SOLARLOK* Combiner Box Assemblies 1954283-1 and 1954283-2

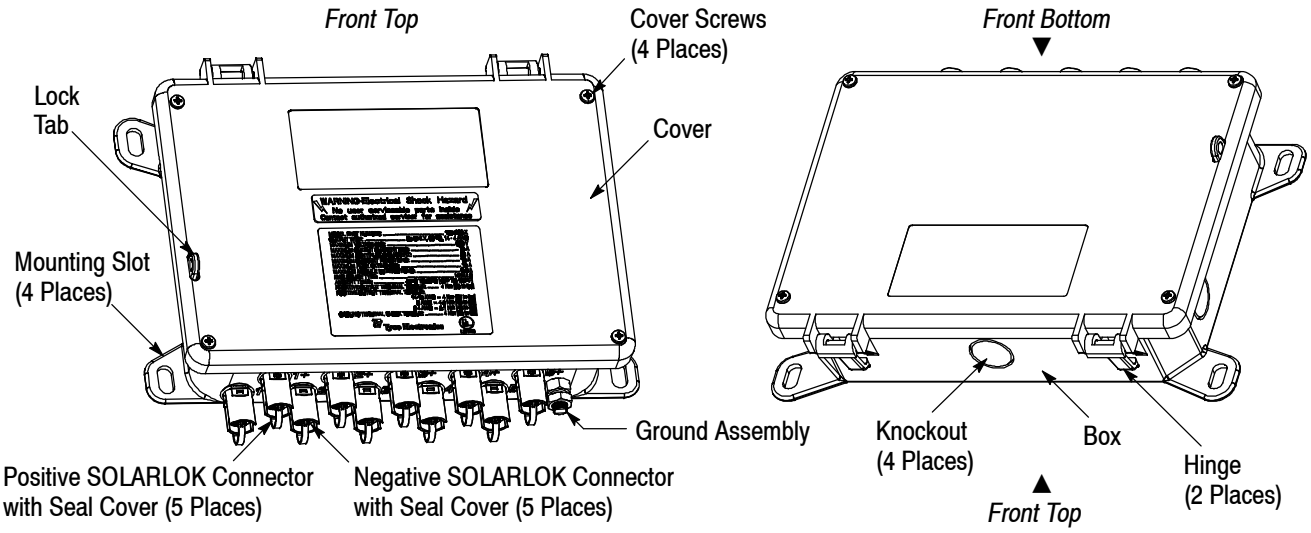


Figure 1

1. INTRODUCTION

SOLARLOK Combiner Box Assemblies 1954283-1 and 1954283-2 are used to combine up to five strings in a pre-terminated connectorized weather-resistant enclosure to meet National Electric Code (NEC) requirements for series fusing of photovoltaic (PV) modules.

NOTE

All numerical values in this instruction sheet are in metric units [with U.S. customary units in brackets]. Figures are not drawn to scale.

Combiner Box Assembly Specifications

System Voltage (DC):	600 V Maximum
Output Current (DC):	75 A Maximum
Continuous Current (DC):	60 A Maximum
Current Per String (DC):	15 A Maximum
Accepts Fuse Rating (DC):	15 A Maximum
Module Short Circuit Rating (Isc) Per String:	9.6 A Maximum
Weatherability Enclosure Type:	NEMA Type 3
Ambient Temperature:	50°C [122°F] Maximum
Torque:	
Negative Output Terminal	4 Nm [35 in.-lbs]
Positive Output Terminal	
Wire Sizes 14-10 AWG	4 Nm [35 in.-lbs]
Wire Size 8 AWG	4.5 Nm [40 in.-lbs]
Wire Sizes 6-4 AWG	5.1 Nm [45 in.-lbs]
Ground Terminal Block	4 Nm [35 in.-lbs]

NEMA, National Electrical Code, and NEC are trademarks of their respective owners.

The combiner box assemblies meet the standards of Underwriters Laboratories Inc. (UL) 1741 to be used as an accessory for inverters.

Reasons for reissue of this instruction sheet are provided in Section 5, REVISION SUMMARY.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This instruction sheet contains important instructions for Assemblies 1954283-1 and 1954283-2 that must be followed during installation and maintenance of the power system.

Read and understand the following safety precautions *before* installing or working with the combiner box assembly.

— Wiring methods must comply with the National Electric Code (NEC) and American National Standards Institute (ANSI)/National Fire Protection Association (NFPA).

— The DC input and DC output circuits are isolated from the enclosure. System grounding, if required by Section 250 of the NEC and ANSI/NFPA 70, is the responsibility of the installer.

— The photovoltaic system grounding must be installed according to the requirements of Sections 690.41 through 690.47 of the NEC, ANSI/NFPA 70, and is the responsibility of the installer.

— DO NOT work with the combiner box assembly if it is attached to any live electrical source.

— A DC disconnect switch must be incorporated in the installation in accordance with Article 690 of the NEC.

— This non-metallic enclosure DOES NOT provide grounding between conduit connections. Use grounding-type bushings and jumper wires for grounding the equipment.

— ALWAYS use insulated tools.

— ALWAYS disconnect the combiner box assembly from loads; such as, moving the AC/DC switches to off position and covering the solar cells with opaque (dark) material, before connecting or disconnecting SOLARLOK connectors or installing or replacing fuses.

— ALWAYS disconnect SOLARLOK connectors before working with the combiner box assembly.

— DO NOT connect or disconnect wires when electrical current from SOLARLOK connectors or external source is present.

— DO NOT work with the combiner box assembly if it is wet.

— DO NOT alter the combiner box assembly in any way.

WARNING: PV modules generate electricity when exposed to light and can cause electrical shock or burn. Multiple power sources could be present inside the combiner box assembly, and hazardous voltages could exist on exposed wiring and disconnected terminals. Care must be taken not to touch live terminals or conductive materials without personal protection.

WARNING: There is a risk of electrical shock. Normally grounded conductors may be ungrounded and energized when a ground-fault is indicated.

2. DESCRIPTION

Each combiner box assembly consists of a box, cover (with hinges), transparent dead front lid (under the cover), and 10 pre-terminated SOLARLOK connectors each with a removeable seal cover. The box features 4 knockouts (for output wiring), a lock tab, ground assembly, and mounting slots. See Figure 1.

The interior of the box contains 5 fuse blocks pre-wired to the positive SOLARLOK connectors, 5 terminal blocks pre-wired to the negative SOLARLOK connectors, and an equipment ground terminal block used to ground the equipment (if required). Fuses are not included.

Each combiner box assembly accepts:

Output wire: copper wire sizes 14 through 4 AWG with a maximum of 19 strands (conductor size must be determined by the system designer with respect to the NEC)

Use copper wire rated at 90°C [194°F] minimum

Input wire: (10) SOLARLOK connectors with wire suitable for application (for field installation of SOLARLOK connectors onto wire, refer to instruction sheet 411-18305-1)

Conduit hub (fitting): trade size 21 mm [$^{3}/_{4}$ in.] in diameter (maximum outside diameter of 44.2 mm [1.74 in.]) meeting standards of UL 514B — required to maintain weather resistance for the combiner box assembly

Use only UL Listed rain-tight or wet-location hubs for entry into the enclosure

Fuse size: (qty: 5) 10 by 38-mm [$^{13}/_{32}$ by $1^{1}/_{2}$-in.] Midget/5AG form factor — consult with the PV module manufacturer and refer to NEC Article 690 for appropriate fuse rating

Fuses must be UL Listed and have ratings of 600 VDC (minimum) and 15 A (maximum).

NOTE

For PV systems, the NEC requires that all fuses and wiring be sized for a minimum of 1.56 times the short circuit current rating (Isc) of the PV module used in the system, then rounded up to the next standard fuse size. For example, if the Isc of the PV module is 7.2 A, then the fuse size would be 11.2 (1.56 × 7.2). The next standard fuse size would be 12 A.

3. INSTALLATION

WARNING: The combiner box assembly must be installed and serviced by qualified personnel only.

NOTE

Qualified personnel must be knowledgeable in safety procedures for working with electricity. Installation must be performed in compliance with all applicable building and safety codes including the NEC, ANSI/NFPA 70, and local utility interconnection requirements.

3.1. Mount the Combiner Box Assembly

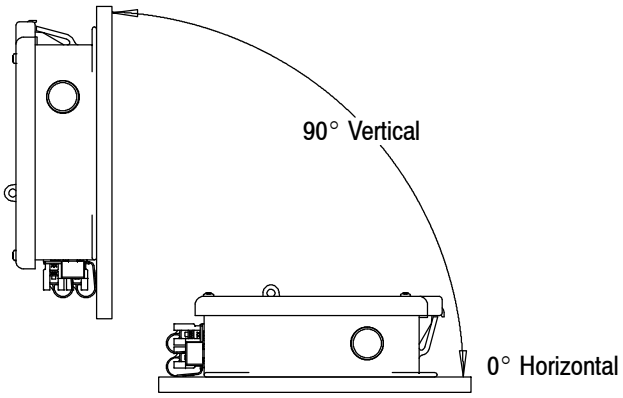
DANGER

To avoid contact with electricity, DO NOT mount the combiner box assembly if the combiner box assembly is attached to any live electrical source.

1. Using a small flat blade screwdriver, remove one of the knockouts to be used for output wire (knockout located on the side of the combiner box is preferred). *Take care not to damage* any of the interior components while removing the knockout.

2. Mount the combiner box onto a planar surface using the mounting slots (DO NOT drill holes into the combiner box) and appropriate hardware: stainless steel $^{1}/_{4}$- or $^{3}/_{8}$-in. bolts or screws with washers. See Figure 2 for mounting dimensions.

Mounting Angle



Mounting Dimensions

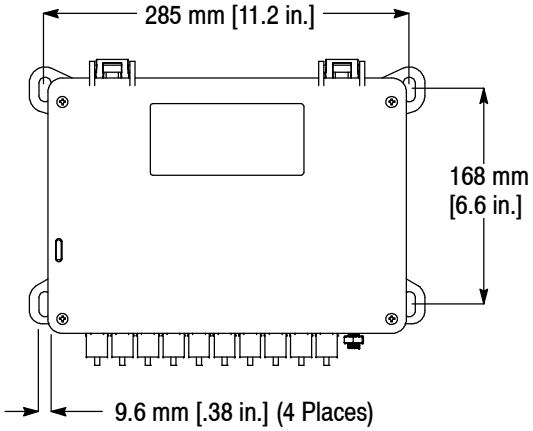


Figure 2

Before system assembly is complete, ensure that:

a. the combiner box assembly and exposed wiring is located in an area that is NOT readily accessible, such as a roof top or behind a fence or barrier, at least 0.914 m [3 ft] above ground level

b. the location surface ranges from 0° horizontal to 90° vertical

c. the combiner box assembly is oriented with the hinges at the top, right, or left

d. there is enough clearance at the front and above the hinges of the combiner box assembly to open the cover and below the connectors for mating and unmating connectors, and approximately 25.4 mm [1 in.] on all 4 sides of the combiner box assembly for ventilation

e. the location does not have continuous water flow or extreme temperature changes

f. the location ambient temperature is a maximum of 50°C [122°F]

g. the combiner box assembly is in the shade (this is recommended)

After system assembly is complete, ensure that:

the combiner box and exposed wiring for connection to the combiner box PV input strings via the SOLARLOK connectors is located in an area that is NOT readily accessible, such as a roof top or behind a fence or barrier

3.2. Ground the Equipment (If Required)

Grounding the equipment is the responsibility of the installer. Ensure that the ground wire is not nicked, cut, or scraped.

Refer to Figure 3, and proceed as follows:

NOTE

A size 8 AWG copper wire is installed between the grounding assembly and the equipment ground terminal block.

1. Remove the wire binding hex nut from the wire grounding assembly.

2. Position the ground wire into the wire slot of the ground bolt.

3. Thread the wire binding hex nut onto the ground bolt. Finger-tighten the wire binding hex nut until the wire is compressed.

4. Using a $^{9}/_{16}$-in. open end wrench, hold the hex body of the ground bolt, and using a $^{5}/_{8}$-in. socket wrench, tighten the wire binding hex nut to a torque of 5.08 N-m [45 in.-lbs.].

For additional information on the wire grounding assembly, refer to Instruction Sheet 408-10262.

Optional Grounding

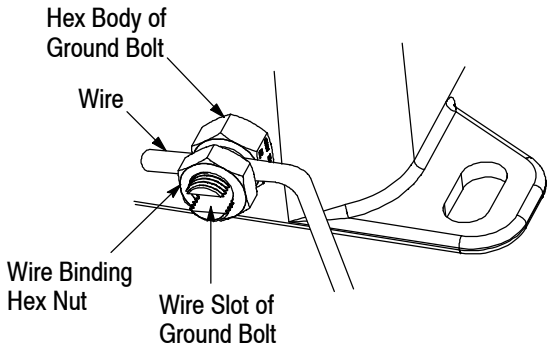


Figure 3

3.3. Connect Wiring and Install Fuses

1. Using a cross-recessed screwdriver, remove the two cover screws opposite the hinge, then remove the two remaining cover screws. Pivot the cover open.

2. Using the screwdriver, remove the two screws securing the transparent dead front lid; then remove the transparent dead front lid. Refer to Figure 4.

3. Install the conduit hub onto the conduit; then install the hub onto the knockout opening of the combiner box. Push the hub toward the floor of the combiner box so that it will not interfere with closing the cover of the combiner box; then tighten the hub. Dress the output wires through the conduit and into the combiner box.

NOTE

The hub must be installed onto the conduit before the hub is installed onto the knockout opening.

4. Strip the output wires to approximately 12.7 mm [.50 in.].

5. Insert the positive wire into the positive output terminal (located on the bus bar of the fuse blocks); insert the negative wire into position 3 (center) negative output terminal located on the terminal blocks (the negative wires are commoned via the terminal block assembly); and, if required, insert the ground wire into the equipment ground terminal (located on the equipment ground terminal block) — then using the screwdriver, tighten each terminal screw to the torque indicated in Section 1. See Figure 4.

NOTE

DO NOT use the terminal block as a system ground. Use it only as an equipment ground pass-through.

6. Install each fuse in the fuse blocks as follows: pivot the fuse puller until it opens, insert the fuse into the holder ensuring that the end sits in the metal clip, then press the fuse puller down until it snaps into place.

Fuses must be UL Listed and have ratings of 600 VDC (minimum) and 15 A (maximum).

7. Remove the seal covers, and retain. Connect the SOLARLOK connectors (of input wiring) from the PV modules to the appropriate SOLARLOK connectors of the combiner box assembly.

3.4. Inspect and Close the Combiner Box Assembly

1. Inspect the combiner box to ensure the following:

— all terminations are secure

— conduit hub (fitting)(s) is properly sealed

— connectors are fully mated

Connecting Wire and Installing Fuses

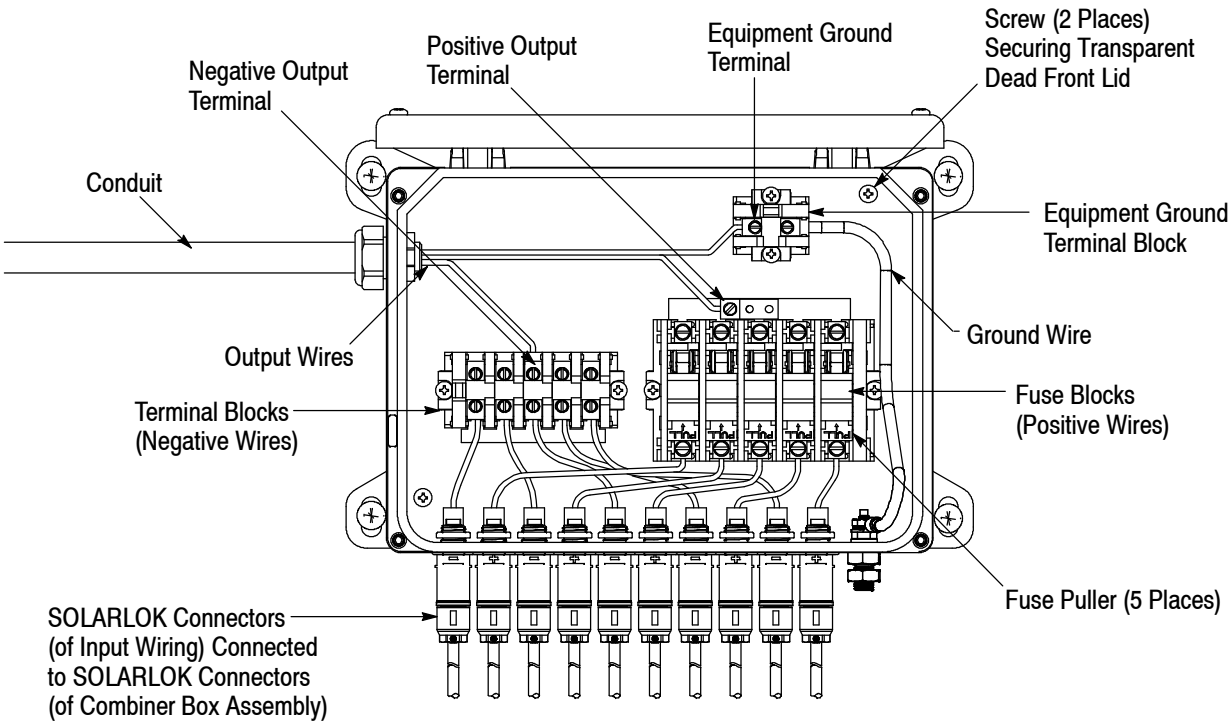


Figure 4

2. Re-install, and secure (using the two screws), the transparent dead front lid. Tighten the screws to a torque of 0.5 N-m [4 in.-lbs].

3. Close the cover, and secure it using the four cover screws. Tighten the screws to a torque of 0.9 N-m [8 in.-lbs].

4. REPLACEMENT AND REPAIR

Components of the combiner box assembly are not repairable. DO NOT use a damaged or defective combiner box assembly. DO NOT alter any components of the combiner box assembly.

Fuses (not included with the box) can be replaced.

Order replacement combiner box assemblies through your representative, or call 1-800-526-5142, or send a facsimile of your purchase order to 717-986-7605, or write to:

CUSTOMER SERVICE (038-035)
TYCO ELECTRONICS CORPORATION
PO BOX 3608
HARRISBURG PA 17105-3608

5. REVISION SUMMARY

Revisions to this instruction sheet include:

- Changed fuse rating requirement in Section 2 and Step 6 of Paragraph 3.3