

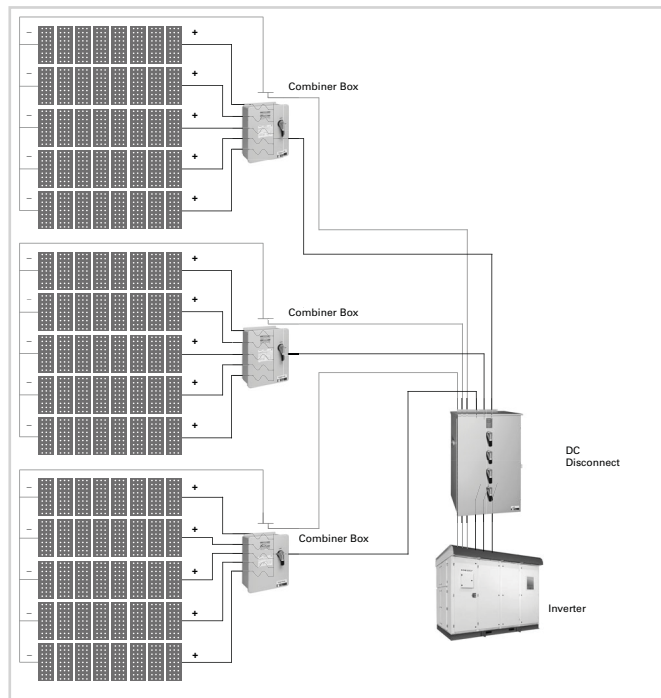
Solar Combiner Solutions

Grid-tied Solar System Information

A grid-tied solar array may be a few panels or many in series, and may range from a few 12 volt panels to high voltage multi-panel arrays for grid-tied systems. Grid-tied systems can go as high as 1000 VDC, while off-grid battery systems are typically 12, 24 or 48V.

Higher voltage systems (over 48V) have different NEC code requirements than those for low voltage battery systems, and the two types are NOT interchangeable.

Eaton's Crouse-Hinds Series Solar Combiner Boxes are designed for higher voltage circuits used in grid-tied applications. All meet NEC requirements, are made in accordance with UL1741 standards and are protected by Eaton's Bussmann® Series DC Fuses specifically designed for the protection and isolation of photovoltaic strings.



Typical Solar Grid-tied System Diagram

Eaton's Crouse-Hinds Series Solar Protection for Fiberglass Enclosures

Eaton's Crouse-Hinds Series standard NEMA 4X Solar Combiner Boxes are shipped with fiberglass enclosures. These enclosures contain a solar protection formula that gives the enclosure strength and durability to provide long, dependable service even in the most demanding environmental conditions. They retain gloss and color even when exposed to harsh UV light and offer superior resistance to chemicals and are fire retardant.

A special UV absorber is added into this solar protection formula and works to absorb UV energy and release it without damaging the fiberglass enclosure, thus providing increased protection of the polyester material and increased resistance to the damaging effects of UV radiation. For additional information on Eaton's Crouse-Hinds Series solar protection, choose fiberglass enclosures from: <http://www.crouse-hinds.com>.

How to Size a Solar Combiner*:

1. Current Inputs:

a. Eaton provides a "Max. Short Circuit Current Rating per String" (Isc) for use as a direct comparison between the published Isc of the PV module. De-rating requirements per Article 690 of the NEC are applied and should be used to make a direct comparison with the PV module Isc ratings (i.e. CCBF12 has an Isc rating of 9.6A. PV modules with Isc ratings at or below 9.6A would be acceptable). For additional information, consult the electrical ratings table found in the technical section of this brochure.

2. Ratings:

a. Voltage: (600 VDC/1000 VDC systems) – Eaton provides the total system voltage ratings to be used in comparison with the sum of the maximum number of modules in series per string. Consult NEC, ANSI and local codes when designing a system.

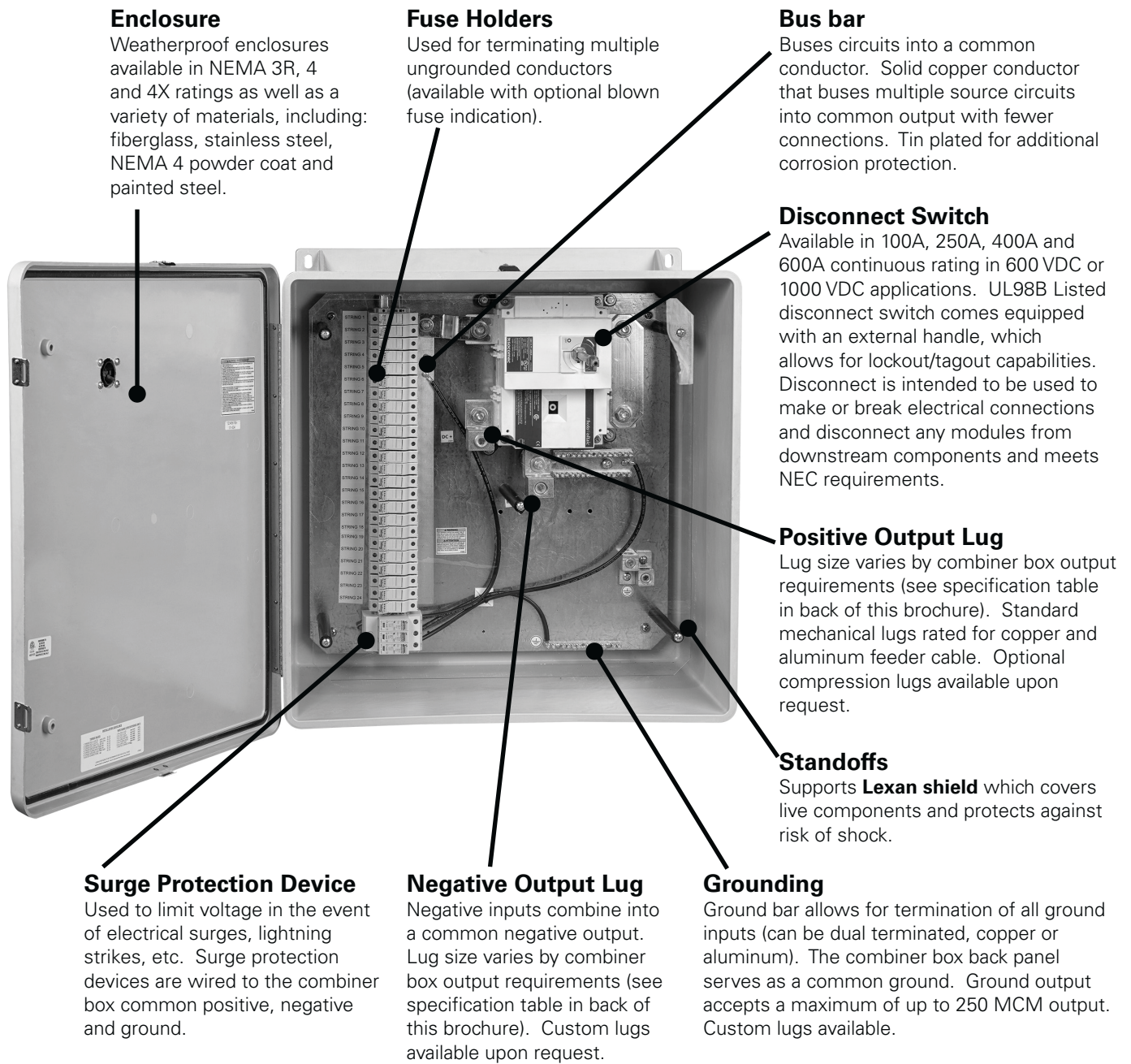
b. Current: Customer provided max. array current per string multiplied by number of combiner input circuits must be less than or equal to the max. current found in the electrical ratings table at the end of this section.

3. Hardware Sizing:

a. Integral Disconnect Switch Sizing: To determine the rating of the integral disconnect, simply multiply the number of input circuits by the max. current per string (as indicated above), and then round to the next (higher) disconnect size. In NO case can the maximum current exceed the amperage rating. Disconnect switches are rated for 100% continuous duty. Example: A 12-string combiner box with solar modules rated to 9.6A has a maximum current of 12A; 12A per string x 12 strings = 144A, which results in a 250A disconnect switch.

*The information above is provided for reference and information only. 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 Eaton's 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/her intended use and assumes all risk and liability whatsoever in connection therewith.

Combiner Box Components & Features



Enclosure

Weatherproof enclosures available in NEMA 3R, 4 and 4X ratings as well as a variety of materials, including: fiberglass, stainless steel, NEMA 4 powder coat and painted steel.

Fuse Holders

Used for terminating multiple ungrounded conductors (available with optional blown fuse indication).

Bus bar

Buses circuits into a common conductor. Solid copper conductor that buses multiple source circuits into common output with fewer connections. Tin plated for additional corrosion protection.

Disconnect Switch

Available in 100A, 250A, 400A and 600A continuous rating in 600 VDC or 1000 VDC applications. UL98B Listed disconnect switch comes equipped with an external handle, which allows for lockout/tagout capabilities. Disconnect is intended to be used to make or break electrical connections and disconnect any modules from downstream components and meets NEC requirements.

Positive Output Lug

Lug size varies by combiner box output requirements (see specification table in back of this brochure). Standard mechanical lugs rated for copper and aluminum feeder cable. Optional compression lugs available upon request.

Standoffs

Supports **Lexan shield** which covers live components and protects against risk of shock.

Surge Protection Device

Used to limit voltage in the event of electrical surges, lightning strikes, etc. Surge protection devices are wired to the combiner box common positive, negative and ground.

Negative Output Lug

Negative inputs combine into a common negative output. Lug size varies by combiner box output requirements (see specification table in back of this brochure). Custom lugs available upon request.

Grounding

Ground bar allows for termination of all ground inputs (can be dual terminated, copper or aluminum). The combiner box back panel serves as a common ground. Ground output accepts a maximum of up to 250 MCM output. Custom lugs available.

Options:

Integral Connectors, Whips & Harnesses

Available as a pre-wired option for fast install and labor savings.

Current Monitoring

Can be added as an option. Incoming, ungrounded conductors (1 or 2) are fed through a single current transducer. Module configurations allow up to 12 string inputs. **NOTE:** Integration of this device typically increases enclosure size requirements.

See product pages for additional available options.



Current Monitoring

Custom Whips

Solar Combiner Boxes

Applications:

- Built to minimize system costs by providing maximum flexibility
- Available with 1-48 input circuits* and help save material costs, installation time and labor when joining the combiner box and disconnect within one enclosure (eliminating the need for a disconnect switch in a separate enclosure)

Features:

- Rated for 600 VDC, 1000 VDC or 1500 VDC† – continuous duty
- Optional integral disconnects available in 100A, 250A, 350A, 400A and 600A
- Touch-safe fuse holders
- Lexan shield covers all live components
- 90°C output terminals
- Configured for positive and negative grounded arrays**

Certifications and Compliances:

- cETLus 1741 Listed
- cETLus Listed to CSA Standards C22.2 No. 31 & No. 107.1
- NEMA 4X (fiberglass and stainless steel)
- NEMA 4 (powder coated steel)
- NEMA 3R (painted steel, for vertical mounting positions only)



Standard Materials and Finishes:

- NEMA 4X fiberglass (non-conductive, impact-resistant, UV-resistant, flame retardant) – natural
- NEMA 4X stainless steel – natural
- NEMA 4 steel – powder coated
- NEMA 3R steel (for vertical mounting applications only) – painted

Options:

- Fuses (shipped uninstalled)
- Surge protection
- Solar cable whips (pre-assembled and installed)
- Compression output lugs
- Factory installed breather vent or drain
- Bipolar construction (to 1000 VDC combined voltage)
- Smart combiners available (DC string monitoring)
- Factory drilled entrance holes
- Factory installed conduit fittings/cable glands
- Dual output lugs
- Lockable enclosures
- Integral power supply
- Terminal blocks
- Factory installed strut
- Custom options available – consult factory

Integral Disconnect Rating:

To determine the rating of the integral disconnect, simply multiply the number of input circuits by the max. current per string, and then round to the next (higher) disconnect size. In NO case can the maximum current exceed the amperage rating. Disconnect switches are rated for 100% continuous duty. Example: A 12-string combiner box with solar modules rated to 9.6A has a maximum current of 12A; 12A per string x 12 strings = 144A, which results in a 250A disconnect switch.

Catalog Number Matrix:

	CCBF	12	F15	DS250	SP	DCM		
Enclosure Type	CCBF = Fiberglass N4X							
	CCBS = Painted steel N3R							
	CCBSS = Stainless steel N4X							
	CCB4S = Powder coated steel N4							
Number of Input Circuits								
	01 = 1 input circuit							
	02 = 2 input circuits							
	03 = 3 input circuits							
	04 = 4 input circuits							
	05 = 5 input circuits							
	06 = 6 input circuits							
	(Offered up to 48 circuits*)							
Fuse Amperage**								
	F08 = 8A fuse							
	F10 = 10A fuse							
	F12 = 12A fuse							
	F15 = 15A fuse							
	(Offered up to 30A)							
	BLANK = Fuses not provided by factory							
	• Eaton's Bussmann Series fuses recommended							
	- PVM fuses for 600 VDC combiner boxes							
	- PV fuses for 1000 VDC combiner boxes							
Integral Disconnect Rating								
	DS = Disconnect switch for use with 1-48* input circuits							
	DS100 = 100A - standard on combiners up to 6 circuits							
	DS250 = 250A - standard on combiners from 7 to 24 circuits							
	DS325 = 325A - consult factory							
	DS400 = 400A - available on combiners greater than 17 circuits. Standard on combiners from 24 circuits to 36.							
	DS600 = 600A - consult factory							
	BLANK = No integral disconnect							
DC Monitoring								
	DCM = Pre-installed DC current monitoring unit							
	BLANK = No DC current monitoring							
Surge Protection								
	SP = Surge protection							
	30kA/600 VDC interrupting rating or 30kA/1000 VDC							
	IP20 finger-safe construction							
	Small size takes up minimal space in enclosure (only 2 inches wide)							
	BLANK = No surge protection							
Breather Vent or Drain								
	BV = Breather vertical							
	BH = Breather horizontal							
	DV = Drain vertical							
	DH = Drain horizontal							
	BLANK = No vent or drain							
	Orientation refers to position of the combiner, not the breather or drain							
Voltage								
	1000V = 1000V							
	BLANK = 600V							

*Combiners with 37-48 input circuits are not third party certified, but are constructed to UL1741 standards.
 **Negative fused configurations available for positive grounded arrays. Replace 'F15' with 'NF15' in the catalog number.
 †Consult factory for 1500 VDC version.