

# Conext XW+

## hybrid inverter/charger

One solution for global power needs



### Product at a glance

Conext™ XW+ is an adaptable single-phase and three-phase inverter/charger system with grid-tie functionality and dual AC power inputs. Compatible solar charge controllers, monitoring, and automated generator control modules enable further compatibility. From a single Conext XW+ unit to clusters up to 76.5 kW, the Conext XW+ is a scalable system that allows for the integration of solar capacity as required. Adaptable and scalable, the Schneider Electric Conext XW+ system is a complete solution for grid-interactive and off-grid, residential and commercial, solar and backup power applications.

### Conext XW+

#### Designed for reliability

- Extensive quality and reliability testing
- Highly accelerated life testing
- Globally proven and recognized field performance

#### Flexible

- Single or three-phase off-grid systems from 7.0 kW to 76.5 kW (30 minutes rating at 25 °C)
- Supports DC-coupled and AC-coupled off-grid and grid-tie architectures
- Supports charging of lithium ion battery packs

#### Easy to service

- Monitor, troubleshoot, or upgrade firmware with Conext™ Gateway

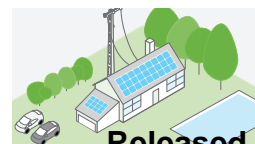
#### Easy to install

- System configures quickly into compact, wall-mounted system
- Integrates both grid and generator power with dual AC inputs
- Balance-of-system components integrates battery bank, solar charge controllers, and generators
- Commission the entire system with PC software tool and Conext™ Gateway

### Product application



Residential grid-tie solar with backup power



Self-consumption

Released for Permit

08/24/2020 7:54:55 AM

Pikes Peak  
REGIONAL  
Building Department

shelby

ELECTRICAL



Backup power



Community electrification

# Conext XW+ series (120/240 V)

Device short name	XW+ 5548 NA (Discontinued)	XW+ 6848 NA
<b>Inverter AC output (standalone)</b>		
Output power (continuous) at 25°C	5500 W	6800 W
Overload 30 min/60 sec at 25°C	7000 W/9500 W	8500 W/12000 W
Output power (continuous) at 40°C	4500 W	6000 W
Maximum output current 60 seconds (rms)	82 A (120 V); 41 A (240 V)	102 A (120 V); 52 A (240 V)
Output frequency (selectable)	50/60 Hz	50/60 Hz
Output voltage	L-N: 120 V +/- 3%; L-L: 240 V +/- 3%	L-N: 120 V +/- 3%; L-L: 240 V +/- 3%
Total harmonic distortion at rated power	< 5 %	< 5 %
Idle consumption search mode	< 8 W	< 8 W
Input DC voltage range	42 to 60 V (48 V nominal)	42 to 60 V (48 V nominal)
Maximum input DC current	150 A	180 A
<b>Charger DC output</b>		
Maximum output charge current	110 A	140 A
Output charge voltage range	40 – 64 V (48 V nominal)	40 – 64 V (48 V nominal)
Charge control	Three stage, two stage, boost, custom	Three stage, two stage, boost, custom
Charge temperature compensation	Battery temperature sensor included	Battery temperature sensor included
Power factor corrected charging	0.98	0.98
Compatible battery types	Flooded (default), Gel, AGM, Lithium ion, custom*	Flooded (default), Gel, AGM, Lithium ion, custom*
Battery bank range (scaled to PV array size)	440 – 10000 Ah	440 – 10000 Ah
<b>AC input</b>		
AC 1 (grid) input current (selectable limit)	3 – 60 A (60 A default)	3 – 60 A (60 A default)
AC 2 (generator) input current (selectable limit)	3 – 60 A (60 A default)	3 – 60 A (60 A default)
Automatic transfer relay rating/typical transfer time	60 A/8 ms	60 A/8 ms
AC input voltage limits (bypass/charge mode)	L-N: 78 - 140 V (120 V nominal); L-L: 160 - 270 V (240 V nominal)	L-N: 78 - 140 V (120 V nominal); L-L: 160 - 270 V (240 V nominal)
AC input frequency range (bypass/charge mode)	55 – 65 Hz (default) 52 – 68 Hz (allowable)	55 – 65 Hz (default) 52 – 68 Hz (allowable)
<b>AC grid-tie output</b>		
Grid sell current range on AC1(selectable limit)	0 to 40 A (120 V) / 0 to 20 A (240 V)	0 to 48 A (120 V) / 0 to 27 A (240 V)
Grid sell voltage range on AC1 (auto adjusts entering sell mode)	L-N: 105.5 to 132 +/- 1.5 V; L-L: 211 to 264 +/- 3.0 V	L-N: 105.5 to 132 +/- 1.5 V; L-L: 211 to 264 +/- 3.0 V
Grid sell frequency range on AC1 (auto adjust entering sell mode)	59.4 to 60.4 +/- 0.05 Hz	59.4 to 60.4 +/- 0.05 Hz
<b>Efficiency</b>		
Peak	95.7%	95.7%
CEC weighted efficiency	93.0%	92.5%
<b>General specifications</b>		
Part number	865-5548-01 (Discontinued)	865-6848-01
Product/shipping weight	53.5 kg (118.0 lb)/75.0 kg (165.0 lb)	55.2 kg (121.7 lb)/76.7 kg (169.0 lb)
Product dimensions (H x W x D)	58 x 41 x 23 cm (23 x 16 x 9 in)	58 x 41 x 23 cm (23 x 16 x 9 in)
Shipping dimensions (H x W x D)	71.1 x 57.2 x 39.4 cm (28.0 x 22.5 x 15.5 in)	71.1 x 57.2 x 39.4 cm (28.0 x 22.5 x 15.5 in)
IP degree of protection	NEMA Type 1 Indoor	
Operating air temperature range	-25°C to 70°C (-13°F to 158°F) (power derated above 25°C (77°F))	
Warranty (depending on the country of installation)	Please refer to our website, SEsolar.com for the latest version of the warranty statement.	
<b>Features</b>		
System monitoring and network communications	Available	
Intelligent features	Grid sell, peak load shave, generator support, prioritized consumption of battery or external DC energy	
Auxiliary port	0 to 12 V, maximum 250 mA DC output, selectable triggers	
Off-grid AC coupling	Frequency control	
<b>Regulatory approval</b>		
Safety	UL1741, CSA 107.1	
EMC directive	FCC and Industry Canada Class B	
Interconnect	IEEE 1547 and CS	
<b>Compatible products</b>		
Conext XW+ Mini Power Distribution Panel	865-1010-01	
Conext XW + Power Distribution Panel	865-1015-01	
Conext MPPT 60 150	865-1030-1	
Conext MPPT 80 600	865-1032	
Conext Gateway	865-0329	
Conext System Control Panel	865-1050	
Conext Automatic Generator Start	865-1060	
Conext Battery Monitor	865-1080-01	
Conext Battery Fuse Combiner Box	865-1031-01	
Conext Configuration Tool	865-1155-01	

Specifications are subject to change without notice.

**Schneider Electric**  
 35 rue Joseph Monier  
 92500 Rueil-Malmaison, France  
 Tel: +33 (0)1 41 29 70 00

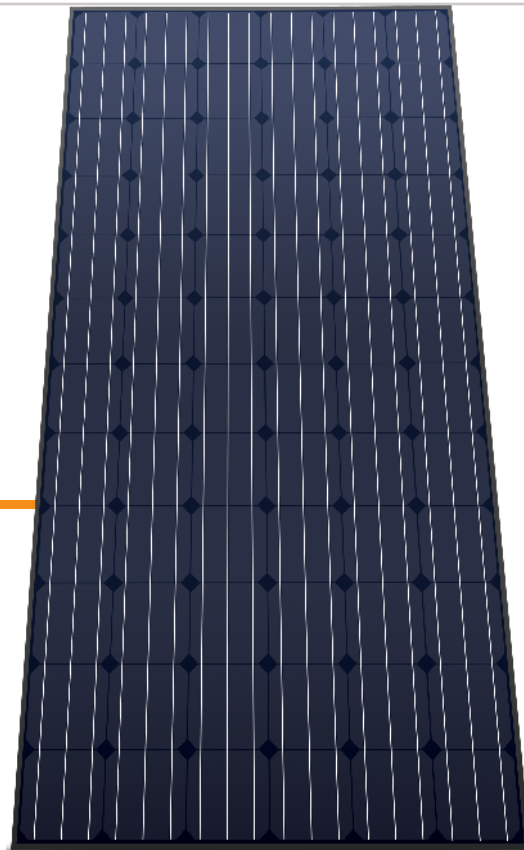
Life Is On





# 72M-BLK

72-CELL MONOCRYSTALLINE MODULE



## 370 Wp

MAX POWER OUTPUT

## 19.1%

MAX EFFICIENCY

## 10 YEAR

PRODUCT WARRANTY

## 25 YEAR

LINEAR PERFORMANCE GUARANTEE

HELIENE IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

HELIENE  
[www.heliene.com](http://www.heliene.com)



GUARANTEED POSITIVE POWER SORTING:  
[-0 : +4.99 WP]



PERFECT FOR HIGH VISIBILITY INSTALLATIONS



MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001

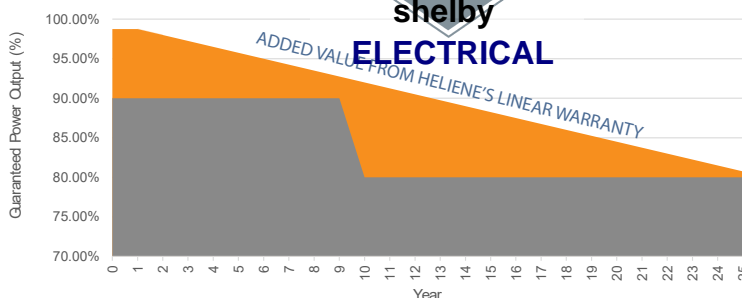


H-BLACK INTEGRATION - BLACK FRAME & BACK-SHEET

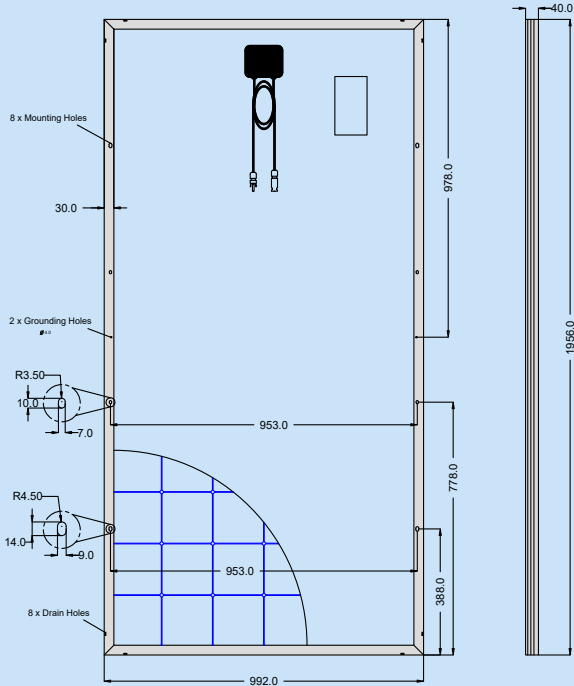
LINEAR PERFORMANCE GUARANTEE

Released for Permit  
08/24/2020 7:54:55 AM

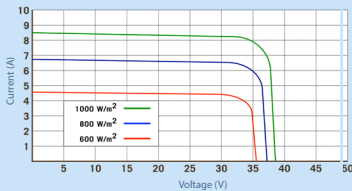
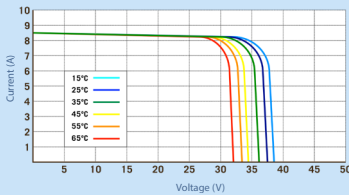
10 YEAR WORKMANSHIP WARRANTY 25 YEAR LINEAR PERFORMANCE GUARANTEE



## DIMENSIONS FOR HELIENE 72M SERIES MODULES



## I-V CURVE FOR HELIENE 72M SERIES



## CERTIFICATIONS



## ELECTRICAL DATA (STC)

Peak Rated Power	$P_{mpp}$ (W)	370	365	360	350
Maximum Power Voltage	$V_{mpp}$ (V)	40.23	39.90	39.71	39.13
Maximum Power Current	$I_{mpp}$ (A)	9.26	9.20	9.13	9.01
Open Circuit Voltage	$V_{oc}$ (V)	48.66	48.50	48.10	47.57
Short Circuit Current	$I_{sc}$ (A)	9.77	9.75	9.71	9.65
Module Efficiency *	Eff (%)	19.1	18.8	18.6	18.0
Maximum Series Fuse Rating	MF (A)	20	20	20	20
Power Output Tolerance		[-0, +4.99] Wp			

STC - Standard Test Conditions: Irradiation 1000 W/m<sup>2</sup> - Air mass AM 1.5 - Cell temperature 25 °C  
 \* Calculated using maximum power based on full positive output tolerance [-0, +4.99] Wp

## MECHANICAL DATA

Dimensions (L x W x D)	1956 x 992 x 40 mm (77 x 39 x 1.6 inch)
Weight	22 kg (48.5 lbs)
Output Cables	1.2 m (47.2 inch) symmetrical cables with MC4 type connectors
Junction Box	IP-67 rated with 3 bypass diodes (IP-67 Available upon request)
Frame	Double webbed 15 micron anodized aluminum alloy
Front Glass	Low-iron content, high-transmission PV solar glass
Solar Cells	72 Monocrystalline cells (156.75 x 156.75 mm)

## CERTIFICATIONS

UL Certification	ULC/ORD-C1703-1, UL1703
IEC Certification	Optional

Heliene modules are certified under the California Energy Commission (CEC) Listing Report

## TEMPERATURE RATINGS

Nominal Operating Cell Temperature (NOCT)	+45°C (±2°C)
Temperature Coefficient of $P_{max}$	-0.39%/°C
Temperature Coefficient of $V_{oc}$	-0.31%/°C
Temperature Coefficient of $I_{sc}$	0.045%/°C

## PACKAGING CONFIGURATION

Modules per box:	26 pieces
Modules per 53' trailer:	780 pieces

## MAXIMUM RATINGS

Operational Temperature	-40°C - +85°C
Max System Voltage	1000V (*1000V) *Optional

## WARRANTY

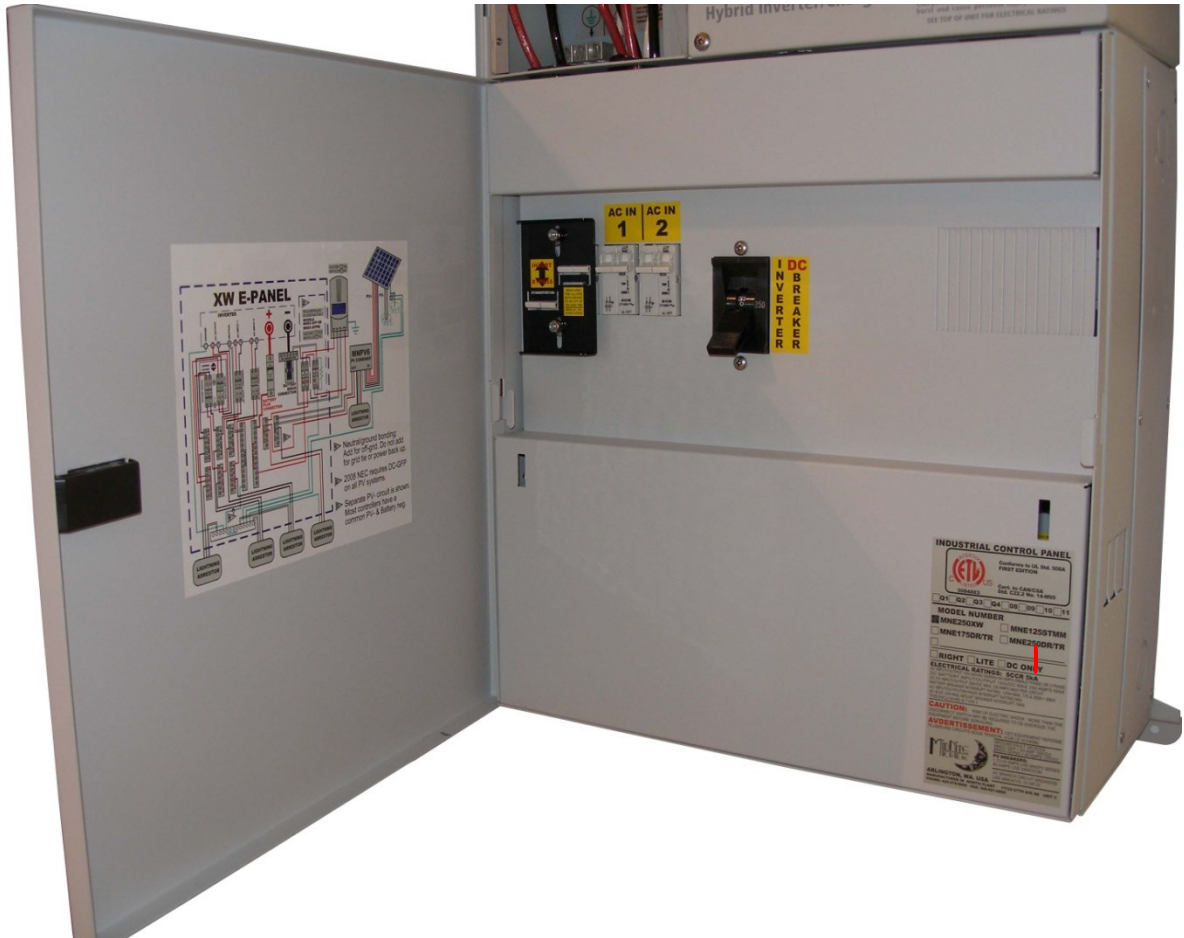
10 Year Manufacturer's Workmanship Warranty
25 Year Linear Power Guarantee
(Refer to product warranty page for details)

Released for Permit  
 08/24/2020 7:54:55 AM





# XW E-Panel Instructions



## Model MNE250XW

The MidNite Solar XW E-Panel is designed for a single XW inverter installation. Use this installation manual to aid in installation. The installation of an electrical system such as this fall under the guidelines of the NEC in the USA. Canadian electrical codes have jurisdiction in Canada. These instructions are not intended to be used in lieu of these local and federal codes, but rather are used as specific to this product. You may need to consult with a professional Solar installer or electrical inspector when in doubt on code specific questions and system installation issues. Even though the E-Panel incorporates and simplifies numerous separate electrical circuits into one enclosure, an inverter system such as this is still a very sophisticated and somewhat complicated electrical system.

**Released for Permit**

**08/24/2020 7:54:55 AM**



## IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTIONS** - These instructions contain important safety and operating instructions for MidNite Solar E-Panels.

If you do not fully understand any of the concepts, terminology, or hazards outlined in these instructions, please refer installation to a qualified dealer, electrician or installer. These instructions are not meant to be a complete explanation of a renewable energy system.

### GENERAL PRECAUTIONS

**WORKING WITH OR IN THE VICINITY OF A LEAD ACID BATTERY, SEALED OR VENTED IS DANGEROUS. VENTED BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. FOR THIS REASON, IT IS VERY IMPORTANT THAT BEFORE SERVICING EQUIPMENT IN THE VICINITY OF LEAD-ACID BATTERIES YOU REVIEW AND FOLLOW THESE INSTRUCTIONS CAREFULLY.**

If service or repair should become necessary, contact MidNite Solar Inc. Improper servicing may result in a risk of shock, fire or explosion. To reduce these risks, disconnect all wiring before attempting any maintenance or cleaning. Turning off the inverter will not reduce these risks. Solar modules produce power when exposed to light. When it is not possible to disconnect the power coming from the Photovoltaics by an external means such as a combiner, cover the modules with an opaque material before servicing any connected equipment.

Never attempt to charge a frozen battery.

When it is necessary to remove a battery, make sure that the battery bank disconnect breaker is in the off position and that the PV breakers, grid breakers and any other sources of power to the inverter are in the off position. Then remove the negative terminal from the battery first.

To reduce risk of battery explosion follow these instructions and those published by the battery manufacturer as well as the manufacturer of any additional equipment used in the vicinity of the batteries. Before installing the battery enclosure, read all instructions and cautionary markings in or on any connected electrical equipment.

Avoid producing sparks in the vicinity of the batteries when using vented batteries. Provide ventilation to clear the area of explosive gases. Sealed AGM and Gel batteries do not under normal conditions create explosive gases. Be especially cautious when using metal tools. Dropping a metal tool onto batteries can short circuit them. The resulting spark can lead to personal injury or damage to the equipment. Provide ventilation to outdoors from the battery compartment when installing vented batteries such as golf cart T-105 batteries. The addition of a spill tray is also a good idea.

Clean all battery terminals. Very high currents are drawn from the batteries; even a small amount of electrical resistance can result in overheating, poor performance, premature failure or even fire.

Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes. Wear complete eye and clothing protection. Always avoid touching eyes while working near batteries. If battery acid or battery terminal corrosion contacts skin or clothing, wash immediately with soap and water. If acid enters the eyes, immediately flood with cool running water for at least 15 minutes and get medical attention immediately. Baking soda neutralizes battery acid electrolyte. Keep a supply near the batteries.

Do not work alone. Someone should be in the range of your voice or close enough to come to your aid when you work with or near electrical equipment.

Remove rings, bracelets, necklaces, watches etc. when working with batteries, photovoltaic modules or other electrical equipment. Power from an illuminated photovoltaic array makes a very effective arc welder with dire consequences if one of the welded pieces is on your person.

To reduce the risk of injury, connect only deep cycle lead acid type rechargeable batteries. **08/24/2020 7:54:55 AM**

This equipment is NOT intended for use with life support equipment or other medical equipment or devices.

It is the responsibility of the installer to verify compliance with all applicable codes.

Before making any connections verify that the circuit breakers are in the off position including the inverter breaker. Double check all wiring before applying power.

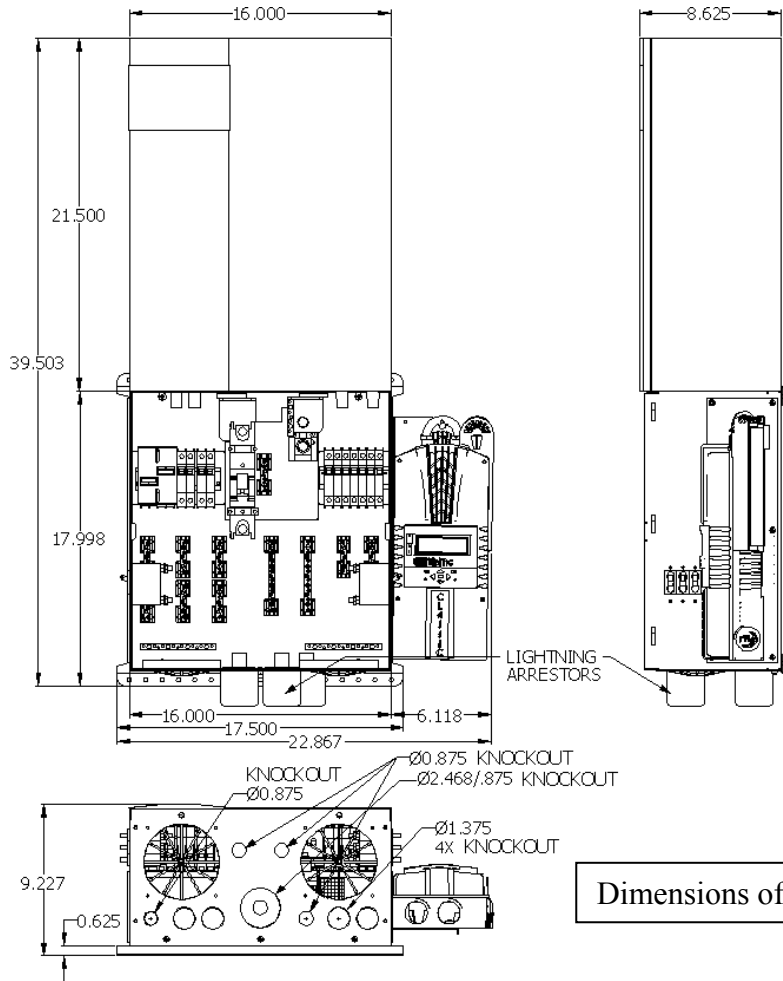


# XW E-Panel installation manual

## Mounting The XW E-Panel:

The XW inverter should be mounted to the wall prior to installing the E-Panel. Pay attention to the total height of the system. Refer to the dimensioned drawing below.

**Installing the E-Panel to the inverter:** To install the E-Panel, remove the door and deadfront. Attach top and bottom wall mounting brackets to the E-Panel using four M6 x 10mm taptite screws supplied. The top mounting bracket slides up behind the inverter to space the inverter out the proper distance from the wall. The top mounting bracket does not screw to the wall, but rather just acts as a spacer



Mounting bracket dimensions.

Dimensions of XW E-Panel and inverter

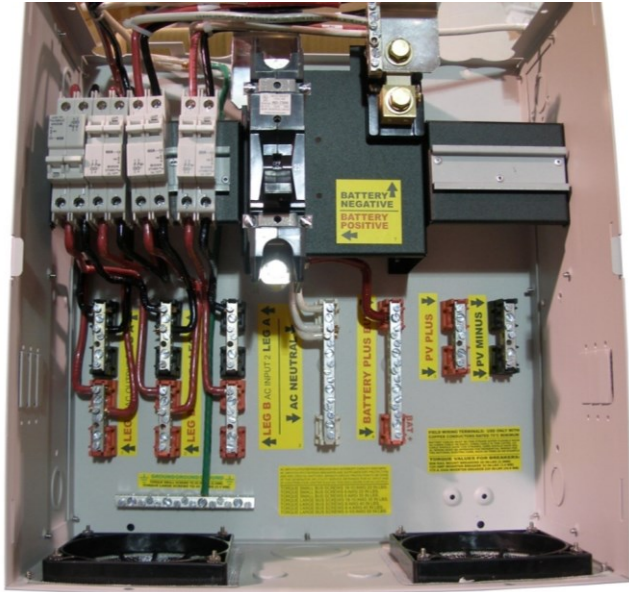


Released for Permit  
08/24/2020 7:54:55 AM

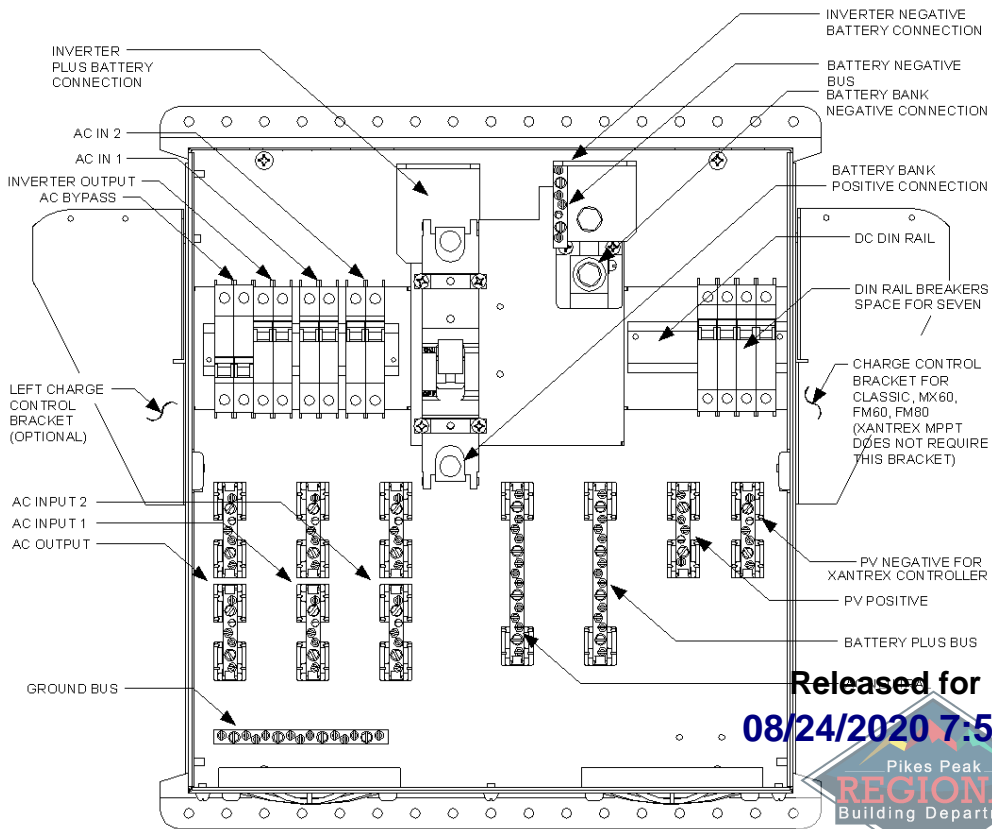


Top left                      Top right                      Bottom left                      Bottom right  
Each mounting bracket is held on using two 6mm x 10mm thread forming screws.  
Use a #3 Philips screwdriver for these four screws.

# XW E-Panel installation manual



Main component placement



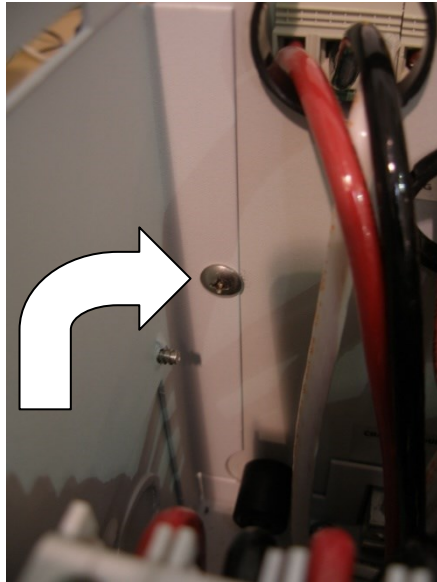
Released for Permit  
 08/24/2020 7:54:55 AM  
 Pikes Peak  
**REGIONAL**  
 Building Department  
**shelby**  
**ELECTRICAL**



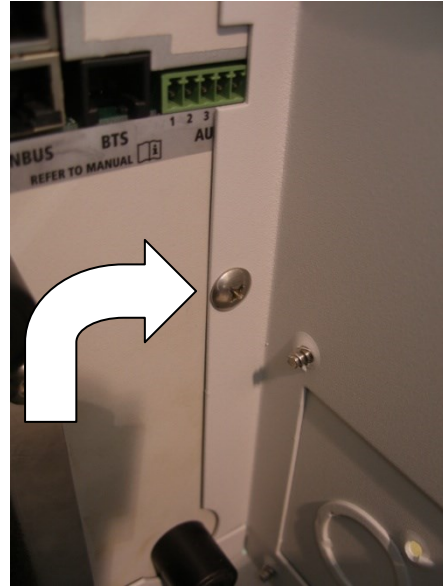
# XW E-Panel installation manual

## Installing the E-Panel to the inverter continued:

Remove two 5mm #2 Philips tip screws from the bottom of the inverter that will be used to attach the E-Panel. These two screws are the only attachment to the inverter. The bottom wall mounting bracket also needs to be secured to the wall. You must also remove the battery terminal bolts prior to setting the E-Panel in place. Note: 10-32 UNF screws are interchangeable with the 5mm screws if you should misplace them.

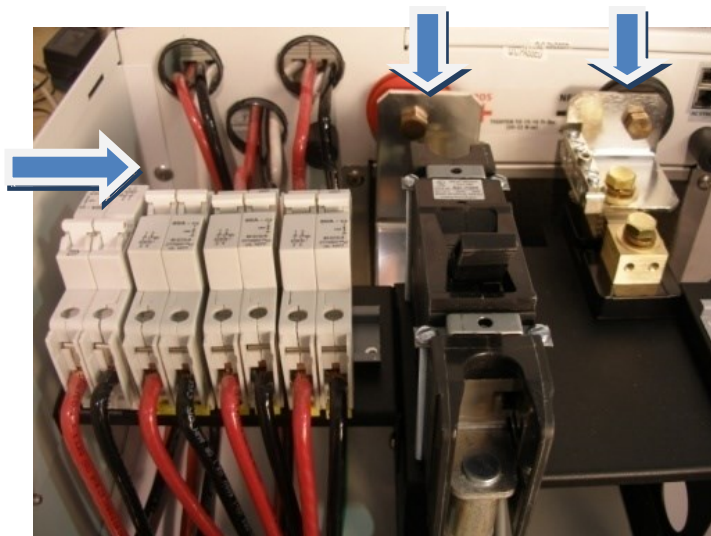


Left attachment. E-Panel to inverter



Right attachment. E-Panel to inverter

To gain access to these two main mounting screws, you will need a long #2 Philips screwdriver. The tip must be at least 9 inches long. Most tool boxes do not have a Philips screwdriver this long, so consider adding it to your arsenal of tools. Slide the AC breakers to the right a bit to allow the screwdriver to line up with the screw. Move them back after the E-Panel is secured to the inverter. Install the battery terminal bolts as shown to the left. Remove the left side plate of the E-Panel. This allows access to tighten the bottom of the battery plus bus bar located on the 250 amp circuit breaker. Both the Plus and Minus battery busbars are shipped loose for ease of alignment and must be tightened. Use a 9/16" wrench for these connections. (Note: some earlier bus bars may require enlarging the slot for battery terminals. If required, use a 3/8" drill and a strong pair of pliers to hold it while drilling.



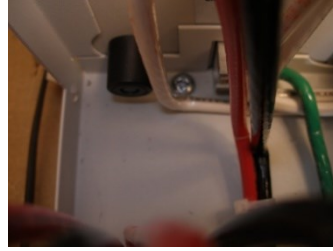
Released for Permit  
08/24/2020 7:54:55 AM  
Pikes Peak  
REGIONAL  
Building Department  
shelby  
ELECTRICAL

# XW E-Panel installation manual

Wiring: Start with the grounds. Wiring the system will be easier if grounds are done first.



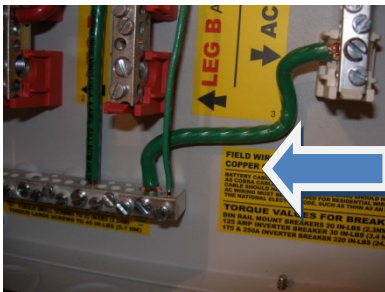
Chassis ground connection to inverter



E-Panel earth ground bus (AC & DC)

The E-Panel comes with a 6AWG green ground wire shown above. The ground chassis lug on the bottom of the inverter is the same electrical connection as the three inside the wiring compartment of the inverter. You may use this large terminal as the one single ground connection to the inverter and then connect all other grounds to the E-Panel ground bus. Since the E-Panel ground, inverter chassis ground and wiring compartment grounds are all at the same potential, you may use any and all as required although electrical inspectors are used to finding all grounds on just one busbar. The E-Panel ground bus is the proper place for this single point ground on an off-grid system. Your main distribution panel ground is the proper AC ground for utility connected systems. Use the E-Panel ground bus for the DC grounds in a utility connected system. Inspectors will want to see a separate ground wire from AC and DC on a utility connected system. You can use a single ground wire from the E-Panel for AC and DC for an off-grid installation.

**Neutral to ground bond:** All AC electrical systems in North America must have an AC Neutral to Earth Ground bonding connection. A typical distribution panel such as Square D makes this bond by use of a bonding screw. That green screw grounds the neutral busbar when installed. Electrical inspectors are used to looking in the main distribution panel for this electrical bond. In a battery backed up grid tie or power back up installation, this bond has already been made in the main distribution / service entrance panel. Do not add it inside the E-Panel when the utility is connected. In an off-grid installation where there is no utility connection, the bond should be done inside the E-Panel as shown here.



6AWG Neutral to Ground bonding wire. The bond should be done at the power source and since the E-Panel is central to the power generation, it is considered the source. Some electrical inspectors are used to looking for this bond to be accomplished in the distribution panel. They may ask you to move it to where they feel comfortable finding it. Don't fight it. The bond will work just fine in a Square D box too.

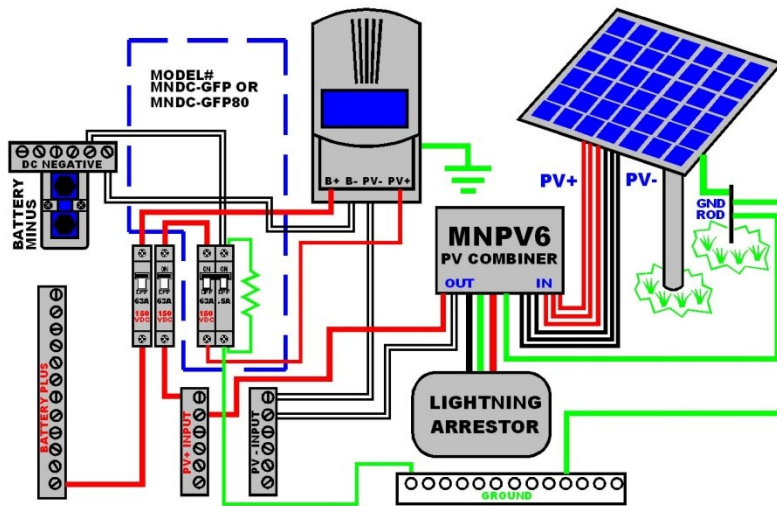
Released for Permit  
08/24/2020 7:54:55 AM



**DC-GFP installation:** The NEC 2008 requires a DC-GFP in all US systems. When installing a DC-GFP in the PV circuit, make sure there is no battery neutral to ground connection. That would effectively short out the sense circuit on the DC-GFP. MidNite solar has

# XW E-Panel installation manual

two DC-GFP devices that fit the E-Panel. One is a 63 amp single circuit din rail mount device while the other is an 80 amp single circuit panel mount device. OutBack Power offers a two circuit 80 amp panel mount DC-GFP that also fits inside the E-Panel. The Xantrex DC-GFP's will not fit in the E-Panel. The MidNite Solar single circuit DC-GFP's are designed for a single PV array. Two MidNite DC-GFP's may be used to accommodate two arrays although the dual OutBack would for dual arrays and dual controllers cost less and take up less room. DC-GFP's are a very misunderstood device. When looking at a wiring diagram you will notice that part of the DC-GFP is a high current breaker. Connected in series with the GFP is yet another high current DC breaker. It is a common mistake to think the second breaker is unnecessary. NEC2008 requires a DC-GFP on all systems whether mounted on the roof top of a residence or not. The NEC also does not allow the DC-GFP to be the PV disconnect. When the DC-GFP is turned off, it leaves the battery negative ungrounded. The only time it is allowed that the system be ungrounded is during a fault condition. This requirement necessitates a PV disconnect in series with the DC-GFP.



80 amp panel mount DC-GFP ready for the high current wires.



63 amp din rail DC-GFP wired with a 63 amp PV disconnect and a 63 amp controller output breaker.

# XW E-Panel installation manual

The DC-GFP device monitors current flowing between battery negative and earth ground and will trip when more than ½ amp is present. There should be no current flowing in this circuit under normal circumstances. In the event your DC-GFP trips, it is usually on a new installation. One of two things is happening. 1: There is an actual ground fault in the wiring, or 2: there is an excess of current flowing through the large 63 or 80 amp breaker. The first thing an installer usually suspects in the case of this device tripping is that the device is faulty. Sorry, but this will not be the reason for a DC-GFP tripping, so **check your wiring!** Refer to the wiring diagram in these instructions or on the inside of the door. These wiring diagrams show a PV disconnect breaker connected directly after the PV array + busbar and before the DC-GFP. It doesn't matter which order these two devices are connected. The DC-GFP can be connected to the Array plus output before the PV disconnect just as well. Make sure the polarity of all DC breakers are correct. The din rail mount breakers have a + sign at the bottom terminal. Panel mount breakers have a "Line" marking on the top connection. The + and Line connections need to be connected to the most positive point in the circuit. Since the DC-GFP is acting as a switch and not as a breaker, the PV disconnect is the device that polarity needs to be observed. It is much easier to wire the din rail mount devices as shown in the picture, but the DC-GFP + connection is furthest away from the PV+ array. In the case of the panel mount 80 amp PV disconnect breaker and 80 amp DC-GFP, connect the PV+ array output to the top of the PV disconnect breaker. The DC-GFP polarity will not be important. The polarity of the PV disconnect breaker is important!

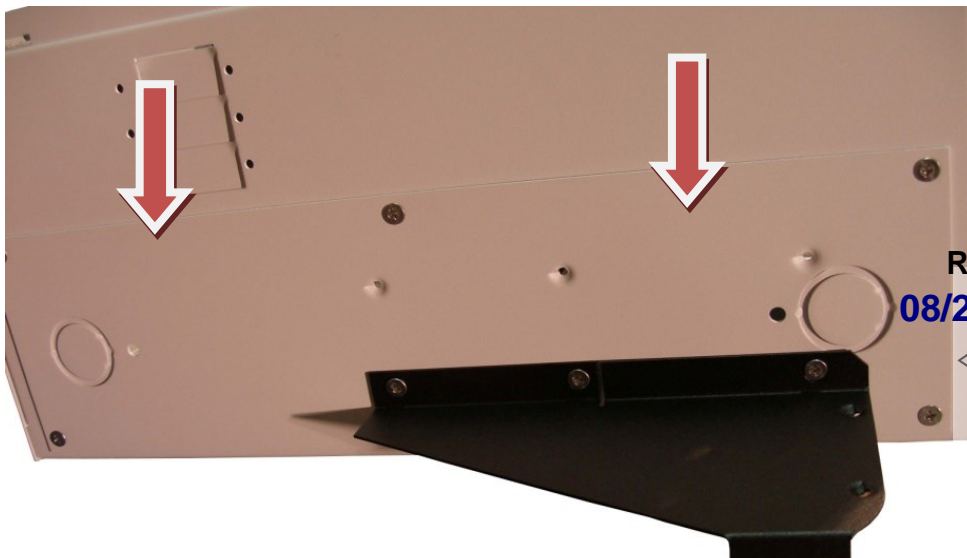
The output of the PV charge controller also requires over-current protection. Most installations will use either a 63 amp din rail mount breaker or an 80 amp panel mount breaker. The + or "Line" side of this breaker must be connected to the Battery+ busbar. Use a red 6AWG wire for the 63 amp breaker and 4AWG wire for an 80 amp breaker. The charge controller output breaker must be sized large enough for the expected output. You can always use a larger breaker and wire than the array output though. The breaker is there to protect the wire, not the controller, so you can use a 63 amp breaker even if the controller is not capable of outputting more than 30 amps.

**Solar Controller hook up:** The E-Panel is set up to accept numerous controllers. These controllers may be installed on either side of the enclosure using brackets like shown below.

The bracket below is the standard bracket that comes with every E-Panel. If your controller must mount to the opposite side, then order a MNCCB-Left. This bracket directly accepts the MidNite Classic controller, OutBack MX60, FM60 and FM80. Some PWM controllers such as the Xantrex

C40/C60 and the Morningstar Tristar 60 can also mount to this bracket by adding an additional mounting hole. The Xantrex MPPT controller does

not require a bracket. It mounts to the two holes marked with arrows.



Released for Permit  
08/24/2020 7:54:55 AM  
Pikes Peak  
REGIONAL  
Building Department  
shelby  
ELECTRICAL

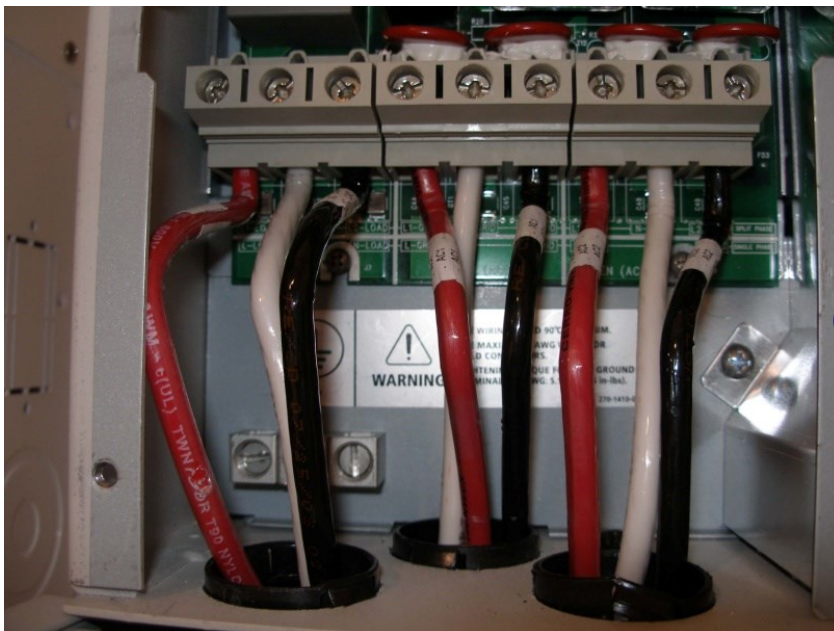
# XW E-Panel installation manual



Wires pass through a 1" conduit knockout in the side plate. Install a 1" Close nipple, three 1" locknuts and two bushings to complete the wire passage. One of the locknuts is placed between the two enclosures to act as a spacer. The picture to the right shows the MidNite Classic installed. Note the two 80 amp panel mount breakers. The E-Panel can accept up to three panel mount breakers on either side and up to seven din rail mount breakers. Din rail breakers go up to 63 amps at the present. Panel mount breakers are available in 80 amps and even higher. Most controllers are too large to allow panel mount breakers to be mounted in front of the controller as is shown with the Classic here. Each charge controller must have a breaker/disconnect coming in from the PV combiner and also a breaker on the output of the controller. The need for breakers on both sides of the controller is an NEC requirement. Refer to the wiring diagram on page 6. A more complete wiring diagram is at the end of these instructions and on the inside of the door.

## Inverter wiring compartment:

The E-Panel comes wired with 6AWG wire for all AC circuits. The left three terminals on the



inverter are the AC output terminals. The output of the inverter terminals are wired to the E-Panel AC output terminal busbars. Wires are supplied and marked AC out. AC in 1 and AC in 2 are supplied and marked as such. These wires also connect to the E-Panel terminal busbars of the same name. Cut and strip these wires as required to hook up as shown. Refer to the inverter manual for torque values.

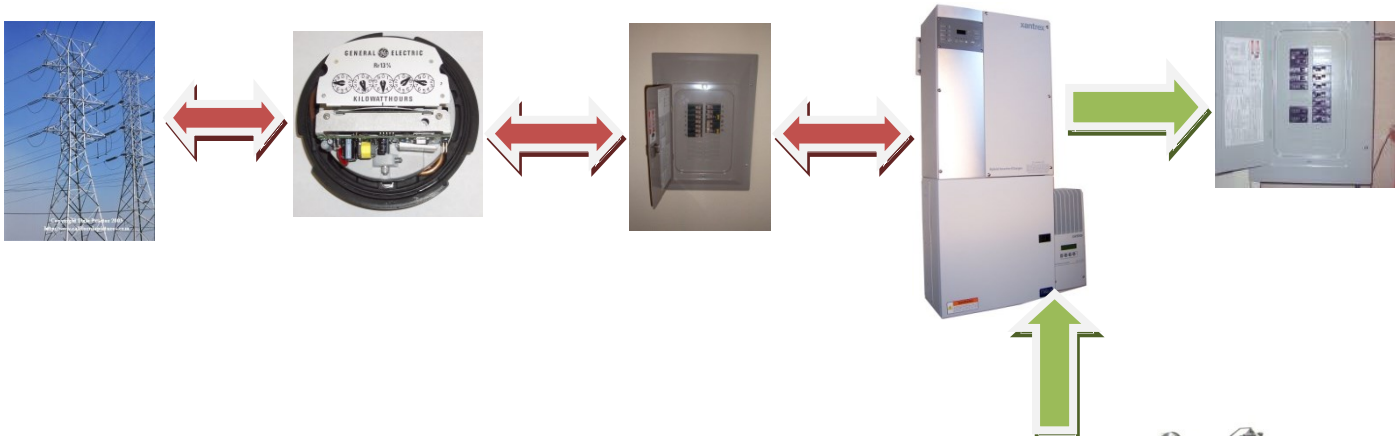
Released for Permit  
08/24/2020 7:54:56 AM  
Pikes Peak  
REGIONAL  
shelby  
ELECTRICAL

**AC hook up:** The E-Panel is supplied with 2 pole 60 amp

# XW E-Panel installation manual

continuous breakers for the generator input, utility input and AC input/output bypass switch. Most generators come with a UL489 branch circuit output breaker. All main distribution/service entrance panels such as Square D utilize UL489 branch circuit rated breakers. The AC breakers supplied in the E-Panel are supplementary protection listed to UL1077. These breakers are used as disconnects or switches, but not as branch circuit devices. Branch circuit breakers made for a residential service entrance panels are typically thermal breakers. These breakers are not allowed under NEC guidelines to normally carry more than 80% of their rating. That means a 60 amp Square D QO stab in breaker may only be sized for 48 amps continuous power. The MidNite breakers are a hydraulic/magnetic variety and are allowed under NEC guidelines to carry full rated current. The XW E-Panel comes with 60 amp hydraulic/magnetic breakers.

Bus bars are provided for easy hook up from a generator and or the utility and also for an AC sub-panel. The AC input and output busbars are also the ideal place to connect lightning or surge arrestors. The output busbar must not be connected to the main distribution panel in a utility connected installation. The main utility connected distribution panel will go dead during an outage. Only circuits connected to the AC output busbar (sub-panel) will have power during a power outage. Do not try to back feed a utility connected distribution panel from the output of the inverter.



The above flow diagram shows AC current flow direction for a battery backed up grid tie system with a generator. DC current flow is not shown. Note that all loads powered by the inverter must be connected to the AC sub-panel on the right.



The above flow diagram shows AC current flow in an off-grid system. DC current flow is not shown.

Released for Permit  
08/24/2020 7:54:56 AM

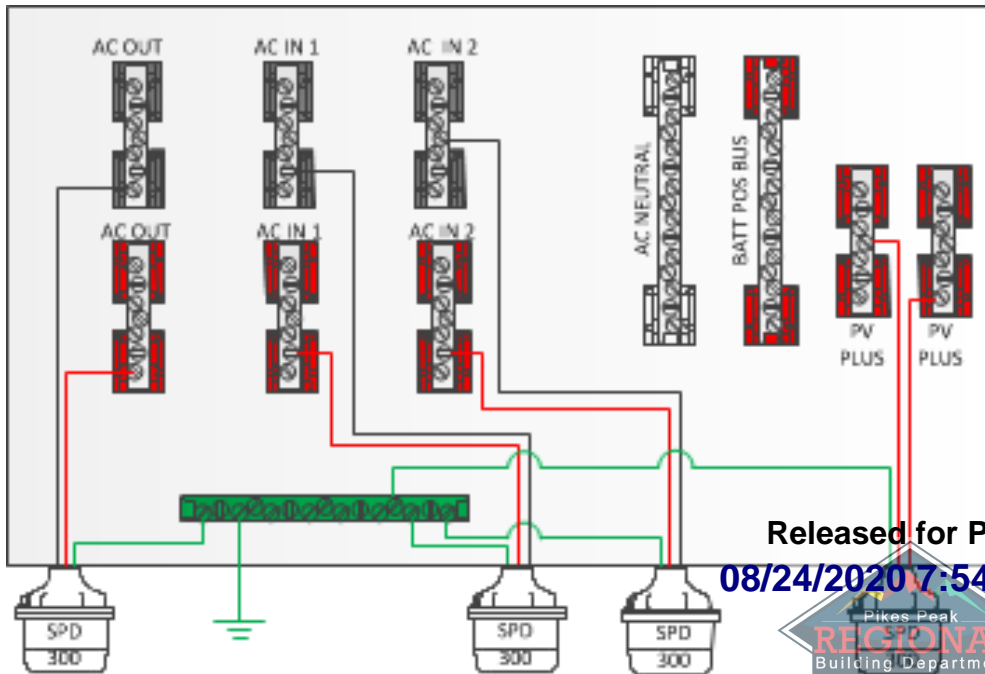
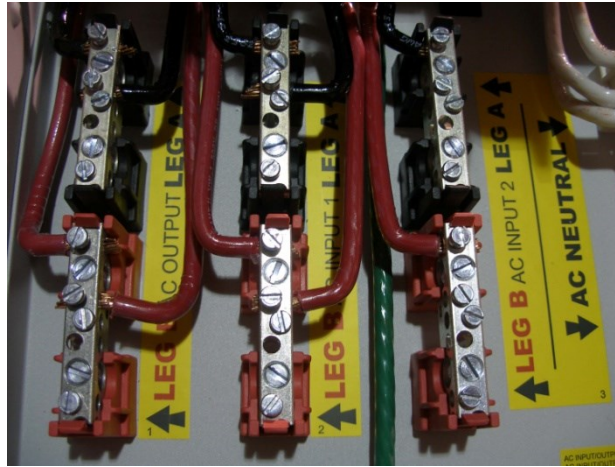
Pikes Peak  
REGIONAL  
Building Department

shelby  
ELECTRICAL

This is a pictorial explanation of the main AC circuits. AC input1, AC input2 and AC output.

In a utility connected system, only the loads connected to the AC output Sub-panel will have power during an outage. The main service entrance loads will have no power.

# XW E-Panel installation manual

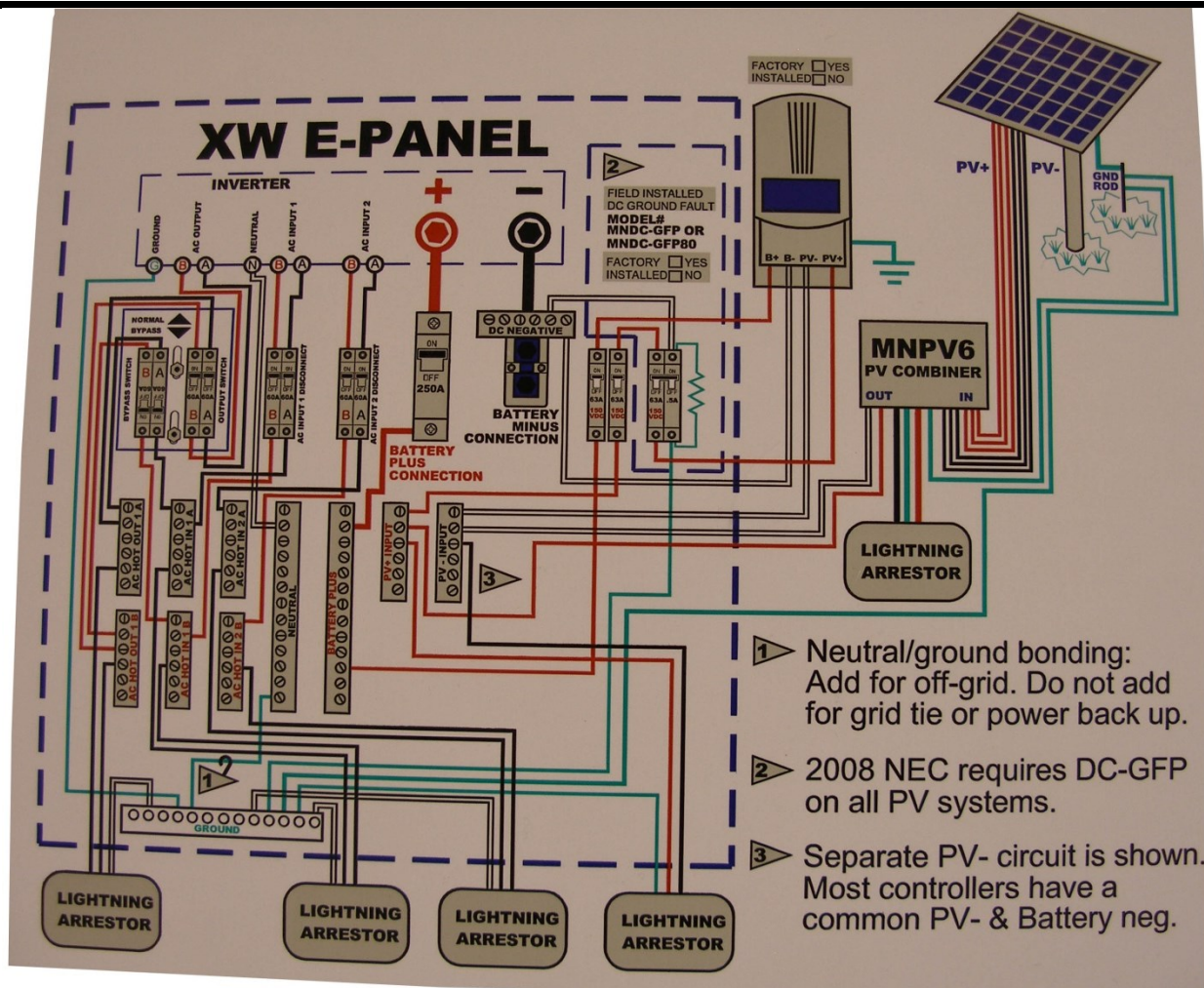


Released for Permit  
08/24/2020 7:54:56 AM



Lightning arrestor hook up. Note there is no arrestor on the battery bank. Lightning arrestor has marginal value since the batteries make a pretty large arrestor themselves. MidNite Solar does not endorse the Delta lightning arrestors shown. These are for reference only.

# XW E-Panel installation manual



Door label, located on the inside of the door.

Other MidNite Solar components that may be included in the XW installation include:  
 PV combiner MNPV3, MNPV6, MNPV12 or MNPV16

Battery enclosures MNBE-A, MNBE-B, MNBE-C, MNBE-D

DC din rail mount breakers: MNEPV1,2,3,4,5,6,7,8,9,10,12,15,20,30,40,50,63

DC panel mount breakers: MNEDC80

AC din rail mount single pole 120VAC breakers: MNEAC10,15,20 UL489 listed

AC din rail mount single pole 277VAC breakers: MNEAC30,40,50 or 60QZD

AC din rail mount 2 pole 20 amp 120/240VAC breakers: MNEAC20QZD2P

AC din rail mount 2 pole 30 amp 120/240VAC breakers: MNEAC30QZD2P

AC din rail mount 2 pole 50 amp 120/240VAC breakers: MNEAC50QZD2P

AC din rail mount 2 pole 60 amp 120/240VAC breakers: MNEAC60QZD2P

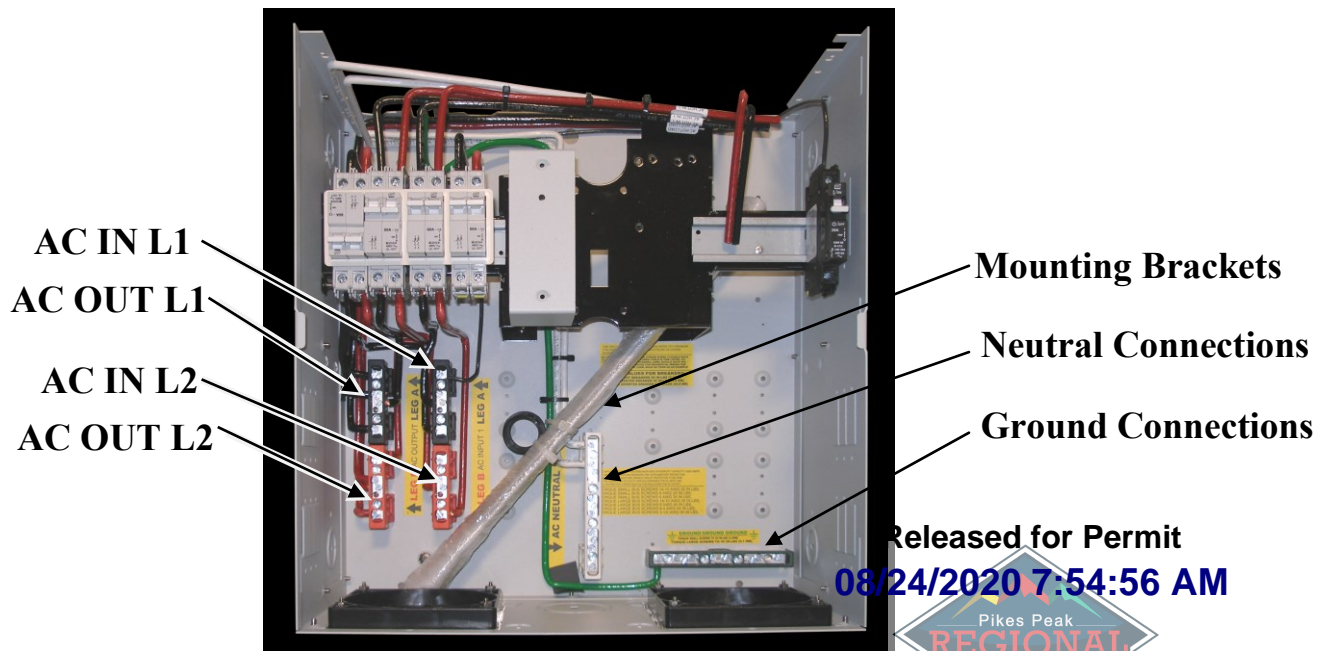
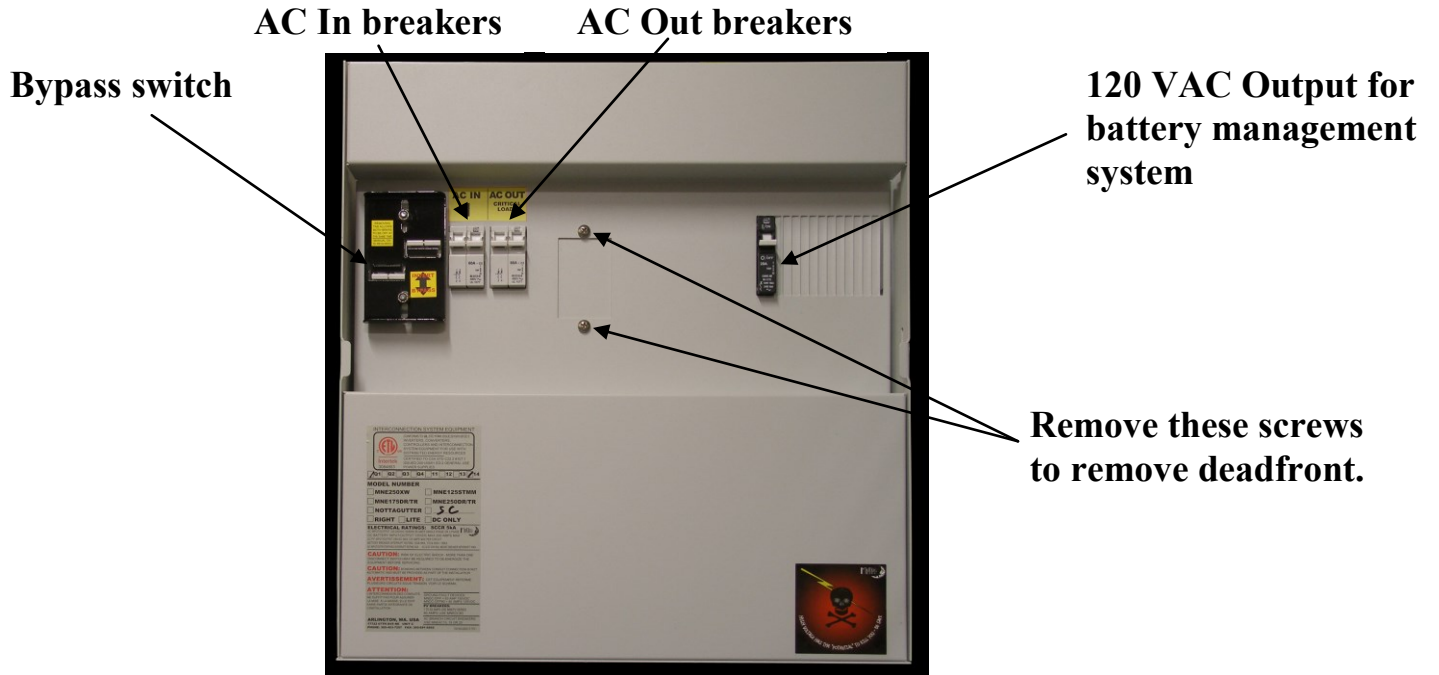




# XW E-Panel installation manual

## MNEXWSC

The MNEXWSC2 provides the AC interconnections and AC bypass for XW Inverters.

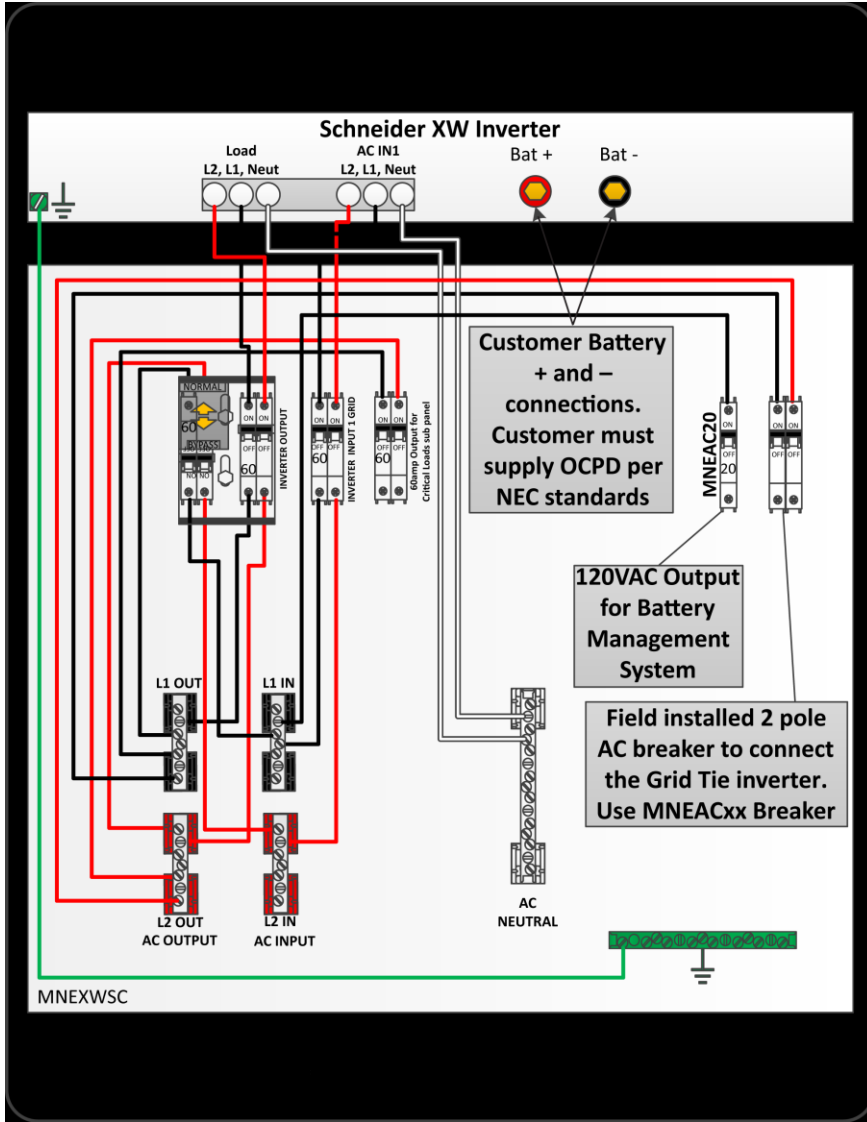


**MNEXWSC Internal wiring**

Released for Permit  
08/24/2020 7:54:56 AM



# XW E-Panel installation manual



## MNEXWSC Wiring Diagram

This diagram is also on the inside of the front cover of the E-Panel.

Stickers for the MNEXWSC E-Panel only.



XW Main Sticker set

AC INPUT	AC OUTPUT	NEUTRAL	GENERAL AC OUTLET	HYDRO OUTLET	WIND CONTROL INPUT	WIND CONTROL OUTPUT	AC CONTROL INPUT	AC CONTROL OUTPUT	BATTERY WINDER	BATTERY WINDER	GROUND PROTECT	DC OUTPUT TWO	PV ARRAY INPUT ONE	PV ARRAY INPUT TWO	PV ARRAY OUTPUT	PV ARRAY OUTPUT	PV ARRAY	LOAD CIRCUIT THREE	LOAD CIRCUIT TWO	LOAD CIRCUIT ONE	INVERTER BATTERY SHUTOFF	INVERTER	ACT GENERATOR
----------	-----------	---------	-------------------	--------------	--------------------	---------------------	------------------	-------------------	----------------	----------------	----------------	---------------	--------------------	--------------------	-----------------	-----------------	----------	--------------------	------------------	------------------	--------------------------	----------	---------------

**PV + IN**

**BAT +**

**DC BREAKER**

**INVERTER**

**AC IN 1**

**AC IN 2**

**LEG B AC OUTPUT LEG A**

**LEG B AC INPUT 1 LEG A**

**LEG B AC INPUT 2 LEG A**

**AC NEUTRAL**

**BATTERY PLUS BUS**

**BATTERY NEGATIVE**

**BATTERY POSITIVE**

**PV PLUS**

**PV MINUS**

**INTERCONNECTION SYSTEM EQUIPMENT**

ETL LISTED

MODEL NUMBER

MNE175XW  MNE250XW

MNE125STMM  MNEXWSC

**Released for Permit**

08/24/2020 7:54:56 AM

**CAUTION:** RISK OF ELECTRIC SHOCK - MORE THAN ONE DISCONNECT REQUIRED TO DE-ENERGIZE THE EQUIPMENT BEING SERVICED.

**ATTENTION:** ALL WIRING BETWEEN CONDUIT CONNECTION IS NOT AUTOMATICALLY GROUNDING. ALL WIRING MUST BE PROVIDED AS PART OF THE INSTALLATION.

**GROUND FAULT DEVICES:** MINDC-GFP = 85 AMP / 150VDC MINDC-GFPB = 80 AMPS / 125VDC

**PV BREAKERS:** TO 30 AMPS USE MNEP SERIES 80 AMPS USE MNEAC20

**AC BRANCH CIRCUIT BREAKERS:** USE MNEAC15, 15 OR 20

ARLINGTON, WA, USA  
17732 67TH AVE NE  
PHONE: 360-463-7307 FAX: 360-691-6662

# XW E-Panel installation manual

---

## **MIDNITE SOLAR INC. LIMITED WARRANTY** **MidNite Solar Power electronics, sheet metal enclosures and accessories**

MidNite Solar Inc. warrants to the original customer that its products shall be free from defects in materials and workmanship. This warranty will be valid for a period of five (5) years for all products except the MNKID Charge Controller which will be two (2) years.

At its option, MidNite Solar will repair or replace at no charge any MidNite product that proves to be defective within such warranty period. This warranty shall not apply if the MidNite Solar product has been damaged by unreasonable use, accident, negligence, service or modification by anyone other than MidNite Solar, or by any other causes unrelated to materials and workmanship. The original consumer purchaser must retain original purchase receipt for proof of purchase as a condition precedent to warranty coverage. To receive in-warranty service, the defective product must be received no later than two (2) weeks after the end of the warranty period. The product must be accompanied by proof of purchase and Return Authorization (RA) number issued by MidNite Solar. For an RMA number contact MidNite Solar Inc., 17722 67<sup>th</sup> Ave NE, Arlington, WA 98223 (360) 403-7207.

Purchasers must prepay all delivery costs or shipping charges to return any defective MidNite Solar product under this warranty policy. Except for the warranty that the products are made in accordance with, the specifications therefore supplied or agreed to by customer:

MIDNITE SOLAR MAKES NO WARRANTY EXPRESSED OR IMPLIED, AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEEDS THE FOREGOING WARRANTY IS HEREBY DISCLAIMED BY MIDNITE SOLAR AND EXCLUDED FROM ANY AGREEMENT MADE BY ACCEPTANCE OF ANY ORDER PURSUANT TO THIS QUOTATION. MIDNITE SOLAR WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES, LOSS OR EXPENSE ARISING IN CONNECTION WITH THE USE OF OR THE INABILITY TO USE ITS GOODS FOR ANY PURPOSE WHATSOEVER. MIDNITE SOLAR'S MAXIMUM LIABILITY SHALL NOT IN ANY CASE EXCEED THE CONTRACT PRICE FOR THE GOODS CLAIMED TO BE DEFECTIVE OR UNSUITABLE.

Products will be considered accepted by customer unless written notice to the contrary is given to MidNite Solar within ten (10) days of such delivery to customer. MIDNITE SOLAR is not responsible for loss or damage to products owned by customer and located on MIDNITE SOLAR'S premises caused by fire or other casualties beyond MIDNITE SOLAR'S control. This warranty is in lieu of all other warranties expressed or implied.

MIDNITE SOLAR INC. 17722 67<sup>TH</sup> AVE NE ARLINGTON, WA 98223

Email:

info@midnitesolar.com

PH: 360.403-7207 FAX: 360-691-6862

Released for Permit  
08/24/2020 7:54:56 AM

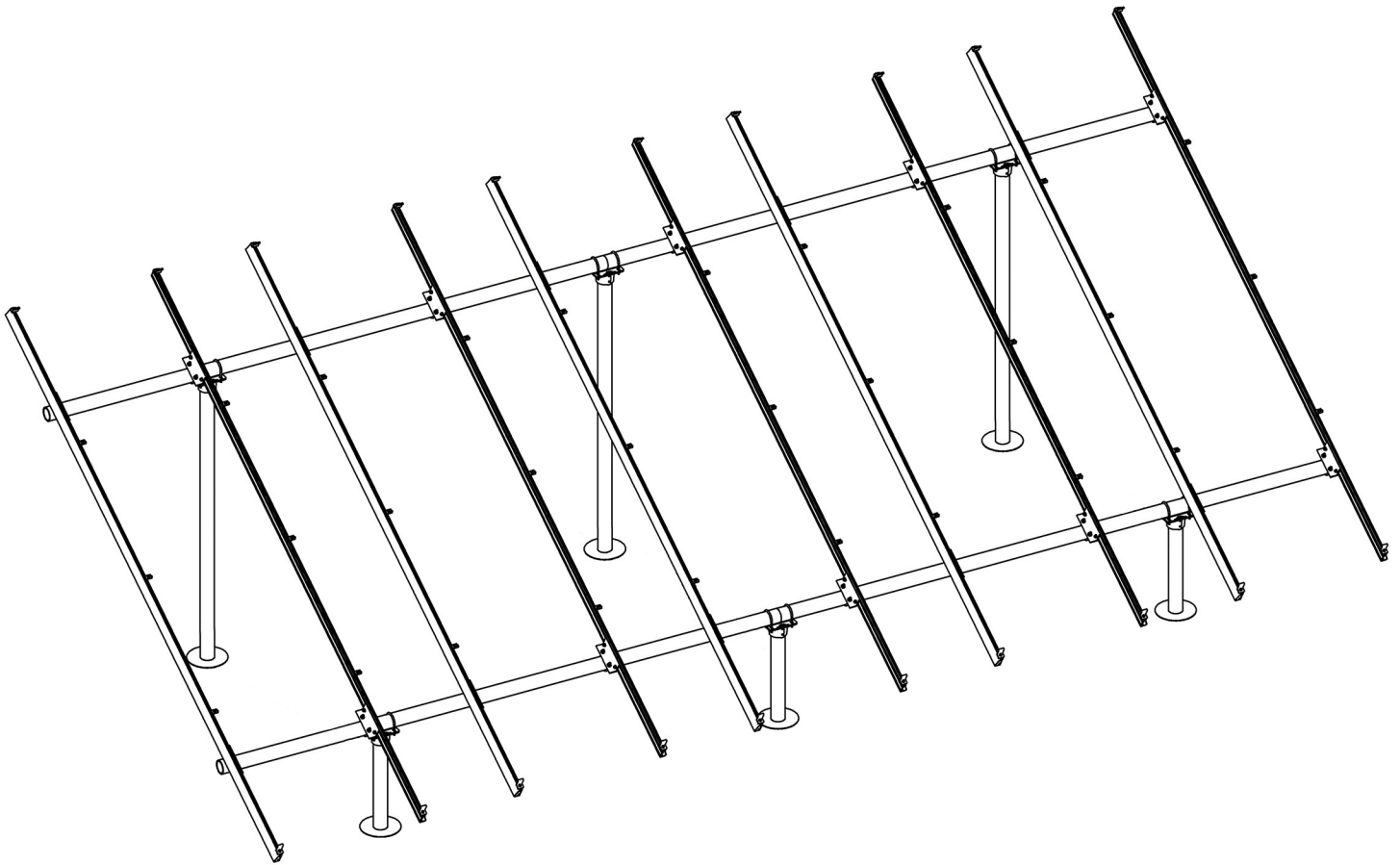


**Classic 150, 200 or 250 MPPT Charge Controllers**

Nominal Battery Voltage	12 Through 72 volts on Classic's
Maximum Output Current	Classic 150 = 96A on 12V, 94A on 24V and 86A on 48V battery Classic 200 = 79A on 12V, 78A on 24+48V and 65A on 72V battery Classic 250 = 61A on 12V, 62A on 24V, 55A on 48V and 43A on 72V battery
PV Open Circuit Voltage VOC <i>(NOTE: See HyperVOC at bottom)</i>	Classic150 = 150V + HyperVOC (battery voltage up to 48V) <i>Example 150V + 48V = 198VOC</i> Classic200 = 200V + HyperVOC (battery voltage up to 48V) Classic250 = 250V + HyperVOC (battery voltage up to 48V) <i>(NOTE: See HyperVOC at bottom)</i>
Power Conversion Efficiency	98% (Typical system)
Maximum Stand-By Self-Consumption (12V)	2.8W - 4W
Reverse Current At Night	Zero - Internal relay for reverse current
Low Battery Voltage	Low Battery voltage disconnect and re-connect of loads fully programmable with 2 Auxiliary outputs to control external load disconnect /re-connect switches
Hyper VOC <i>(NOTE: See HyperVOC at bottom)</i>	Standard all models - Extended VOC range for cold climates
Arc Fault Protection	Standard on Classic, 0.25 second detect and trip speed
Ground Fault Protection	Standard all models - resettable, no fuse to blow
Charging Regulation	Bulk, Absorb, Float as well as Equalization
Battery Voltage Regulation Set Points	10-100VDC
Equalization Charging	Adjustable Voltage and Duration, Manual or Auto
PV Reverse Polarity	Protected to Max VOC ( Classic MPPT Charger Controllers are fully protected from reverse current on both input and output)
Battery Reverse Polarity	Fully protected ( Classic MPPT Charger Controllers are fully protected from reverse current on both input and output)
Battery Over Voltage	Fully protected (Classic MPPT Charger Controllers are fully protected from over current on both input and output)
Battery Short Circuit	Fully protected
Battery Temp Compensation	Automatic when BTS is installed, Adjustable mV per degree C per 2V cell
Programmable Auxiliary Control Output	2 Auxiliary outputs, Aux1 can be 12V out or dry contact, Aux2 is 12V out or Logic IN
Graphic Display	Graphical display
Networking Cabling	Standard 4 conductor phone cable, no hub needed
Communications	ModBus openly published over Ethernet and RS232
Remote Display	Display (MNGP) can be relocated and a second display can be added
Remote Monitoring And Control	Local Application software included allows viewing and control from the network or over the Internet. MyMidNite.com - online status monitoring
Terminal Rating	75 C
Internet Ready	All models
Data Logging	380 days of daily history, 24 hours of data at 5 minute intervals
Wind And Hydro Applications	Standard on all models
Positive Ground Applications	Requires 2 pole input and output breakers
Operating Temperature	Minimum of -40C to 50C - Controller will auto derate as temperature rises above 25C
Environmental Rating	Indoor type IP30 (The Classic is IP22 Rated to 60529 when used with Classic Drip Shield)
Conduit knock Outs	Single 1" conduit (35.05mm) on left and right sides. Two 1" conduit (35.05mm) on bottom. Two 3/4" conduit (27.76mm) on back.
Warranty	5 Year
Weight & Dimensions	12 Lbs. (5.45 kgs) - 14.9" x 6" x 4" (378mm x 152mm x 102mm)
Shipping Dimensions HxWxD	19" x 8.5" x 5.7" (482.6mm x 215.9mm x 144.78mm)
Options	MNGP graphical display, 3ft networking cable
Certifications	Listed by ETL for US & Canada, CE Certified, FCC Class B

**HyperVOC:** A non-operative VOC safety zone over and above the maximum input voltage for cold climates. **NOTE:** Turbine short circuit protection is provided by the additional MidNite Clipper Turbine voltage and speed protection provided when used with MidNite Clipper

# GROUND MOUNT



Released for Permit  
08/24/2020 7:54:56 AM



# CONTENTS

<b>DISCLAIMER</b>	<b>1</b>
<b>RATINGS</b>	<b>2</b>
<b>MARKINGS</b>	<b>2</b>
<b>CHECKLIST</b>	<b>3</b>
<b>1. BUILD BASE</b>	<b>4</b>
<b>2. CONNECT SUBSTRUCTURE</b>	<b>4</b>
<b>3. PLACE RAILS</b>	<b>5</b>
<b>4. SECURE LUGS</b>	<b>5</b>
<b>5. SECURE MODULES</b>	<b>6</b>
<b>CAMO</b>	<b>7</b>
<b>ELECTRICAL DIAGRAM</b>	<b>8</b>
<b>DIAGONAL BRACES (OPTIONAL)</b>	<b>9</b>
<b>END CAPS</b>	<b>9</b>
<b>WIRE CLIPS</b>	<b>9</b>
<b>SPLICING CROSS PIPE</b>	<b>10</b>
<b>MICROINVERTER KITS</b>	<b>11</b>
<b>SYSTEMS USING ENPHASE MICROINVERTERS OR SUNPOWER AC MODULES</b>	<b>11</b>
<b>SYSTEMS USING MICROSTORAGE PRODUCTS</b>	<b>12</b>
<b>FRAMELESS MODULE KITS</b>	<b>12</b>
<b>MODULE COMPATIBILITY</b>	<b>13</b>
<b>MODULE COMPATIBILITY</b>	<b>14</b>
<b>MODULE COMPATIBILITY</b>	<b>15</b>
<b>MODULE COMPATIBILITY</b>	<b>16</b>

## DISCLAIMER

This manual describes proper installation procedures and provides necessary standards required for product reliability. Warranty details are [available on website](#). All installers must thoroughly read this manual and have a clear understanding of the installation procedures prior to installation. Failure to follow these guidelines may result in property damage, bodily injury or even death.

### IT IS THE INSTALLER'S RESPONSIBILITY TO:

- Ensure safe installation of all electrical aspects of the array. All electrical installation and procedures should be conducted by a licensed and bonded electrician or solar contractor. Routine maintenance of a module or panel shall not involve breaking or disturbing the bonding path of the system. All work must comply with national, state and local installation procedures, product and safety standards.
- Comply with all applicable local or national building and fire codes, including any that may supersede this manual.
- Ensure all products are appropriate for the installation, environment, and array under the site's loading conditions.
- Use only IronRidge parts or parts recommended by IronRidge; substituting parts may void any applicable warranty.
- Review the [Design Assistant](#) and [Certification Letters](#) to confirm design specifications.
- Ensure provided information is accurate. Issues resulting from inaccurate information are the installer's responsibility.
- Validate foundation parameters prior to installation, as a local geotechnical report may be required to assess ground conditions. We recommend consulting with a local engineer familiar with local regulations and build site requirements, including soil conditions, terrain and load criteria. All parameters may impact foundation requirements.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, re-tighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.
- Disconnect AC power before servicing or removing modules, AC modules, microinverters and power optimizers.
- Review module manufacturer's documentation for compatibility and compliance with warranty terms and conditions.

Released to Permit

08/24/2020 7:54:56 AM



## RATINGS

### UL 2703 LISTED



#5003225

Intertek

- Conforms to STD UL 2703 (2015) Standard for Safety First Edition: Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels.
- Certified to CSA STD LTR AE-001-2012 Photovoltaic Module Racking Systems.
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 24ft<sup>2</sup>
- Max Frameless Module Size for Canadian LTR-AE: 19.5 ft<sup>2</sup>
- CAMO Specific Allowable Design Load Rating: 50 PSF downward, 50 PSF upward, 15 PSF lateral
- LTR AE Canadian Load Rating: 2400 Pa
- System Level Allowable Design Load Rating: meets minimum requirements of the standard (10 PSF downward, 5 PSF upward, 5 PSF lateral). Actual system structural capacity is defined by PE stamped [certification letters](#).

### CLASS A SYSTEM FIRE RATING PER UL 2703

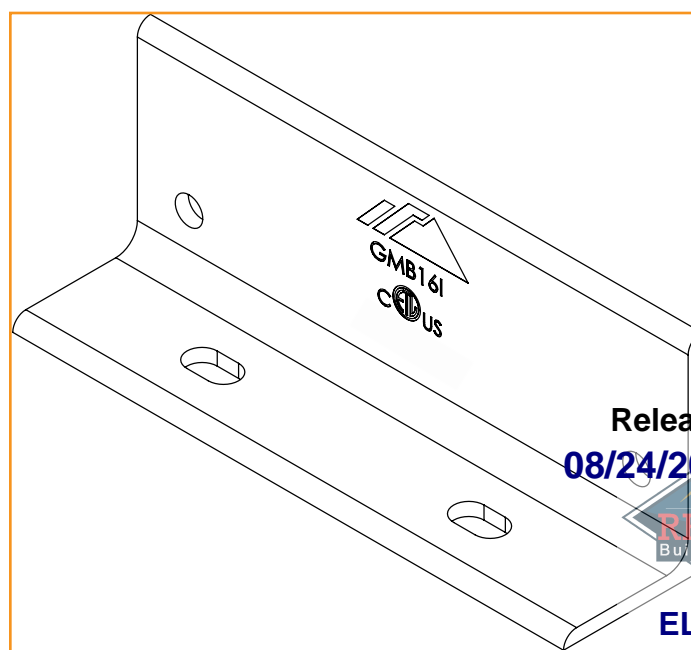
- Not Fire Rated

### STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7

## MARKINGS

Product markings are located on the system's Rail Connectors.



# CHECKLIST

## PRE-INSTALLATION

- Verify module compatibility. See [Page 12](#) for info.
- Purchase 2" or 3" ASTM A53 Grade B Schedule 40 Pipe, galvanized to a min of ASTM A653 G90 or ASTM A123 G35, or 2.375" or 3.500" Allied Mechanical Tubing with Gatorshield or FlowCoat Zinc coating (ASTM A1057).

## TOOLS REQUIRED

- Post Hole Digger or Powered Auger
- Socket Drive (7/16", 9/16", and 1/2" Sockets)
- Torque Wrenches (0-240 in-lbs and 10-40 ft-lbs)
- Transit, String Line, or Laser Level
- 3/16" Allen Head

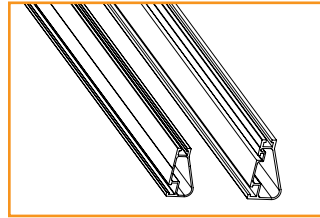
## TORQUE VALUES

- Top Cap Set Screws (3/16" Allen Head)
- Schedule 40 Grade B Pipe: 20 ft-lbs
- 2" Allied Mechanical Tubing: 11 ft-lbs
- 3" Allied Mechanical Tubing: 16 ft-lbs
- Top Cap U-Bolt Nuts (9/16" Socket): 15 ft-lbs
- Rail Connector Bracket Nuts (9/16" Socket): 21 ft-lbs
- Rail Connector U-Bolt Nuts (9/16" Socket): 60 in-lbs
- Grounding Lug Nuts (7/16" Socket): 80 in-lbs
- Grounding Lug Terminal Screws (7/16 Socket): 20 in-lbs
- Universal Fastening Objects (7/16" Socket): 80 in-lbs
- Diagonal Brace Set Screws (1/2" Socket): 15 ft-lbs
- Diagonal Brace Bolts (1/2" Socket): 40 ft-lbs
- Microinverter Kit Nuts (7/16" Socket): 80 in-lbs
- Frameless Module Kit Nuts (7/16" Socket): 80 in-lbs

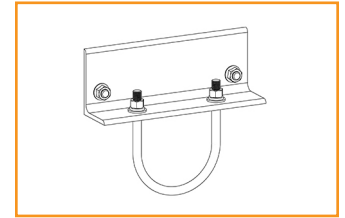
💡 If using previous version of: Integrated Grounding Mid Clamps, Grounding Lug, End Clamps, and Expansion Joints please refer to Alternate Components Addendum (Version 1.30).

💡 If installing on a low slope roof please refer to Ground Mount for Flat Roof Applications Addendum (Version 2.0).

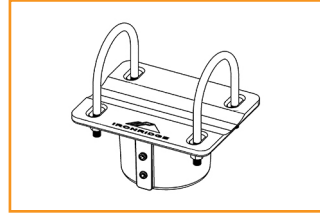
## IRONRIDGE COMPONENTS



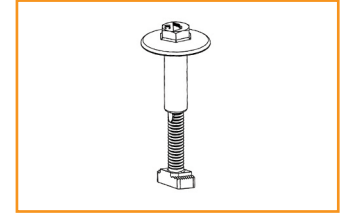
XR100 & XR1000 Rail



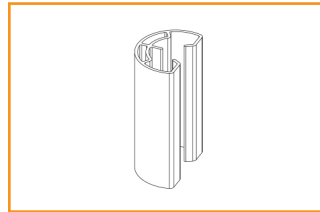
Rail Connector



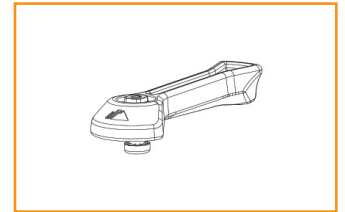
Top Cap



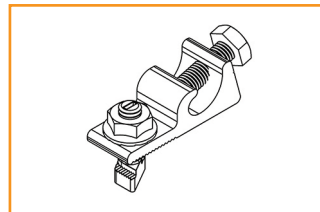
UFO



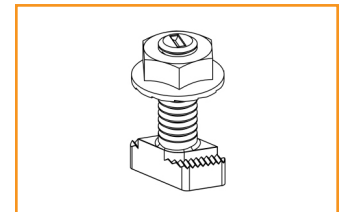
Stopper Sleeve



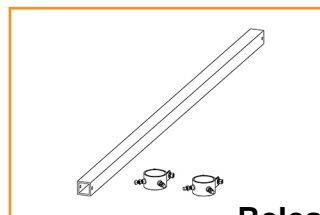
CAMO



Grounding Lug



Microinverter Kit



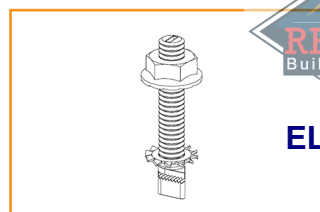
Diagonal Brace



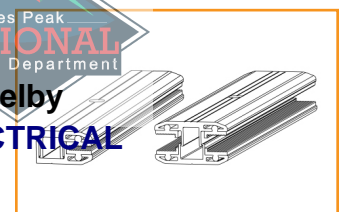
End Cap



Wire Clip



Frameless Module Kit



Frameless End/Mid Clamp

Released for Permit  
08/24/2020 7:54:56 AM

Pikes Peak  
**REGIONAL**  
Building Department  
shelby  
**ELECTRICAL**

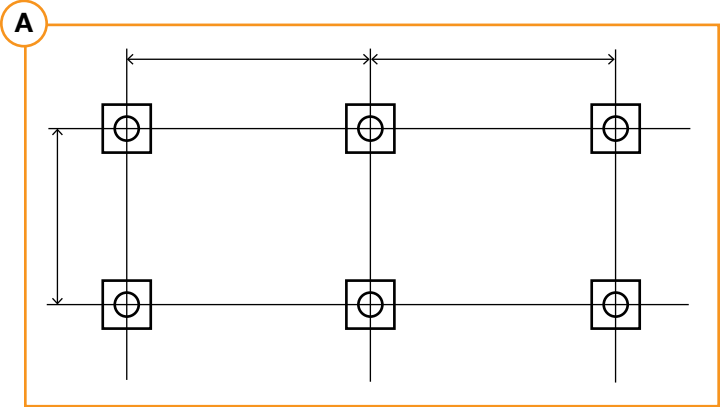


## 1. BUILD BASE

### A. MARK LOCATIONS

Establish pier locations. Once grid of pier locations has been set, verify all angles are square.

💡 Spacing varies with load conditions. Consult engineering specs.

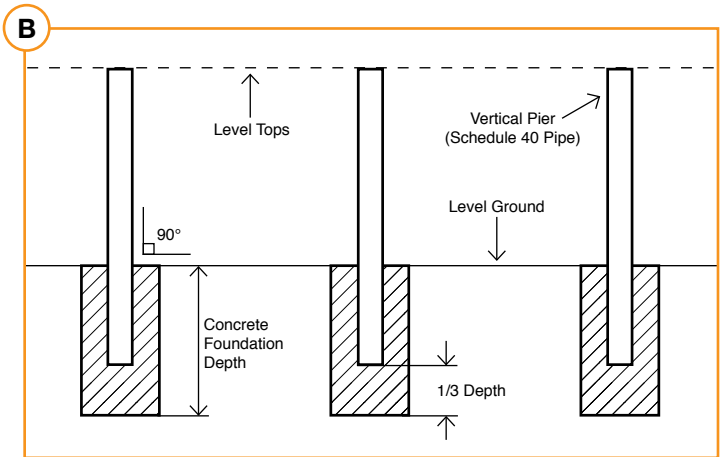


### B. POSITION PIERS

Excavate the foundation holes. Insert vertical piers into foundation holes, and pour in concrete mixture. Ensure vertical piers are plumb, level, square, and placed in parallel rows. Level the tops so they are even.

💡 Brace piers until concrete foundation has cured.

💡 In some cases, cross bracing is required to provide extra support for piers. If required, install [Diagonal Braces](#) at this time.

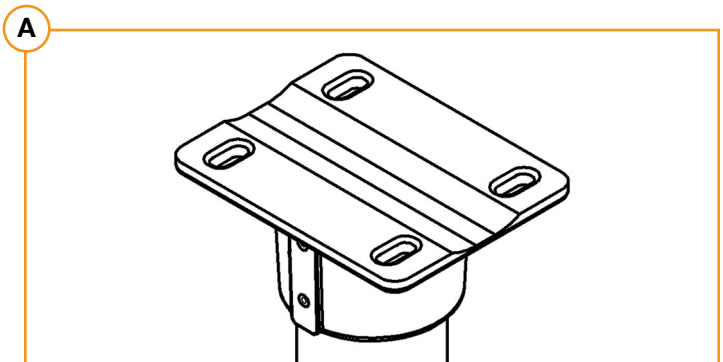


## 2. CONNECT SUBSTRUCTURE

### A. MOUNT TOP CAPS

Mount a Top Cap on each pier. Wait to tighten set screws.

💡 If using [Diagonal Braces](#), install them prior to Top Caps.

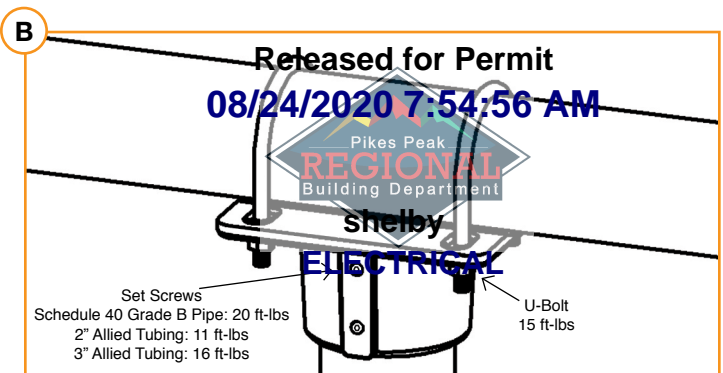


### B. LAY CROSS PIPE

Set cross pipes or tubing in Top Cap grooves. Attach with 3/8" U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolts to **15 ft-lbs** and align assembly.

Torque Top Cap set screws to **20 ft-lbs** for Schedule 40 Grade B Pipe, **11 ft-lbs** for 2" Allied Mechanical Tubing, and **16 ft-lbs** for 3" Allied Mechanical Tubing.

💡 To join more than one section of cross pipe, see [Page 10](#).

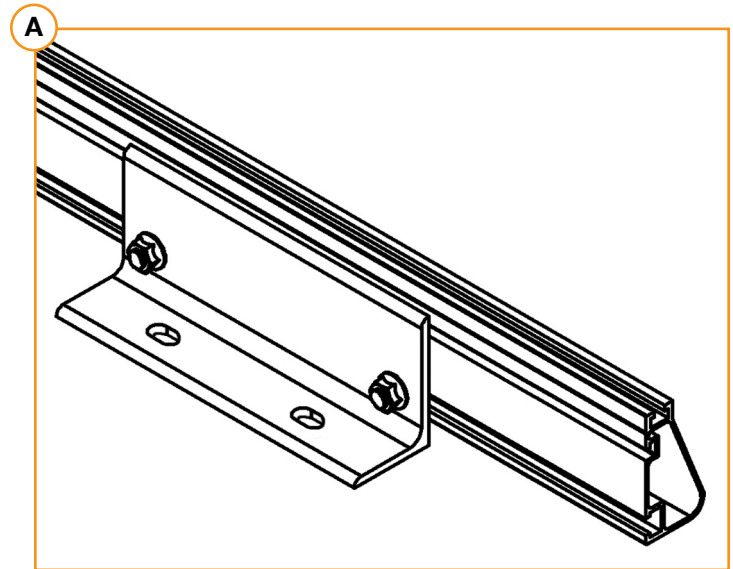


### 3. PLACE RAILS

#### A. ATTACH HARDWARE

On the ground, attach Rail Connector brackets to rail by sliding 3/8"-16 bonding bolts into side slot. Space out to match pier spacing. With brackets in place, finger tighten flange nuts onto bolts.

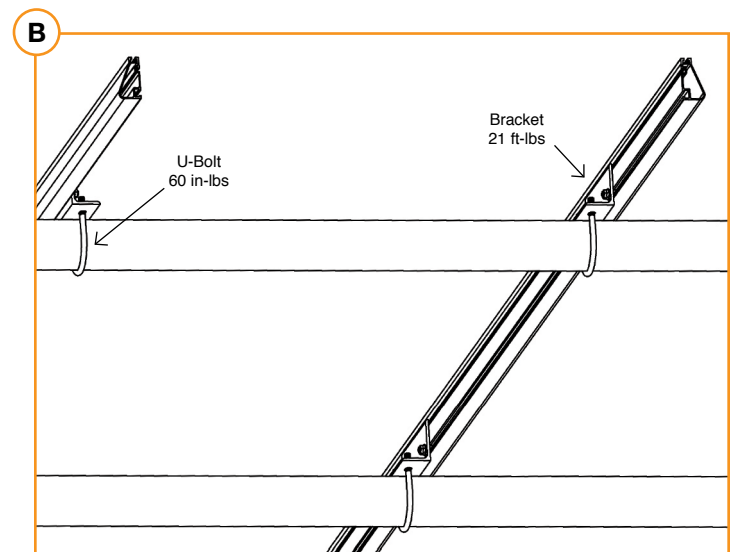
💡 Tape ends of rail, to keep bolts from sliding out while moving.



#### B. FASTEN CONNECTORS

Center rails on cross pipes, leaving equal distance on ends. Secure with Rail Connector hardware: 3/8"-16 U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolt nuts to **60 in-lbs** and bracket to **21 ft-lbs**.

💡 Spacing between rails should align with module manufacturer recommended clamping locations.



### 4. SECURE LUGS

#### GROUNDING LUGS

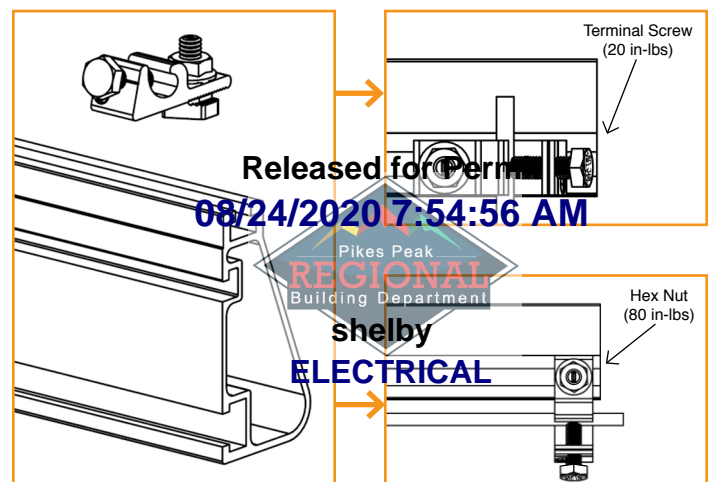
Insert T-bolt in top rail slot and torque hex nut to **80 in-lbs**. Install a minimum 10 AWG solid copper or stranded grounding wire. Torque terminal screw to **20 in-lbs**.

💡 Only one Grounding Lug required per continuous subarray, regardless of subarray size (Unless frameless modules are used, see Page 10).

💡 If using Enphase microinverters or Sunpower AC modules, Grounding Lugs may not be needed. See Page 11 for more info.

💡 Grounding Lugs can be installed anywhere along the rail and in either orientation shown.

💡 Grounding Lugs are intended to for use with one solid or stranded copper wire, conductor size 10-4AWG.



## 5. SECURE MODULES

### A. SECURE FIRST END

Place first module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Fasten module to rail using the UFO, ensuring that the UFO is hooked over the top of the module. Torque to **80 in-lbs**.

- 💡 Ensure rails are square before placing modules.
- 💡 Hold Stopper Sleeves on end while torquing to prevent rotation.
- 💡 If using CAMO instead of UFO + Stopper Sleeve, refer to [Page 7](#) for CAMO installation procedure.

### B. SECURE NEXT MODULES

Place UFO into each rail, placing them flush against first module. Slide second module against UFO. Torque to **80 in-lbs**. Repeat for each following module.

- 💡 When reinstalling UFO, move modules a minimum of 1/16" so UFOs are in contact with a new section of module frame.
- 💡 When UFOs are loosened and re-tightened, ensure UFO T-bolt bottoms out in rail channel before re-torquing UFO to achieve full engagement between T-bolt and rail.
- 💡 If using Wire Clips, refer to [Page 9](#).

### C. SECURE LAST END

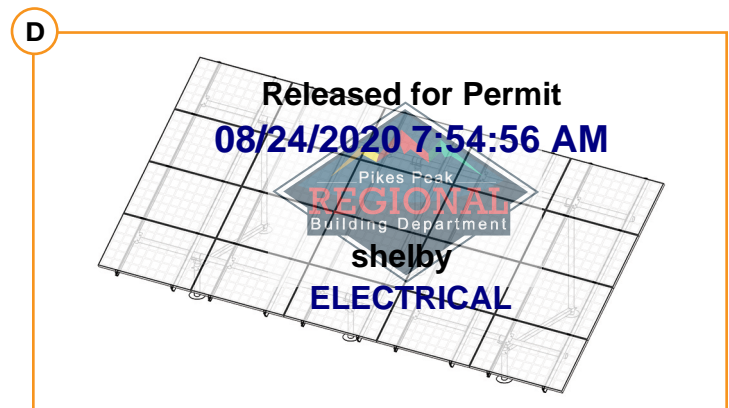
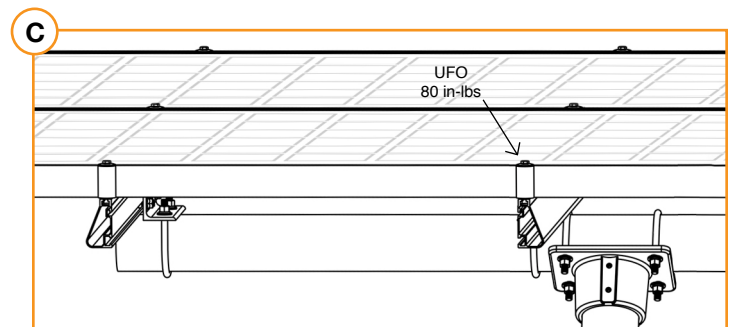
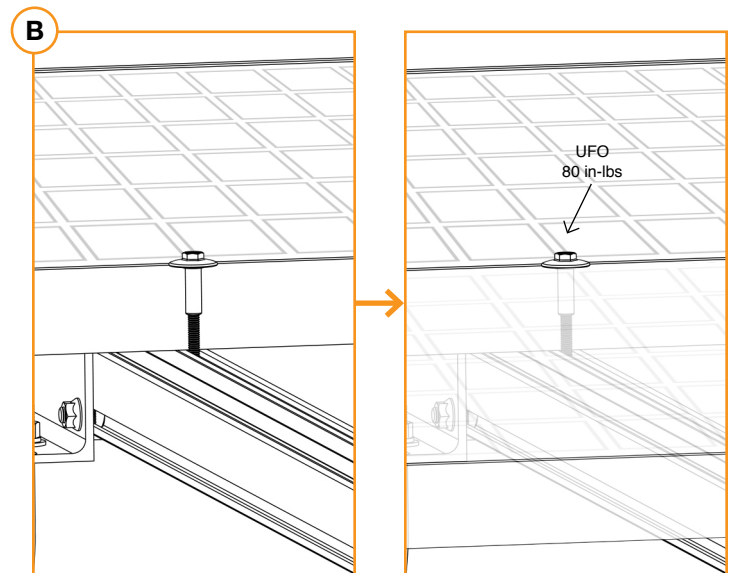
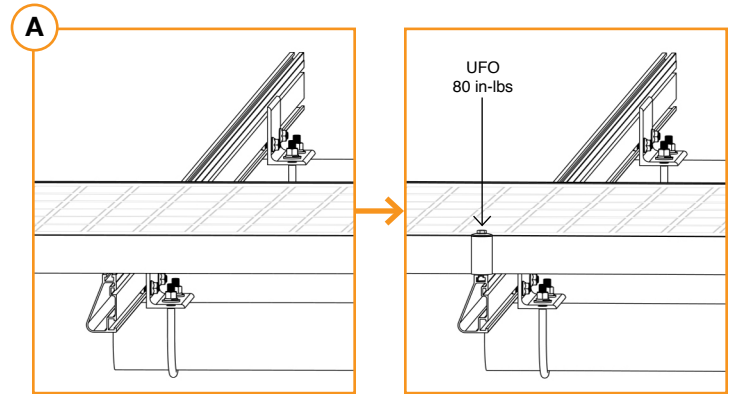
Place last module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Secure UFO Clamps on rails, ensuring they are hooked over top of module. Torque to **80 in-lbs**.

- 💡 Hold Stopper Sleeves on end while torquing to prevent rotation.
- 💡 If using CAMO instead of UFO + Stopper Sleeve, refer to [Page 7](#) for CAMO installation procedure.

### D. REPEAT STEPS

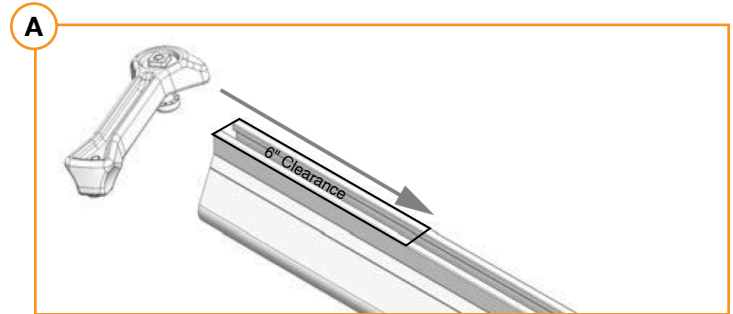
Secure remaining module rows, leaving a minimum 3/8" gap between rows.

- 💡 If using End Caps, refer to [Page 9](#).



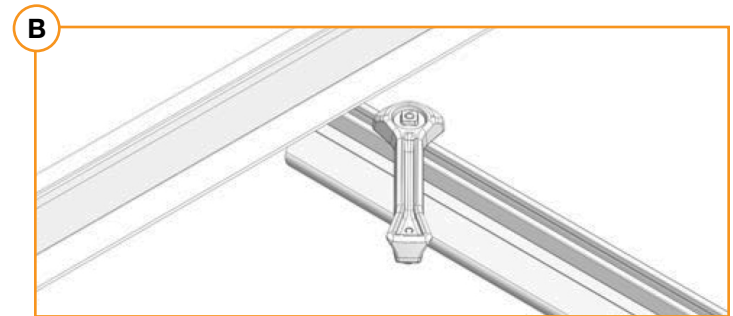
## A. SLIDE INTO RAIL

Slide CAMO into rail channel far enough to clear the module frame. CAMO requires 6" of clearance from end of rail.



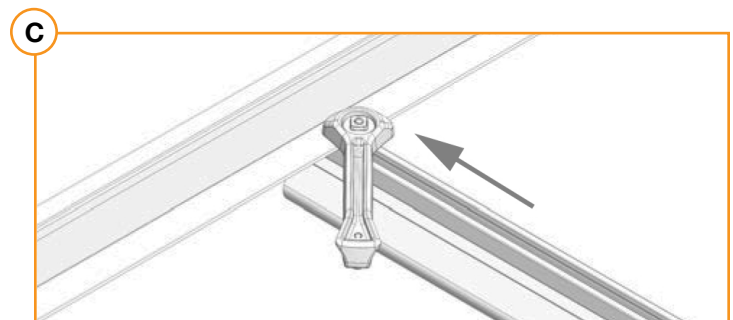
## B. PLACE MODULE

Place module on rails (module cells not shown for clarity). When installing CAMO the module can overhang the rail no more than 1/4".



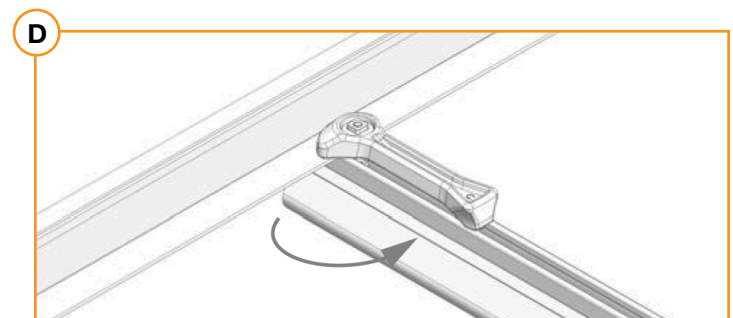
## C. PULL TOWARDS END

Pull CAMO towards rail ends, at 45 degree angle, so the bonding bolt contacts the module flange edge.



## D. SECURE TO FRAME

Rotate handle with an upwards motion until CAMO snaps into rail channel. Ensure CAMO bonding pins are fully seated on top of module frame.

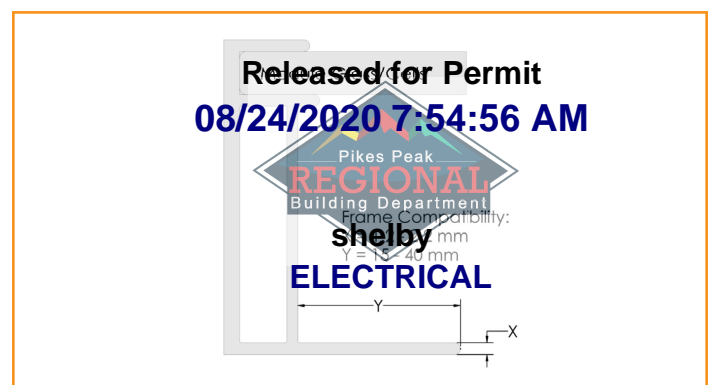


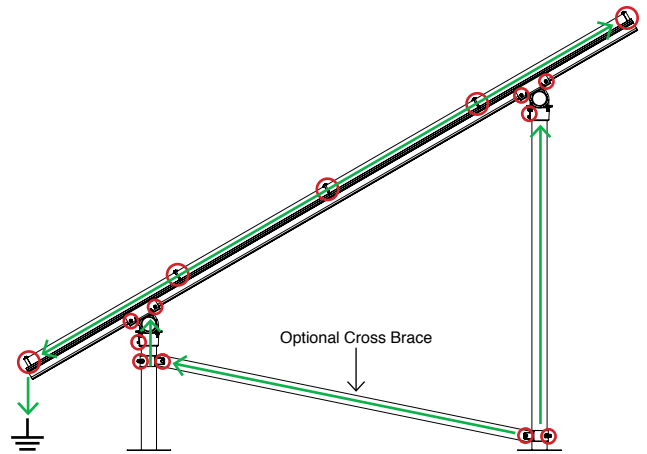
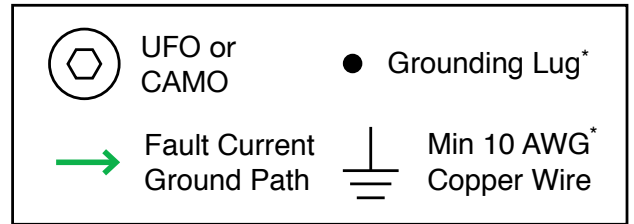
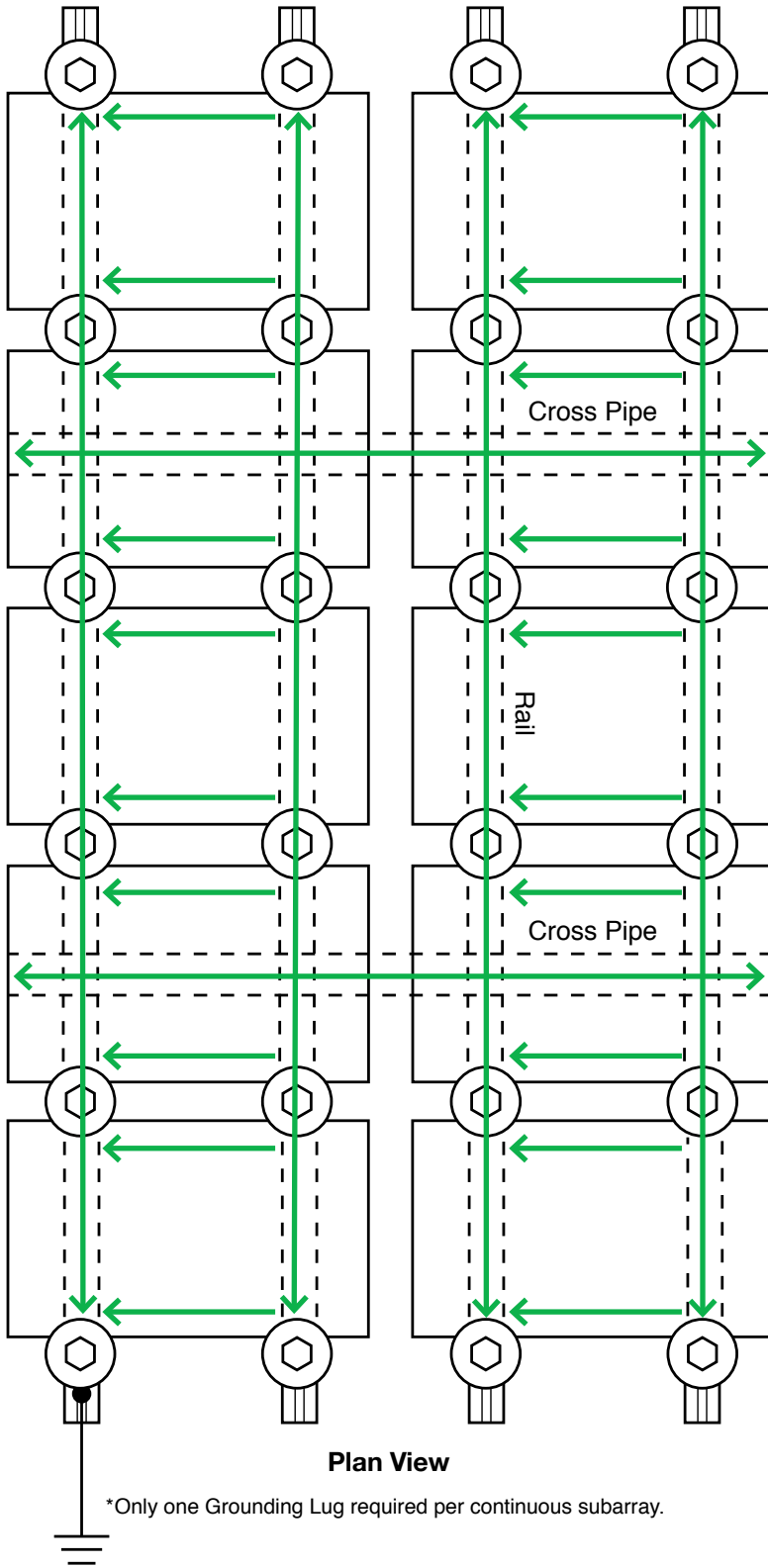
## FRAME COMPATIBILITY

CAMO has been tested or evaluated with all modules listed in the Module Compatibility section having frames within the referenced dimensions. Be sure the specific module being used meets the dimension requirements.

💡 For installations with Hanwha Q CELLS modules with 32 mm frame heights, the maximum ground snow is 45 PSF (33 PSF module pressure).

💡 CAMO is not compatible with Canadian Solar modules.





\*Grounding Lugs and wire are not required in systems using certain Enphase microinverters or certain Sunpower modules. Equipment grounding is achieved with the Engage cable for Enphase or the AC module cable system for Sunpower via their integrated EGC.

Released for Permit  
08/24/2020 7:54:56 AM

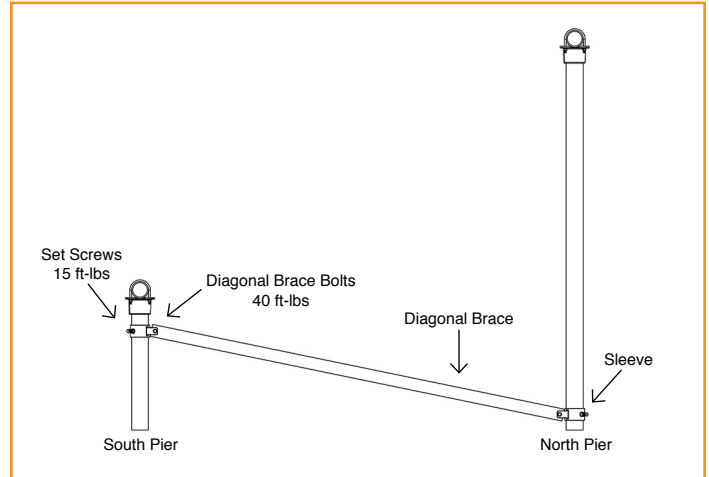


## DIAGONAL BRACES (OPTIONAL)

Slide sleeve on north pier 2-3" above the ground (6" max). Attach Diagonal Brace to sleeve with 1/2" hardware.

Slide second sleeve up on south pier 2-3" below top cap (6" max). Raise Diagonal Brace to align holes in sleeve and brace. Attach hardware and raise sleeve to full extent.

Torque Diagonal Brace bolts to **40 ft-lbs**. Torque set screws to **15 ft-lbs**.



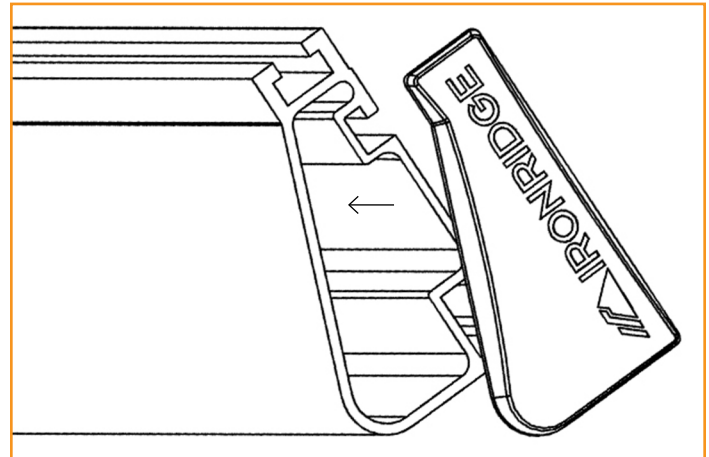
## END CAPS

End Caps add a completed look and keep debris and pests from collecting inside rail.

Firmly press End Cap onto rail end.

💡 End Caps come in sets of left and right. Check that the proper amount of each has been provided.

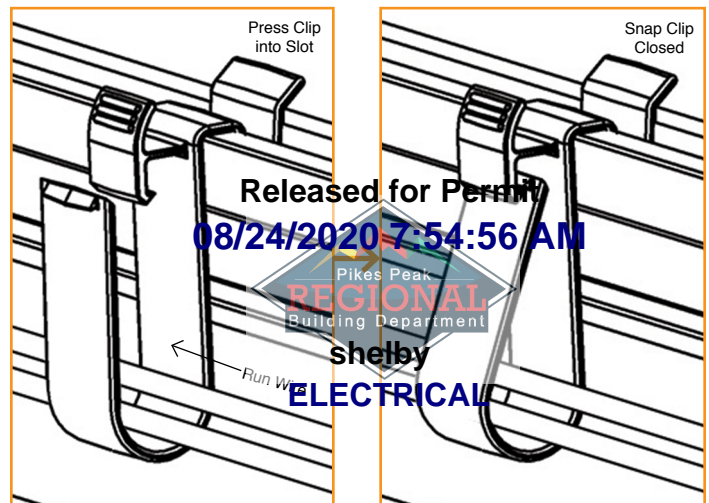
💡 For open-structure installations, you can use adhesive to secure the End Caps.



## WIRE CLIPS

Wire Clips offer a simple wire management solution.

Firmly press Wire Clip into top rail slot. Open clip and insert electrical wire accordingly. Close clip once complete.



# SPLICING CROSS PIPE

The following instructions should be followed, when required, to join more than one section of cross pipe together to ensure bonding is maintained throughout the system.

## A. ALLIED MECHANICAL TUBING SPLICES

Mechanical tube splices shown in the table below shall be of equivalent Allied Flowcoat or Gatorshield zinc coating.

Mechanical Tube Size of the Structure	Splice Tube Size
2.375" OD, 12 Gauge	2.000" OD, 9 Gauge, Minimum 12" Long
3.500" OD, 8 Gauge	3.000" OD, 12 Gauge, Minimum 12" Long

Insert splice tube 6" into first section of cross pipe and secure with 2 self-drilling screws (1/4"-14 x 3/4"), spacing them approximately 1.25" from end of pipe and approximately 3.50" apart, tightening screws to 9 ft-lbs.

Slide second section of cross pipe over splice tube and secure with two more self-drilling screws. Tighten screws to 9 ft-lbs.

⚡ Pre-drill 5/32" pilot holes through cross pipe and splice tube for easier installation of self-drilling screws.

## B. SCHEDULE 40 GRADE B PIPE SPLICES

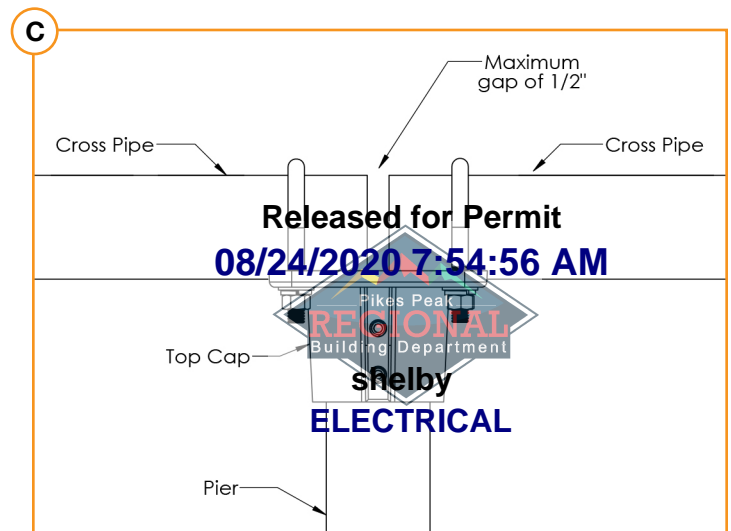
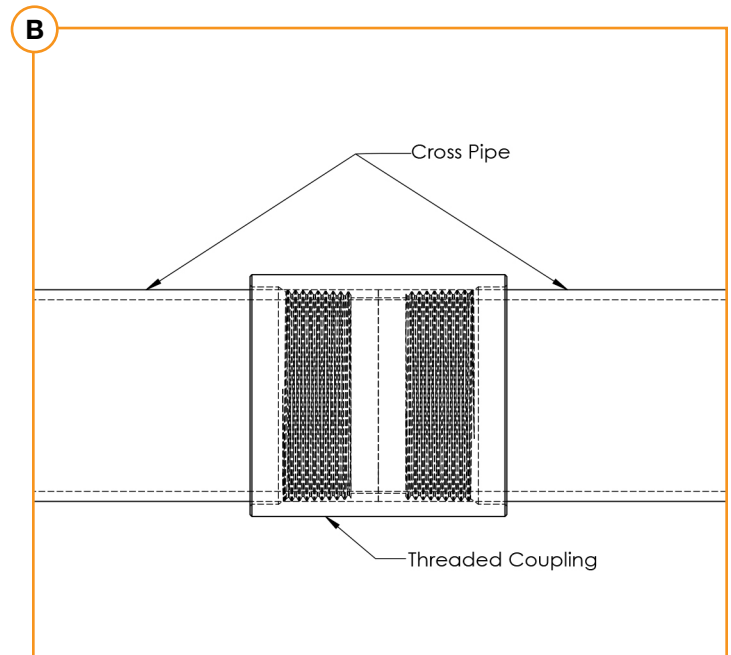
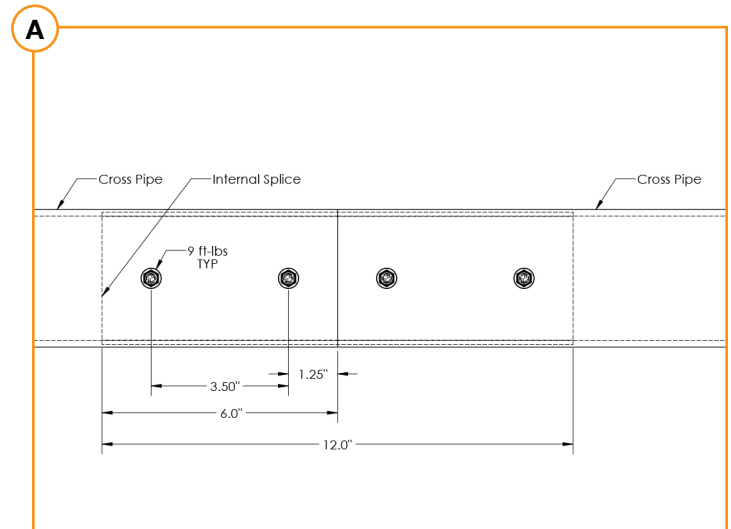
Use galvanized threaded pipe couplings that match the pipe size used for the structure. Threaded Schedule 40 Grade B Pipe must be used when splicing cross pipe together.

Fully thread coupling onto both sections of pipe being spliced together.

⚡ To ensure structural integrity of cross pipes, mechanical tube or coupling splices are not permitted in end spans or in middle 1/3 of interior cross pipe spans.

## C. CROSS PIPES CAN BE JOINED OVER AN INTERIOR TOP CAP WITH A MAXIMUM GAP OF 1/2"

⚡ To avoid potential problems from the effects of thermal expansion, a maximum total continuous cross pipe length of 100 ft is recommended.



## MICROINVERTER KITS

Use IronRidge's Microinverter Kit to bond compatible microinverters and power optimizers to the racking system.

Insert Microinverter Kit T-bolt into top rail slot. Place compatible microinverter or power optimizer into position and tighten hex nut to **80 in-lbs**.

💡 If installing in areas with ground snow loads greater than 40 psf, install MLPE devices directly next to module frame edge

### COMPATIBLE PRODUCTS

#### Enphase

M250-72, 250-60, M215-60, C250-72, S230, S280, IQ 6, IQ 6+, IQ IQ7, IQ 7A, IQ 7+, IQ 7X, Q Aggregator

#### Darfon

MIG240, MIG300, G320, G640

#### Solar Edge

P300, P320, P340, P370, P400, P405, P485, P505, P600, P700, P730, P800p, P800s, P850, P860

#### SMA

RoofCommKit-P2-US, TS4-R Module Retrofit Kits (TS4-R-S, TS4-R-O, TS4-R-F)

#### Tigo

Tigo Access Point (TAP), TS4-R-X (where X can be O, S, F, or M), TS4-R-X-DUO (where X can be O, S, or M), TS4-A-F, TS4-A-2F, TS4-A-O, TS4-A-O-DUO

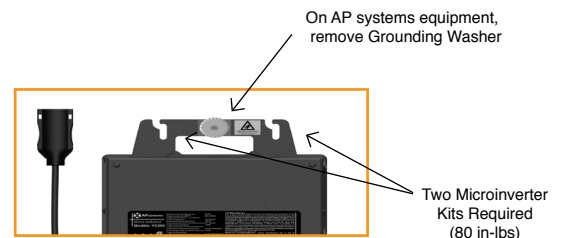
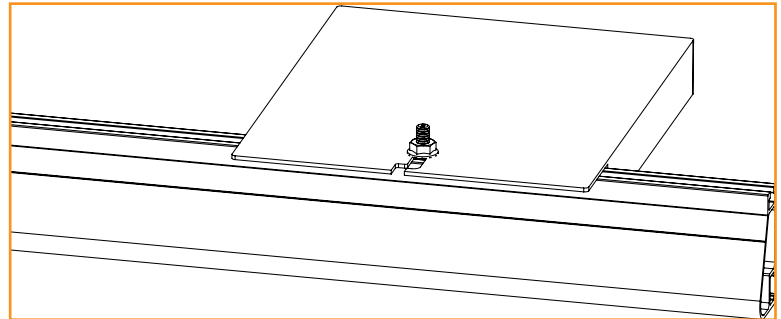
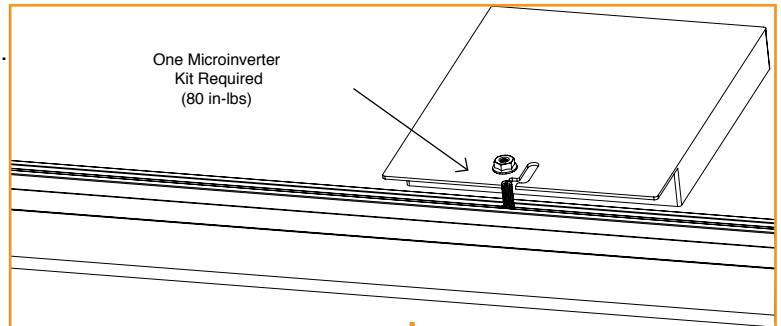
#### AP Systems

QS1, YC600

💡 Remove Grounding Washer on AP Systems QS1 and YC600 inverters before installing to XR rails.

💡 Remove the Stainless Steel Clip on Tigo-"A" MLPE Devices before attaching to XR rails.

💡 Use the number of IronRidge Microinverter kits allowed by the MLPE mounting flange. Some will require 1 kit and others 2 kits.



## SYSTEMS USING ENPHASE MICROINVERTERS OR SUNPOWER AC MODULES

IronRidge systems using approved Enphase products or SunPower modules eliminate the need for lay-in lugs and field installed equipment grounding conductors (EGC). This solution meets the requirements of UL 2703 for bonding and grounding and is included in this listing.

### COMPATIBLE PRODUCTS

#### Sunpower

Modules with model identifier Ab-xxx-YY and InvisiMount (G5) 46mm frame; where "A" is 16, 17, 18, 19, 20, 21, or 22; and "YY" can be C-AC, D-AC, BLK-C-AC, or BLK-D-AC.

#### Enphase

Microinverters M250-72, M250-60, M215-60, C250-72, and Engage cables ETXX-240, ETXX-208, ETXX-277

💡 A minimum of two inverters mounted to the same rail and connected to the same Engage cable are required.

💡 The microinverters or Sunpower AC modules must be used with a maximum 20 A branch rated overcurrent protection device (OCPD).

💡 If an AC module is removed from a circuit for maintenance, you must first disconnect AC power and then install a temporary EGC to bridge the gap by inserting an AC extension cable (or via other NEC-compliant means), in order to maintain effective ground continuity to subsequent modules.

Released for Permit

06/24/2020 7:54:57 AM





## SYSTEMS USING MICROSTORAGE PRODUCTS

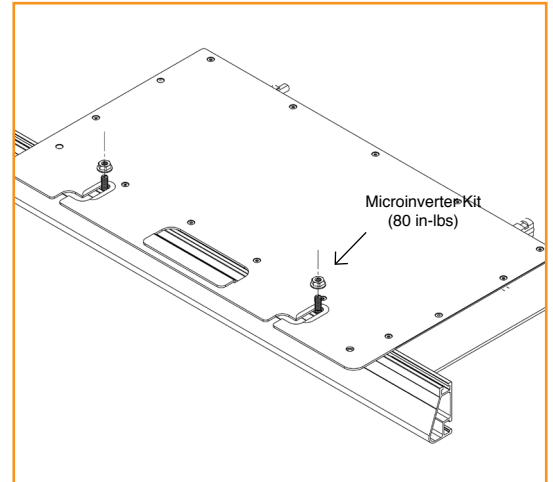
Use IronRidge's Microinverter Kit to bond compatible microstorage devices to the racking system. Insert Microinverter Kit T-bolt into top rail slot. Place compatible microstorage into position and tighten hex nut to **80 in-lbs**.

### COMPATIBLE PRODUCTS

#### PHAZR

PHAZR Devices PHAZR-X, where X is 6-12.

- 💡 Running a separate equipment grounding conductor to the PHAZRs is not required.
- 💡 If installing in areas with ground snow loads greater than 40 psf and underneath a module, install PHAZR devices as close as possible to module frame edge.
- 💡 Use the number of IronRidge Microinverter kits allowed by the microstorage mounting flange. Some will require 1 kit and others 2 kits.



## FRAMELESS MODULE KITS

Insert Frameless Kit T-bolt in top rail slot. Place star washer over T-bolt, allowing it to rest on top of rail. Secure module clamps with a hex nut and torque to **80 in-lbs**.

### COMPATIBLE PRODUCTS

#### Sunforson

Sunforson silver or black SFS-UTMC-200(B) mid and SFS-UTEC-200(B) end clamps.

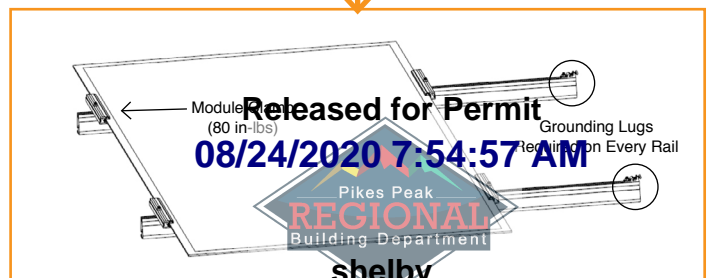
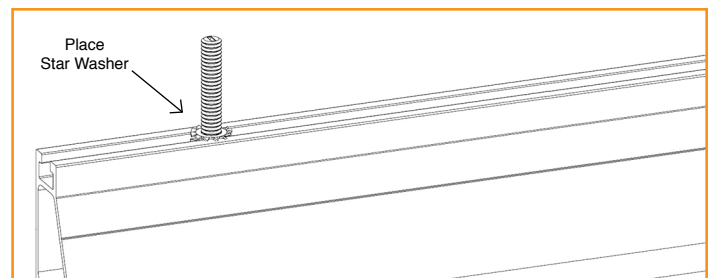
#### Sunpreme

Sunpreme silver or black mid and end clamps with part numbers 7500105X where "X" is 1, 5, 6 or 7.

#### Ironridge

IronRidge silver or black mid and end clamps with part numbers FMLS-XC-001-Y where "X" is E or M and "Y" is B or blank.

- 💡 Follow module manufacturer's installation instructions to install the module clamps.
- 💡 Frameless modules require using a Grounding Lug on every rail.
- 💡 For Sunpreme Modules Only: If required to use slide prevention hardware, see Module Slide Prevention Addendum (Version 1.10).



Released for Permit  
08/24/2020 7:54:57 AM

Pikes Peak  
REGIONAL  
Building Department  
shelby  
ELECTRICAL

## MODULE COMPATIBILITY

The Ground Mount System may be used to ground and/or mount a PV module complying with UL 2703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, "xxx" refers to the module power rating and both black and silver frames are included in the certification.

MAKE	MODELS
Amerisolar	Amerisolar modules with 35, 40 and 50 mm frames AS-bYxxxZ Where "b" can be 5 or 6; "Y" can be M, P, M27, P27, M30, or P30; "xxx" is the module power rating; and "Z" can be blank, W or WB
Aptos	Aptos modules with 35 and 40 mm frames DNA-yy-zz23-xxx Where "yy" can be 120 or 144; "zz" can be MF or BF; and "xxx" is the module power rating
Astronergy Solar	Astronergy modules with 30, 35, 40 and 45 mm frames aaSMbbyyC/zz-xxx Where "aa" can be CH or A; "bb" can be 60, 66, or 72; "yy" can be blank, 10 or 12; "C" can M, P, M(BL), M-HC, M(BL)-HC, P-HC, M(DG), or M(DGT); "zz" can be blank, HV, F-B, or F-BH ; and "xxx" is the module power rating Astronergy frameless modules CHSM6610P(DG)-xxx Where "xxx" is the module power rating
ASUN	ASUN modules with 35 and 40 mm frames ASUN-xxx-YYZZ-aa Where "xxx" is the module power rating; "YY" can be 60 or 72; "ZZ" can be M, or MH5; and "aa" can be blank or BB
Auxin	Auxin modules with 40 mm frames AXN6y6zAxxx Where "y" can be M or P; "z" can be 08, 09, 10, 11, or 12; "A" can be F or T; and "xxx" is the module power rating
Axitec	Axitec Modules with 35 and 40 mm frames AC-xxxY/aaZZb Where "xxx" is the module power rating; "Y" can be M, P or MH; "aa" can be blank, 125- or 156-; "ZZ" can be 54, 60, 72, 120, or 144; "b" can be S or SB
Boviet	Boviet modules with 35 and 40mm frames BVM66aaYY-xxxBB Where "aa" can be 9, 10 or 12; "YY" is M or P; "xxx" is the module power rating; and "BB" can be blank or L
BYD	BYD modules with 35 mm frames BYDxxxAY-ZZ Where "xxx" is the module power rating; "A" can be M6, P6, MH or PH; "Y" can be C or K; and "ZZ" can be 30 or 36
Canadian Solar	Canadian Solar modules with 30, 35 and 40 mm frames CSbY-xxxZ Where "b" can be 1, 3 or 6; "Y" can be H, K, P, U, V, W, or X; "xxx" refers to the module power rating; and "Z" can be M, P, MS, PX , M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, or MS-SD Canadian Solar frameless modules CSbY-xxx-Z Where "b" can be 3 or 6; "Y" is K, P, U, or X; "xxx" is the module power rating, and "Z" can be M-FG, MS-FG, P-FG, MB-FG, or PB-FG
CertainTeed	CertainTeed modules with 35 and 40 frames CTxxxYZZ-AA Where "xxx" is the module power rating; "Y" can be M, P or HC; "ZZ" can be 00,01, 10, or 11; and "AA" can be 01, 02, 03 or 04
CSUN	Csun modules with 35 and 40 mm frames YYxxx-zzAbb Where "YY" is CSUN or SST; xxx is the module power rating; "zz" is blank, 60, or 72; and "A" is blank, P or M; "bb" is blank, BB, BW, or ROOF
Ecosolargy	Ecosolargy modules with 35, 40 and 50 mm frames ECOxxxYzzA-bbD Where "xxx" is the module power rating; "Y" can be A, H, S, or T; "zz" can be 125 or 156; "A" can be M or P; "bb" can be 60 or 72; and "D" can be blank or B

Released for Permit  
**08/24/2020 7:54:57 AM**  
  
**shelby**  
**ELECTRICAL**

## MODULE COMPATIBILITY

ET Solar	ET Solar modules with 35, 40 and 50 mm frames ET-Y6ZZxxxAA Where “Y” can be P, L, or M; “ZZ” can be 60 or 72; “xxx” refers to the module power rating; and “AA” can be WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC
Flex	Flex modules with 35, 40 and 50 mm frames and model identifier FXS-xxxYY-ZZ; where “xxx” is the module power rating; “YY” can be BB or BC; and “ZZ” can be MAA1B, MAA1W, MAB1W, SAA1B, SAA1W, SAC1B, SAC1W, SAD1W, SBA1B, SBA1W, SBC1B, or SBC1W
GCL	GCL modules with 35 mm and 40 mm frames GCL-ab/YY xxx Where “a” can be M or P; “b” can be 3 or 6; “YY” can be 60, 72, 72H, or 72DH; and xxx is the module power rating
GigaWatt Solar	Gigawatt modules with 40 mm frames GWxxxYY Where “xxx” refers to the module power rating; and “YY” can be either PB or MB
Hansol	Hansol modules with 35 and 40 frames HSxxxYY-zz Where “xxx” is the module power rating; “YY” can be PB, PD, PE, TB, TD, UB, UD, or UE; and “zz” can be AH2, AN1, AN3, AN4, HV1, or JH2
Hanwha Solar	Hanwha Solar modules with 40, 45, and 50 mm frames HSLaaP6-YY-1-xxxZ Where “aa” can be either 60 or 72; “YY” can be PA or PB; “xxx” refers to the module power rating; and “Z” can be blank or B
Hanwha Q CELLS	Hanwha Q CELLS Modules with 32, 35, 40, and 42mm frames and model identifier aaYY-ZZ-xxx where “aa” can be Q. or B.; “YY” can be PLUS, PRO, PEAK, LINE PRO, LINE PLUS, PLUS DUO or PEAK DUO; and “ZZ” can be G3, G3.1, G4, G4.1, L-G2, L-G2.3, L-G3, L-G3.1, L-G3y, L-G4, L-G4.2, L-G4y, LG4.2/TAA, BFR-G3, BLK-G3, BFR-G3.1, BLK-G3.1, BFR-G4, BFR-G4.1, BFR G4.3, BLK-G4.1, G4/SC, G4.1/SC, G4.1/TAA, G4.1/MAX, BFR G4.1/TAA, BFR G4.1/MAX, BLK G4.1/TAA, BLK G4.1/SC, EC-G4.4, G5, BLK-G5, L-G5, L-G5.1, L-G5.2, L-G5.2/H, L-G5.3, G6, G6+, BLK-G6, L-G6, L-G6.1, L-G6.2, L-G6.3, G7, BLK-G6+, BLK-G7, G7.2, G8, BLK-G8, G8+, BLK-G8+ L-G7, L-G7.1, L-G7.2, L-G7.3, L-G8, L-G8.1, L-G8.2, or L-G8.3; and “xxx” is the module power rating
Heliene	Heliene modules with 40 mm frames YYZZxxxA Where “YY” can be 36, 60, 72, or 96; “ZZ” can be M, P, or MBLK; “xxx” is the module power rating; and “A” can be blank, HomePV, or Bifacial
HT-SAAE	HT-SAAE modules with 40 mm frames HT72-156Z-xxx Where “Z” can be M, P, M-C, P-C, M(S), M(VS), M(V), P(V), M(V)-C, P(V)-C; and “xxx” is the module power rating
Hyundai	Hyundai modules with 33, 35, 40 and 50 mm frames HiY-SxxxZZ Where “Y” can be A, D, M or S; “xxx” refers to the module power rating; and “ZZ” can be HG, HI, KI, MI, MF, MG, RI, RG, RG(BF), RG(BK), SG, TI, or TG
Itek	Itek Modules with 40 and 50 mm frames IT-xxx-YY Where “xxx” is the module power rating; and “YY” can be blank, HE, or SE, or SE72
JA Solar	JA Solar modules with 30, 35, 40 and 45 mm frames JAyyzz-bbww-xxx/aa Where “yy” can be M, P, M6 or P6; “zz” can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); “bb” can be 48, 60, or 72; “ww” can be D09, S01, S02, S03, S06, S09, or S10; “xxx” is the module power rating; and “aa” can be BP, MP, SI, SC, PR, 3BB, 4BB, 4BB/RE, 5BB
Jinko	Jinko modules with 35 and 40 mm frames JKMYxxxZZ-aa Where “Y” can either be blank or S; “xxx” is the module power rating; “ZZ” can be M, P, or PP; and “aa” can be blank, 60, 60B, 60H, 60L, 60BL, 60HL, 60HBL, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 72, 72-V, 72H-V, 72L-V, 72HL-V, 72-MX, 72H-BDVP, or 72HL-TV Jinko frameless modules JKMxxxPP-DV Where “xxx” is the module power rating
Kyocera	Kyocera Modules with 46mm frames KYxxxZZ-AA Where “Y” can be blank, L, P, or S; “ZZ” is the module power rating; “ZZ” can be blank, GX, or SX; and “AA” can be LPU, LEU, UPU, LPS, LPB, LFR, LFB, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5CC, 5DC, 5FC, 5B, 5C, 5MCA, or 6MPA
LG	LG modules with 35, 40, and 46 mm frames LGxxxYaZ-bb Where “xxx” is the module power rating; “Y” can be A, E, N, Q, S; “a” can be 1 or 2; “Z” can be C, K, T, or W; and “bb” can be A3, A5, B3, G3, G4, J5, K4, or V5
Longi	Longi modules with 30, 35 and 40 mm frames LRA-YYZZ-xxxM Where “Y” can be blank or 6; “YY” can be blank, 60 or 72; “ZZ” can be blank, BK, BP, HV, PB, PE, PH, HBD, HPB, or HPH; “xxx” is the module power rating

Released for Permit  
 08/24/2020 7:54:48 AM  
 Pikes Peak  
 ELECTRICAL  
 shelby

## MODULE COMPATIBILITY

Mission Solar	Mission Solar modules with 33 and 40 mm frames MSEbbxxxZZaa Where “bb” can be blank or 60A; “xxx” is the module power rating; “ZZ” can be blank, MM, SE, SO, SQ, SR, or TS; and “aa” can be blank, 1J, 4J, 4S, 5K, 5T, 60, 6J, 6S, 6W, 8K, 8T, or 9S
Mitsubishi	Mitsubishi modules with 46 mm frames PV-MYYxxxZZ Where “YY” can be LE or JE; xxx is the module power rating; and “ZZ” can be either HD, HD2, or FB
Motech	IM and XS series modules with 40, 45 and 50 mm frames
Neo Solar Power	Neo Solar Power modules with 35 mm frames D6YxxxZZaa Where “Y” can be M or P; xxx is the module power rating; “ZZ” can be B3A, B4A, E3A, E4A, H3A, H4A; and “aa” can be blank, (TF), ME or ME (TF)
Panasonic	Panasonic modules with 35 and 40 mm frames VBHNxxxYYzzA Where “xxx” refers to the module power rating; “YY” can be either KA, RA, SA or ZA; “zz” can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and “A” can be blank, E, G, or N
Peimar	Peimar modules with 40 mm frames SbxxxYzz Where “b” can be G or P; “xxx” is the module power rating; “Y” can be M or P; and “zz” can be blank, (BF), or (FB)
Phono Solar	Phono Solar modules with 35, 40, and 45 mm frames PSxxxY-ZZ/A Where xxx refers to the module power rating; “Y” can be M, M1, MH, or M1H or P; “ZZ” can be 20 or 24; and “A” can be F, T, U, or TH
Prism Solar	Prism Solar frameless modules BiYY-xxxBSTC Where “YY” can be 48, 60, 60S, 72 or 72S; and “xxx” is the module power rating
REC Solar	REC modules with 30, 38 and 45 mm frames RECxxxYYZZ Where “xxx” is the module power rating; “YY” can be AA, M, NP, PE, PE72, TP, TP2, TP2M, TP2SM, or TP2S; and “ZZ” can be blank, Black, BLK, BLK2, SLV, or 72
Renesola	ReneSola modules with 35, 40 and 50 mm frames AAxxxY-ZZ Where “AA” can be SPM(SLP) or JC; “xxx” refers to the module power rating; “Y” can be blank, F, M or S; and “ZZ” can be blank, Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bbh, Bbh-b, Bbv, Bbv-b, Db, Db-b, or 24/Bb
Renogy	Renogy Modules with 40 and 50 mm frames RNG-xxxY Where “xxx” is the module power rating; and “Y” can be D or P
Risen	Risen Modules with 35 and 40 mm frames RSMyy-6-xxxZZ Where “yy” can be 60, 72, 120 or 144; “xxx” is the module power rating; and “ZZ” can be M or P Frameless modules RSMyy-6-xxxZZ Where “yy” can be 60, 72, 120 or 144; “xxx” is the module power rating; and “ZZ” can be MDG or PDG
S-Energy	S-Energy modules with 40 frames SNxxxY-ZZ Where “xxx” is the module power rating; “Y” can be M or P; and “ZZ” can be 10, or 15
Seraphim Energy Group	Seraphim modules with 35 and 40 mm frames SEG-aYY-xxxZZ Where “a” can be blank, 6 or B; “YY” can be blank, MA, MB, PA, or PB; “xxx” is the module power rating; and “ZZ” can be blank, BB, BG, BW, HV, WB, WW, BMB, BMB-HV
Seraphim USA	Seraphim modules with 40 and 50 mm frames SRP-xxx-6YY Where “xxx” is the module power rating; and “YY” can be MA, MB, PA, PB, QA-XX-XX, and QB-XX-XX
Sharp	Sharp modules with 35 and 40 mm frames NUYYxxx Where “YY” can be SA or SC; and “xxx” is the module power rating
Silfab	Silfab Modules with 38 mm frames SYZ-xxxAb Where “YY” can be IL, SA, LA, SG or LG; “Z” can be blank, M, P, or X; “A” can be blank, B, H, M, or N; and “b” can be blank, M, P, or X
Solaria	Solaria modules with 40 mm frames PowerXT xxxY-ZZ Where “Y” can be blank, M, P, or X; “ZZ” can be blank, R or C; and “ZZ” can be AC, BD, BX, BY, PD, PX, PZ, WX or WZ
Solarcity (Tesla)	Solarcity modules with 40 mm frames SCxxxYY Where “xxx” is the module power rating; and “YY” can be blank, B1 or B2
SolarTech	SolarTech modules with 42 mm frames STU-xxxYY Where “xxx” is the module power rating; and “YY” can be PERC or HJT

Released for Permit

08/24/2020 7:54:57 AM

Pikes Peak  
Building Department

shelby  
ELECTRICAL

## MODULE COMPATIBILITY

SolarWorld AG / Industries GmbH	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 31, 33 or 46 mm frames SW-xxx Where "xxx" is the module power rating
SolarWorld Americas Inc.	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 33 mm frames SWA-xxx Where "xxx" is the module power rating
Stion	Stion Thin film modules with 35 mm frames STO-xxx or STO-xxxA Thin film frameless modules STL-xxx or STL-xxxA Where "xxx" is the module power rating
SunEdison	SunEdison Modules with 35, 40 and 50 mm frames SE-YxxxZABCDE Where "Y" can be B, F, H, P, R, or Z; "xxx" refers to the module power rating; "Z" can be 0 or 4; "A" can be B,C,D,E,H,I,J,K,L,M, or N ; "B" can be B or W; "C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2
Suniva	Suniva modules with 35, 38, 40, 46 and 50 mm frames OPTxxx-AA-B-YYY-Z MVXxxx-AA-B-YYY-Z Where "xxx" is the module power rating; "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B
Sunpower	Sunpower standard (G3 or G4) or InvisiMount (G5) 40 and 46 mm frames SPR-Zb-xxx-YY Where "Z" is either A, E, P or X; "b" can be blank, 17, 18, 19, 20, 21, or 22; "xxx" is the module power rating and "YY" can be blank, BLK, COM, C-AC, D-AC, E-AC, G-AC, BLK-C-AC, or BLK-D-AC
Sunpreme	Sunpreme frameless modules GXB-xxxYY Where "xxx" is the module power rating; and "YY" can be blank or SL
Sunspark	Sunspark modules with 40 mm frames SYY-xxxZ Where "YY" can be MX or ST; "xxx" is the module power rating; and "Z" can be M, P or W
Suntech	Vd, Vem, Wdb, Wde, and Wd series modules with 35, 40 and 50 mm frames
Talesun	Talesun modules with 35 and 40 frames TP6yZZaaxx-b Where "yy" can be blank, F or H; "ZZ" can be 60 or 72; "aa" can be M or P; and "b" can be blank, B, T, or (H)
Trina	Trina Modules with 30, 35, 40 and 46mm frames TSM-xxxYYZZ Where "xxx" is the module power rating; "YY" can be DD05, DD06, DD14, DE14, DE15, DEG15, PA05, PC05, PD05, PD06, PA14, PC14, PD14, PE14, or PE15 ; and "ZZ" can be blank, .05, .08, .10, .18, .08D, .18D, 0.82, .002, .00S, 05S, 08S, A, A.05, A.08, A.10, A.18, A(II), A.05(II), A.08(II), A.082(II), A.10(II), A.18(II), H, H(II), H.05(II), H.08(II), HC.20(II), HC.20(II), or M Frameless modules TSM-xxxYY Where "YY" can be either DEG5(II), DEG5.07(II), DEG5.40(II), DEG5.47(II), DEG14(II), DEG14C(II), DEG14C.07(II), DEG14.40(II), PEG5, PEG5.07, PEG5.40, PEG5.47, PEG14, or PEG14.40
URE	URE modules with 35 mm frames DyZxxxHaa Where "y" can be 6 or 7; "Z" can be K or M; "xxx" is the module power rating; and "aa" can be H3A, H4A, or H8A
Vikram	Vikram solar modules with 40 mm frames VSyy.ZZ.AAA.bb Where "yy" can be M, P, MBB, MH, MS, MHBB, or PBB; "ZZ" can be 60 or 72; "AAA" is the module power rating; and "bb" can be 03.04 or 05
VSUN	VSUN modules with 35 and 40 mm frames, VSUNxxx-YYz-aa, Where "YY" can be 60, 72, 120, or 144; "z" can be M, P, MH, PH, or BMH; and "aa" can be blank, BB, or DG
Winaico	Winaico modules with 35 and 40 mm frames Wsy-xxxZa Where "y" can be either P or T; "xxx" is the module power rating; "Z" can be either M, P, or MX; and "a" can be blank or 6
Yingli	Panda, YGE, YGE-U, and YLM series modules with 35, 40, and 50 mm frames



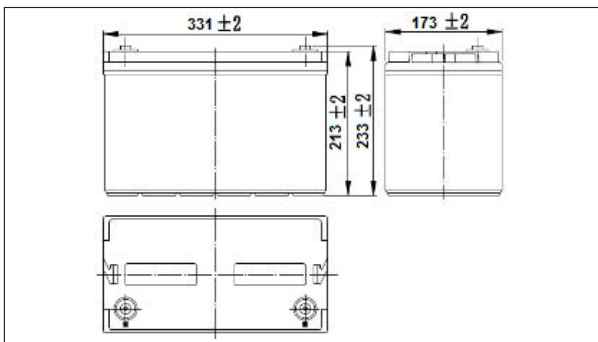
## HR12390W-FR (12V390 Watts/cell)

### Specifications

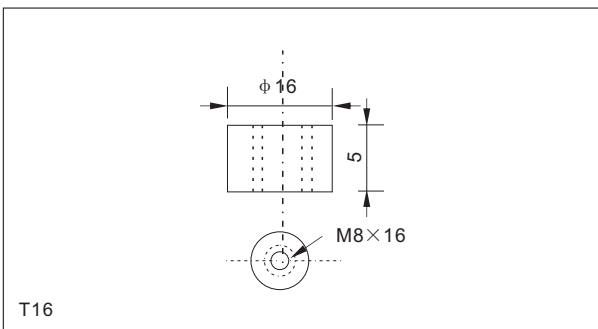
Nominal Voltage	12V	
Number of cell	6 cells	
Rated capacity(15min.rat)	390 Watts/cell	
Dimensions	Length	331±2mm(13.03inch)
	Width	173±2mm(6.81inch)
	Height	213±2mm(8.39inch)
	Total Height	233±2mm(9.17inch)
Approx. Weight	32.7kg(72.77lbs)±3%	



### Outer dimensions (mm)



### Terminal Type (mm)



### Characteristics

Capacity(10HR,25°C)	120Ah	
Capacity(15min.rate,25°C)	390 Watts/cell	
Terminal type	T16	
Internal resistance (Fully charged,25°C)	Approx.4m Ω	
Capacity affected by temperature (20HR)	40°C	102%
	25°C	100%
	0°C	85%
	-15°C	65%
Self-discharge (25°C)	3 months	Remaining Capacity:91%
	6 months	Remaining Capacity:82%
	12 months	Remaining Capacity:65%
Nominal operating temperature	25°C ±3°C(77°F ±5°F)	
Operating temperature range	Discharge	-15°C~50°C(5°F~122°F)
	Charge	-10°C~50°C(14°F~122°F)
	Storage	-20°C~50°C(-4°F~122°F)
Float charging voltage(25°C)	13.50 to 13.80V Temperature compensation: -18mV/°C	
Cyclic charging voltage(25°C)	14.50 to 15.00V Temperature compensation: -30mV/°C	
Maximum charging current	30A	
Maximum discharge current	800A(5 sec.)	
Designed floating life(20°C)	10years	

### Construction

Component	Positive plate	Negative plate	Container	Cover	Separator	Electrolyte	Safety valve	Terminal
Raw material	Leaddioxide	Lead	ABS	ABS	AGM	Sulfuric acid	Relief	Terminal

### Constant Current Discharge Characteristics Unit:A(25°C,77°F)

08/24/2020 7:54:57 AM

F.V/Time	10min	15min	20min	30min	45min	60min	2h	3h	4h	5h	6h
1.60V/cell	255	208	167	118	88.0	71.8	38.4	27.5	22.9	19.1	16.5
1.67V/cell	243	202	160	114	85.2	70.0	38.0	27.3	22.9	19.1	16.3
1.70V/cell	237	196	157	112	83.6	68.9	37.8	27.2	21.9	19.0	16.3
1.75V/cell	227	189	151	110	81.6	67.6	37.2	27.0	21.7	18.9	16.2
1.80V/cell	214	179	143	105	78.6	65.5	36.3	26.2	21.1	18.3	15.7

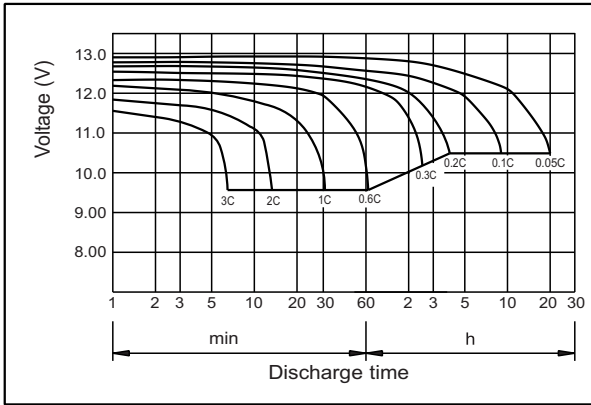
### Constant Power Discharge Characteristics Unit:W(25°C,77°F)

F.V/Time	10min	15min	20min	30min	45min	60min	2h	3h	4h	5h	6h
1.60V/cell	479	402	322	228	170	139	74.8	54.2	43.7	38.2	32.7
1.67V/cell	457	390	309	221	164	135	74.2	53.7	43.3	37.8	32.4
1.70V/cell	445	378	303	217	161	133	73.7	53.5	43.1	37.7	32.2
1.75V/cell	426	365	292	211	157	130	72.6	53.2	42.8	37.4	32.0
1.80V/cell	402	346	277	204	152	126	70.8	51.6	41.5	36.3	31.1

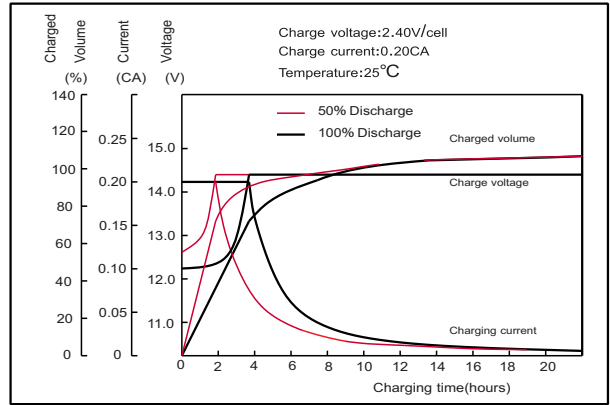
Note: The above characteristics data can be obtained within three charge or discharge cycles.

**HR12390W-FR (12V390 Watts/cell)**

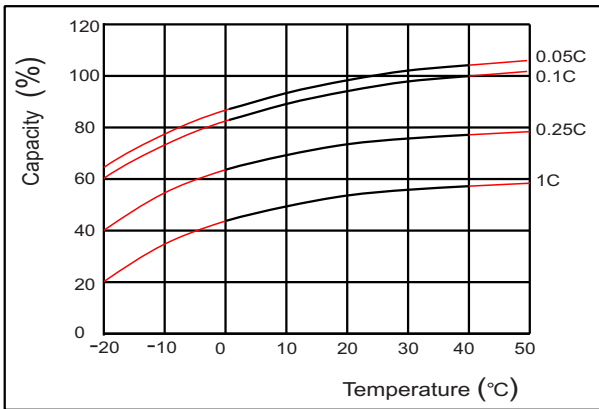
**Discharge characteristics(25°C)**



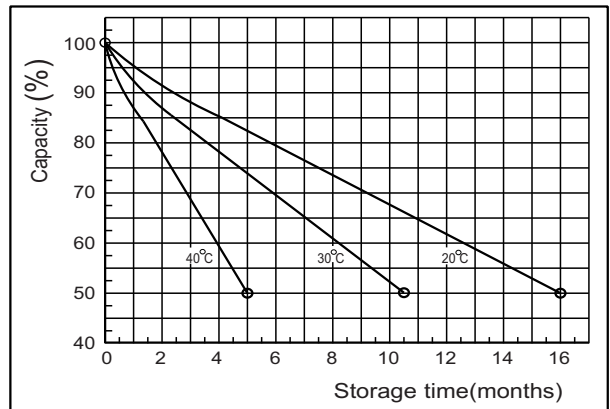
**Charging characteristics (25°C)**



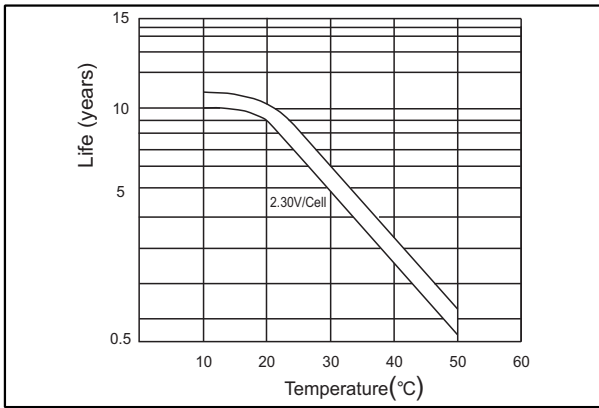
**Effect of Temperature on Capacity**



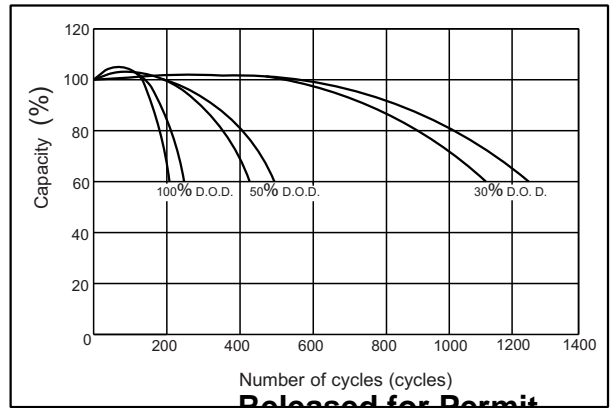
**Self-discharge characteristics**



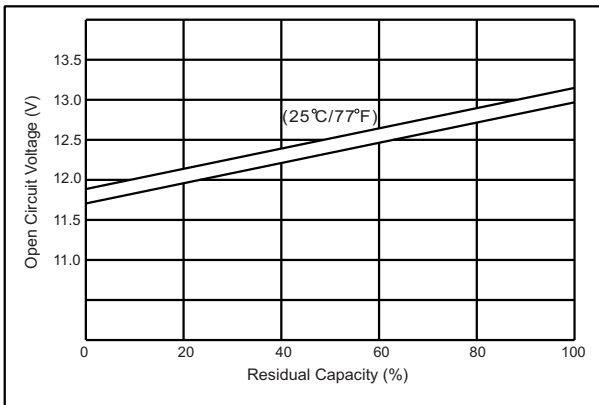
**Floating Life on Temperature**



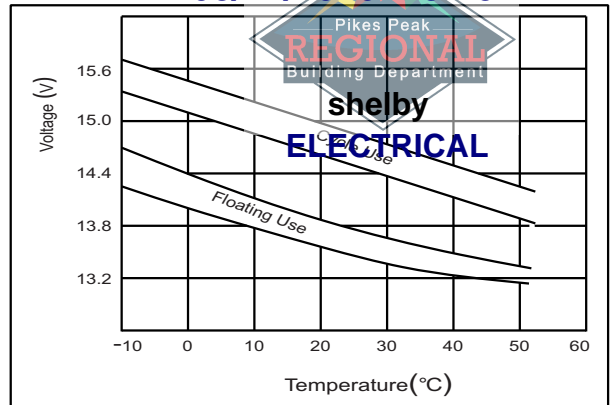
**Cycle service Life on D.O.D (25°C)**



**The relationship for OCV and Capacity (25°C)**



**The relationship for**



Released for Permit  
08/24/2020 7:54:57 AM

