

FIXGRID PRO

UL 3741 PV Hazard Control Installation Appendix



Assembly instructions for UL3741 compliance

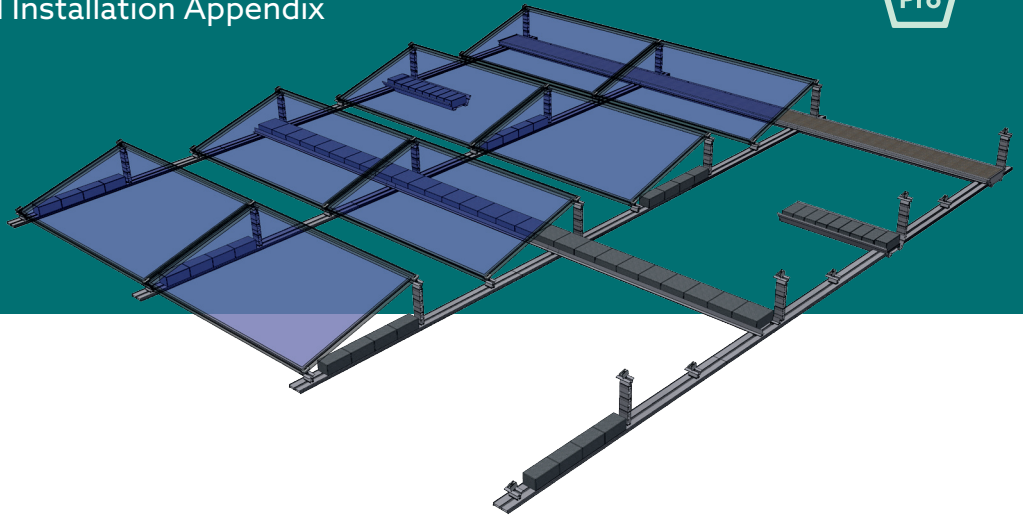


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INTRODUCTION

FixGrid Pro 5°, 10°, 15° and Dual Tilt flat roof mounting systems are comprised of four major components that intuitively assemble into a support structure for photovoltaic (PV) modules.

This installation appendix explains how to install the 5°, 10°, 15° and Dual Tilt FixGrid Pro Products to meet requirements of the UL 3741 PV Hazard Control Standard. Please refer to the 5°, 10°, 15° and Dual Tilt Installation Manuals for complete installation instructions.



WARNING: TO REDUCE THE RISK OF INJURY, READ ALL INSTRUCTIONS

INSTALLER'S RESPONSIBILITY

Ensure the secure installation of all electrical components within the array. All electrical installation and procedures must be carried out by a licensed and bonded electrician or a solar contractor. Regular maintenance of a module or panel should not disrupt the system's bonding path. All work must adhere to national, state, and local installation procedures, as well as product and safety standards.

Comply with any applicable local or national building and fire codes, even if they override this manual. Make sure that all products used are suitable for the installation, environmental conditions, and the array's load at the site.

Utilize only FixGrid Pro parts or components recommended by Schletter NA Inc. Substituting parts may invalidate any applicable warranties.

Any issues arising from inaccurate information are the responsibility of the installer.

Prevent galvanic corrosion by ensuring that the bare copper grounding wire does not come into contact with aluminum and zinc-plated steel components.

During routine inspections, immediately tighten any loose components or fasteners. Replace any components displaying corrosion or damage that could compromise safety.

Implement an appropriate method of direct-to-earth grounding in accordance with the latest edition of the National Electrical Code, including NEC 250: Grounding and bonding, and NEC 690: Solar Photovoltaic Systems.

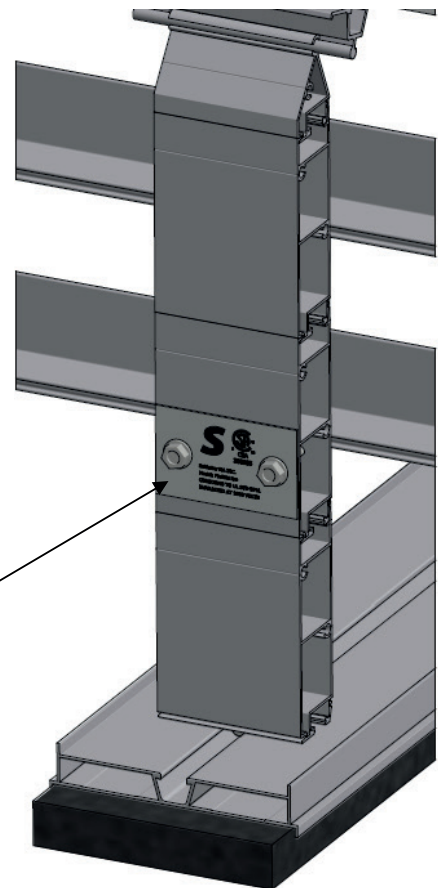
Before servicing or removing modules, AC modules, microinverters, and power optimizers, disconnect AC power.

Review the documentation for the module and any third-party manufacturers to ensure compatibility and compliance with warranty terms and conditions.



MARKINGS

Product markings are located on the FixGrid Pro rear tilt support.



RATINGS

Listed according to UL 2703

Listed in accordance with UL 3741

Complies with the UL 3741 Safety Standard for Photovoltaic Hazard Control Systems.

FixGrid Pro List of approved PV Hazard Control Equipment or Components evaluated at 1500V Max System Voltage:

Review PV module approved list in the Fix Grid Pro Installation Manual for module compatibility

FixGrid Pro Components:

165001-02500	Pro floor profile 2500 mm
165001-06000	Pro floor profile 6000mm
165001-00550	Pro 550 floor rails - intermediate support if ballast rail support distance exceeds 2500mm
169004-003	Surface protection mat 300 x 110 x 20 mm SK
129200-001	Pro floor profile connectors
165005-001	Pro screw-in module support - For installation on the Pro floor profile
165005-004	Pro module support - For installation on the Pro screw-in and heightening element
165005-002	Pro screw-in heightening element - For installation on the Pro floor profile
165005-003	Pro heightening element - For installation on the Pro screw-in and heightening element
169020-100	Pro ballast tray
169020-001	Pro ballast tray cover plate
169200-000	Pro ballast tray clamping wedge
165002-02350	Pro ballast + composite rail 2350 mm
165002-06000	Pro ballast + composite rail 6000 mm
129200-002	Pro ballast rail connectors (Splice)
169205-215	Pro Windsafe 5 up to 2150 mm module
169205-250	Pro Windsafe 5 up to 2500 mm module
169210-215	Pro Windsafe 10 up to 2150 mm module
169210-250	Pro Windsafe 10 up to 2500 mm module
169215-215	Pro Windsafe 15 up to 2150 mm module
169215-250	Pro Windsafe 15 up to 2500 mm module
131020-001	RapidPro mid clamp
131020-000	RapidPro end clamp
131020-901	RapidPro mid clamp - black anodized
131020-900	RapidPro end clamp - black anodized
129063-010	Cross connector Rapid Pro
129065-001	Proklip-Multi 10S
149023-001	Mounting clips 1.0 – 3.0 mm, upper guide
149023-002	Mounting clips 1.0 – 3.0 mm, lateral guide
943000-360	Drill screw 6.0x25 incl. EPDM sealing washer for SingleFixPro
129063-002	RapidConnect90
942000-902	Pro hammerhead nut
119026-102	Rapid2+ Pro SML
119026-122	RapidPro L
129063-020	Rapid cross connector 90 Pro
120020-04800	Pro 35 - 4.8m (15.75') length
943001-238	Round head screw M8x16
129062-021	Tension connector
129061-001	Ridge connector set

FixGrid Pro Wire Management

RayTray v2 Solar Wire Management System (UL 870 Listed Control No. 4009754)

Review RayTray installation Manual

Material : Non-metallic RPVC Polymer. UV rating :F1 / Voltage rating 2,000 VDC

Base 6" sections, Tray 8' sections & Cap 8' sections



EQUIPMENT INVERTERS

Approved Electrical Equipment (UL3741 Listed)

Canadian Solar Inverters

CSI-75K-T480GL03-U
CSI-80K-T480GL03-U
SI-90K-T480GL03-U
CSI-100K-T480GL03-U

Chint Inverters

CPS SCA25KTL-DO/US-208
CPS SCA25KTL-DO-R/US-480
CPS SCA50KTL-DO/US-480
CPS SCA60KTL-DO/US-480

GoodWe Inverters

GW50K-SMT-US
GW60K-SMT-US

Fronius Inverters

Fronius Symo Advanced 10.0-3 208-240/Lite
Fronius Symo Advanced 12.0-3 208-240/Lite
Fronius Symo Advanced 15.0-3 480/Lite
Fronius Symo Advanced 20.0-3 480/Lite
Fronius Symo Advanced 22.7-3 480/Lite
Fronius Symo Advanced 24.0-3 480/Lite

SMA Core 1 Inverters

STP 33-US-41
STP 50-US-41
STP 62-US-41

Solectria Inverters

Solectria Renewables PVI 25TL-208
Solectria Renewables PVI 25TL-480-R
Solectria Renewables PVI 50TL-480
Solectria Renewables PVI 60TL-480

SOLIS Inverters

S5-GC75K-US
S5-GC80K-US
S5-GS90K-US
S5-GC100K-US

Sungrow Inverters

SG36CX-US
SG60CX-US



INTRODUCTION: GRASPING UL 3741 AND NEC 690.12

The 2020 NEC 690.12 background information explains that the NEC mandates the incorporation of rapid shutdown functions in all PV arrays situated on or within buildings. This requirement is intended to minimize the risk of electrical shock for Fire Fighters ("FF"), as specified in 690.12(A) through (D).

In accordance with 2020 NEC 690.12(B)(2) concerning the control of conductors within the array boundary, the FixGrid Pro Photovoltaic Hazard Control System (PVHCS) is a UL 3741 Listed system that meets the requirements of NEC 690.12(B)(2)(1) when it is installed by qualified individuals following the installation procedures detailed in the FixGrid Pro System Installation Manual and this Appendix. For specific instances of system designs that adhere to 690.12(B)(2), please consult the subsequent pages of this appendix.

Controlled Conductors:

1. DC circuits of the PV system
2. Output circuits from inverters positioned within the array boundary

Controlled Limits:

1. Beyond the Array Boundary: Voltage reduced to $\leq 30V$ within 30 seconds
2. Within the Array Boundary: [Please provide the value or description you intend for this limit]

Listed PV Hazard Control System (UL 3741): Voltage reduced to $\leq 80V$ within 30 seconds after the commencement of rapid shutdown PV array with concealed wiring methods and non-conductive components.

Initiation Devices:

Devices responsible for triggering the rapid shutdown function of the PV system.

Equipment:

Any equipment designed to carry out rapid shutdown functions apart from initiation devices, including listed disconnect switches, circuit breakers, or control switches.

According to NEC 690.2, the array is described as a cohesive assembly of modules with a supporting structure, which also encompasses any connected system elements like inverters or dc-to-dc converters, along with their associated wiring. This clarification implies that the FixGrid Pro Racking and adjacent inverters are considered integral components of the array.

According to NEC 690.12(B), the array boundary is defined as extending 1ft from the array in all directions. This means that the array boundary can encompass an area extending 1ft from the outer edge of the FixGrid Pro racking, inverter, or module.



INSTALLATION APPROACHES ACCORDING TO UL 3741 AND NEC 690.12

Schletter FixGrid Pro offers the following case studies as illustrations of installation configurations that align with NEC 690.12(B). It's important to note that compliance is not restricted to these specific examples.

Page 8: Configuration A: UL 3741 Certified System

Page 9: Configuration B: UL 3741 Certified System with Adjacent Sub-Array

Page 10: Configuration C: UL 3741 Certified System with Disconnected Sub-Array

Page 11: Configuration D: UL 3741 Certified System with MLPE (Module-Level Power Electronics) Sub-Array

The most straightforward approach to meet the requirements of NEC 690.12(B) is to utilize the FixGrid Pro UL 3741 system in conjunction with a continuous array that has one or more inverters located nearby. In this scenario (Configuration A), all DC input circuits of the inverters fall within the 1ft array boundary. In cases where sub-arrays are necessary and cannot be contained within this 1ft boundary, compliance can still be achieved by implementing a single or a combination of the three available options (Configuration B - D).



UL 3741 CERTIFIED SYSTEM, CONFIGURATION A:

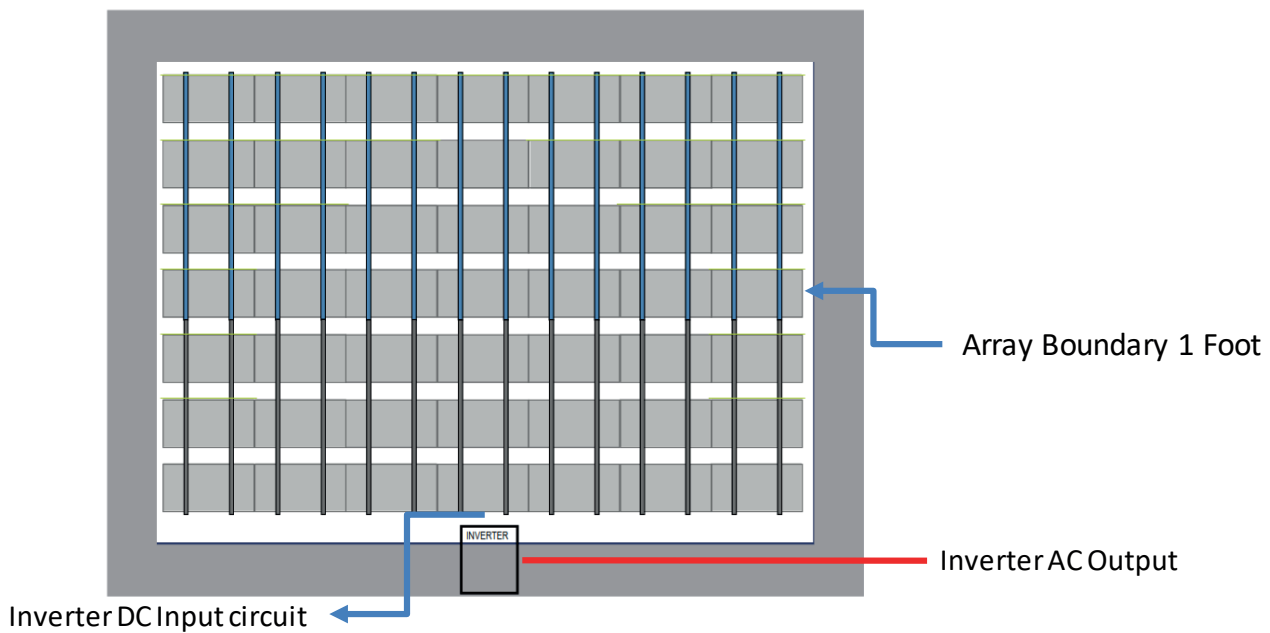
Array(s) comply with
NEC 690.12(B)(2)(1)

PV Circuit Voltages:

- Outside Array Boundary:
≤ 30V within 30 Seconds
- Inside Array Boundary:
≤ 1500V

CONFIGURATION A: ARRAY(S) COMPLIES WITH 690.12(B) BY UTILIZING A LISTED UL 3741 PV HAZARD CONTROL SYSTEM

1. The input circuits of all inverters (DC) are enclosed within the PV array perimeter and do not necessitate extra precautions to lower string voltages as per 690.12(B)(2)(1) following activation (such as the Inverter DC disconnect, AC breaker, or AC disconnect).
2. The output circuits of the inverter (AC) are situated beyond the array perimeter and comply with the 690.12(B)(1) requirement following activation (via AC breaker or AC disconnect).



UL 3741 CERTIFIED SYSTEM, CONFIGURATION B:

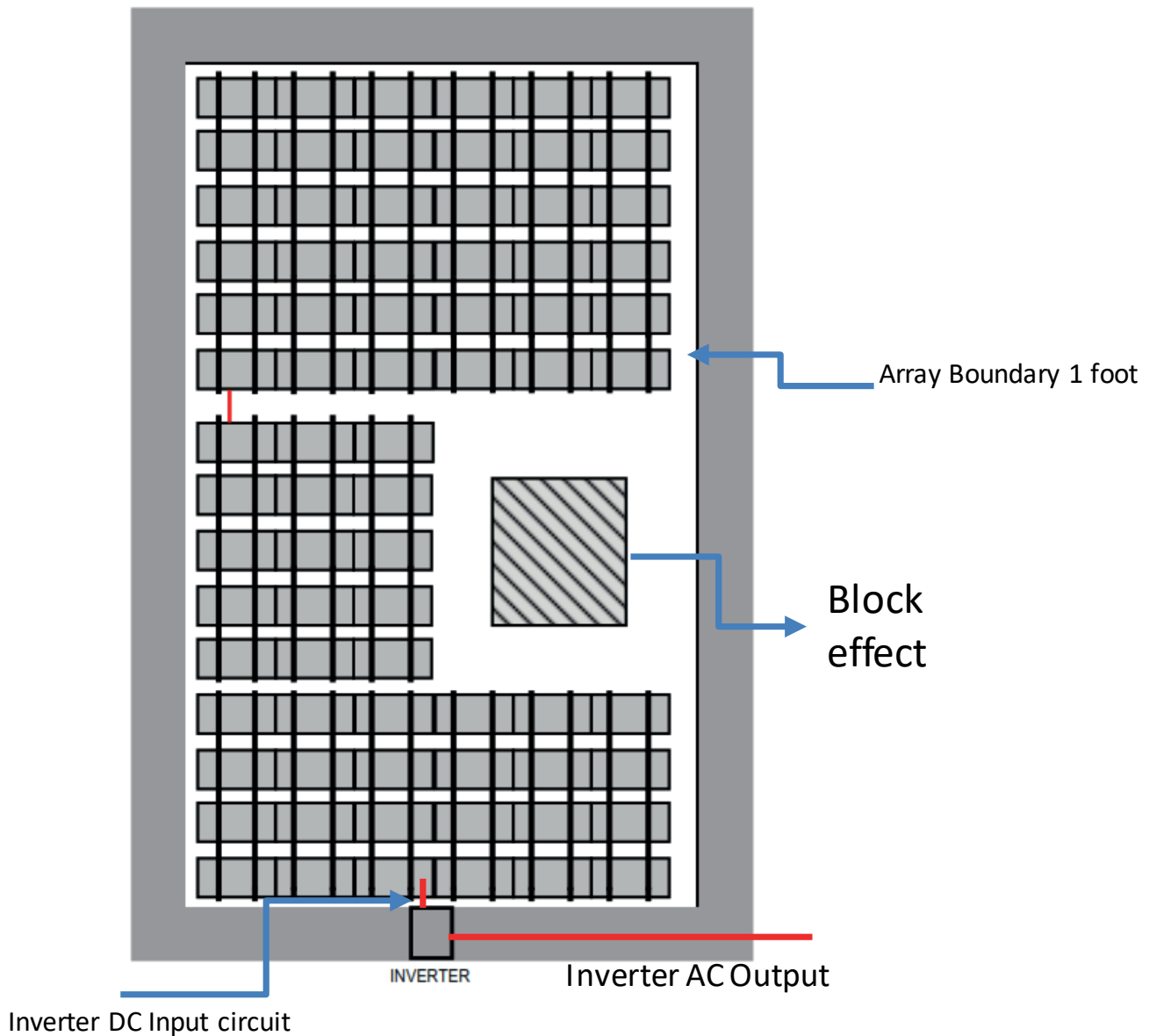
The Sub-Array(s) are enclosed within the array perimeter, and the Array(s) conform to the NEC 690.12(B)(2)(1) stipulations

PV Circuit Voltages:

- Outside Array Boundary:
≤ 30V within 30 Seconds
- Inside Array Boundary:
≤ 1500V

CONFIGURATION B: ENSURING NEC COMPLIANCE WITH SUB-ARRAY(S) INSIDE THE ARRAY PERIMETER

A single array boundary is established with a maximum spacing of 2 feet between all array components.



UL 3741 CERTIFIED SYSTEM, CONFIGURATION C :

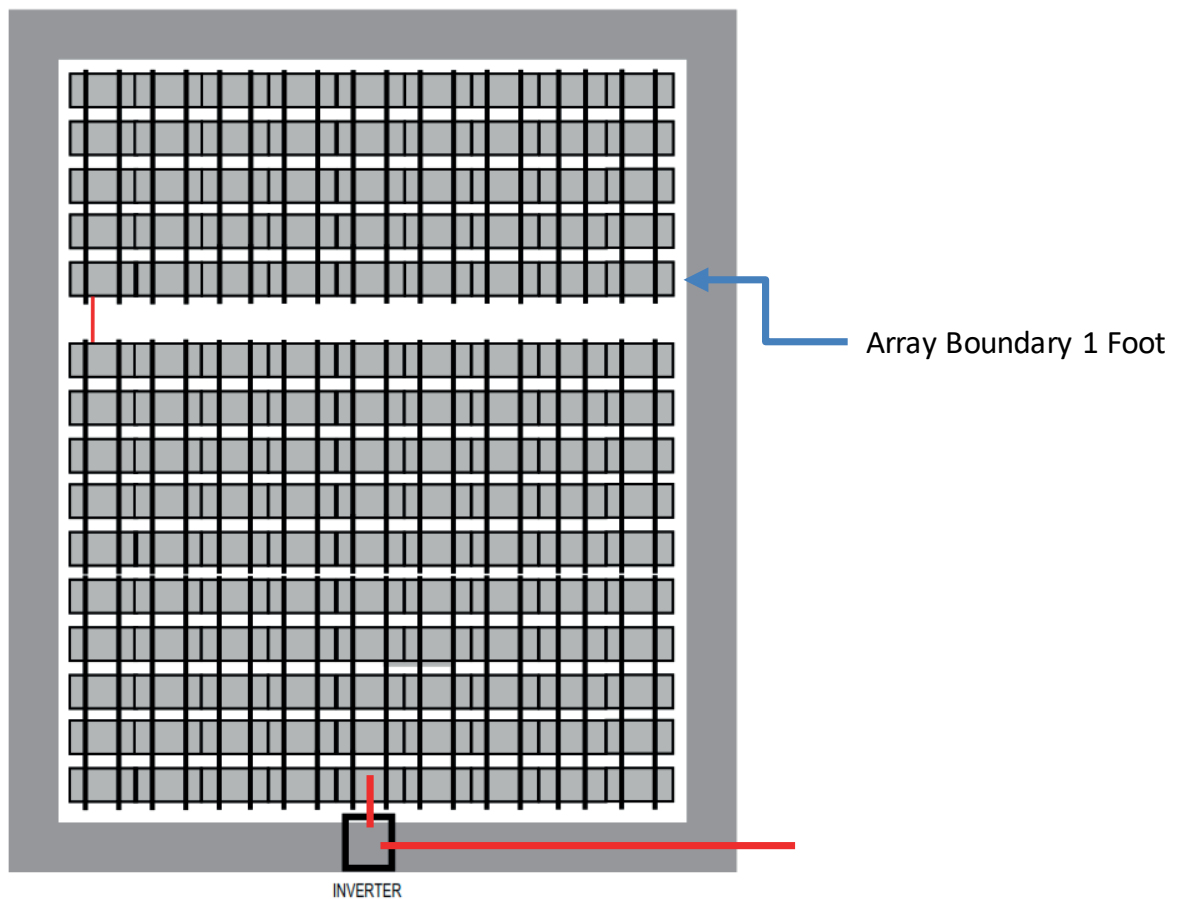
String Isolation Device(s) are used to manage Multiple Sub-Arrays with conductors extending beyond the Array Boundary.

PV Circuit Voltages:

- Outside Array Boundary:
≤ 30V within 30 Seconds
- Inside Array Boundary:
≤ 1500V

CONFIGURATION C: ENSURING NEC COMPLIANCE FOR CONDUCTORS INSTALLED AMONG MULTIPLE SUB-ARRAYS

When utilized for a portion of the string, isolation devices are necessary on both ends of the pathway to account for voltage presence on both sides.



Inverter DC Input circuit

Inverter AC Output

UL 3741 CERTIFIED SYSTEM, CONFIGURATION D (USING MLPE):

Sub-array(s) employ MLPEs to manage circuits in order to comply with 690.12(B)(1) and (B)(2) requirements.

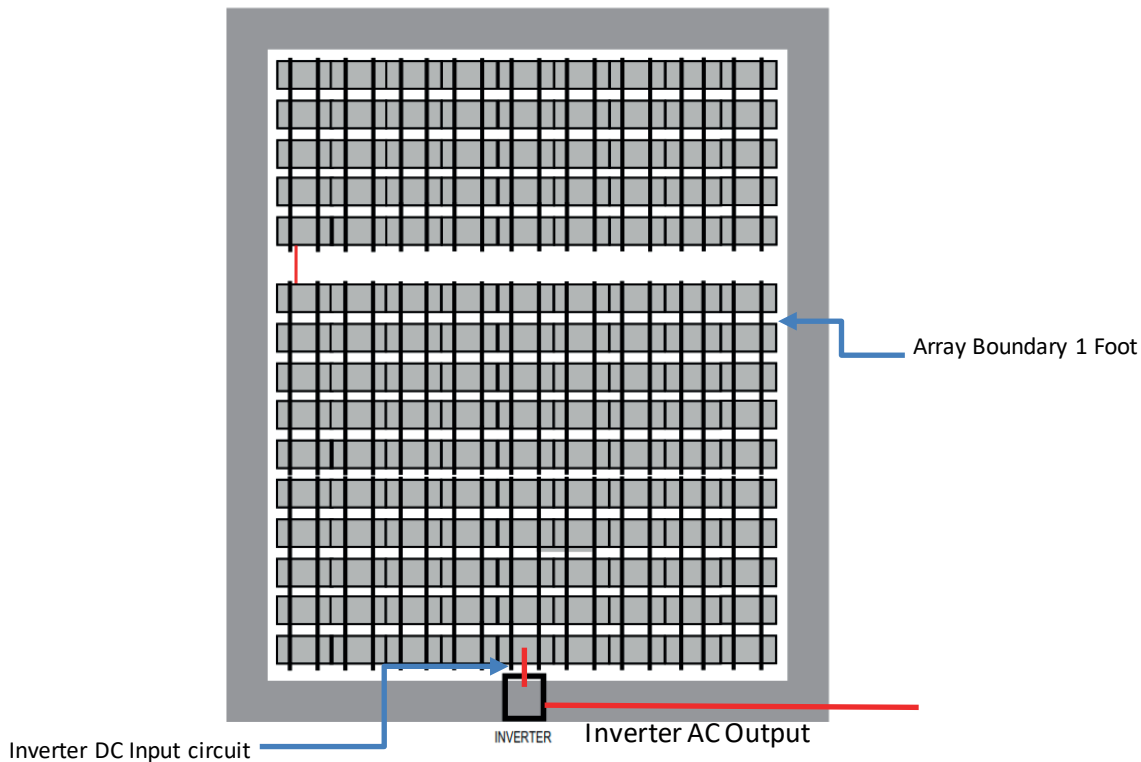
PV Circuit Voltages:

- **Outside Array Boundary:**
 $\leq 30V$ within 30 Seconds
- **Inside Array Boundary:**
 $\leq 1500V$

Implement Module-Level Power Electronics in the lower sub-array.

Every module connected to the same inverter input must have an MLPE connection. The upper array achieves compliance through a UL 3741 listing without the use of MLPEs.

CONFIGURATION D: ENSURING NEC COMPLIANCE FOR SUB-ARRAY(S) LOCATED BEYOND THE ARRAY BOUNDARY.



CAUTION: When employing MLPE devices, carefully review the installation guidelines for both the MLPE device and the Inverter to confirm that both devices adhere to UL 1741 Rapid Shutdown criteria

GUIDELINES FOR WIRE MANAGEMENT IN COMPLIANCE WITH UL 3741

Route all wires in a manner that prevents potential FF interactions, ensuring they are not exposed to such risks. The Wire management components specified in the list of approved PVHCS equipment.

To route wires under modules and along module rows, utilize either the FixGrid Pro Wire Clip or other cable ties and wire management devices that are UL Listed.

To route wires across rows, use either the FixGrid Pro clip 129065-018 and Raytray wire management components.

Note: Installers should consult the Ray Tray Wire Management manual for comprehensive installation instructions regarding Wire Management Accessories.

