vertically (door opens out) only. The fiberglass combiner box may be mounted both horizontally and vertically. Place the box in areas out of continuous water flow and extreme temperature.

6.0 CONDUIT ROUTING

6.1. CONDUIT HOLES

Please refer to Figure 1 for conduit entry areas on the enclosure for all models. Cut conduit holes in the desired location. The preferred method is the use of a Greenlee® cutter of the appropriate size. The punch of the cutter should be placed on the inside of the enclosure and drawn to the outside. Remove all shavings and debris from enclosure.

6.2. CONNECTOR TYPE

The use of UL514B or equivalent conduit fittings is required to maintain the environmental rating of the enclosure. Installation of fittings must comply with UL50 for USA installations and CSA C22.2 No. 94 for Canadian installations to maintain rating of the enclosure. See Figure 2 for suitable connectors. For use with rigid/IMC conduit use of Cooper Crouse-Hinds Myers™ conduit hub is recommended. For non-metallic liquidtight conduit, Cooper Crouse-Hinds Lt-NM series connector is recommended.

Recommended photovoltaic string inputs for all fiberglass enclosures and steel enclosures sizes 1-6 string and 7-12 string

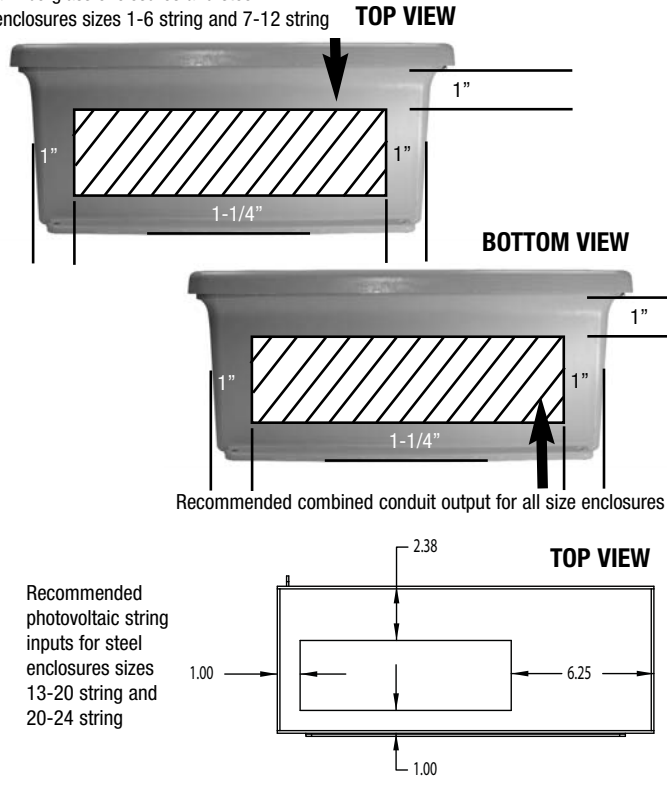


Figure 1 - Conduit Entry Locations

6.3. INSTALL CONNECTOR

6.3.1. METALLIC CONDUIT

Place Myers hub through hole as shown in Figure 3 with the o-ring on the outside of the enclosure. Screw on and tighten the locknut. Next screw on the grounding bushing, rotate to desired location and tighten set screws. If ground hub configuration is used, terminate ground wire to ground screw on locknut. If standard configuration is used screw on grounding bushing (Cooper Crouse-Hinds HGLL series recommended). Rotate to desired location, tighten set screw and terminate ground wire to ground lug.

| Myers® Hubs | | | |
|---|-------------|--|---------------------|
| HUB BASIC SCRU-TITE® - NEMA 2, 3, 3R, 4, 4X and 12 - Optional nickel-chrome plate finish available.† | | GROUND HUB - NEMA 2, 3, 3R, 4, 4X and 12 | |
| Size | ZINC Cat. # | ALUMINUM Cat. # | |
| 1/2" | ST-1† | STA-1 | 1/2" STG-1 STAG-1 |
| 3/4" | ST-2† | STA-2 | 3/4" STG-2 STAG-2 |
| 1" | ST-3† | STA-3 | 1" STG-3 STAG-3 |
| 1 1/4" | ST-4† | STA-4 | 1 1/4" STG-4 STAG-4 |
| 1 1/2" | ST-5† | STA-5 | 1 1/2" STG-5 STAG-5 |
| 2" | ST-6† | STA-6 | 2" STG-6 STAG-6 |

Figure 2 - Suitable Conduit Connectors

6.3.2. NON-METALLIC LT CONDUIT

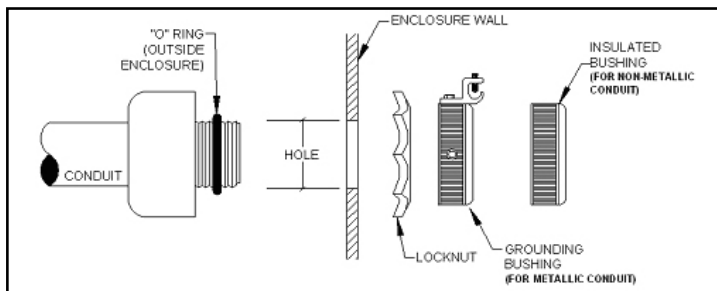


Figure 3 - Conduit Connector Exploded View

Place connector through hole as shown in Figure 3 with the o-ring on the outside of the enclosure. Screw on and tighten the locknut. Screw Insulated or plastic bushing onto connector threads to protect conductors from damage. Grounding bushings are not used with non-metallic conduit.

6.3.3. PVC CONDUIT

Place Cooper Crouse-Hinds male adapter connector (MA-NM series recommended) through hole. Secure with steel locknut (Cooper Crouse-Hinds 11, 12 etc. - order separately). Grounding bushings are not used with PVC conduit.

7.0 GROUNDING

A ground bar has been provided for the convenience of combining several grounds into one larger ground wire. Please refer to NEC Article 690 on grounding PV arrays for specific requirements.

Surge Protection (if equipped)

Surge Protective Device (Thermally Protected) for PV applications

The Surge-Trap PV provides advanced overvoltage protection to photovoltaic systems, which does not require additional over-current protection due its high short circuit withstand.

8.0 FUSE SELECTION

CAUTION

To prevent damage to your photovoltaic system and equipment, the CCB Series Solar Combiner Box must have fuses installed into each fuse holder in order to operate properly.

Cooper Crouse-Hinds recommends the use of Cooper Bussmann DCM Series fuses.

Please consult the module manufacturer and/or rating label to select the appropriate fuse size. Please consult NEC Article 690 for more information. A maximum of a 15 Amp fuse may be used with this product. Cooper Crouse-Hinds Combiners are not shipped with fuses unless ordered with fuses.

9.0 OUTPUT CONDUCTOR SIZING

The combiner box output design current is determined by: (total Isc x 156%) divided by a temperature correction factor. Select the appropriate temperature correction factor from the NEC. See NEC Articles 310.16 and 690.31 for proper wire sizing.

10.0 COMBINER WIRING

DO NOT INSTALL FUSES!

WARNING

To prevent injury, death, or damage to your photovoltaic system, extreme caution should be taken whenever entering the control cabinet due to energized components.

Photovoltaic panels generate power whenever exposed to ANY light. Cover the panel entirely prior to wiring or servicing with an opaque cover.

Prior to installation or servicing, switch all disconnects to OFF position and use only insulated tools and proper P.P.E.

- Make ground connections first. This includes source circuit grounds, conduit grounds, and enclosure grounds if using a metallic enclosure.
- Insert positive input conductor from the source circuit to the Touch Safe fuse holder and tighten to torque specifications in Table 1.
- Insert negative input conductor from the source circuit to the negative collector holder and tighten to torque specifications in Table 1.
- Insert positive output wire to the inverter (or other destination) into the positive output terminal and secure to the torque requirements in Table 1.
- Insert negative output wire to the inverter (or other destination) into the negative output terminal and secure to the torque requirements in Table 1.

Make sure all connections are tight, secure and safe.

| Number of input circuits | 1 through 4 | 5 through 6 | 7 through 12 | 13 through 20 | 21 through 24 |
|--|-------------|-------------|--------------|---------------|---------------|
| Positive Input Terminal Torque (in-lbs) | 16-22 | 16-22 | 16-22 | 16-22 | 16-22 |
| Negative Input Terminal Torque (in-lbs) | 20 | 35 | 35 | 35 | 35 |
| Positive Output Terminal Torque (in-lbs) | 35 | 35 | 120 | 275 | 120 |
| Negative Output Terminal Torque (in-lbs) | 120 | 500 | 120 | 275 | 120 |
| Ground Output Terminal Torque (in-lbs) | 20-35 | 20-35 | 275 | 275 | 275 |

Table 1

11.0 CHECK YOUR WORK

WARNING

To prevent injury, death, or damage to your photovoltaic system, extreme caution should be taken whenever entering the control cabinet due to energized components.

Photovoltaic panels generate power whenever exposed to ANY light. Cover the panel entirely prior to wiring or servicing with an opaque cover.

Prior to installation or servicing, switch all disconnects to OFF position and use only insulated tools and proper P.P.E.

These steps need to be completed with your personal safety in mind. Before installing fuses, complete these simple time-saving checks:

11.1. MEASURE VOLTAGE (VOC)

Check the open circuit positive voltage (Voc) from each individual solar array string to the negative bus bar. Ensure each Voc is the proper polarity and within the intended range. Voc does not vary much with irradiance and temperature conditions.

11.2. CHECK GROUND CURRENTS

Check the DC current from each individual string (fuse holder) to ground. If current is present, locate and repair any ground faults.

11.3. INSERT FUSES

Check that the fuses are the proper rating and type and insert fuses into fuse holders and secure it in the closed position.

11.4. FINAL INSPECTION

Check the DC voltage from the combined output lug to the negative bar. Ensure voltage is the proper polarity and within the desired voltage range.

Check to ensure that all conduit connections are clean and tight and are properly sealed against environmental concerns.

Close and secure the enclosure door.

12.0 MAINTENANCE

WARNING

To prevent component damage or electric shock, avoid touching any component or any part of the circuitry while the equipment is operating. Do not place heavy loads on associated system cables or maneuver them in a manner which may expose personnel or equipment to current. Do not connect system cables when the terminals are wet or damp. Do not disconnect cables under load.

Please review this manual fully before beginning work on combiner boxes. Follow all safety guidelines and warnings.

Every 6 months inspect and re-torque the wire connections.

We recommend an Electrical Preventive Maintenance Program as described in the National Fire Protection Association Bulletin NFPA 70B: Recommended Practice for Electrical Equipment Maintenance (www.nfpa.org).

| Number of input circuits | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS |
|---|-------------|-----------|-----------|-----------|-----------|-----------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | | | | | | | | | | | | |
| Maximum Input Fuse Rating (A) | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Tested current | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 10 |
| Max. Continuous Op Current (A) Using Max Input Fuse | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 120 | | | | | | | | | | | | |
| SCCR at 600VDC (A) | 7.69 | 15.38 | 23.08 | 30.77 | 38.46 | 46.15 | 53.85 | 61.54 | 69.23 | 76.92 | 84.62 | 76.92 | | | | | | | | | | | | |
| Max Voltage (VDC) | 600 | | | | | | | | | | | | 600 | | | | | | | | | | | |
| Operating Voltage Range - Combiner Only(VDC) | 0-600 | | | | | | | | | | | | 0-600 | | | | | | | | | | | |
| Pos Input Wire Size | #8-#18 AWG | | | | | | | | | | | | #8-#18 AWG | | | | | | | | | | | |
| Neg Input Wire Size | #10-#14 AWG | | | | | | | | | | | | #4-#14 AWG | | | | | | | | | | | |
| Pos Output Wire Size | 1/0-#10 AWG | | | | | | | | | | | | 350kcmil-#4 AWG | | | | | | | | | | | |
| Neg Output Wire Size | 2/0-#8 AWG | | | | | | 500kcmil-#6 AWG | | | | | | 350kcmil-#4 AWG | | | | | | | | | | | |
| Ground Output Wire Sizes | #4-#14 AWG | | | | | | | | | | | | 250-#6 AWG | | | | | | | | | | | |
| Enc Nema Rating | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R |
| Enclosure Size | 12X10 X06 | 12X10 X05 | 12X10 X06 | 12X10 X05 | 12X10 X06 | 12X10 X05 | 12X10 X06 | 12X10 X05 | 12X10 X06 | 12X10 X05 | 12X10 X06 | 12X10 X05 | 16X14 X06 | 16X16 X06 | 16X14 X06 | 16X16 X06 | 16X14 X06 | 16X16 X06 | 16X14 X06 | 16X16 X06 | 16X14 X06 | 16X16 X06 | 16X14 X06 | 16X16 X06 |
| Max # of inputs | 6 | | | | | | | | | | | | 12 | | | | | | | | | | | |

| Number of input circuits | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS | CCBF | CCBS |
|--|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | | | | | | | | | | | |
| Maximum Input Fuse Rating (A) | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Tested current | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Max Continuous Op Current (A) Using Max Input Fuse | 104 | 112 | 120 | 128 | 136 | 144 | 152 | 160 | 168 | 176 | 184 | 192 | | | | | | | | | | | | |
| SCCR at 600VDC (A) | 66.67 | 71.79 | 76.92 | 82.05 | 87.18 | 92.31 | 97.44 | 102.56 | 107.69 | 112.82 | 117.95 | 123.08 | | | | | | | | | | | | |
| Max Voltage (VDC) | 600 | | | | | | | | | | | | 600 | | | | | | | | | | | |
| Operating Voltage Range - Combiner Only(VDC) | 0-600 | | | | | | | | | | | | 0-600 | | | | | | | | | | | |
| Pos Input Wire Size | #8-#18 AWG | | | | | | | | | | | | #8-#18 AWG | | | | | | | | | | | |
| Neg Input Wire Size | 14 AWG ONLY | | | | | | | | | | | | 14 AWG ONLY | | | | | | | | | | | |
| Pos Output Wire Size | 350kcmil-#4 AWG | | | | | | | | | | | | 350kcmil-#4 AWG | | | | | | | | | | | |
| Neg Output Wire Size | 350kcmil-#4 AWG | | | | | | | | | | | | 350kcmil-#4 AWG | | | | | | | | | | | |
| Grnd Output Wire Sz | 250-#6 AWG | | | | | | | | | | | | 250-#6 AWG | | | | | | | | | | | |
| Enc Nema Rating | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R | 4X | 3R |
| Enclosure Size | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 18X16 X08 | 18X18 X06 | 20X16 X08 | 20X16 X06 | 20X16 X08 | 20X16 X06 | 20X16 X08 | 20X16 X06 | 20X16 X08 | 20X16 X06 |
| Max # of inputs | 20 | | | | | | | | | | | | 24 | | | | | | | | | | | |

Table 2: Electrical and Mechanical Combiner Box Characteristics

* – Imp Maximum Allowed (Sum of paralleled source circuits)

All statements, technical information and recommendations contained herein are based on information and tests we believe to be reliable. The accuracy or completeness thereof are not guaranteed. In accordance with Crouse-Hinds "Terms and Conditions of Sale," and since conditions of use are outside our control, the purchaser should determine the suitability of the product for his intended use and assumes all risk and liability whatsoever in connection herewith.