



# SBCB-6, SCCB-12, 28, 52 6 to 52 Circuit Combiner Boxes



User Manual

U.S. Version 2.3

DOC-CBUG-01



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### Revision History

Rev. No.	Date	By	Description
1.0	Nov. 1, 2004	ES / JP	Preliminary Release
1.1	Dec. 1, 2004	KS / JP	First Release
1.2	Dec. 10, 2004	JP	Torque Update
1.3	Feb. 09, 2005	JP	Revised Specifications
2.0	Feb, 2006	JP	Update
2.1	Jul, 23, 2007	JL	Add Drawings for all 4 models
2.2	July 17, 2009	WZ	Address Change
2.3	September 9, 2009	WZ	Warranty Change

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## IMPORTANT SAFETY INSTRUCTIONS

### \*SAVE THESE INSTRUCTIONS\*

This manual contains important instructions for the Combiner Box models SBCB-6-90, SCCB-12-240, SCCB-28-420 and SCCB-52-416 that must be followed during the installation and use of the Combiner Boxes.

The Combiner Boxes are designed and tested according to international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing the Combiner Boxes. To reduce the risk of personal injury and to ensure the safe installation and operation of the Combiner Boxes, you must carefully read and follow all instructions and warnings in this *Installation Guide*.

### Safety and Hazard Symbols



This symbol is used to call attention to important information that you must have when installing and/or operating the Combiner Boxes. Failure to read and follow instructions marked with this symbol could result in serious injury and/or damage to the equipment.



This symbol appears beside instructions and warnings that deal with dangerous voltages that can injure people who come in contact with them.

### Warnings



**WARNING:** A Warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

Warnings may also be accompanied by one or more of the safety and hazard symbols described above to indicate the type of hazard described therein.

### Other Symbols

In addition to the safety and hazard symbols described previously, the following symbol is also used in this *Installation Guide*:



This symbol accompanies notes that call attention to supplementary information that you should know to ensure optimal operation of the system.

## Warranty

All Combiner Boxes sold in the USA have a five-year warranty. For warranty coverage, or if you have questions about the Combiner Box warranty, contact SMA America at the address, telephone number, or Web site listed on page iii (to send E-mail, see the Contact section of the SMA America Web site: [www.sma-america.com](http://www.sma-america.com)).



**WARNING:** All electrical installation must be done in accordance with the National Electrical Code ANSI/NFPA 70, local building codes and the requirements of the authority having jurisdiction.



**WARNING:** To prevent electrical shock or injury, all wiring and commissioning procedures must be performed by qualified personnel.



**WARNING:** Before installing or using the Combiner Box, read all of the instructions and warnings on the Combiner Box and in this Installation Guide.



**WARNING:** PV arrays produce electrical energy when exposed to light and thus create an electrical shock hazard.



This GROUND symbol marks areas in the Combiner Box for connecting equipment grounds only.



## Introduction

SMA America has introduced a new line of PV combiner boxes designed for use with the SMA family of inverters.

Combiner Box features include:

- Listed to UL 1741 for the United States and Canada
- Simplified input and output wiring
- Compact, low-cost design
- Wall-mount NEMA type 3R outdoor steel enclosure (NEMA type 4 available for SCCB-12, SCCB-28).
- Reliable bus-work for combined high current conductors

## Unpacking and Inspection

All SMA Combiner Boxes are thoroughly checked before they are packaged and shipped. Although they are shipped in sturdy packaging, damage can still occur during shipping and delivery. It is important to carefully inspect the shipping container and contents prior to installation. If you detect any external damage after unpacking, report the damage immediately to your SMA dealer and shipping company that delivered the unit. If it becomes necessary to return the Combiner, use the original packing material.

If you need assistance in dealing with a damaged unit, contact SMA America at 916 625 0870.

## Input Circuit Configurations

The SBCB and SCCB Combiner Boxes are commonly available with 6, 12, 28 or 52 PV input circuits. Other sizes in between 6 and 52 circuits may be special ordered. Please allow sufficient lead time when custom ordering. Contact SMA America for details.

# 1 Installation

Refer to Figures 1-1 through 1-4 for enclosure dimensions. Use appropriate hardware for the mounting surface. The weight of the units is shown in the specification list.

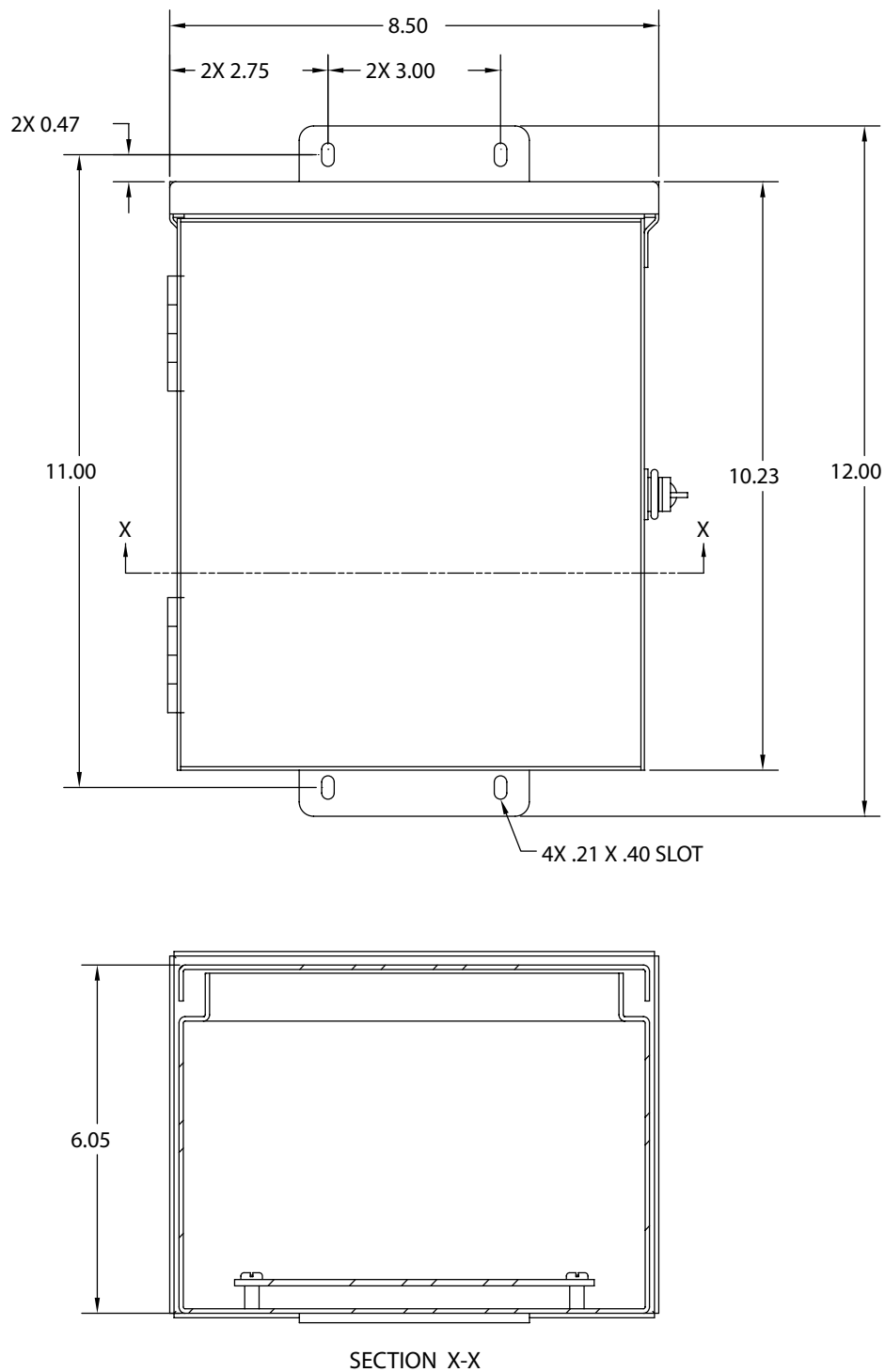


Figure 1-1 SBCB-6-90 type 3R Dimensions



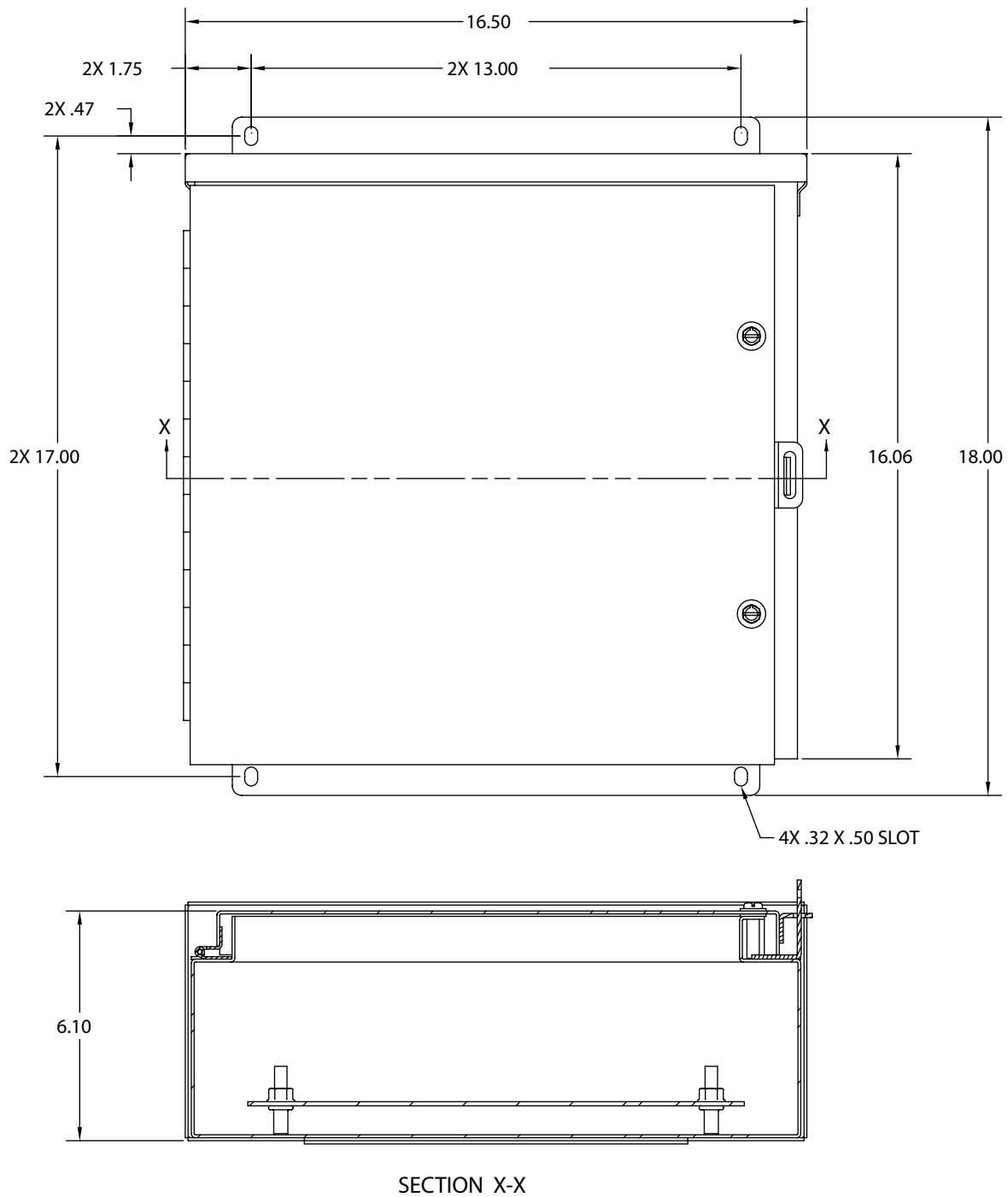


Figure 1-2 SCCB-12-240 type 3R Dimensions

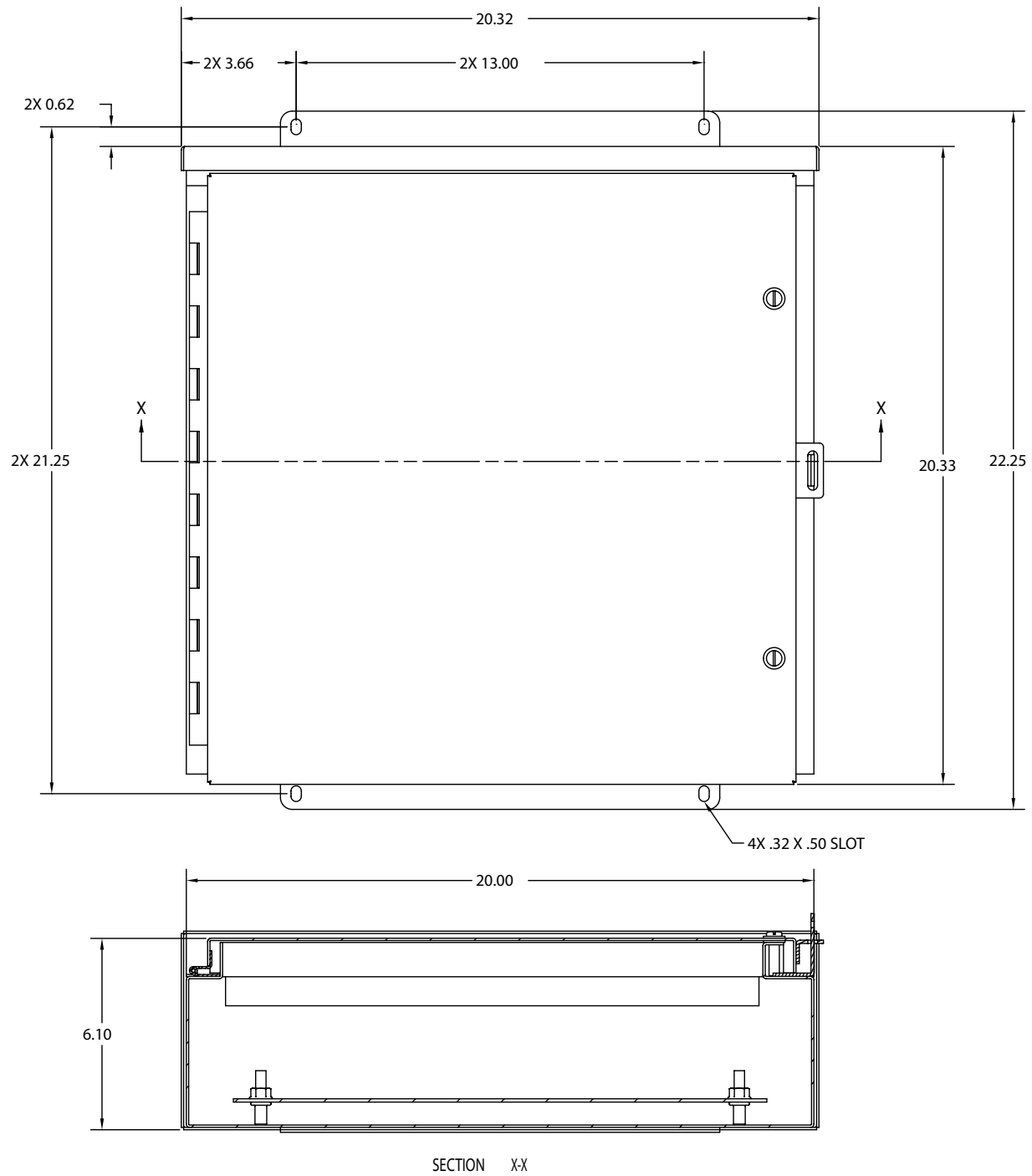


Figure 1-3, SCCB-28-420 type 3R Dimensions

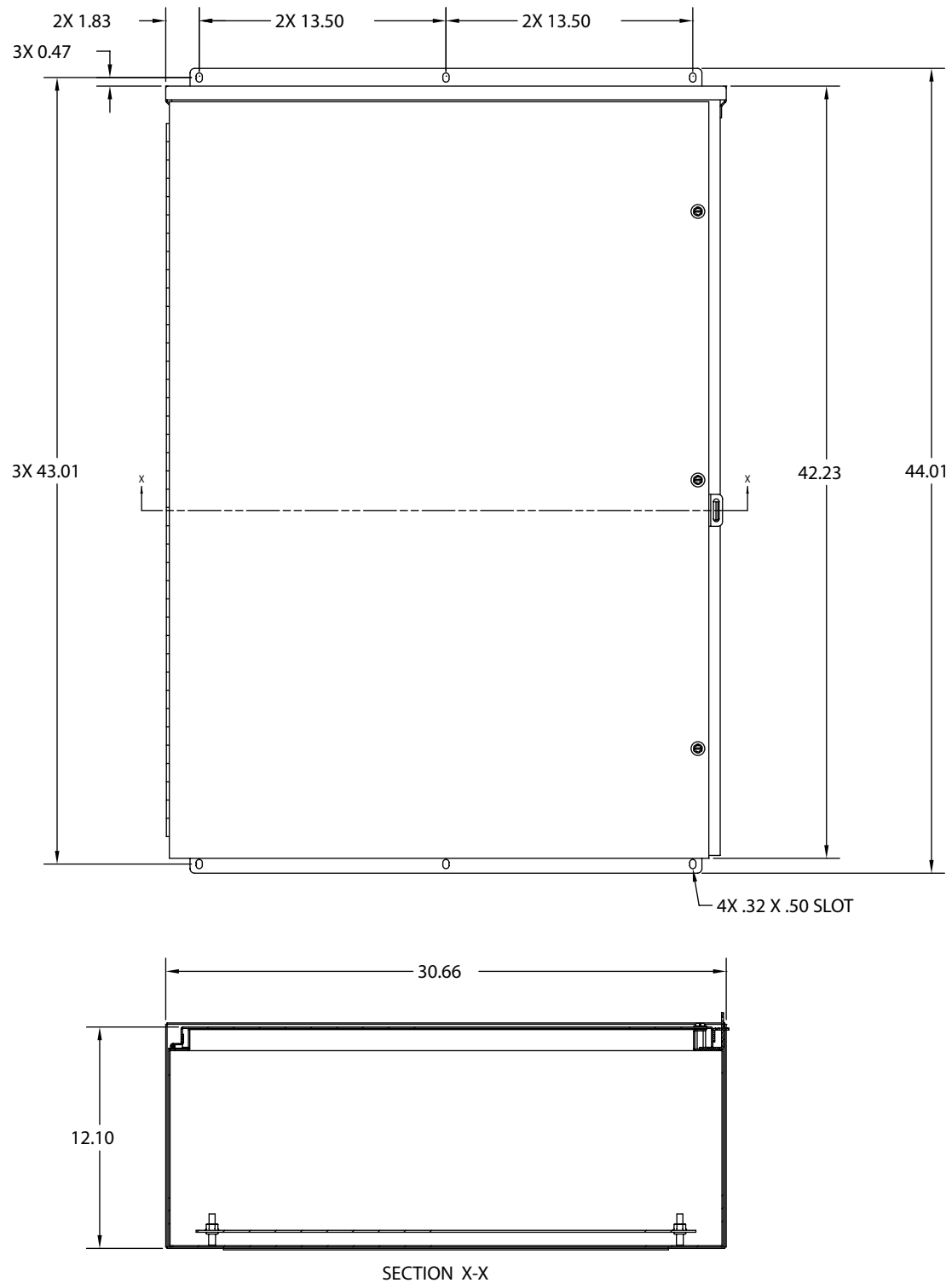


Figure 1-4, SCCB-52-416 type 3R Dimensions

## 2 Wiring



NOTE: The combiner enclosure is shipped with no entry holes. A knock-out is required for the appropriate conduit size. SMA recommends wire entry be made from the bottom, but there is no restriction, other than local code, for making wire entries from other locations in the enclosure.

### Input Wiring

Refer to Figures 2-1 through 2-4 for the input and output wiring locations of the combiner box. PV ungrounded conductors (positive in a negative ground system, negative in a positive ground system) are wired into the outside fuse holder terminals. PV grounded conductors (negative in a negative ground system, positive in a positive ground system) are wired into the terminal buses located at the top of the combiner box. All PV safety ground conductors are wired into the terminal busses located at the bottom of the combiner box.

### Output Wiring

The SBCB 6 circuit combiner box has a 90A DC fault current rating.

The SCCB 12 circuit combiner boxes has a 240A DC fault current rating.

The SCCB 28 circuit combiner boxes has a 420A DC fault current rating.

The SCCB 52 circuit combiner boxes has a 416A DC fault current rating.

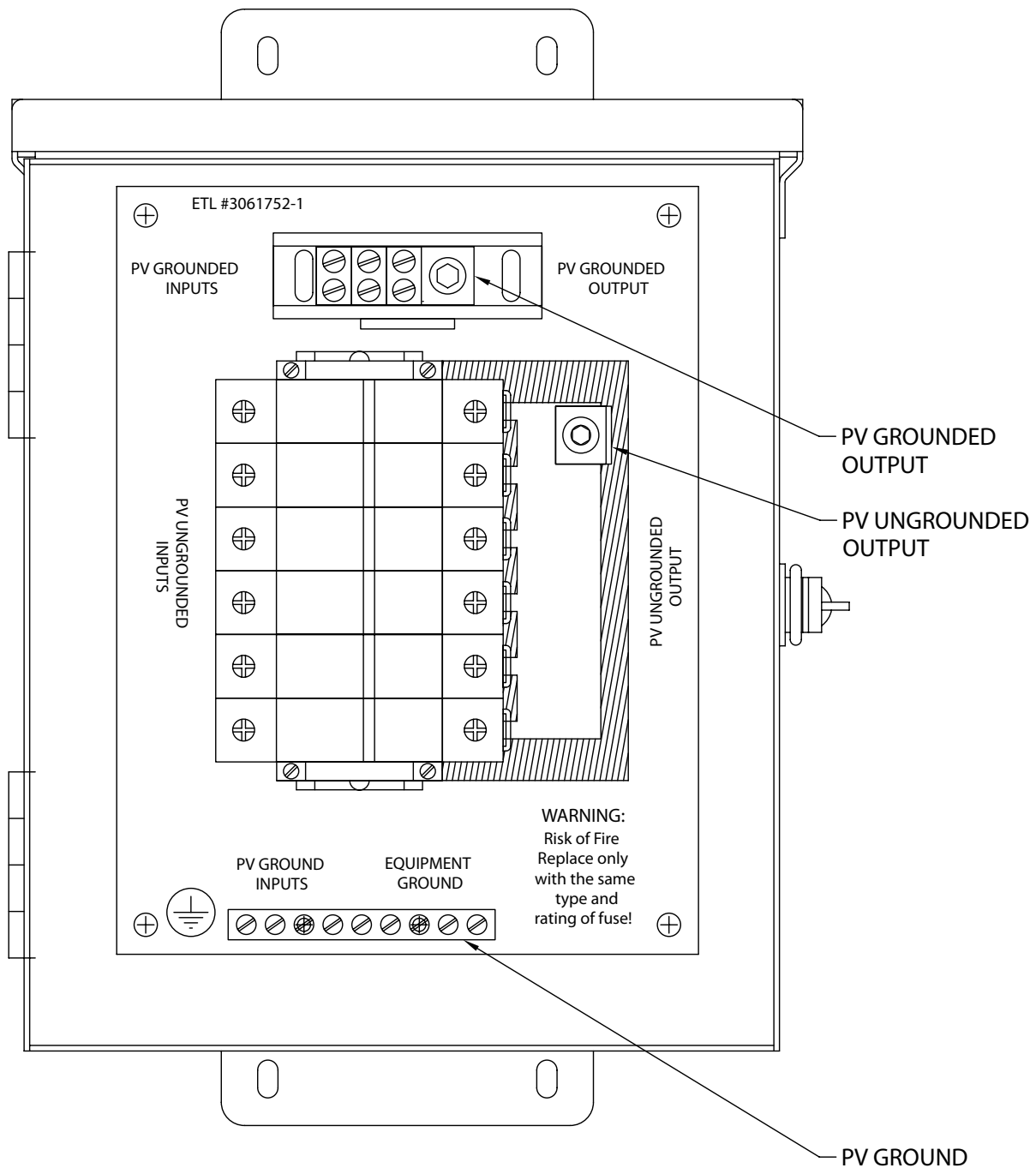
When temperature and voltage drop adjustments are considered, the output conductor sizes can become quite large (500 mcm or greater) and difficult to manage. NEC 310.4 allows paralleling of conductors greater than 1/0 to achieve higher ampacities.

The SCCB-28, and 52 circuit combiner boxes provide output terminals for paralleling two conductors for the PV positive and negative, as well as the equipment ground conductors.

### Combiner Box Output Fusing

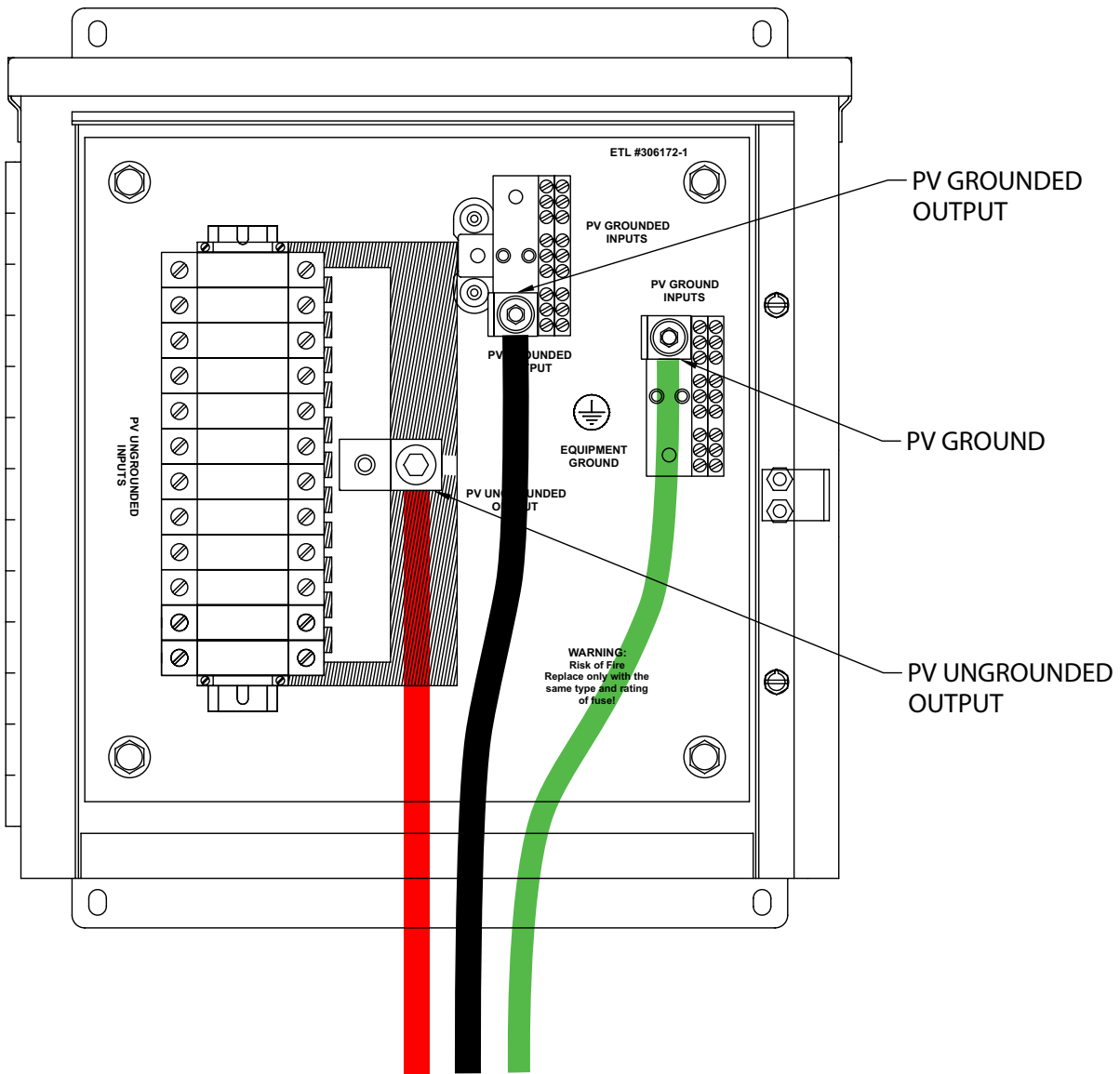
If more than three combiner boxes are needed for one inverter, it may be necessary to fuse the combiner box output conductors. Please contact SMA America for further details.

Refer to Figures 2-1 through 2-4 for the terminal locations of the combiner circuits.



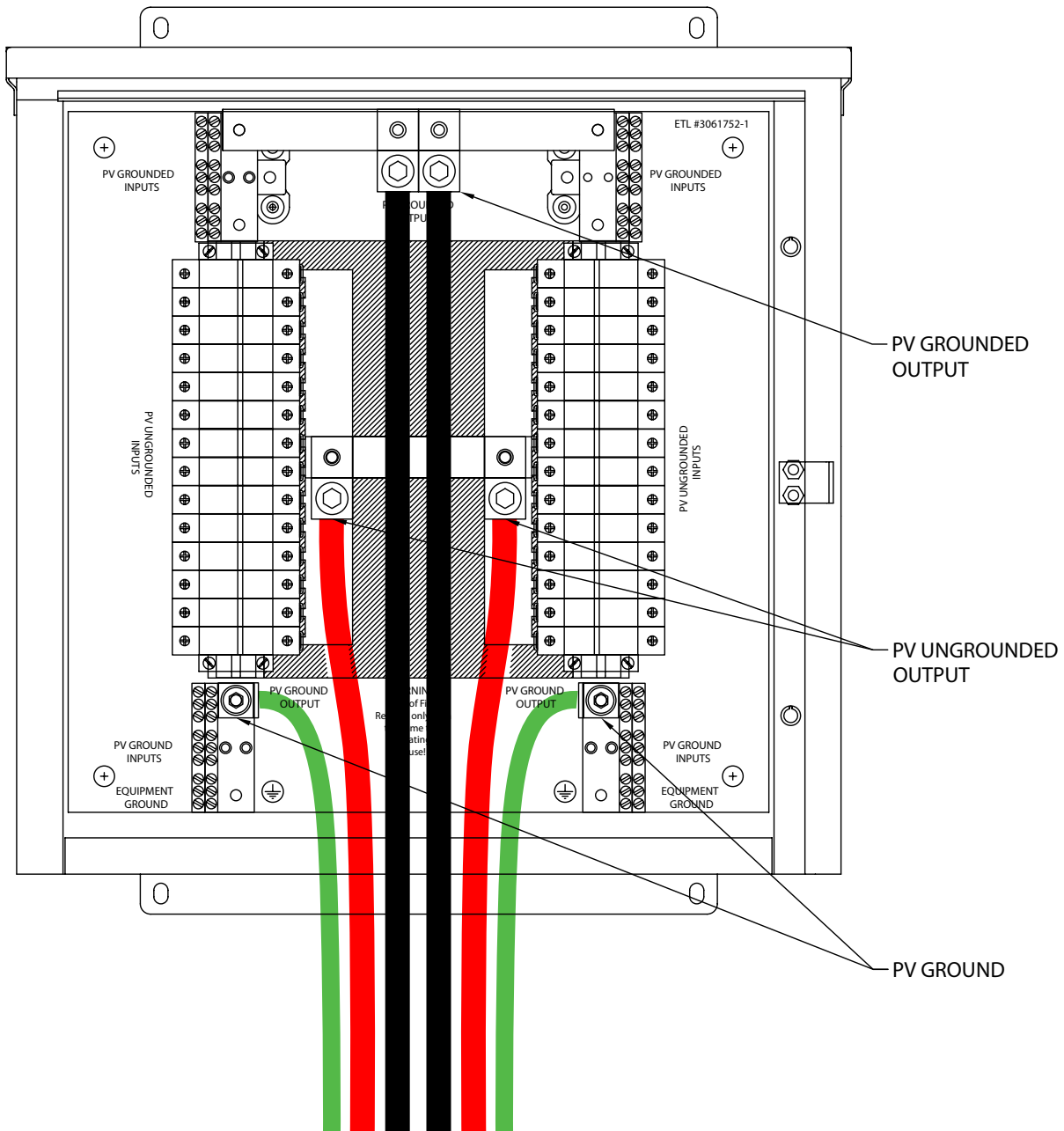
**Figure 2-1, Combiner Box Wiring, SBCB-6-90**

6 PV input fuse holders, 15 Amp maximum fuse size



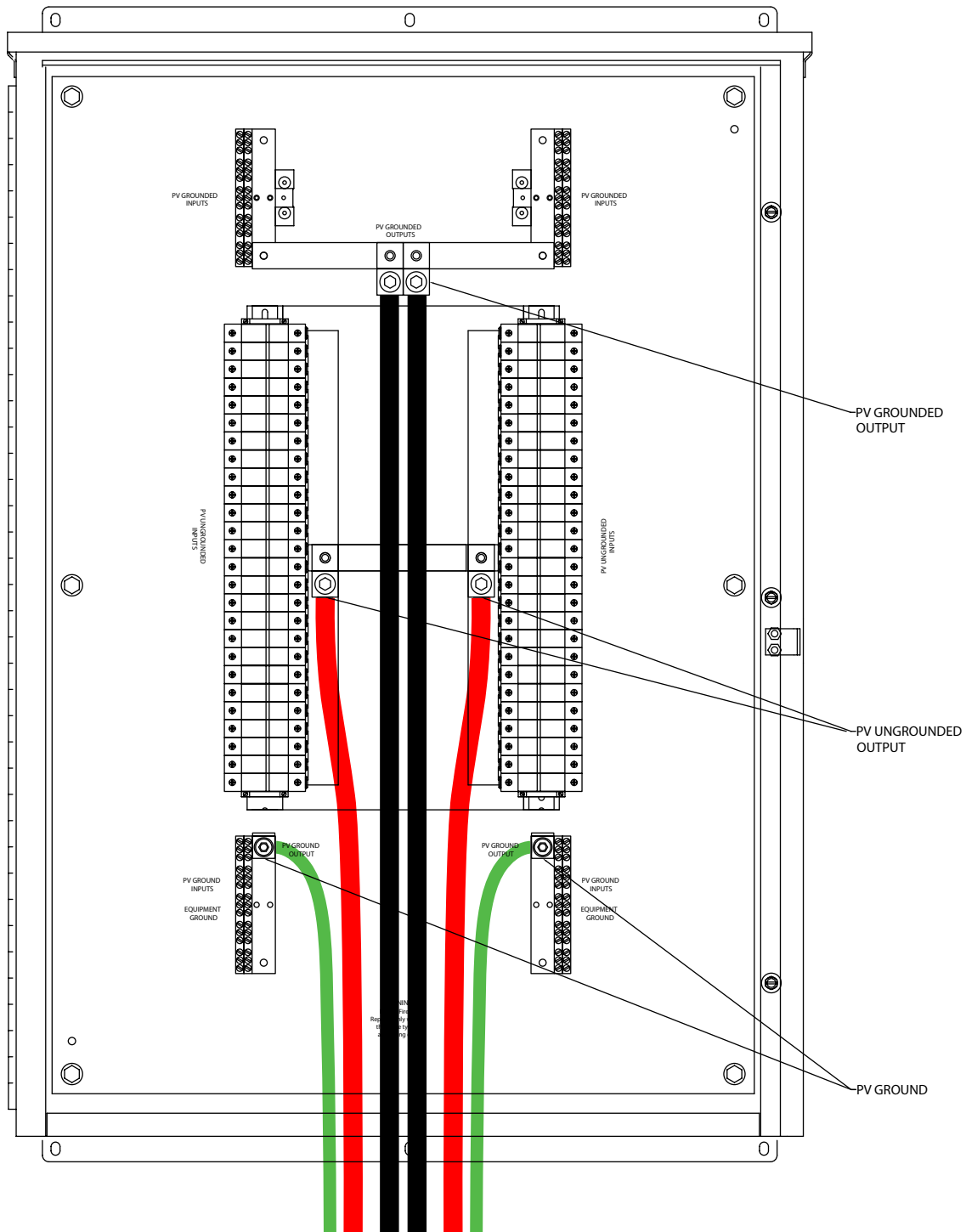
**Figure 2-2, Combiner Box Wiring, SCCB-12-240**

12 PV input fuse holders, 20 Amp maximum fuse size



**Figure 2-3, Combiner Box Wiring, SCCB-28-420**

28 PV input fuse holders, 15 Amp maximum fuse size



**Figure 2-4, Combiner Box Wiring, SCCB-52-416**

52 PV input fuse holders, 8 Amp maximum fuse size



## Fuse Sizing

In any electrical system, fuses are used to protect wiring and equipment from excessive currents that can cause damage, heating or in extreme cases even fire. If the fuse rating is too small it could open during normal operation. If the fuse rating is too large, it cannot provide the needed protection. In PV systems, the minimum and maximum size of the series fuse is determined by the electrical ratings of the PV module as well as by UL and National Electrical Code (NEC) requirements. Be sure to consult with your PV module manufacturer for appropriate fuse ratings.

The minimum size of fuses and wiring are calculated using the Short Circuit Current Rating ( $I_{sc}$ ) of the PV module. The NEC requires that all fuses and wiring be sized for a minimum of 1.56 times the  $I_{sc}$  of the PV module used in the system.

The proper size PV string fuse is determined by calculating  $1.56 \times I_{sc}$  (of the PV module) and then rounding up to the next standard fuse size.

**Example:** If the  $I_{sc}$  of the PV module equals 6.9 Adc, then the fuse size is determined by  $1.56 \times 6.9 = 10.76$ . The next standard fuse size would be a 12A, 600Vdc fuse.

## DC Disconnect Requirements

NEC 690.15-18 allows the use of fuse holders as a suitable means of disconnecting PV arrays for servicing. Additional DC disconnects external to the inverter may be required by the local authority having jurisdiction.



**WARNING:** Never open a fuse holder while it is under load. Electrical arcing and damage to the fuse holder will occur if a fuse holder is opened under load.

## PV String Fuses

The SBCB/SCCB is shipped **without** PV string fuses. SMA America maintains stock of common fuse sizes for the SBCB/SCCB products. The current rating of the fuse is dependent upon the specific PV module used in the PV array. Please contact SMA America to order the appropriate fuses for your project.

## Specifications

### SBCB-6 (6 Circuit)

Number of Inputs	6
Ungrounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 14 in-lb.
Grounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 35 in-lb.
Output Wire Size Terminal Torque Value	10 to 1/0 AWG 120 in-lb.
Max Input Fuse Rating (Midget)	15 A, 600 V DC
Max Output Current	90 A DC
Max Continuous Output Current	72 A DC
Number of Output Wires	1 Positive, 1 Negative
PV Array Configuration	Negative or Positive Grounded
Field Wiring	75 Deg C minimum
Operating Temperature Range	-25 to 50 Deg C
Enclosure Type	NEMA type 3R, Steel
Weight	11 lbs. (approx.)
Dimensions H x W x D (inches)	10 x 8 x 6

### SCCB-12 (10, 14, 16 Circuit may be special ordered)

Number of Inputs	10 to 16
Ungrounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 14 in-lb.
Grounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 35 in-lb.
Output Wire Size Terminal Torque Value	6 AWG to 350 kcmil 350 in-lb.
Max Input Fuse Rating (Midget)	20 A, 600 V DC
Max Output Current	200 to 320 A DC

Max Continuous Output Current	160 to 256 A DC
Number of Output Wires	1 Positive, 1 Negative
PV Array Configuration	Negative or Positive Grounded
Field Wiring	75 Deg C minimum
Operating Temperature Range	-25 to 50 Deg C
Enclosure Type	NEMA type 3R/4, Steel
Weight	48 lbs. (approx.)
Dimensions H x W x D (inches)	16 x 16 x 6

### **SCCB-28 (18 to 26 Circuit may be special ordered)**

Number of Inputs	18 to 28
Ungrounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 14 in-lb.
Grounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 35 in-lb.
Output Wire Size Terminal Torque Value	6 AWG to 350 kcmil 350 in-lb.
Max Input Fuse Rating (Midget)	15 A, 600 V DC
Max Output Current	270 to 420 A DC
Max Continuous Output Current	216 to 336 A DC
Number of Output Wires	2 Positive, 2 Negative
PV Array Configuration	Negative or Positive Grounded
Field Wiring	75 Deg C minimum
Operating Temperature Range	-25 to 50 Deg C
Enclosure Type	NEMA type 3R/4, Steel
Weight	56 lbs. (approx.)
Dimensions H x W x D (inches)	20 x 20 x 8

**SCCB-52**

Number of Inputs	52
Ungrounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 14 in-lb.
Grounded Input Wire Size and Terminal Torque Value	10 to 6 AWG 35 in-lb.
Output Wire Size Terminal Torque Value	6 AWG to 350 kcmil 350 in-lb.
Max Input Fuse Rating (Midget)	8 A, 600 V DC
Max Output Current	416 A DC
Max Continuous Output Current	333 A DC
Number of Output Wires	2 Positive, 2 Negative
PV Array Configuration	Negative or Positive Grounded
Field Wiring	75 Deg C minimum
Operating Temperature Range	-25 to 50 Deg C
Enclosure Type	NEMA type 3R
Weight	70 lbs. (approx.)
Dimensions H x W x D (inches)	42 x 30 x 12

