

# CP-720-60/72/96-208/240-MC4

## Microinverter with Modular Trunk Cable



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## CP-720 MICROINVERTER SYSTEM

The CP-720 microinverter has been designed ground up for industry leading efficiency (96.6% peak, and 96.0% CEC) and reliability. The devices contain no electrolytic capacitors and no opto-isolators. The chassis uses an aluminum extrusion process optimized for high volume manufacturing and is rated to NEMA-6. This rating allows environmental extremes beyond those found beneath solar panels where the inverters are installed. The microinverters meet stringent radiated emission standards to CISPR-22/EN55022 Class B which has 2X lower levels than FCC Part 15 B at various frequencies and complies with worldwide unintended radiation requirements to eliminate interference with other devices. The inverter has also been designed and tested to withstand 6kVolt line to line, line to ground, and neutral to ground surge. In addition overcurrent protection sampling at 30kHz ensures grid anomalies that cannot be compensated in the AC drive result in a clearing state to protect the output stage.

The Chilicon Power communication stack employs advanced forward error correction and encryption. The system also implements a multi-rate physical layer that automatically adjusts throughput to maintain link reliability. Fail-safe firmware upgradability allows future compatibility with emerging utility interactive requirements such as reactive power control.

In summary the designers at Chilicon Power have made the highest effort to put forward a world class energy conversion device for your use. Please consult this installation manual for further details and send requests or inquiries to [support@chiliconpower.com](mailto:support@chiliconpower.com).

Please find more information in the download and video sections of [www.chiliconpower.com](http://www.chiliconpower.com) -> Resources.

Chilicon Power microinverters are designed to be installed with the Chilicon Power CP-100 gateway. This is the industry's most power and fully featured monitoring solution that provides time-savings in commissioning of the system as well as convenience of day to day use for end customers. More information can be found [www.chiliconpower.com/products/gateway](http://www.chiliconpower.com/products/gateway).

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### THE CP-100 CORTEX GATEWAY



## IMPORTANT SAFETY INFORMATION

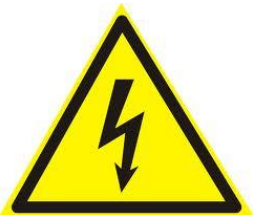
This manual contains important instructions to follow during installation and maintenance of the Chilicon Power CP-720 microinverter. To reduce the risk of electrical shock and ensure the safe installation and operation of microinverters, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

**SAVE THESE INSTRUCTIONS** – This manual contains important instructions for model CP-720-60/72/96-208/240-MC4 that shall be followed during installation and maintenance of the microinverter.



**WARNING:** This indicates a situation where failure to follow instructions may cause a serious hardware failure or personnel danger if not applied appropriately. Use extreme caution when performing this task. The CP-720 microinverter implements an integrated GFDI device that satisfies Article 690 of the National Electrical Code for ground fault detection. The integrated ground fault detector requires that the inverter be properly earth grounded using the integrated trunk cable grounding wire. If an inverter is in ground fault, this state is indicated by the CP-100 gateway device. An inverter in ground fault cannot export power unless the ground fault detection is specifically bypassed by the installer using a message that is broadcast to the inverter from the gateway. Chilicon does not recommend bypassing ground fault power export lock out. However, if this lock out is disabled, the inverter will export power while continuing to indicate ground fault to the gateway.

**Note:** There is no galvanic path from the DC to AC connections in the device, or from DC connectors to the enclosure, or AC connectors to the enclosure. The rated hi-pot on any of these paths is 2900Vrms.



**CAUTION:** Risk of electrical shock. Do not remove endplates from device. No user serviceable parts are inside the inverter. When the photovoltaic array is exposed to light it supplies a DC voltage to this equipment

**WARNING:** Electric Shock Hazard. The DC Conductors of this photovoltaic system are ungrounded and may be energized.

**WARNING:** Perform all electrical installations in accordance with local electrical codes and with National Electrical Code, ANSI/NFPA 70, including Sec. 690.35 with an ungrounded PV array.

**WARNING:** The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the microinverter (for CP-720-60/72/96-208/240-MC4 this is **120 Volts**).

**WARNING:** Verify the voltage and current specifications of your PV module match with those of the microinverter. All poly and mono-crystalline silicon 60, 72, and 96-cell panels should be compatible. Connecting any device whose supply exceeds 105 VDC will cause a shutdown of the inverter. Though the device may continue to operate when returned to normal voltage, *the event will be recorded in flash memory and will void the warranty.*

## Installation and Operation Manual

**WARNING:** Be aware that the body of the Chilicon Power Microinverter is the heat sink, and although it usually rises less than 20°C above ambient, it can reach a temperature of 80°C. To reduce risk of burns, do not touch the body of the microinverter.

**WARNING:** Do NOT attempt to repair the Chilicon Power Microinverter. If it fails, contact customer support to obtain an RMA number and start the replacement process. Damaging or opening the Chilicon Power Microinverter will void the warranty.

**WARNING:** Be aware that only qualified professionals should install and/or replace Chilicon Power microinverters.

**WARNING:** Before installing or using a Chilicon Power Microinverter, please read all instructions and warnings in the technical documents and on the Chilicon Power Microinverter system itself as well as on the PV array.

**WARNING:** Be aware that installation of this equipment includes the risk of electric shock.

**WARNING:** Do not touch any live parts in the system, including the PV array, after the system has been connected to the electrical grid.

**WARNING:** Do NOT connect microinverters to the utility grid or energize the AC circuit until you have completed all of the installation procedures as described in the following sections.

**WARNING:** Do NOT remove AC or DC connectors to the invert under load. Doing so will not damage the inverter, but the connectors are not rated for removal under load.

**WARNING:** Do NOT exceed the maximum number of microinverters in an AC branch circuit, as displayed on the unit label (8 devices (16 modules)).

### INVERTER LABEL INFORMATION



Chilicon Power  
CP-720-60/72/96-208/240-MC4  
Designed in California  
Manufactured in California  
Enclosure NEMA-6  
Max. Ambient Op. Temp: 65C  
FCC Part 15 Class B  
Conforms to UL1741, IEEE1547  
Certified to CSA Std C22.2 No. 107.1  
© CSA T.L.L. 1-35  
UL1741SA Rule-21

Grid Support Interactive Inverter  
Input Operating Voltage: 47 - 82V  
Max DC Input Current: 11.8A  
Rated Output Power: 120 VA  
Max. Cont. Output Current: 3A (240V)  
AC Output Voltage (min/nom/max): 211V 240V 284V  
Max. Cont. Output Current: 3.43A (208V)  
AC Output Voltage (min/nom/max): 185V 208V 229V  
Operating Freq. Hz (min/nom/max): 59.9 60 60.5  
Output Power Factor: -0.8 to 0.8 (1.0 Default)  
Max Units Per Branch: 7 (208V) or 8 (240V)



CAUTION: Risk of electric shock.  
The DC Conductors of this photovoltaic system are ungrounded and may be energized.



Do not remove endplates,  
no user serviceable parts inside.  
When the photovoltaic array is exposed to light it supplies a DC voltage to this equipment.  
Input/Output galvanically isolated from chassis.

ATTENTION: Risque de choc électrique.  
Ne pas dévisser le boîtier.  
Aucune pièce réparable par l'utilisateur.

Lorsque le panneau solaire est exposé à la lumière, il fournit une tension continue à cet équipement.  
Entrée/Sortie galvaniquement isolées du châssis.

U.S. Patent No. 8,870,592

Serial No

# INSTALLATION OVERVIEW

A PV system using Chilicon Power microinverters is simple to install. Each microinverter mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the microinverter, eliminating the risk of high DC voltage.

## INSTALLATION KITS FOR CHILICON POWER MICROINVERTER SYSTEMS INCLUDE:

- AC interconnect modular trunk cable with self-terminating feature
- CP-100 Gateway Monitoring Device

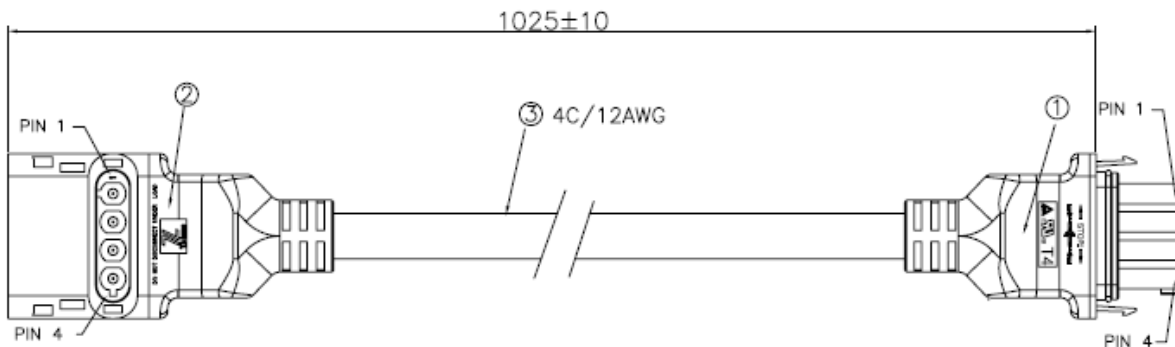
## REQUIRED NON-CHILICON PARTS

In addition to your PV array and its associated hardware, you need to provide the following:

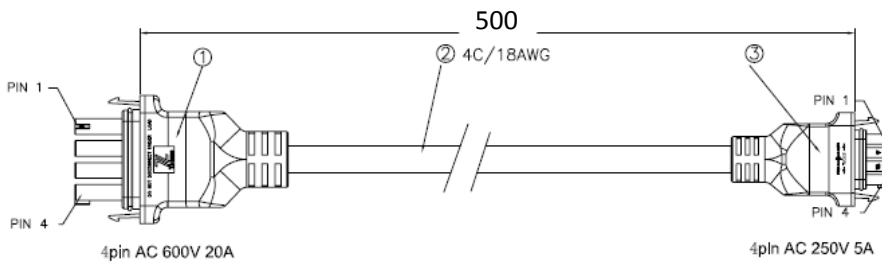
- An AC connection junction box
- Mounting hardware suitable for module racking
- Sockets and wrenches for mounting hardware

## MODULAR TRUNK CABLING

Trunk Cable Segment, portrait shown, 1.7M landscape also available



## Branch Cable Segment, 0.5M



## Color Codes

PIN 1	G: Wire Colour Green
PIN 2	L1: Wire Colour Black
PIN 3	N: Wire Colour White
PIN 4	L2: Wire Colour Red

# INSTALLATION INSTRUCTIONS

## STEP1: DC CONNECTION

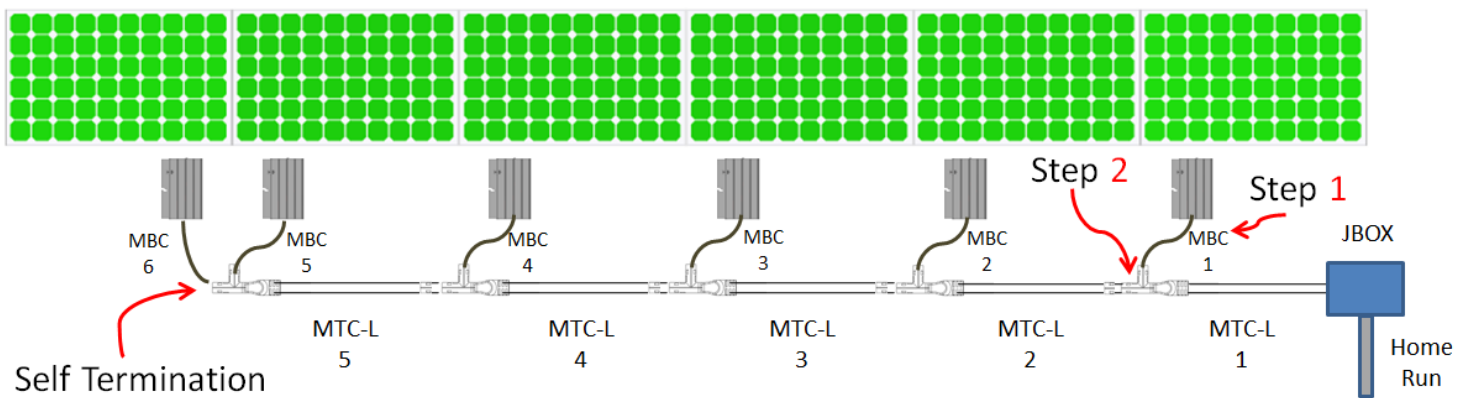


**IMPORTANT:** ALWAYS CONNECT DC FIRST. DO NOT ENERGIZE AC BUS TO INVERTERS UNTIL ALL INVERTERS HAVE BEEN DC POWERED WITH ENOUGH SUN LIGHT (LED code continuously blinking)

## STEP2: AC CONNECTOR – INSTALLATION PROCEDURE

**IMPORTANT:** all MCB connections must be placed with care not to miss-align. All connectors are keyed to ensure properly polarity.

- 1) Place the modular branch connector (MBC) on the inverter FIRST. This will make it easier to align the small pins on the inverter with the connector. They self-align and are keyed.
- 2) Join the larger connector of the MBC to the T-Junction of the modular trunk cable (MTC).



## LED CODES

AFTER DC is applied:

Blink Sequence	Meaning
Slow, 1 blink every 4 seconds	DC Connected, <b>NOT Ready for AC</b> to be applied
Continuous Blinking	DC Connected, <b>Ready for AC</b> to be applied (see step 1 warning)

AFTER AC is applied:

Blink Sequence	Meaning
1 blink every 16 seconds	Normal operation, inverter bound to gateway
1 blink every 8 seconds	Normal operation, inverter not bound to gateway
2 blinks every 4 seconds	Inverter phase locked to Grid, no export, no errors
4 blinks every 4 seconds	Error: Grid Voltage out of range
5 blinks every 4 seconds	Error: Panel Voltage out of range

## WIRING FOR COMMUNICATION TO THE GATEWAY (240 V SPLIT-PHASE SYSTEMS)

Chilicon Power trunk cables have 4 color-coded conductors: **RED**, **BLACK**, **WHITE**, **GREEN**

**BLACK** and **WHITE** conductors are for the PLC communication. The same grid line (**BLACK**) must be used to connect the inverter to the Gateway to ensure robust communication. Specifically, the Gateway inside the home (120 V) should be powered using **GRID HOT LINE B** (= **BLACK** trunk conductor) and **GRID NEUTRAL** (= **WHITE** trunk conductor).

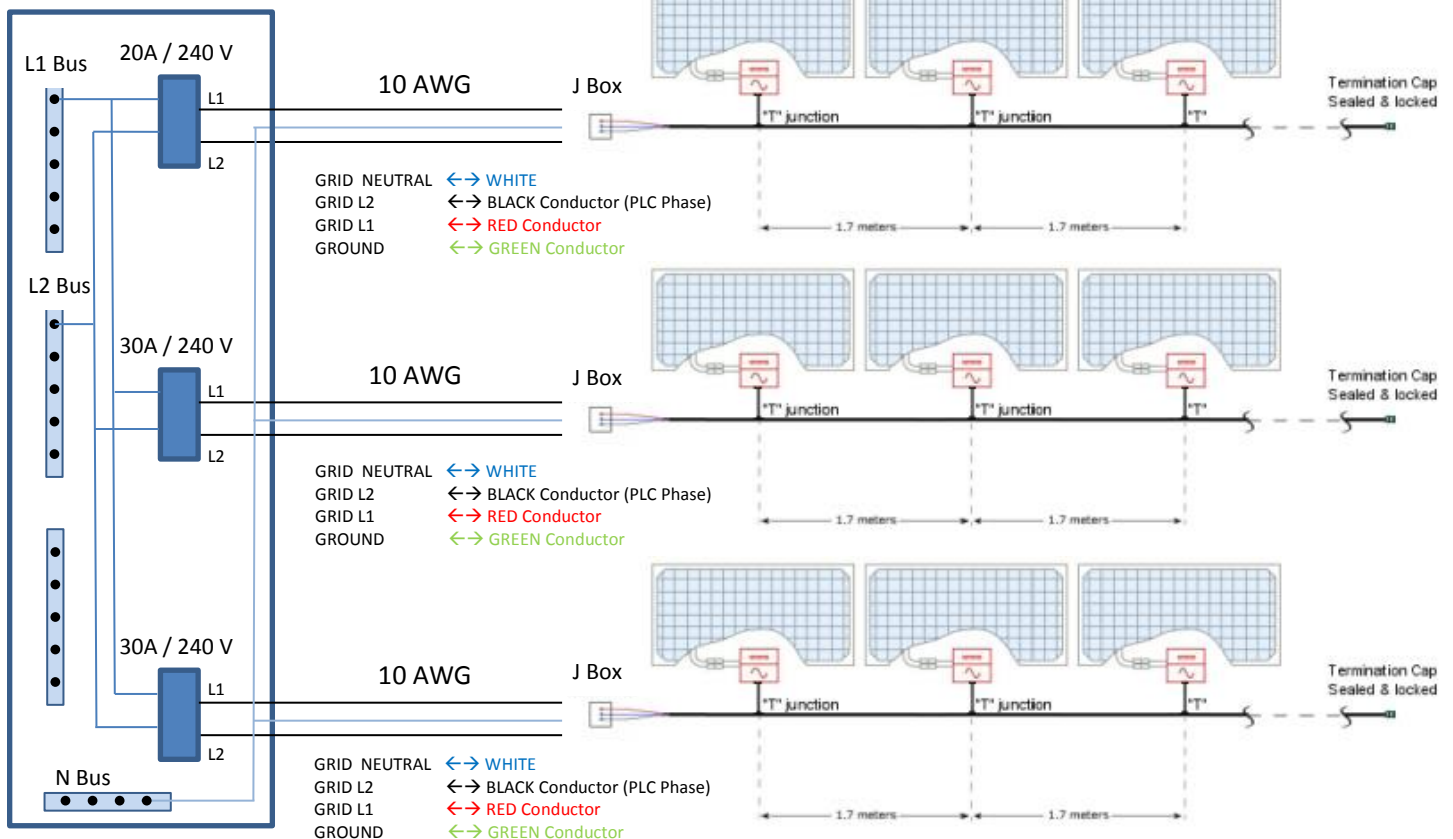
**NOTE:** Communication with the Gateway is usually fine even if the Gateway is connected in the wall socket to the **RED** and **WHITE** trunk-equivalent wires. However, the signal will be weaker. The Gateway socket survey screen (Menu->Advanced Settings) indicates the strength of the signal. In the worst case, you simply have to swap the **RED** and **BLACK** trunk wires on the breaker or at the AC disconnect.

**NOTE:** Miss-wiring AC grid lines to the inverter trunk (for instance swapping a GRID L1 for GRID NEUTRAL) will not damage the inverters. However, they will not export power in this configuration. If inverters are miss-wired, LED single blink export confirmation from the LED will never be established.

**WARNING:** NEVER CONNECT **GREEN** to a Live Wire

Max 8 Inv (16 modules) / String

### Solar AC Subpanel





## THREE PHASE 208 VOLT WIRING

The maximum number of inverters per 208-V split-phase string is 7 (14 modules). There are three power conductors in a split phase installation. Strings should be staggered across these 3 conductors, with a third conductor (neutral) to reference the mid-voltage of any 2 of the 3 power conductors. Chilicon Power trunk cables have 3 color coded conductors, these are: **RED**, **BLACK**, **WHITE**. The CP-720 microinverter system uses the **BLACK** and **WHITE** conductors for communication. The inverters automatically detect when they are connected to a 3-phase grid and the user does not need to provide any additional configuration control.

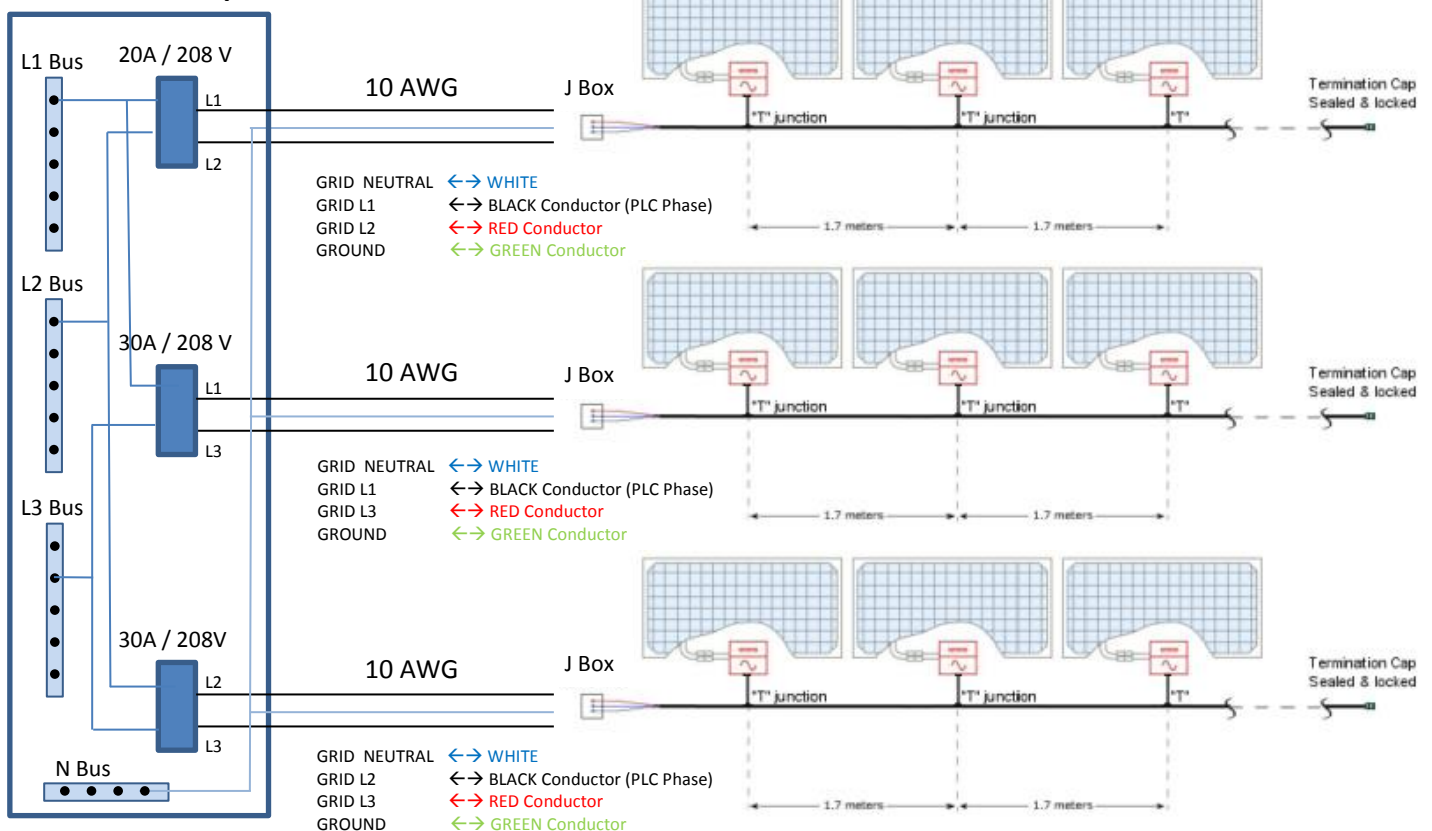
The Chilicon Power 3-phase gateway option accepts three lines, neutral, and ground. In a 3 phase installation, strings should be configured to connect {L1,L2,N} to {**Black,Red, WHITE** }; {L3,L1,N} to {**Black,Red, WHITE** }; and {L2,L3,N} to {**Black,Red, WHITE** } as shown in the figure below.

**NOTE:** Miss-wiring AC grid lines to the inverter trunk (for instance swapping a GRID L1 for GRID NEUTRAL) will not damage the inverters. However, they cannot export power in this configuration. If inverters are miss-wired, single blink export confirmation from the LED will not be established.

**WARNING:** NEVER CONNECT **GREEN** to a Live Wire

### Solar AC Subpanel

Max 7 Inv (14 modules) / String



### CABLE MAXIMUMS

The maximum size current protection device allowed by NEC code for use with 10AWG wire in the trunk cable is 30A. This leads to the following calculations for the maximum number of allowed inverters per trunk cable.

- A. Maximum number of inverters on a 30 amp, 240V circuit:

$$720W \text{ output mode: } (30A / (3 * 1.25)) = 8$$

- B. Maximum number of inverters on a 30 amp, 208V circuit:

$$277W \text{ output mode: } (30A / (3.43 * 1.25)) = 7$$

- C. Portrait Mode Installations In portrait mode installations, the maximum supplied trunk cable length (8 taps at 2.15 m) is 17.2m = 56 ft.

- D. Landscape Mode Installations In landscape format installations, the maximum supplied trunk cable length (7 taps at 3.4m) is 23.8m = 78 ft.