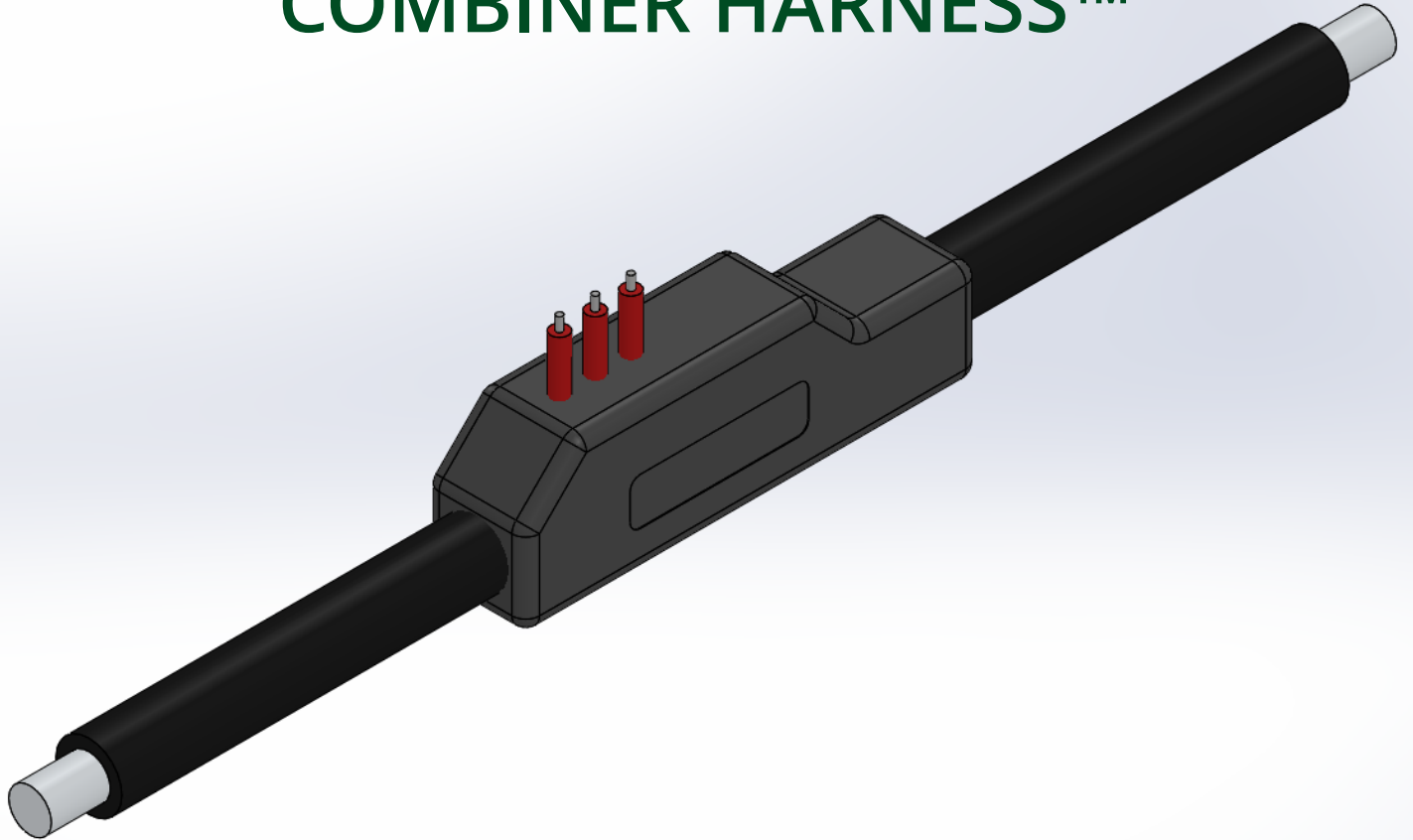


Installation Manual

CONSTRUCTION INNOVATIONS COMBINER HARNESS™



March 2019



**CONSTRUCTION
INNOVATIONS**

INNOVATE TO SIMPLIFY™

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IMPORTANT SAFETY INFORMATION

SAVE THIS INFORMATION

This manual contains important information that shall be followed during installation of Construction Innovations Combiner Harness™.



QUALIFIED PERSONNEL: This information is for use by qualified personnel only. Any servicing of the Combiner Harness™ should be done by the manufacturer.



SHOCK HAZARD: Risk of electric shock. Disconnect Combiner Harness™ from power source(s) prior to handling.



PHOTOVOLTAIC (PV) SOURCE CIRCUITS: The Combiner Harness™ may be fed by PV Source Circuits that are energized during daylight hours and may maintain lethal voltages.



STORED ENERGY HAZARD: Risk of electrical shock exists from stored energy in the capacitors within connected inverters fed by the Combiner Harness™. Safely discharge stored energy prior to handling.



MULTIPLE SOURCES OF SUPPLY: The Combiner Harness™ will be live at both input and output terminals. Combiner Harness™ must be disconnected and isolated from the PV strings prior to handling.

Contact Construction Innovations at 1-855-725-9555 for additional assistance.

PRODUCT OVERVIEW

The Combiner Harness™ is a custom-configured commercial wiring system designed to safely combine up to 6 conductors per node into a single output. The combined output may be connected directly to an inverter, overcurrent protection device, or spliced to a feeder.

The Combiner Harness™ is listed to UL 9703 and is rated for direct burial, above ground/suspended, or cable tray support installation. The Combiner Harness™ is UV resistant, rated for outdoor installation, and should be installed using wiring methods in accordance with NEC NFPA70 and local building requirements.

The Combiner Harness™ is available in a variety of configurations. Variables include: feeder and tap conductor sizes and colors, quantity of nodes, and quantity of tap conductors, depending on application requirements. See *Table 2: Electrical and Physical Attributes* on page 5 for more information.

RATINGS

The Combiner Harness™ is available with a variety of configurations. Refer to *Figure 1: Combiner Harness™ Label* for an example of the device's important environmental and electrical ratings and to *Table 2: Electrical and Physical Attributes* for the range of options available.

The rated operating current of each harness shall be determined according to the feeder conductor size in accordance with *Table 1: Ampacity Ratings* and NEC NFPA70 Article 310.15.

For Photovoltaic (PV) applications, the installation shall be in accordance with NEC Articles 690 and 691, where applicable, see *Additional Installation Criteria for PV Applications* on page 6.

Table 1: Ampacity Ratings

	Conductor size	Max System Voltage (V)	Direct Burial or Raceway		Supported by Messenger Wire	
			Ampacity At 30°C Ambient NEC 310.15(B)(16)	Max Overcurrent Protection NEC 240.4	Ampacity At 40°C Ambient NEC 310.15(B)(20)	Max Overcurrent Protection NEC 240.4
Feeder	250 kcmil Al	1500VDC/AC	230	250	292	300
	300 kcmil Al		260	300	328	350
	350 kcmil Al		280	300	364	400
	400 kcmil Al		305	350	395	400
	500 kcmil Al		350	350	458	500
	600 kcmil Al		385	400	514	600
	700 kcmil Al		425	450	570	600
	750 kcmil Al		435	450	598	600
Tap	10 AWG Cu	1000VDC/AC	40	30	40	30
	10 AWG Cu	1500VDC/AC	40	40*	40	40*
	8 AWG Al	1500VDC/AC	45	45	51	60
	8 AWG Cu	1500VDC/AC	55	60	66	70
Notes:	1. Ampacities shown at 90C conductor operating temperature and shall to be adjusted based on installation in accordance with NEC Article 310 and 110.14. * Overcurrent Protection sized based on NEC Article 240 Part IX					

Figure 1: Combiner Harness™ Label Example

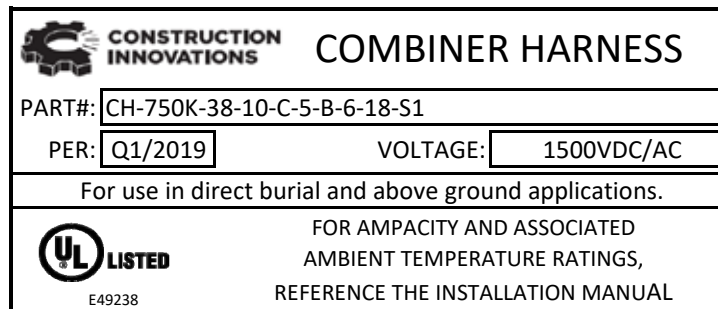


Figure 2: Combiner Harness™ Part Number

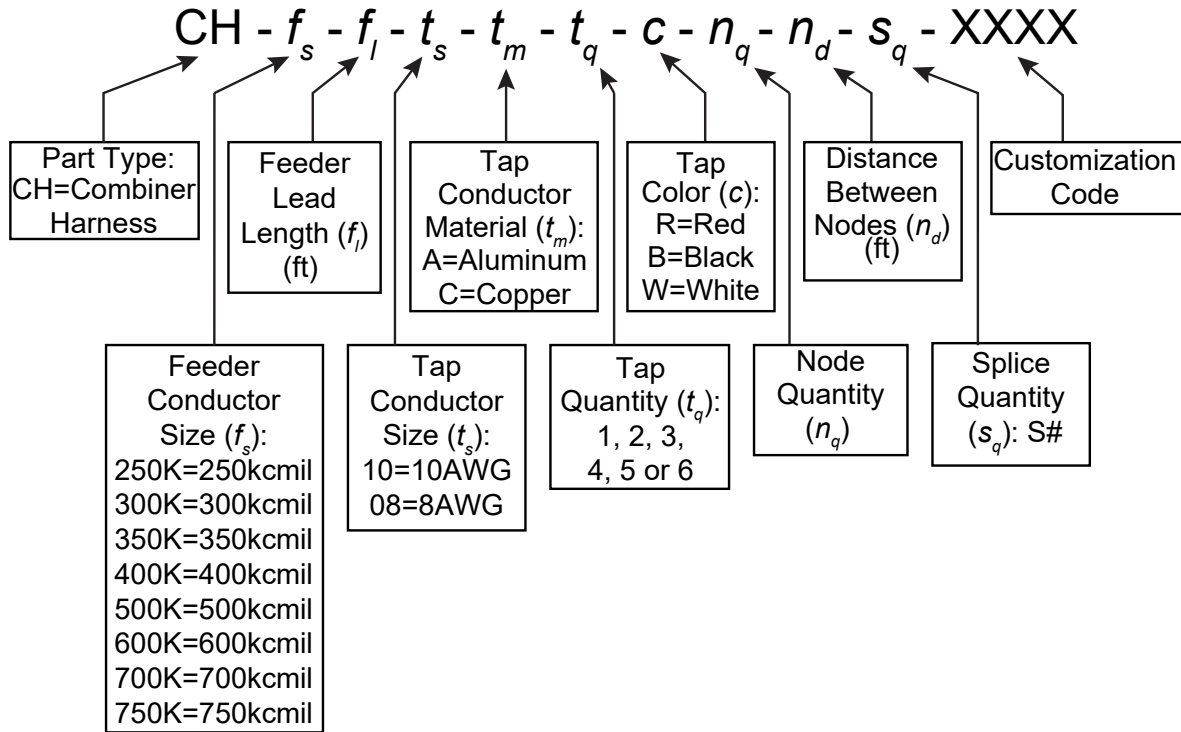


Figure 3: Combiner Harness™ Diagram

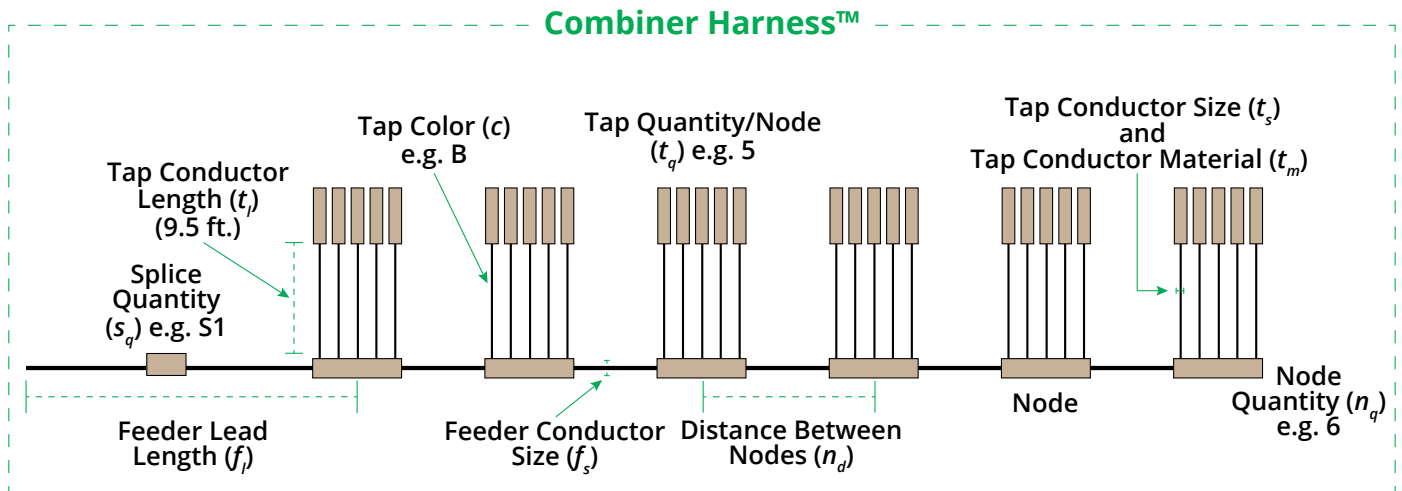


Table 2: Electrical and Physical Attributes

FEEDER	
Feeder Conductor Size (f_s):	250kcmil, 300kcmil, 350kcmil, 400kcmil, 500kcmil, 600kcmil, 700kcmil, or 750kcmil (Standard is identically sized throughout harness.)
Feeder Lead Length (f_l):	Distance from end of feeder conductor to first node (ft.)
Feeder Conductor Material:	Aluminum
TAPS	
Tap Conductor Size (t_s):	10AWG or 8AWG
Tap Conductor Material (t_m):	Aluminum or Copper
Tap Quantity per Node (t_q):	1, 2, 3, 4, 5, or 6 (Standard is identical tap quantity per node.)
Tap Conductor Length:	9.5 ft. (Standard)
Tap Color (c):	Red, Black or White
GENERAL/NODES	
Node Quantity (n_q):	1 minimum
Distance Between Nodes (n_d):	2 ft. - 250 ft. (Standard is equal distance between nodes.)
Voltages:	1,500VDC/AC maximum
Splice Quantity (s_q):	Quantity of splices
Insulation Type:	UL 4703 (PV)
Ultraviolet (UV) Resistant:	Yes
Flame Resistant (FR):	Yes
Direct Burial (DB) Rated:	Yes
Listings:	UL 9703

INSTALLATION

INSTALLATION AND MOUNTING

Installation shall comply with NEC NFPA70 Article 300 and all laws and regulations applicable at the site of installation.

The Combiner Harness™ may be mounted in any orientation and accessibility deemed suitable by code. CI Combiner Harness™ can be direct buried or may be installed above grade.

For direct burial applications, backfill shall be free of large rocks, paving material, cinders, sharply angular substances, and/or corrosive material. Where necessary to prevent physical damage to the Combiner Harness™ or conductor insulation, backfill material shall be provided in the form of granular or selected material in accordance with NEC300.5 and 300.50. Nodes do not need to be accessible.

***Input and output overcurrent protection is not included with the CI Combiner Harness.** Overcurrent protection shall be sized in accordance with NEC NFPA70 Articles 240, 690 and 691, as applicable.

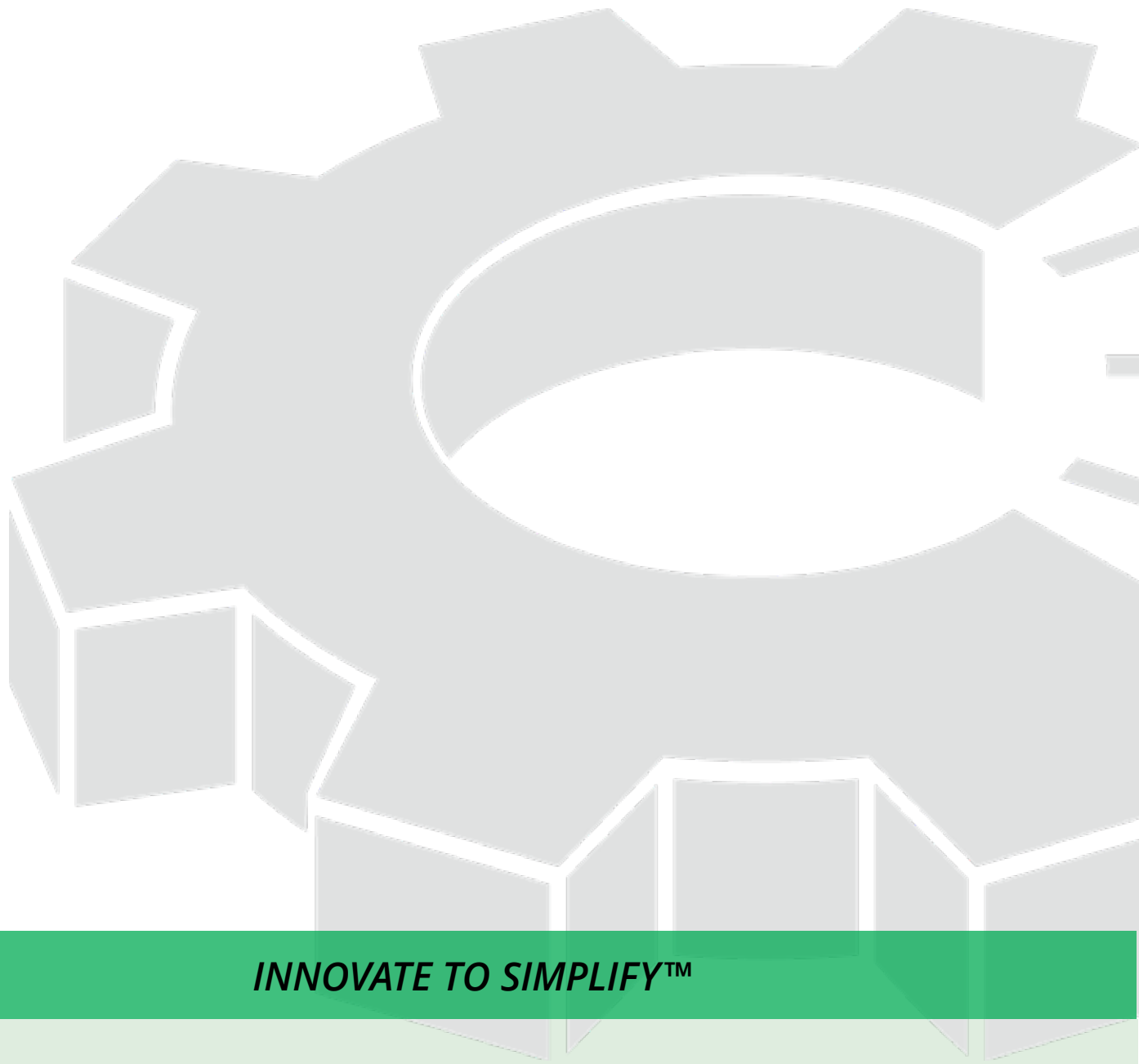
METHOD FOR DISCONNECTION (WHEN NOT UNDER LOAD)

For disconnection of the Combiner Harness™ ensure a qualified person has disconnected/discharged all electrical sources and has tested (at minimum, in accordance with NFPA 70E and all application specific safety standards) for absence of voltage at all available electrical sources (see *Warnings* listed on page 2 of this manual). Upon verification of absence of voltage, disconnect all Combiner Harness™ electrical connections.

ADDITIONAL INSTALLATION CRITERIA FOR PV APPLICATIONS

For PV Applications, installation shall be in accordance with NEC NFPA70 Articles 690 and 691.

- The provisions in NEC NFPA70 Article 690.7 for *Maximum Voltage* apply to this product.
- The provisions in NEC NFPA70 Article 690.8 for *Circuit Sizing and Current* apply to this product.
 - When applicable, in accordance with Article 690.8(A)(1), *Calculation of Maximum Circuit Current*, the value of ISC marked on the modules used with this wiring harness should be multiplied by a factor of 1.25 when determining the value of “maximum current” to be used for the calculation of conductor ampacities, fuse sizes, and size of controls connected to the PV output. Some photovoltaic module technologies may be rated as requiring a different factor than 1.25. For modules so rated, the manufacturers multiplying factor shall be used for this purpose.
 - When applicable, in accordance with Article 690.8(B)(1), *Conductor Ampacity*, the circuit conductors are considered to be subject to the calculated maximum current and shall be sized to carry not less than 125 percent of the sum of the maximum currents as calculated in Article 690.8(A).
- The provisions in NEC NFPA Article 690.9 for *Overcurrent Protection* apply to this product.
 - In accordance with Article 690.9(A), *Circuits and Equipment*, PV system DC circuit and inverter output conductors shall be protected against overcurrent. Overcurrent protective devices are required for each PV source or inverter output circuit with insufficient ampacity for the highest available current at the higher source connection.
 - When applicable, in accordance with Article 690.9(B)(1), *Overcurrent Device Ratings*, the overcurrent devices are considered to be subject to the calculated maximum current and shall be sized to carry not less than 125 percent of the sum of the maximum currents as calculated in Article 690.8(A).
 - In accordance with Article 690.9(C), *Photovoltaic Source and Output Circuits*, a single overcurrent protective device, where required, shall be provided to protect the PV modules and conductors of each source circuit or the conductors of each output circuit.
 - The maximum value for the overcurrent protection should be provided as per the manufacturers rating for the modules used, not to exceed the maximum values in *Table 1: Ampacity Ratings*.



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