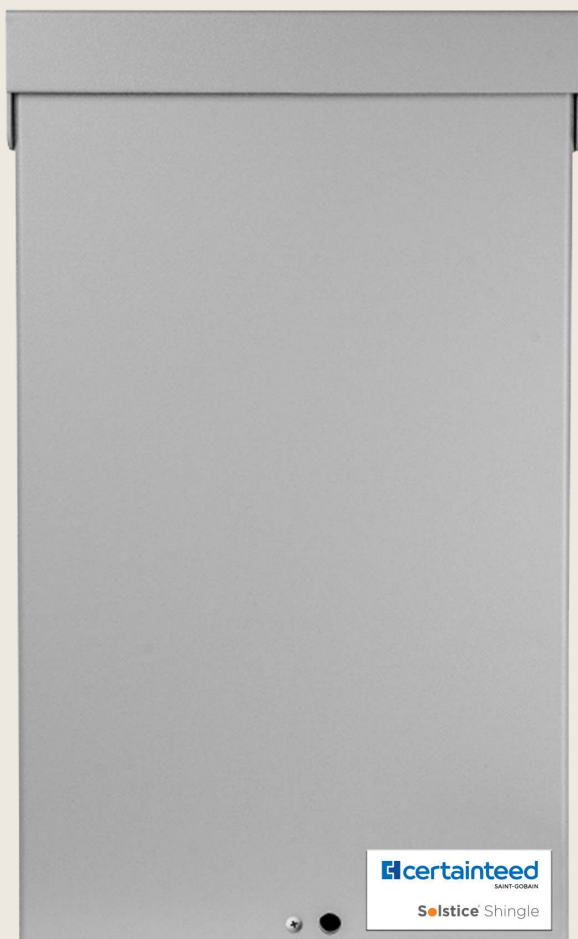


Solstice[®] Shingle

RAPID SHUTDOWN
MNPV6-WS



**600V, String-Level, SunSpec
Rapid Shutdown Receiver**

Important Safety Instructions

(Save These Instructions)

This manual contains important safety instructions for the Midnite Solar MNPV6-WS 600v SunSpec rapid shutdown receiver that shall be followed during installation and operation.

Manufactured by
Midnite Solar (www.midnitesolar.com)
for CertainTeed

Rev 2, 11/16/2023

certainteed
SAINT-GOBAIN

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. Before using the MNPV6-WS, read all instructions and cautionary markings. These instructions are for use by qualified personnel only. Do not perform any installation other than that specified in this manual unless you are qualified to do so. Incorrect installation may result in a risk of electric shock, fire, or other safety hazard.

Standards

- The MNPV6-WS is listed as a Type 3 enclosure, designed for outdoor installation. Mount the enclosure vertically or up to a 14-degree angle.
- System grounding is the responsibility of the system installer and must comply with local and national electrical codes and standards.
- Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.
- All electrical work must be performed in accordance with local and national electrical codes.
- Use only #12 AWG (or larger) copper wires with a minimum temperature rating of 90°C.
- Use insulated tools to reduce the chance of electrical shock or accidental short circuits.
- Install using Class 1 wiring methods. There are no Class 2 circuits in this PV Combiner.
- Only qualified service personnel can remove front cover, shock hazards are present.
- Torque all wiring and cable connections to the required torque values.
- All unused conduit holes must be filled with a UL listed conduit plug.
- Activate the system DC disconnect before opening the front panel.
- The MNPV6-WS must be properly grounded.

Warning

High voltage is present in the MNPV6-WS and can cause severe injury or death. Wear Personal Protective Equipment before opening or performing diagnostic measurements while energized.

Wiring Requirements

- The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code, Part 1) for Canada provide standards for safely wiring residential and commercial installations. The NEC and CEC list the requirements for wire size, over-current protection, and installation methods.
- Wires to and from solar equipment must be protected as required by code. This can be done by using jacketed wires or by feeding the wires through conduit or a conduit box.
- Always check for existing electrical, plumbing, or other areas of potential damage prior to making cuts in structural surfaces or walls.
- Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician.
- Use only #12 AWG (or larger) copper wires with a minimum temperature rating of 90°C.
- Over-current protection must be provided as part of any installation.
 - Coordination of conductor sizes and over-current protection shall be done in accordance with the NEC and the CEC, Part 1.
 - NOTE – Breakers/fuses protect the wire, not the equipment.
- The equipment ground is marked with this symbol:



Warning

Ensure all sources of DC power (PV, batteries) and AC power (utility or AC generator) are de-energized (breakers opened, fuses removed) before proceeding—to prevent accidental shock.

Installing the MNPV6-WS

The MNPV6-WS may be installed inside a dwelling. As such, the National Electrical Code (NEC) requires 30" clear on the wall. The MNPV6-WS may be located anywhere within this 30". The NEC also requires 36" free and clear of obstructions in front of this enclosure. The 36" clear area in front of electrical panels is to provide a space to fall back into in case of electrical shock.

All unused holes should be blocked using RTV sealant or duct seal in order to keep rain and bugs out of the enclosure. It is common for critters to enter through an unused mounting hole, which may eventually degrade the performance of your system.

Mounting

- Determine suitable installation location.
- MNPV6-WS has pre-drilled holes on back panel for mounting.
- Use appropriate mounting hardware and ensure the enclosure is securely fastened.

Conduit Knockouts

- Knockouts are concentric plugs, that once removed reveal holes in the enclosure for wire passage. The holes can accept MC cable connectors, strain reliefs, or conduit fittings. Several brands will fit the ½" diameter knockouts.
- The knockout is nominally held in place with a small dot of metal called "point of attachment." Position screwdriver opposite the point of attachment, gently strike screwdriver handle with hammer. Twist knockout off with fingers or pliers.

Wiring the MNPV6-WS

The MNPV6-WS contains one 600V SunSpec Rapid Shutdown Receiver, pre-wired into a DIN-rail mounted terminal block. Wiring the MNPV6-WS consists of the following:

- Wires from the PV array
- Wires to the grid-tie inverter
- Ground wires

Overall system wiring diagram shown in Figure 1.

SunSpec Receiver mounted inside the MNPV6-WS shown in Figure 2.

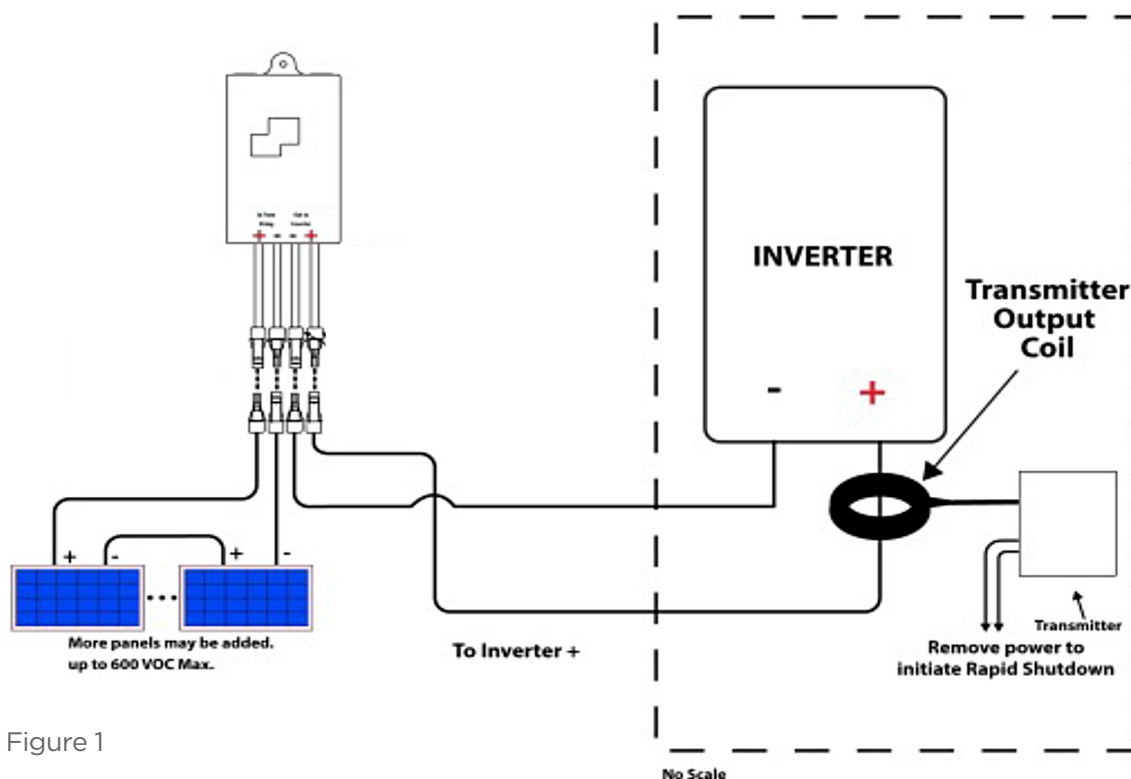


Figure 1

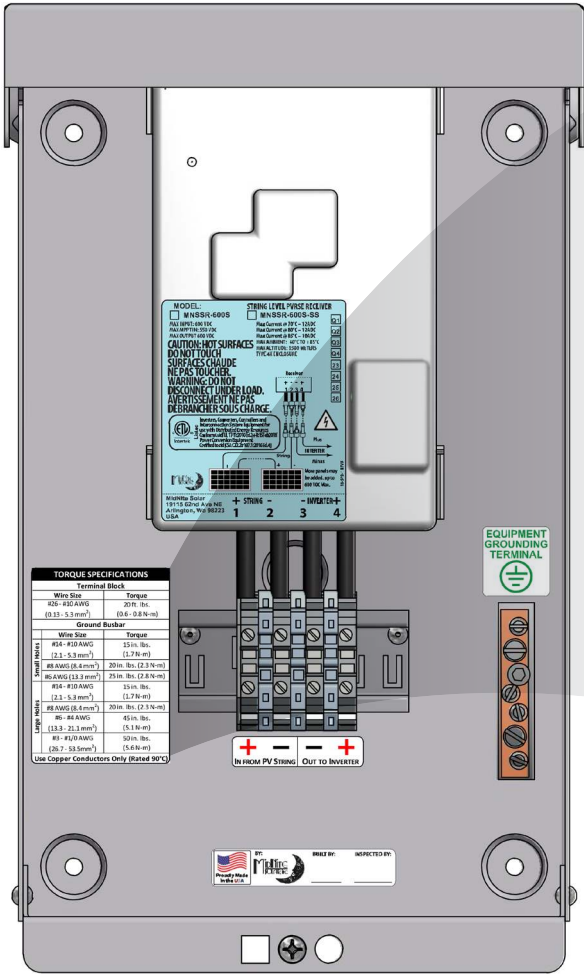


Figure 2

TORQUE SPECIFICATIONS		
Terminal Block		
Wire Size		Torque
#26 - #10 AWG (0.13 - 5.3 mm ²)		20 ft. lbs. (0.6 - 0.8 N-m)
Ground Busbar		
Small Holes	Wire Size	Torque
	#14 - #10 AWG (2.1 - 5.3 mm ²)	15 in. lbs. (1.7 N-m)
	#8 AWG (8.4 mm ²)	20 in. lbs. (2.3 N-m)
Large Holes	Wire Size	Torque
	#6 AWG (13.3 mm ²)	25 in. lbs. (2.8 N-m)
	#14 - #10 AWG (2.1 - 5.3 mm ²)	15 in. lbs. (1.7 N-m)
Large Holes	Wire Size	Torque
	#8 AWG (8.4 mm ²)	20 in. lbs. (2.3 N-m)
	#6 - #4 AWG (13.3 - 21.1 mm ²)	45 in. lbs. (5.1 N-m)
Large Holes	Wire Size	Torque
	#3 - #1/0 AWG (26.7 - 53.5 mm ²)	50 in. lbs. (5.6 N-m)
Use Copper Conductors Only (Rated 90°C)		

Important!
Re-torque all connections after one hour. Do NOT skip this step. You may be surprised by how much the connections may loosen after the initial tightening.

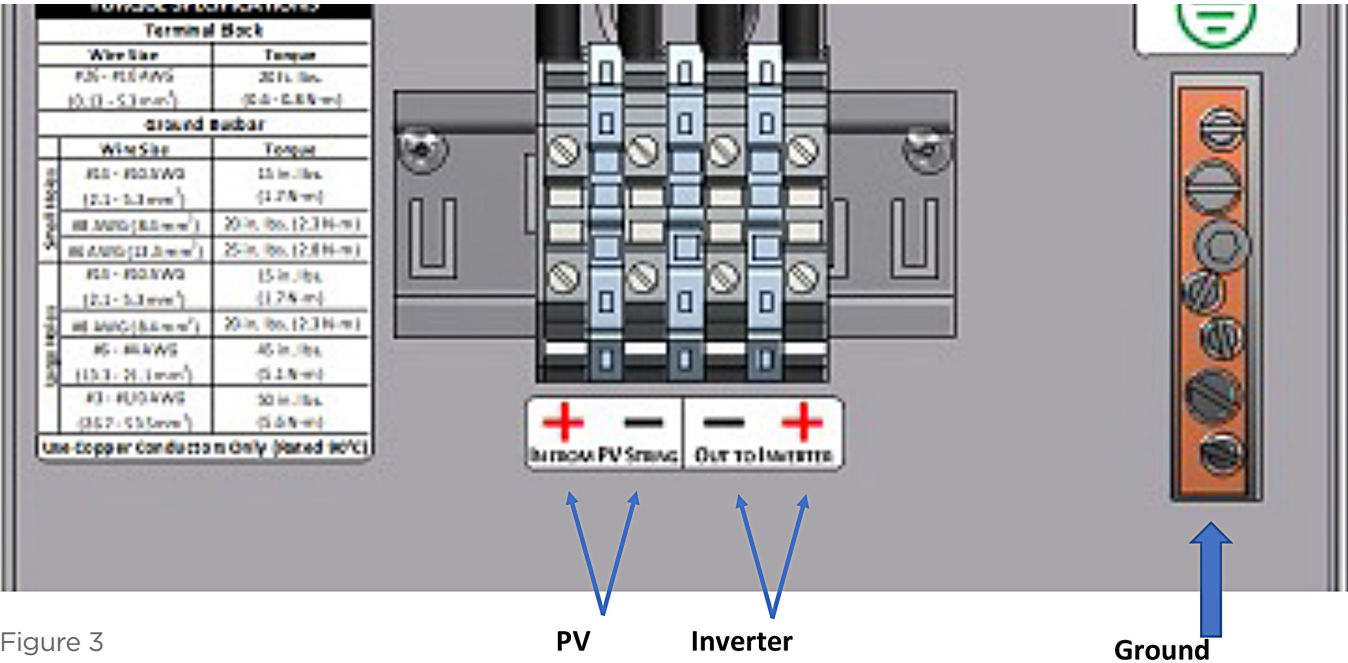


Figure 3

PV

Inverter

Ground

PV Array Wires (Figure 3)

- Connect PV+ wire from the PV array in terminal block marked “In from PV String +.”
- Connect PV- wire from the PV array in terminal block marked “In from PV String -.”
- Torque per specs.

Inverter Wires (Figure 3)

- Connect the inverter’s PV+ homerun wire into terminal block marked “Out to Inverter +.”
- Connect the inverter’s PV- homerun wire into terminal block marked “Out to Inverter -.”
- Torque per specs.

Ground Wires (Figure 3)

- Connect PV array bonding ground wire to the ground terminal block.
- Connect the grounding electrode conductor to the ground terminal block and to the grounding electrode (“ground rod”).
- Torque per specs.

Emergency Push Button Installation

Install Emergency Push Button in accordance with inverter vendor manual instructions.

Kit for Non SunSpec Compatible Inverters

The MNPV6-WS SunSpec Rapid Shutdown Receiver requires the PV system to provide a SunSpec Certified Transmitter for rapid shutdown control. Normally, this transmitter is integrated in the inverter. However, if the inverter is not SunSpec compatible or doesn’t provide the ability to transmit the SunSpec communication signal, then use a standalone SunSpec Transmitter: MNSST-KIT by MidNite Solar. The MNSST-KIT provides a SunSpec certified RSS (Rapid Shutdown System) Transmitter in a DIN-rail mounted housing, two toroid’s, and a DIN-rail mounted ultra slim power supply to power the transmitter. Refer to the following pages for instructions on installation of the MNSST-KIT.

MidNite Solar Dual-Core SunSpec Transmitter Kit

Introduction

Article 690.12 of the National Electrical Code (NEC) requires that a PV system has the means to be rapidly shutdown to safe voltage levels in 30 seconds. The MidNite Solar rapid shutdown **MNPV6-WS** with the transmitter **MNSST-KIT** is a convenient and economical Rapid Shutdown System that meets the requirements of NEC 690.12.

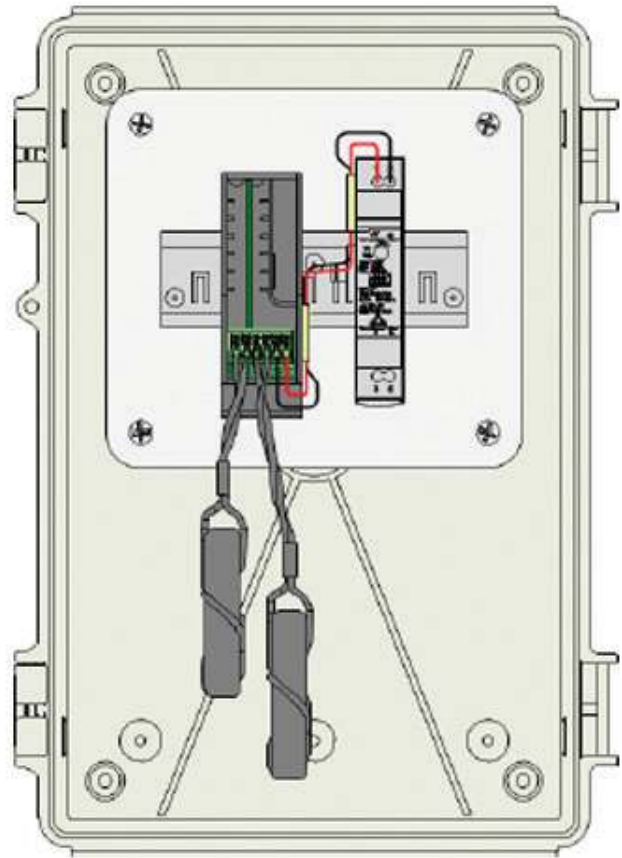
A PV Rapid Shutdown System consists of a transmitter (TX) and one or more receivers (RX). A RX is connected to a PV string (NEC 2014, String-Level Shutdown) or to a PV module (NEC 2017/2020, Module-Level Shutdown). The TX generates a signal that is inductively coupled into the PV array. This signal is detected by the RX(s) and, if the signal is correct and present, the RX connects the PV string or module to the inverter or charge controller. If the TX's signal is absent, the RX(s) reduces PV array output circuit voltage, thus shutting down the PV input to the inverter or charge controller.

Rapid Shutdown ensures the safety of fire rescue personnel or other emergency responders. Rapid Shutdown is initiated by removing power to the TX, which in turn causes the RX(s) to reduce voltage, resulting in <30VDC in accordance with NEC 690.12.

MidNite Solar's **MNSST-KIT** is designed to work with 600VDC SunSpec Receivers in either a string-level system or a module-level system.

Standard features include:

- Dual-Core Transmitter, meets SunSpec requirements
- PV string count through the TX toroid varies based on wire gauge, not to exceed 60A per toroid.
- Outdoor rated enclosure (NEMA 4X)
- AC powered, 100-240VAC



Important Safety Instructions

Save These Instructions

This manual contains important instructions for the Midnite Solar sunspec transmitter kit that shall be followed during installation and operation.

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. Before using the **MNSST-KIT**, read all instructions and cautionary markings. The installation instructions are for use by qualified personnel only. Do not perform any installation other than that specified in this manual unless you are qualified to do so. Incorrect installation may result in a risk of electric shock, fire, or other safety hazard.

Safety Symbols

The following safety symbols have been placed throughout this manual to indicate dangerous and important safety instructions.

Warning

Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Caution

Caution indicates conditions or practices that could result in damage to the unit or other equipment.

Safety Precautions

- Over-current protection of the AC power wires must be provided as part of the installation.
- This product is designed for indoor/compartment installation. It must not be exposed to rain, snow, moisture, or liquids of any type.
- Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.
- All electrical work must be performed in accordance with local and national electrical codes.
- Use insulated tools to reduce the chance of electrical shock or accidental short circuits.
- Always verify proper wiring prior to energizing the system.
- Properly mount the **MNSST-KIT**.

Wiring Requirements

- The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide standards for safely wiring residential and commercial installations. The NEC/CEC lists the requirements for wire size, overcurrent protection, and installation methods.
- All wires to and from the **MNSST-KIT** must be protected as required by code. This can be done by using jacketed wires or by feeding the wires through conduit or a conduit box.
- Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician.
- Use only copper wires with a minimum temperature rating of 75°C.

Caution

Internal components of the **MNSST-KIT** must not be exposed to rain or direct sunlight.

Warning

Ensure all sources of DC power are de-energized (i.e., breakers opened, fuses removed) before proceeding—to prevent accidental shock.

Application Notes

Note 1

- The RX may be installed at either end of the PV string.
- Do NOT connect the RX in the middle of the PV string, doing so will NOT reduce voltage of all panels.
- Either the plus or minus string wire may go through the transmitter's output coil but not both.
- For NEC 2023, RX must be installed within 1 ft of the array being protected per UL3741 requirements.
- It may be more convenient to couple the transmitter using the PV- versus the PV+, depending upon the installation.

Note 2

- One Transmitter (TX) can support up to 60A through the Output Coil.
 - Determine number of PV strings that can safely pass through the Output Coil by dividing 60A by the PV Isc rating.
 - Example: $60A / 9.3A (Isc) = 6$ PV strings
- The **MNSST-KIT** offers two TX coils, thus up to 120A per **MNSST-KIT**.
- If more than one **MNSST-KIT** is used, then each **MNSST-KIT** must be on a separate system without interconnections to avoid interference with other transmitters.
 - Example: Two inverters, powered by two separate strings, both inverters connected to same Rapid Shutdown System, requires one **MNSST-KIT**.
 - Example: Two inverters, powered by two separate strings, each inverter with its own Rapid Shutdown System, requires two separate **MNSST-KITs**.
 - Example: Single inverter with parallel strings (up to 120A) requires one **MNSST-KIT**.
- Normally all MNSST's should be shut down at the same time, the MNSST-KIT should not be used as service disconnects.
- Be aware that if multiple transmitters are used and are NOT powered or disconnected by a single source, cross-talk may occur. Cross-talk may leave a PV array unexpectedly powered.

- If the PV conductors connected to each transmitter are installed in the same conduit or wiring enclosure, cross-talk may occur. Cross-talk refers to multiple TXs transmitting on the same frequency, canceling each other's signals.

Note 3

- Rapid attenuation is initiated by removing power to the transmitter.
- The transmitter power should be connected such that when the inverter shuts down, the transmitter also shuts down.
- Fire-fighters frequently pull the power meter to cut power to the building. In a grid tied system this should also cause shutdown of the PV array.
- A normally closed non-momentary "Panic button" may be installed in line with the transmitter power for manual shutdown.
- For off-grid and other systems, connect the transmitter such that removing the main power will also remove power from the transmitter, thus attenuating the PV array.

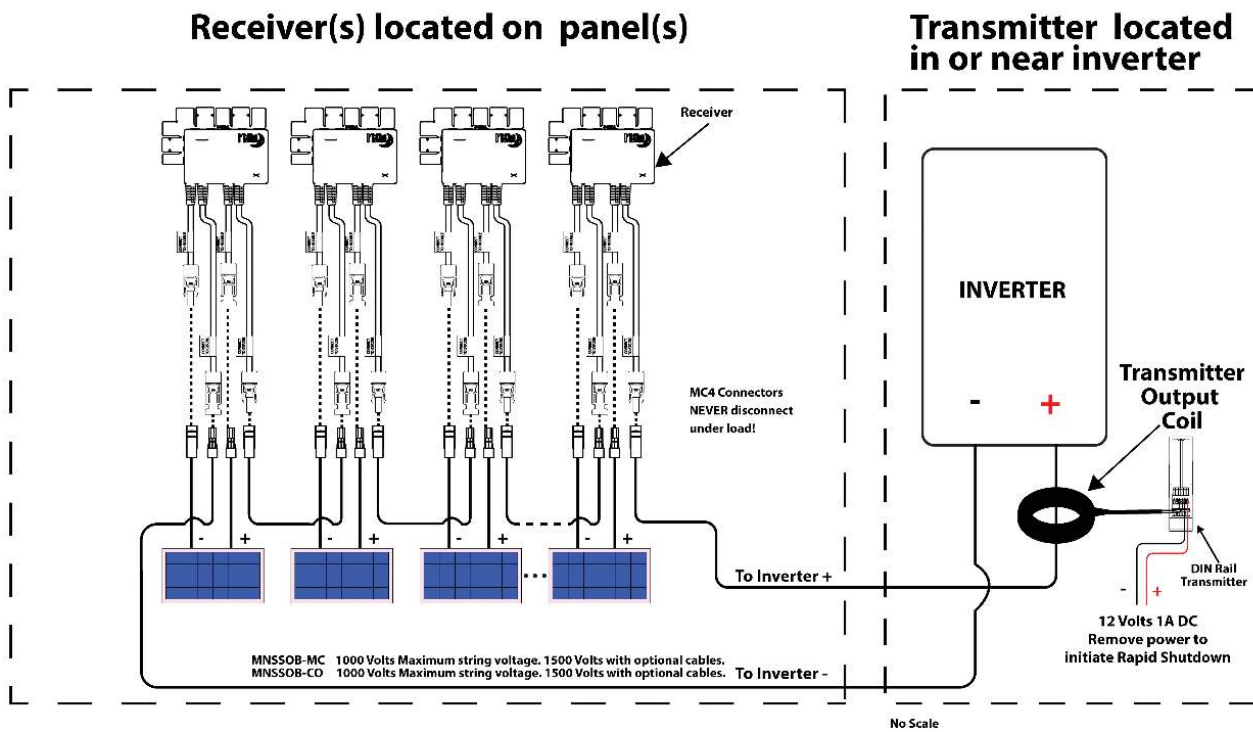


Figure 4

Installation

Installation of the **MNSST-KIT** consists of 3 phases:

- **Conduits**
- **Mounting**
- **Wiring**

Read all instructions before proceeding.

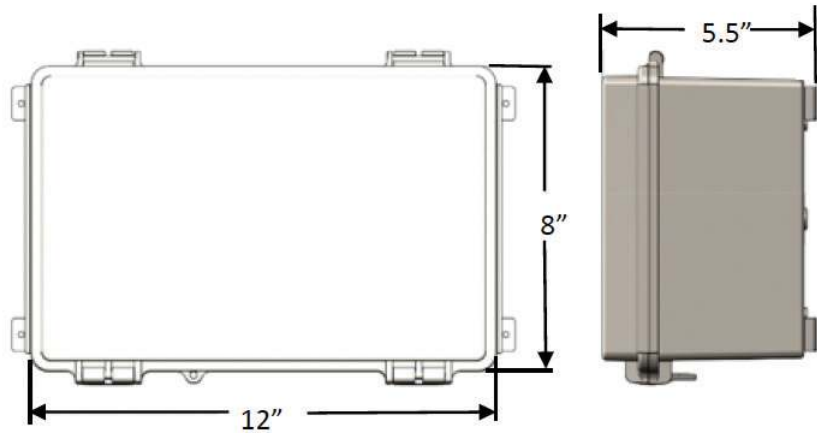


Figure 5 - Enclosure Dimensions

Conduits

1. Plan all conduit runs now.
2. Determine size of conduit to accommodate quantity of PV wires to pass through the **MNSST-KIT**.
3. Use drilling guides (Figures 6 and 7) to drill conduit holes.

Caution

If system requires more than one MNSST-KIT, then the PV wires to each MNSST-KIT should be routed in separate conduits, as "cross-talk" (interference) of the TX signals may occur.

Warning

Multiple transmitters in the PV system need to be turned off by a single event and are NOT to be used as Service Disconnects.

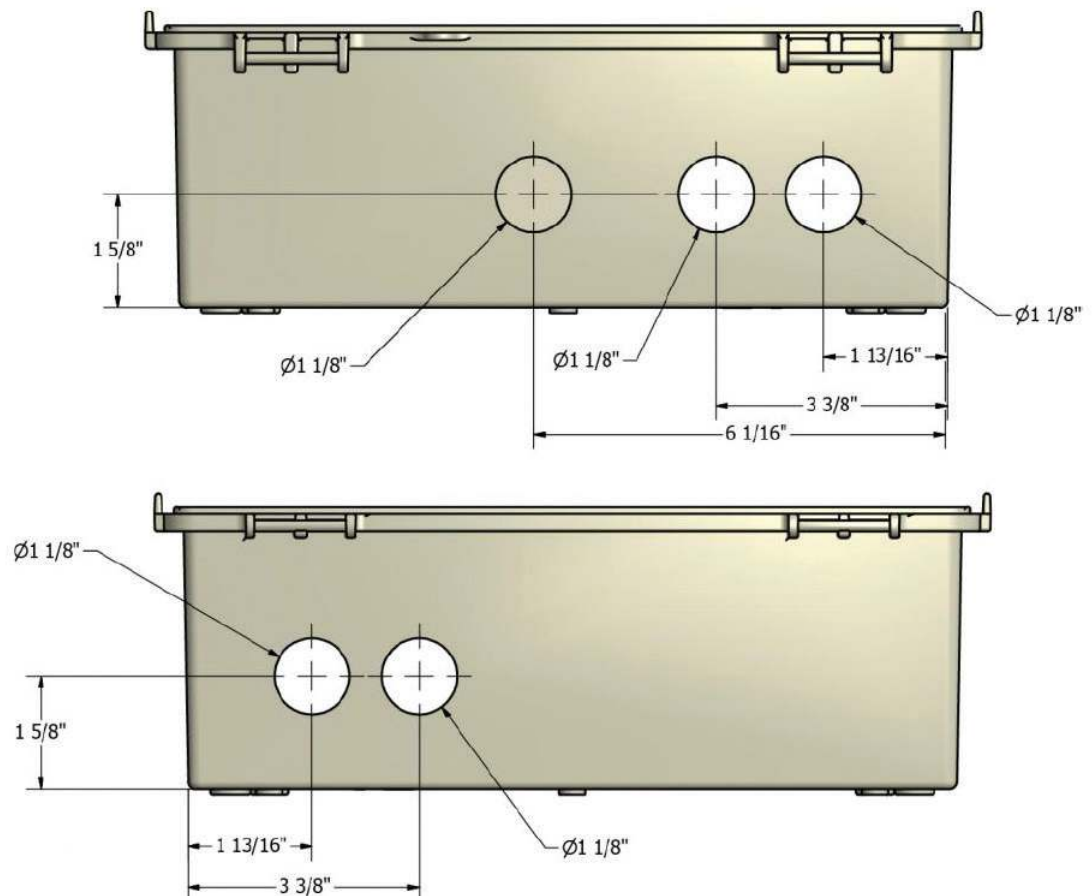


Figure 6

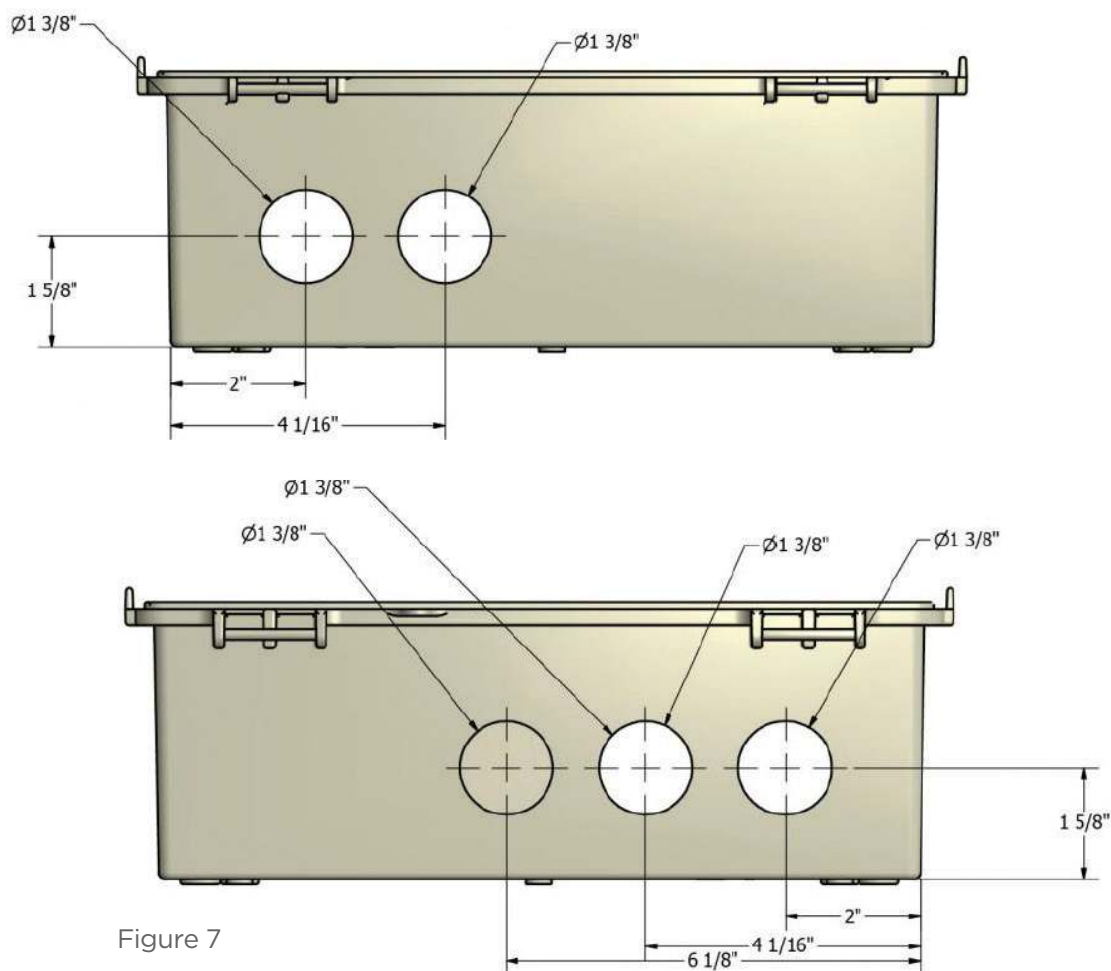


Figure 7

Mounting

- The PV wires that connect to your grid-tie inverter or charge controller must pass through the **MNSST-KIT**.
 - Select mounting location that allows for that configuration.
 - Normally the **MNSST-KIT** will be installed near the grid-tie inverter or charge controller.
- The area must be free from any risk of condensation, water, or any other liquid that can enter or fall into **MNSST-KIT**.
 - Use conduit sealant after wiring is complete.
- Once installed, there are no adjustments or servicing to be done inside the **MNSST-KIT**.
- Attached enclosure mounting “feet” as shown in Figure 8.

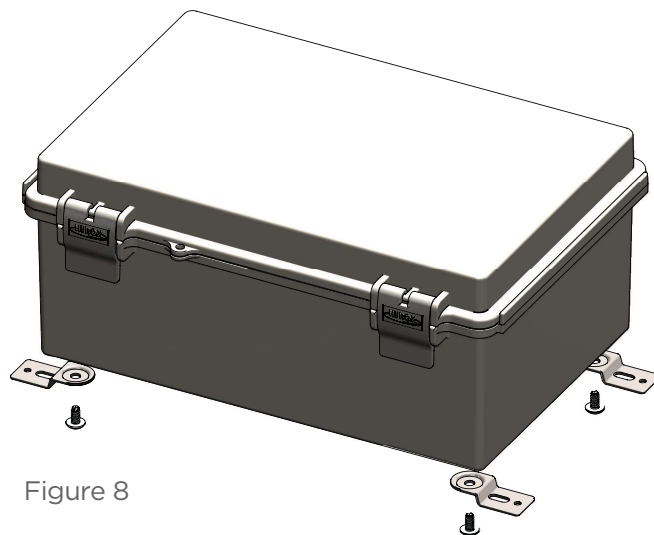


Figure 8

Wiring

1 – Wire AC IN to the TX Power Supply (Figure 9).

- Wire in either 120VAC (L1 and N) or 240VAC (L1 and L2)

Emergency Push Button:

Recommended Sol-Ark Models are:

***(INSIDE OR OUTSIDE MODEL) IMO Automation BG10P34-11 Emergency Stop PushButton | NAZ Solar Electric (solar-electric.com)

***(INSIDE ONLY MODEL) Initiator Switch | 660V 10A 2 Position 1NO 1NC Momentary Emergency Stop Push Button Switch - Signature Solar

Install Emergency Push Button on Sol-Ark B-B terminals per Sol-Ark inverter manual instructions. See section 2.9 Emergency Stop and Rapid Shutdown.

Transmitter and Transmitter Power Supply:

Mount transmitter and power supply junction box nearby the inverter per Rapid Shut Down and Power Supply (Meanwell) vendor manual instructions

At the Protected Load (or Critical) Panel, install a C16 or D16 breaker for the transmitter power supply.

Run power wire from Protected Panel C16 or D16 breaker to power supply per Power Supply Meanwell vendor instructions. Use either 120VAC or 240VAC configuration.

Wire power supply to transmitter per Rapid Shut Down and Power Supply Meanwell vendor instructions.

- Use copper wire only. Minimum 75°C.
- Ensure that all strands of each stranded wire enter the terminal connection and the screw terminals are securely fixed to prevent poor contact. If the power supply possesses multi-Figure 10 output terminals, please make sure each contact is connected to wires to prevent too much current stress on a single contact.

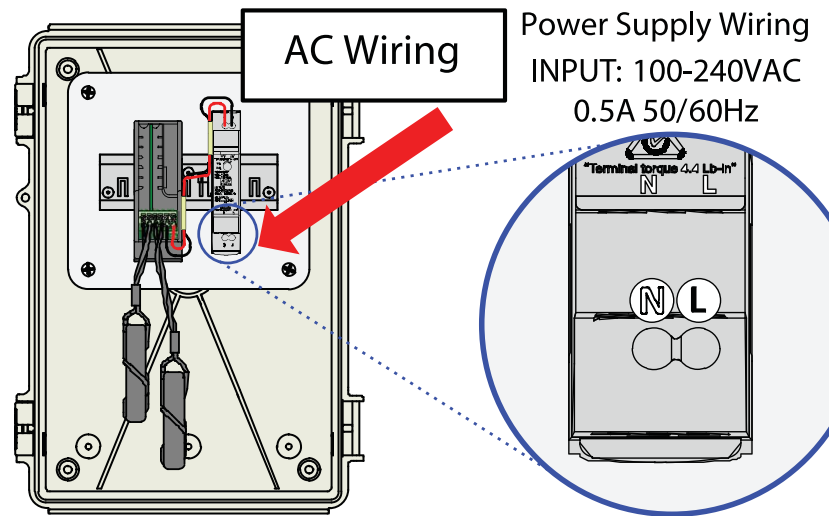


Figure 9

- Recommended wire strapping length is 6mm (0.236").
- Recommended screwdriver is 3mm, slotted type.
- Recommended torque setting for terminals is 5 in-lbs.
- The AC power supply does NOT require a ground connection.

Caution

Restoring power to the transmitter will re-enable output from the PV array. Always ensure that it is safe to restore power before providing power to the transmitter.

2 – Pass ONE PV polarity through the TX coils.

- **Pick a polarity!**
- Only one polarity can pass through both coils (Figure 10). If you choose PV+ to pass through the coils, then PV- will pass around the coils.

3 – Bond the conduit fittings to earth ground.

- The **MNSST-KIT** enclosure is plastic, so the conduit fittings **MUST** be bonded using approved grounding hardware and methods.

Warning

Wait 30 seconds after Rapid Shutdown activation before disconnecting any DC circuits.

System Operation/ Troubleshooting

1 – Energize AC IN to the MNSST-KIT

- a. 100-240VAC required for TX operation.

2 – With AC IN to the TX

- a. RXs should close circuit, pass PV to the grid-tie inverter (or charge controller), and
- b. RX LEDs illuminated (based on the MNPV6-WS Receiver):
 - i) Blue LED indicates RX is energized.
 - ii) Yellow LED indicates RX is sensing active TX signal.

3 – Measure PV string voltage

- a. With TX OFF... PV string voltage is <30 VDC
- b. With TX ON... PV string voltage is V_{oc} (inverter – OFF), V_{mp} (inverter – ON).

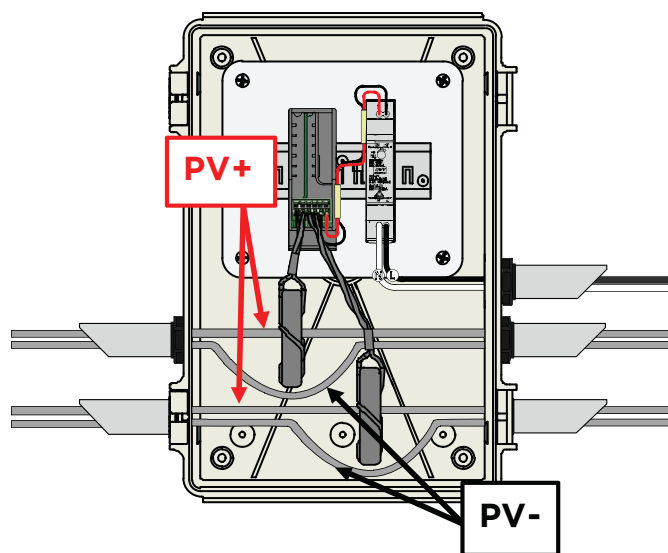


Figure 10

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 ten (10) years.

MidNite Solar will not warranty third party inverter components used in MidNite's pre-wired systems. Those components are warranted by the original manufacturer.

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., (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:

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NOT IN ANY CASE EXCEED THE CONTRACT PRICE FOR THE GOODS CLAIMED TO BE DEFECTIVE OR UNSUITABLE.

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MNPV6-WS 600V SunSpec Rapid Shutdown Receiver User's Manual.

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