BDH-8/10/12KSP-LB

H Y B R I D I N V E R T E R

U S E R M A N U A L

TABLE OF CONTENTS

1. TECHNICAL SPECIFICATIONS

INPUT (PV DC)	BDH-12KSP-LB
Maximum Utilized Solar Power	18000W
Rated PV Input Voltage	360V
PV Input Voltage Range	100~600V
MPPT Operating Voltage Range	120~500V
Start-up Voltage	140V
No. of MPP Trackers	3
No. of Strings per MPPT	2/1/1
Max. Input Current per MPPT	25A/15A/15A
Max. Short Circuit Current per MPPT	31A/19A/19A
Battery	
Battery Type	Lithium-ion/Lead-Acid
Rated Battery Voltage	48V
Battery Voltage Range	40~60V
Max. Charging/Discharging current	250A
Max. Charging/Discharging power	12000W
Force wake up battery from PV function	YES
Grid	
Rated AC Voltage	120V/240V;120V/208V
Rated AC Frequency	50Hz/60Hz
Rated AC Output Current	50A
Rated AC Output Power	12kW@240V/10.4kW@208V
Max. AC Intput Current	200A
Max. AC Intput Power	48000W
PF	0.99(Adjustable from 0.9 leading to0.9 lagging)
THDi	< 3%
AC Bypass (Grid)	200A
EPS	
Rated Output Voltage	120V/240V;120V/208V;240V
Rated Output Frequency	50Hz/60Hz
Rated Output Current	50A
Rated Output Power	12kW@240V/10.4kW@208V
Peak Power	With PV: 13.2kW (2h),14.4kW (15 min), 15.6kW (7.5 min), 20kW (750ms) Without PV: 13.2kW (10 min)
Switching Time	15ms
THDv	< 3%

AC Bypass (Generator)	90A
Efficiency	
Max. MPPT Efficiency	99.9%
Max. Efficiency	97.5%
Max. Battery Charging/ Discharging Efficiency	94.5%
CEC Efficiency	96.5%
Protection	
PV Reverse Polarity Protection	YES
Over Current/Voltage Protection	YES
Anti-islanding Protection	YES
AC Short-circuit Protection	YES
Ground fault monitoring	YES
Leakage Current Protecion	YES
AC/DC Surge Protection Type II	YES
AFCI	YES
RSD	YES
DC Switch	YES
Load Switch(Current)	200A
Battery Switch(Current/Voltage)	2*200A/80VDC
General	
Dimensions(W*H*D)	500*860*290mm/19.68*33.86*11.42inch
Weight	53kg/121.2lbs
Ingress Protection Rating	NAME 4X
Relative Humidity	0~100%
Operating Temperature Range	-25~60℃, >45℃ derating
Storage Temperature Range	-25~60℃
Communication Interface	RS485/CAN/Wi-Fi
Display	Color Touch LCD
Cooling Method	Smart Cooling
Topology	Transformer-less
Altitude	<2000m
Warranty	10 years
Standards&Certification	
UL STD.1741,1741SA,1741SB; IEEE STD.1547,1547.1,1547a; HECO SRD-IEEE-1547.1:2020 Ed.2.0; CSA STD.C22.2 No.107.1 and 330; UL1998:2018; 2030.5; E5000,SA17-18; PCS CRD:2019	

2. ABBREVIATION LIST

- AWG – American Wire Gauge
- A – Amps
- Ah – Amp hour(s)
- AC – Alternating Current
- AFCI – Arc-Fault Circuit Interrupter
- AHJ – Authority Having Jurisdiction
- kAIC – kilo-Amp Interrupting Capability
- ANSI – American National Standards Institute
- BAT – Battery
- BMS – Battery Management System
- COM – Communication
- CT – Current Transformer
- DC – Direct Current
- DIP – Dual In-line Package
- DOD – Depth of Discharge
- EG – Equipment Ground
- EGS – Equipment Grounding System
- EMC – Electromagnetic Compatibility
- EPS – Emergency Power System
- ESS – Energy Storage System
- E-Stop – Emergency Stop
- FCC – Federal Communication Commission
- GE – Grounding Electrode
- GEC – Grounding Electrode Conductor
- GFCI – Ground Fault Circuit Interrupter
- GFDI – Ground Fault Detector/Interrupter
- Imp – Maximum Power Point Current
- IEEE – Institute of Electrical and Electronic Engineers
- IP – Ingress Protection
- Isc – Short-Circuit Current
- In-lbs. – Inch Pounds
- kW – Kilowatt
- kWh – Kilowatt-hour
- LCD – Liquid Crystal Display
- LFP – Lithium Iron Phosphate
- L1 – Line 1
- L2 – Line 2
- mm – Millimeters
- MPPT – Maximum Power Point Tracking
- mV – Millivolt
- N – Neutral
- NEC – National Electric Code
- NEMA – National Electrical Manufacturers Association
- NFPA – National Fire Prevention Association
- Nm – Newton Meters
- NOCT – Normal Operating Cell Temperature
- PC – Personal Computer
- PCB – Printed Circuit Board
- PE – Protective Earth
- PPE – Personal Protective Equipment
- PV – Photovoltaic
- RSD – Rapid Shut Down
- SCC – Standards Council of Canada
- SOC – State of Charge
- STC – Standard Testing Conditions
- UL – Underwriters Laboratories
- UPS – Uninterrupted Power Supply
- V – Volts
- VOC – Open-Circuit Voltage
- VMP – Voltage Maximum Power

3. INVERTER SAFETY

3.1 SAFETY INSTRUCTIONS

International safety regulations have been strictly observed in the design and testing of the inverter. Before beginning any work, carefully read all safety instructions, and always observe them when working on or with the inverter. The installation must follow all applicable national or local standards and regulations.

Incorrect installation may cause:

- Injury or death to the installer, operator or third party
- Damage to the inverter or other attached equipment

3.2 IMPORTANT SAFETY NOTIFICATIONS

DANGER: *Hazardous Voltage Circuits!*

There are various safety concerns that must be carefully observed before, during, and after the installation, as well as during future operation and maintenance. The following are important safety notifications for the installer and any end users of this product under normal operating conditions.

1. **Beware of high PV voltage.** Install an external DC disconnect switch or breaker and ensure it is in the “off” or “open” position before installing or working on the inverter. Use a voltmeter to confirm there is no DC voltage present to avoid electric shock.
2. **Beware of high grid voltage.** Ensure the AC switch and/or AC breaker are in the “off” or “open” position before installing or working on the inverter. Use a voltmeter to confirm there is no voltage present to avoid electric shock.
3. **Beware of high battery current.** Ensure that the battery module breakers and/or on/off switches are in the “open” or “off” position before installing or working on the inverter. Use a voltmeter to confirm there is no DC voltage present to avoid electric shock.
4. Do not open the inverter while it is operating to avoid electric shock and damage from live voltage and current within the system.
5. Do not make any connections or disconnections (PV, battery, grid, communication, etc.) while the inverter is operating.
6. An installer should make sure to be well protected by reasonable and professional insulation equipment [e.g., personal protective equipment (PPE)].
7. Before installing, operating, or maintaining the system, it is important to inspect all existing wiring to ensure that it meets the appropriate specifications and conditions for use.
8. Ensure that the PV, battery, and grid connections to the inverter are secure and proper to prevent damage or injuries caused by improper installation.
9. Some components of the system can be very heavy. Be sure to utilize team-lift among other safe lifting techniques throughout the installation.

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

All work on this product (system design, installation, operation, setting, configuration, and maintenance) must be carried out by qualified personnel. To reduce the risk of electric shock, do not perform any servicing other than those specified in the operating instructions unless qualified to do so.

1. Read all instructions before installing. For electrical work, follow all local and national wiring standards, regulations, and these installation instructions.
2. Make sure the inverter is properly grounded. All wiring should be in accordance with the National Electrical Code (NEC), ANSI/NFPA 70.
3. The inverter and system can inter-connect with the utility grid only if the utility provider permits. Consult with the local AHJ (Authority Having Jurisdiction) before installing this product for any additional regulations and requirements for the immediate area.
4. All warning labels and nameplates on the inverter should be clearly visible and must not be removed or covered.
5. The installer should consider the safety of future users when choosing the inverter's correct position and location as specified in this manual.
6. Keep children from touching or misusing the inverter and relevant systems.
7. **Beware!** The inverter and some parts of the system can be hot when in use. Do not touch the inverter's surface or most of the parts when they are operating. During operation, only the LCD and buttons should be touched.

WARNING!

Cancer and Reproductive Harm – See www.P65Warnings.ca.gov for more details.

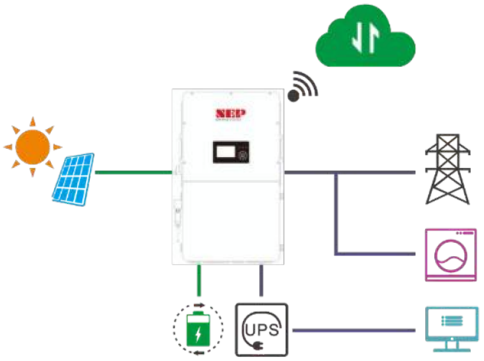
DISCLAIMER

NEP reserves the right to make changes to the material herein at any time without notice.
Please refer to www.northernep.com for the most updated version of our manuals/spec sheets.

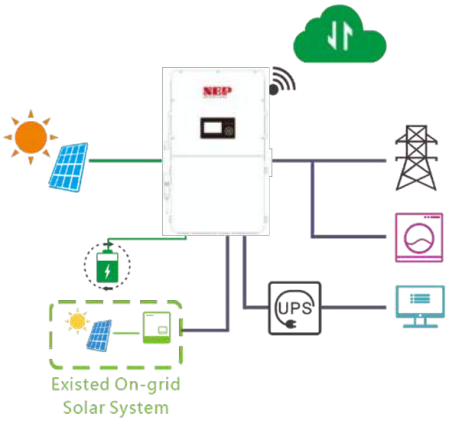
4. SYSTEM DIAGRAMS

This unit and its associated system are suitable for the following applications:

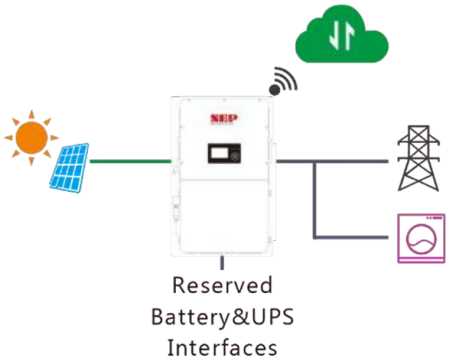
A. Solar and battery storage system



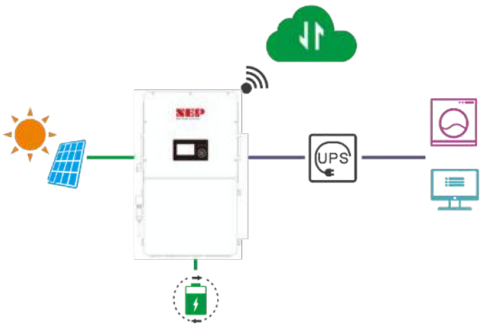
B. AC Coupling with existed solar system



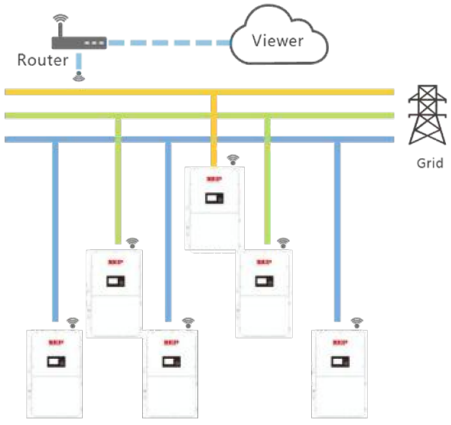
C. On-grid solar system without battery (Support EPS even without battery)



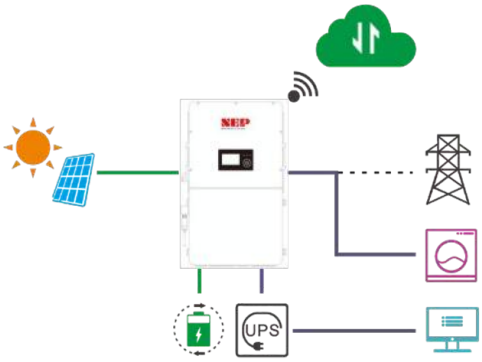
D. Off-grid and back-up applications



E. Single and three phase paralleling system



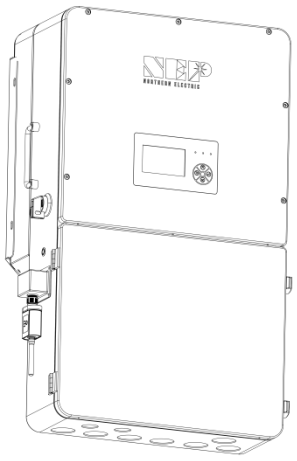
F. Energy storage system with peak shaving Function



5. INSTALLATION

5.1 PACKING LIST

When the product is unpacked, the contents should match those listed below:
Pictures for reference only.

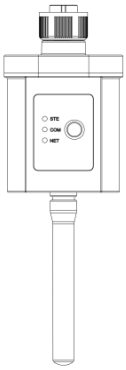


Hybrid Inverter

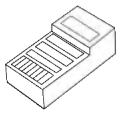
User Manual

Keys

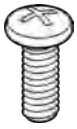
1” CT (2)



Wi-Fi Dongle



RJ45 Terminals (4)

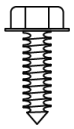


Cross Head Screw
M5×10 (4)

Mounting Bracket

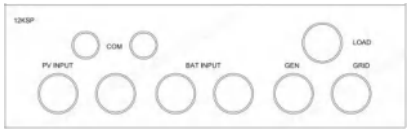
Parallel
Communication
Cable L=2m × 1

BATTERY
Communication
Cable L=2m × 1



Tapping Screws
(4)

Expansion Bolts
(4)



Positioning cardboard

5.2 TOOLS NEEDED FOR INSTALLATION

- Hand truck with all-terrain tires
- Tape measure
- Drill and drill bits (5/16)
- Wire strippers
- Small straight slot
- Lineman’s Pliers, rabbit ears or side cutters
- M8 Hex
- M5 Hex
- Multimeter
- Tech screwdriver
- 14 mm or 9/16 socket for anchors
- Medium flat head screwdriver for PV connection
- 13 mm or ½ socket for lag screws
- Level
- Channel Locks
- Self-tapping screws (2)
- Torque wrench
- Heavy duty wood screws (4) – if anchoring in wood OR
  Hammer Drill or masonry bit (9/16)—if anchoring in concrete

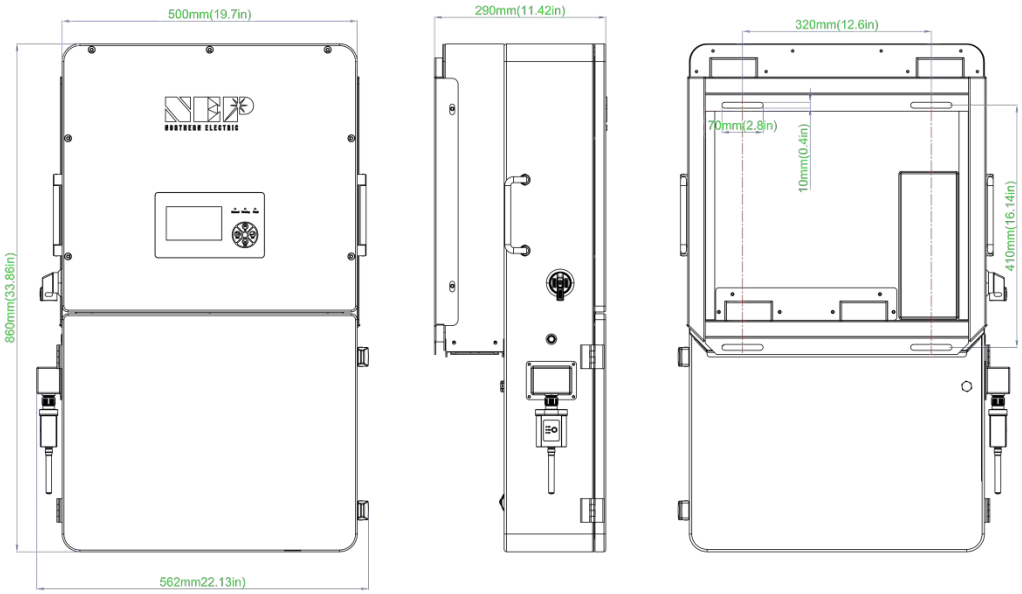
5.3 LOCATION SELECTION AND INSTALLATION

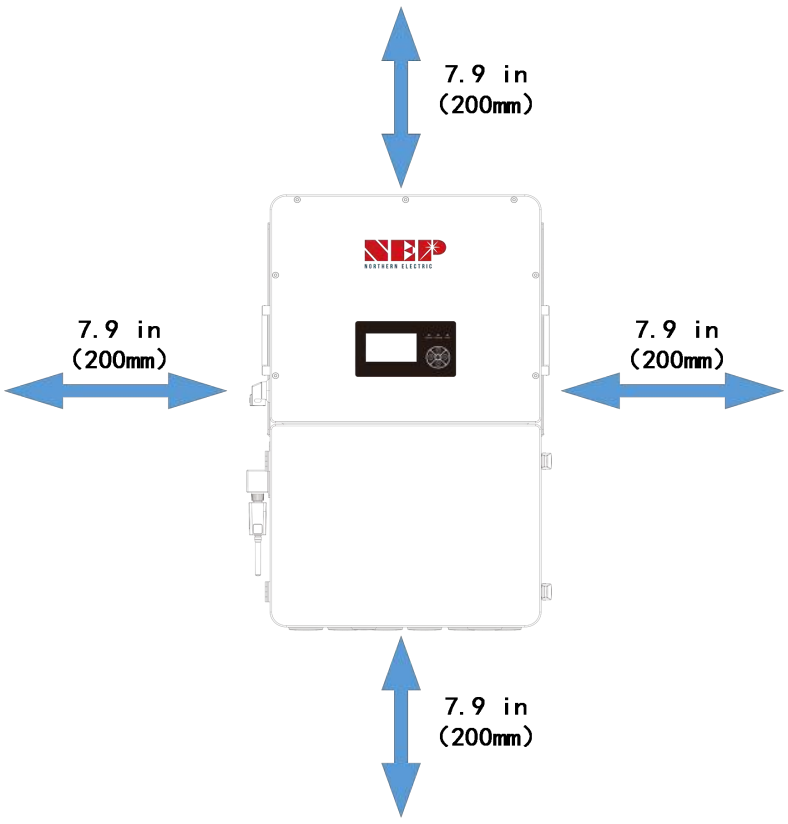
Requirements for Installation Location

DANGER:

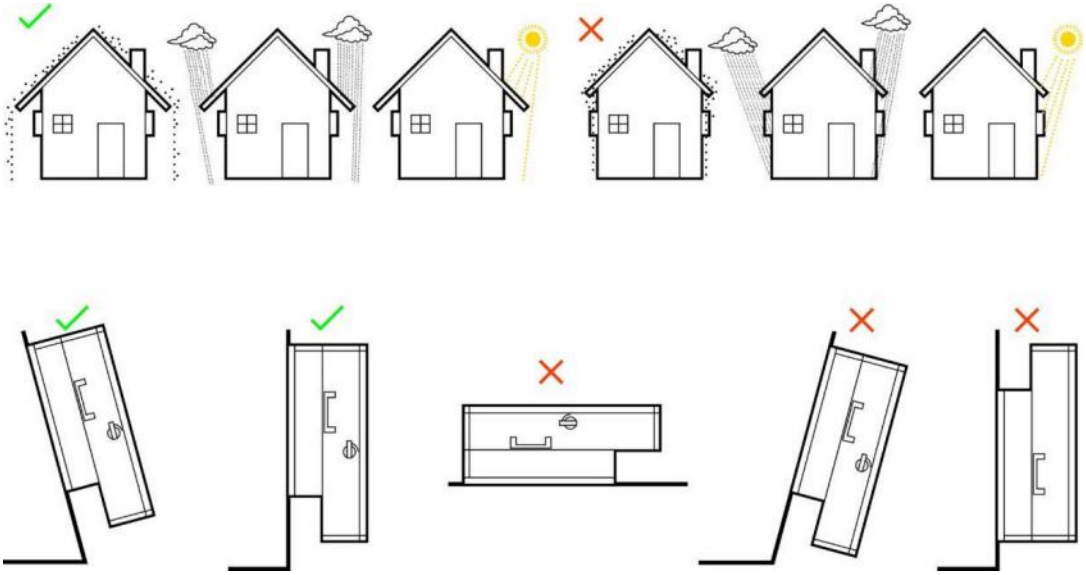
Ensure there is at least 7.9 inches of space around the inverter for heat to dissipate or else there is a risk of fire. Ensure the inverter is mounted away from all combustible materials.

1. The mounting wall should be strong enough to bear the weight of the inverter.
2. Maintain the minimum clearances presented below for adequate heat dissipation.



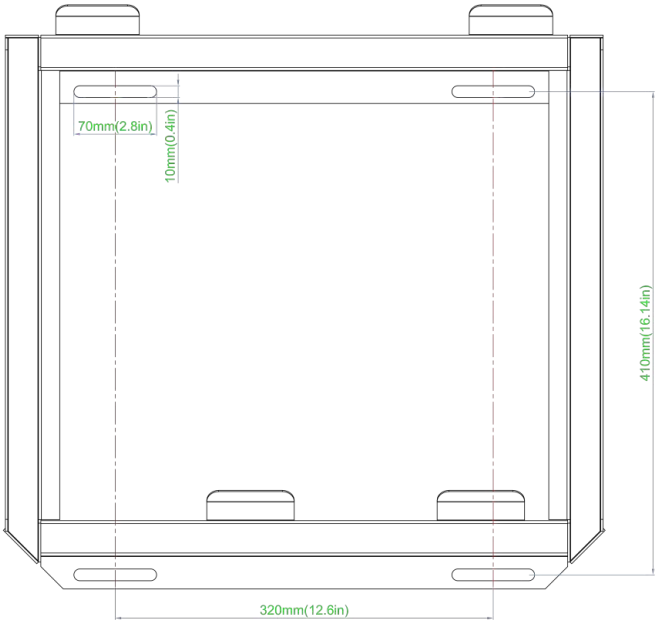


3. Never position the inverter in direct sunlight. Refer to the figure below and choose a well-shaded site or a shed to protect the inverter from direct sunlight. Protect the LCD screen from excessive UV exposure. The inverter should be installed upright on a vertical surface.



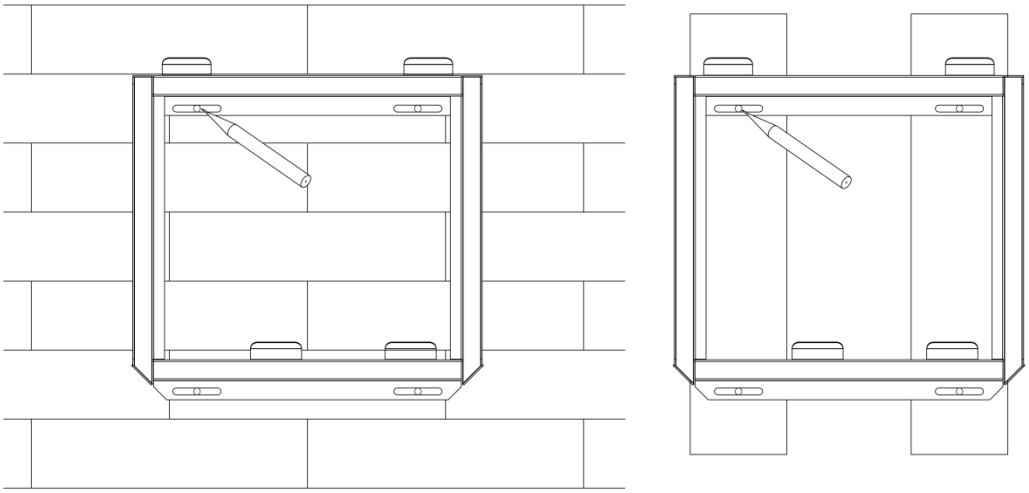
Installing the Inverter

The inverter is designed to be wall-mounted on a vertical, solid **non-combustible** surface such as brick or concrete. Two or more people may be needed to install the inverter due to its weight. The slots on the mounting bracket can accommodate various stud spacings from 12 in. (305 mm) to 15 in. (381 mm).



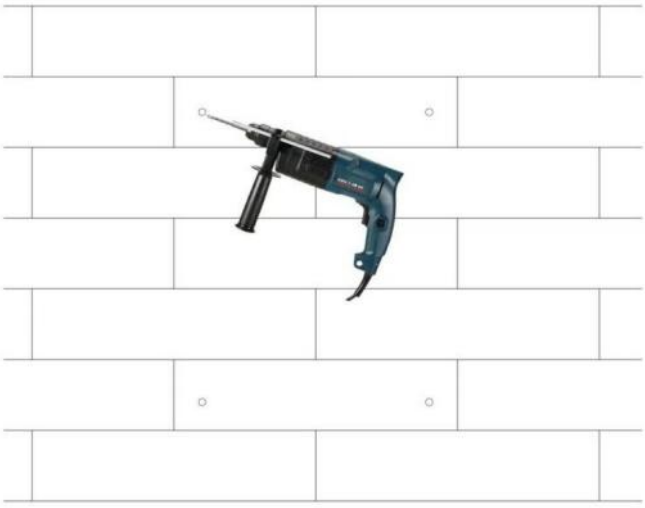
Mounting Steps:

1. Select a location for the inverter's final placement.
2. Use the mounting bracket to mark where the mounting bracket screws will be installed.
   When installing the bracket to studs, verify the marks for the screws are centered over a stud.

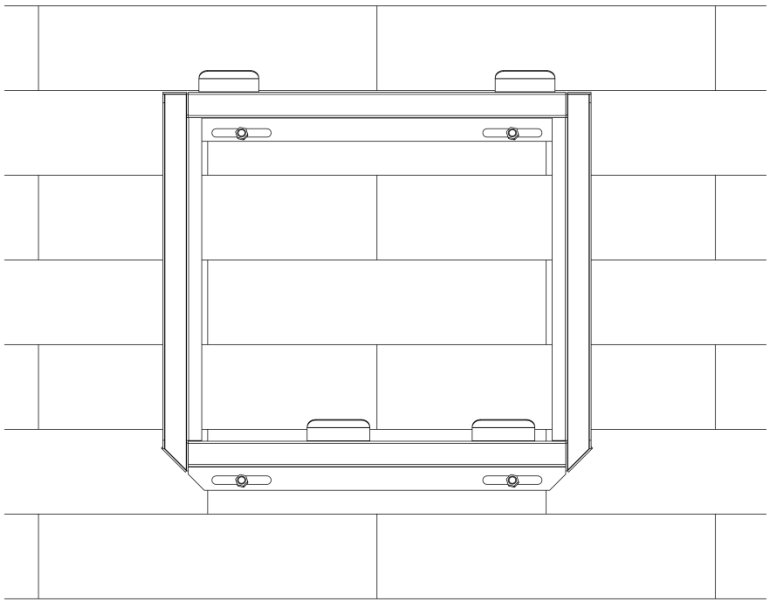


3. When installing the bracket to concrete or brick, drill 5/16 in. (8 mm) diameter holes on the marks, making sure the holes are deeper than 2 in. (50 mm) when using the included expansion bolts.
   When installing the bracket to studs, drill a pilot hole recommended for the screw diameter

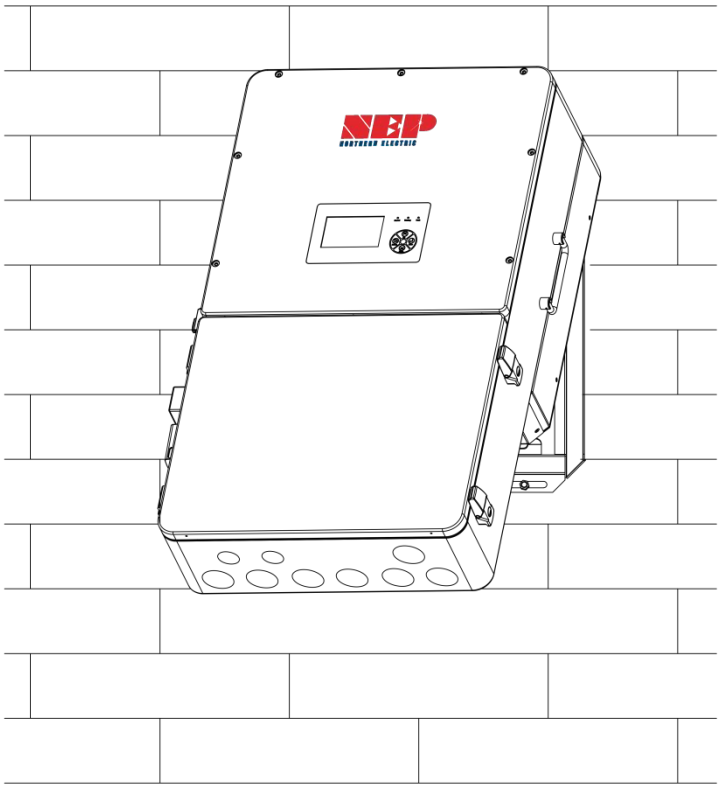
used. Ensure the studs are spaced 12 to 15 in. apart.



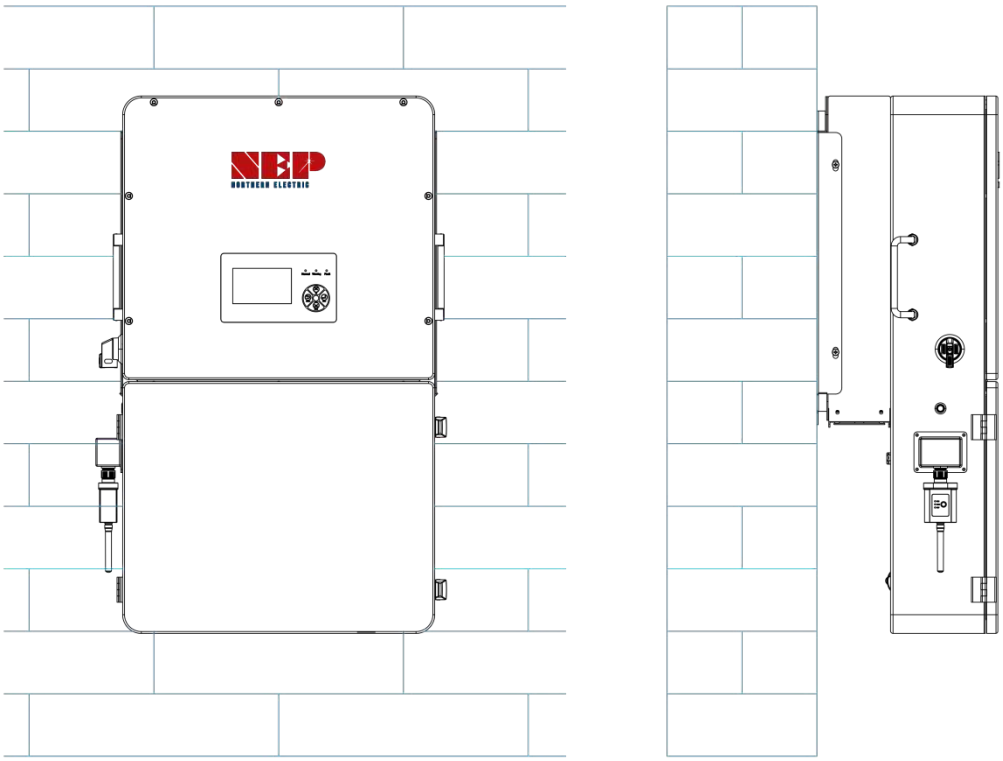
4. For concrete or brick wall installation, insert the expansion bolts into the drilled holes. Install the bracket to the wall. Use the corresponding nuts and washers (packaged together with the expansion bolts) to affix the bracket to the wall.
   For stud wall installation, fix the bracket to the wall by using four tapping screws.



5. Use the team lift technique, place the inverter on to the wall bracket, securing it to the wall.



6. After the inverter is completely attached to the bracket, fix the side of the bracket to the inverter by using the four M5 cross head screws in the accessories.

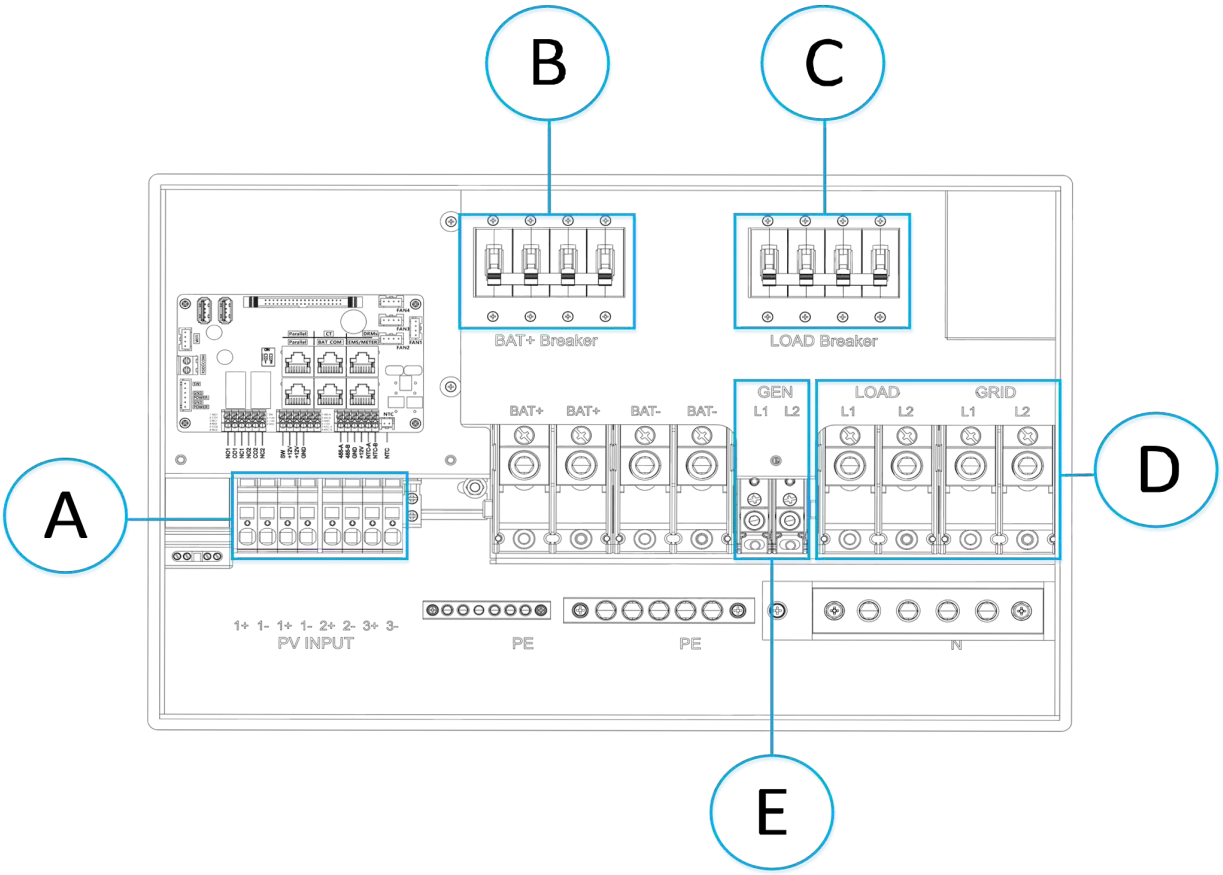


6. CONNECTION OVERVIEW

Breaker selection recommendation for both DC and AC

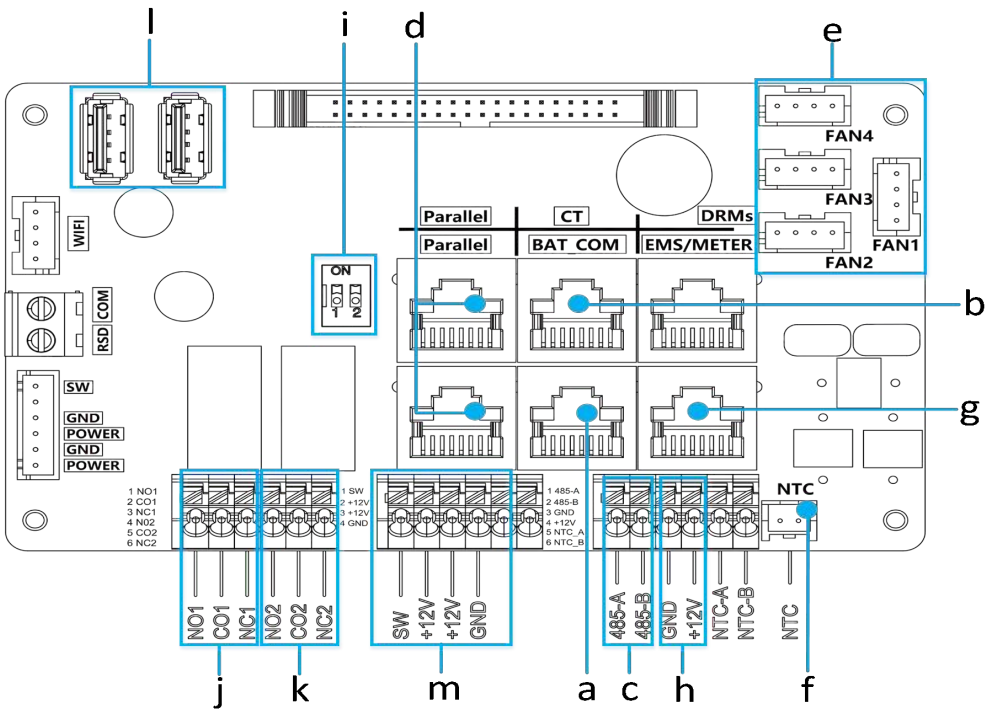
Label	Breaker/Switch	Description
A	PV Input	See Section 6.1
B	Integrated Bonded Battery Breaker	200A × 2
C	Integrated Bonded Load Breaker	L1:200A L2:200A
D	AC Input/Output	See Section 6.2
E	Generator	240VAC/100A

Overview of the Cable Box



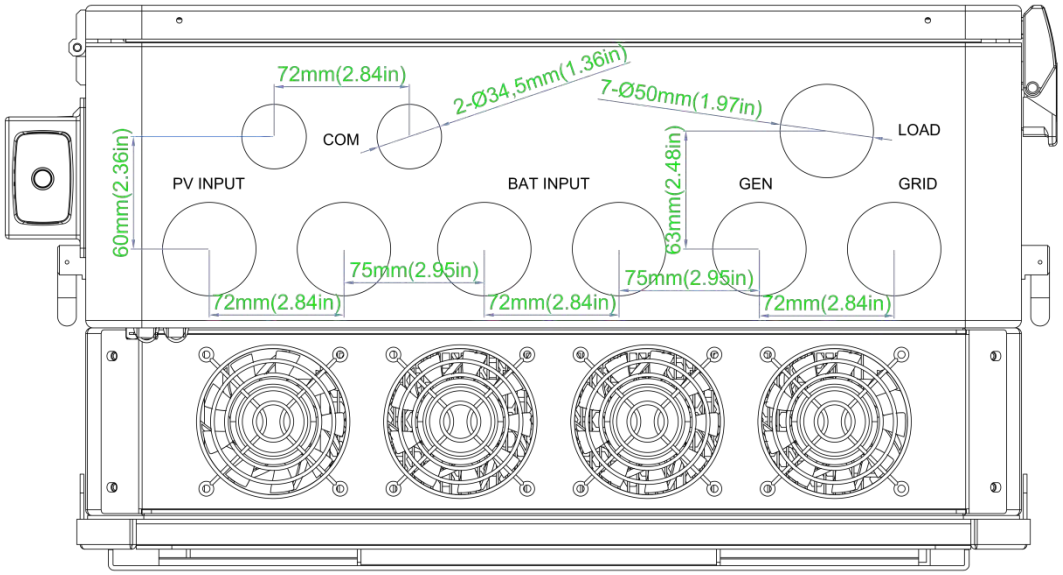
For more information on wiring and connections, see section 6.9.

Overview of Connection Ports



a. Battery communication port (CAN & RS485)
b. CT interface (refer to Section 6.2 for CT connection)
c. INV 485: debugging port
d. Parallel communication port (refer to Section 6.6 for parallel connection)
e. Fans 1/2/3/4
f. Temp sensor connection for lead-acid battery
g. Meter 485A & 485B: for meter communication
h. +12V: reserved for customer to use 500mA Max
i. CAN matching resistance: set DIP switch when using inverters in parallel
j. Connection for generator auto-start function: GEN (NO, NC)
k. Reserved: DRY (NO, NC)
l. LCD UI upgrade port
m. RSD Terminals

Bottom View of Cable Box Knockouts



6.1 PV CONNECTION

Cable Requirements*:

Cable Size	Minimum Insulator Voltage
10 AWG – 8 AWG (Max.) (6 mm^2 – 10 mm^2)	600V

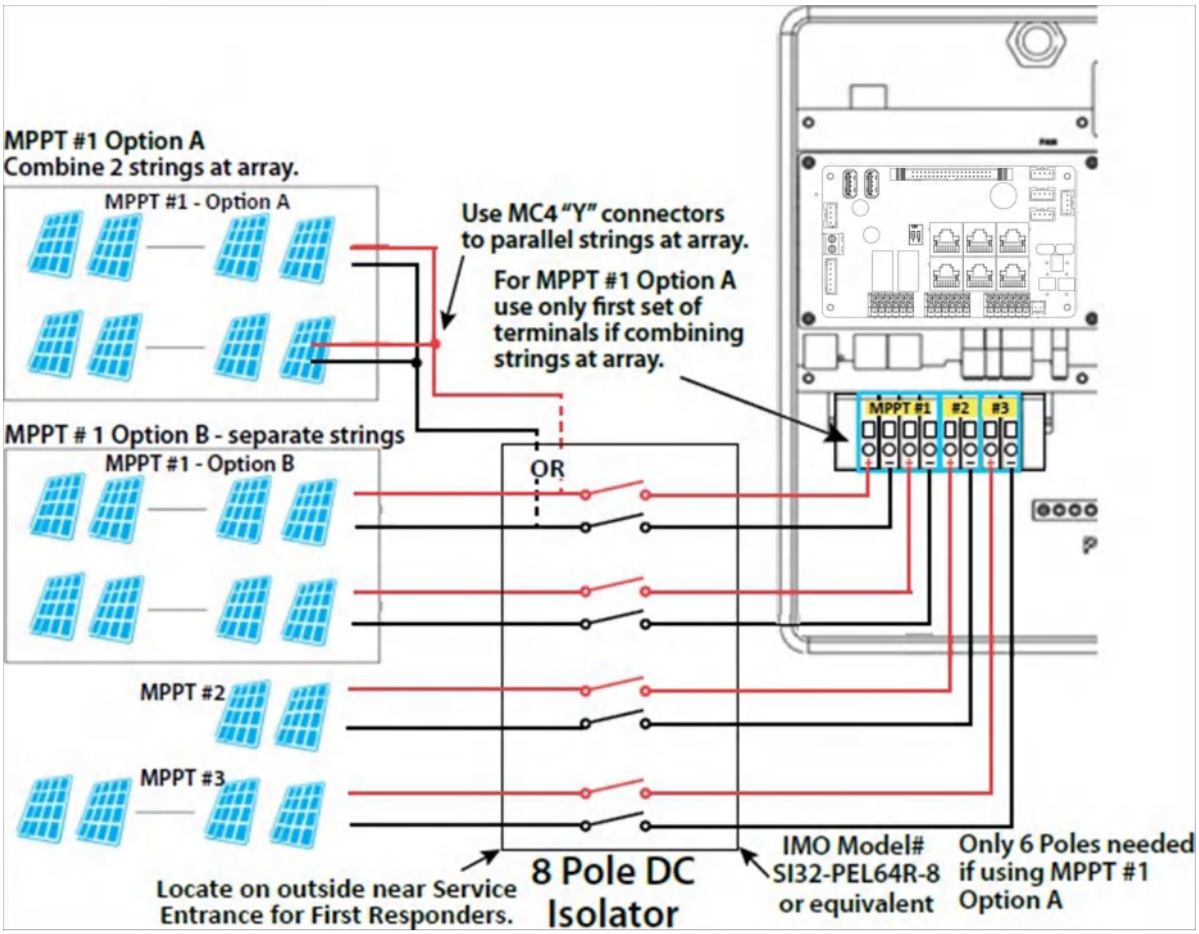
**Consult installer to ensure that appropriate cable sizing is used due to various factors such as voltage drop and Voc.*

IMPORTANT:

Verify the lowest ambient temperature of the installation location. The rated Voc on the solar module nameplate is obtained at STC (77°F/ 25°C). As the ambient temperature drops, the solar module Voc increases. Ensure the maximum solar string voltage, corrected at the lowest temperature, does not exceed the inverter's maximum input voltage of 600V

PV Input Data	Description	Parameter
DC Input Voltage Range	Range required for the unit to operate up to maximum input	100 – 600VDC
Unit Startup Voltage	Voltage needed for the LCD to turn on	100VDC
Load Output Minimum Voltage	Minimum voltage needed to output power on Load side	>140VDC
MPPT Operating Voltage Range	Range where the MPPT can track	120 – 500VDC
Full Power MPPT Voltage Range	Range where the MPPT operates at maximum capabilities	230 – 500VDC
Nominal MPPT Voltage	The MPPT will operate most optimally at this voltage	360VDC
Maximum Utilized Solar Power	Number of watts the unit can utilize from array after considering all power loss factors	18,000W
Rec. Maximum Solar Input	The suggested PV power input to the device for it to utilize the full 18kW of PV that it can process.	21,000W

String Sizing



NOTE:

To determine how many modules per string, first verify the lowest possible ambient temperature of the installation location. Next, find the rated VOC, VMP, Isc and Imp of the solar module at 25ºC and the temperature coefficients for voltage and power. Then, calculate the highest possible VOC for the entire string when the ambient temperature falls to the lowest possible ambient temperature upon sunrise. To make this calculation, use a string calculator or consult a solar designer or solar electrician. For all modules, the calculations must be verified by consulting a professional.

DANGER:

DAMAGE WILL OCCUR if the string voltage on a cold, sunny morning exceeds the inverter's maximum input voltage of 600V!

- When solar modules are put in a series string, the voltage multiplies times the number of modules and the amperage stays the same as each module.
- Calculate the maximum current of the string so as not to exceed the inverter's MPPT circuit ratings. Double check if the calculated Vmp range is within the 230 – 500VDC optimal MPPT circuit operating range. Consult a solar designer if needed.
- When solar modules are put in parallel, the amperage multiplies by the number of modules and the voltage stays the same as each module.
- The inverter has three MPPT PV charging circuits. MPPT #1 will use up to 25 amps, which means two strings can be paralleled for any modules having less than a 12.5A (Imp) rating. MPPT #2 and MPPT #3 will use up to 15 amps each, so they are usually limited to one string (Unless the module has <7.5Amps).
- Each string should ideally contain the same model, brand, and quantity of panels for ease of design, racking, and wiring. However, varying string sizes can be used for unique MPPTs. If two strings are used for MPPT #1 they MUST be the same model, brand and number per string. MPPT#2 and MPPT #3 could differ in model, brand, and number per string (same make/model per string) on the condition that each string complies with the lowest temperature (maximum string number) and maximum amperage calculations above.
- All panels on a series/parallel string should face the same orientation and hopefully be exposed to roughly the same shading across the string. Consideration should be placed on string location and wiring order on the racking to minimize shading effects. One shaded module can disproportionately reduce output for the entire string, so avoiding linear strings in favor of rectangular strings can increase output. Optimizers can also achieve this.
- The inverter will limit the total MPPT current to 25A for MPPT #1, 15A for MPPT #2, and 15A for MPPT #3.

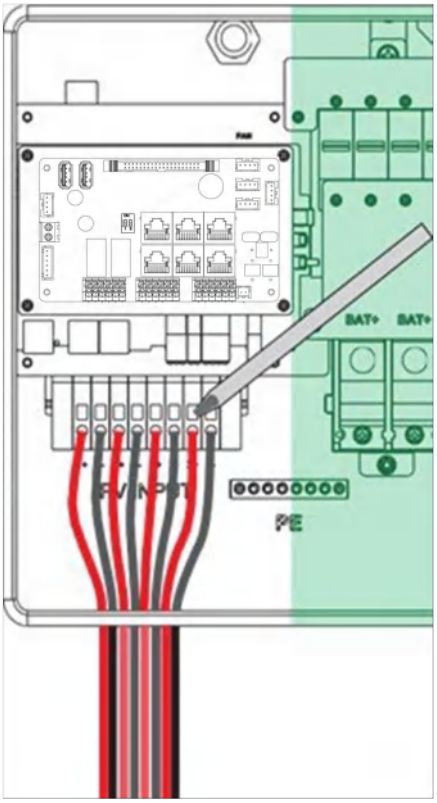
NOTE:

The array can have a higher Imp than the 25A/15A specified, but the MPPTs will not make full use of the extra current. Having an array that can produce more current than the MPPTs can utilize is useful for increasing morning, winter, or cloudy day solar production.

Steps for PV Wiring

1. Ensure all breakers and disconnect switches are in the OFF position before connecting or disconnecting wires. Use a voltmeter to confirm there is no voltage present.
2. Strip off 1/4 in. – 5/16 in. (6 mm – 8 mm) insulation on the PV string's positive and negative conductors.

   Note: Use wire ferrules for the PV string conductors if they are stranded wire.
3. Insert the conduit fitting into the opening for the PV connection and tighten it from the inside using the counter nut.
4. Route the PV conductors through the conduit fitting and into the inverter.
5. Secure the PV conductors in place into the inverter inputs. Verify that they are secured properly by *lightly* pulling on them.
6. Ensure the conduit and conduit fittings are fastened securely and the cable entry holes are sealed.



Connecting Batteries to the Inverter

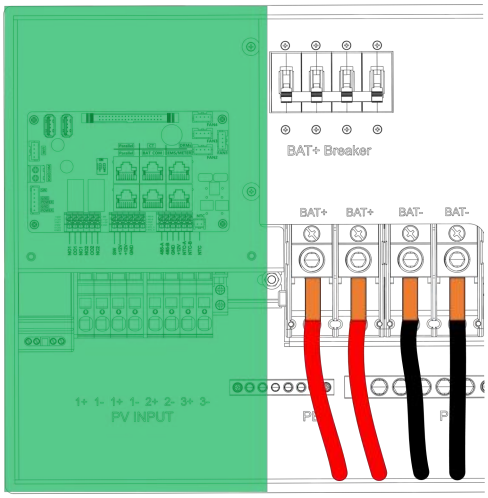
Cable Requirements*

# of cables	Cable Size (90°C)	Max. Distance	Torque for cable connection
2 sets	1/0AWG (53.5 mm^2)	10 ft.	165 in-lbs. (18.6Nm)
2 sets	2/0AWG (67.4 mm^2)	20 ft.	165 in-lbs. (18.6Nm)
1 set	4/0AWG (107 mm^2)	10 ft.	Max. 275 in-lbs. (31.1Nm)
1 set	250kcmil (127 mm^2)	20 ft.	Max. 275 in-lbs. (31.1Nm)

**Suggestions based on distance and battery bank quantity*

Battery Power Cable Connection

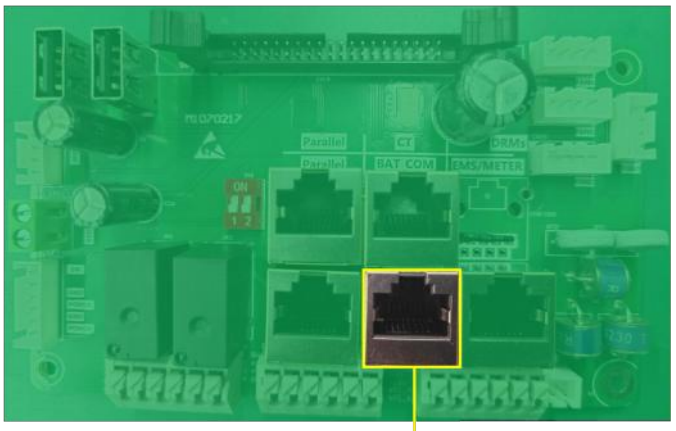
1. Place all breakers in the OFF position before connecting or disconnecting wires. Ensure that there is no voltage present with a voltmeter.
2. Strip 5/8 in. – 13/16 in. (15 mm – 20 mm) insulation from the cable end.
3. Route the battery power cable, connecting positive to BAT +, and negative to BAT -.
4. Secure the conduit fitting to the enclosure using the counter nut.
5. Fasten battery positive and negative cables to the mechanical terminals according to the markings with an M8 hex wrench.



Battery Communication Cable Connection

1. Use the included battery communication cable to connect the battery to the inverter and choose “Lithium” as the battery type*. Select the “Lead-Acid” setting if the lithium battery cannot communicate with the inverter. The battery communication port on the inverter is an RJ45 socket with the pinout for the RJ45 plug shown on the following image. Users can make the communication cable according to the inverter pin description below and the correct pinout of the communication port on the battery. The inverter supports both CAN and RS485 communication.

Pin	Description
1	NC
2	NC
3	NC
4	BAT CAN H
5	BAT CAN L
6	NC
7	BAT RS485 A
8	BAT RS485 B



Battery Communication Port

2. After connecting the battery power and communication cables, enter the APP settings to choose the battery type and brand.

For Lithium Battery:

Ensure that the lithium battery being used is compatible with the inverter. NEP® strongly recommends using closed- loop communications between the battery and inverter. Contact the distributor or support@northernep.com for an updated battery closed-loop communications list.

If using multiple battery modules with the inverter, the inverter communication cable must be connected to the master battery.

Check with the battery supplier for battery master and slave settings.

For Lead-Acid Battery:

The temperature sensor for Lead-Acid batteries is optional. There are three stages for lead-acid battery charging.

6.2 AC WIRING INFORMATION

When sizing AC wires, adhere to the following information.

Cable Requirements:

Terminal Connection	Wire Size	Torque Values
GRID	6 – 4/0AWG (26.7 mm² – 107 mm²)	95 – 165 in-lbs. (10.7Nm – 18.6Nm) depending on wire
GEN	Size according to generator output	95 – 165 in-lbs. (10.7Nm – 18.6Nm) depending on wire
LOAD	6 – 4/0AWG (26.7 mm² – 107 mm²)	95 – 165 in-lbs. (10.7Nm – 18.6Nm) depending on wire

Ground-Neutral Bonding

The information below describes the nature of the ground and neutral in the inverter and their relationship to the system. Always consult with an installer or a licensed electrician to ensure that the right configuration is being used:

- The neutral line is a solid connection between AC input and AC output (known as a Common Neutral Architecture).
- The neutral line between the AC input and AC output is never disconnected.
- **The inverter never creates a ground-neutral bond in any mode of operation**.

IMPORTANT:

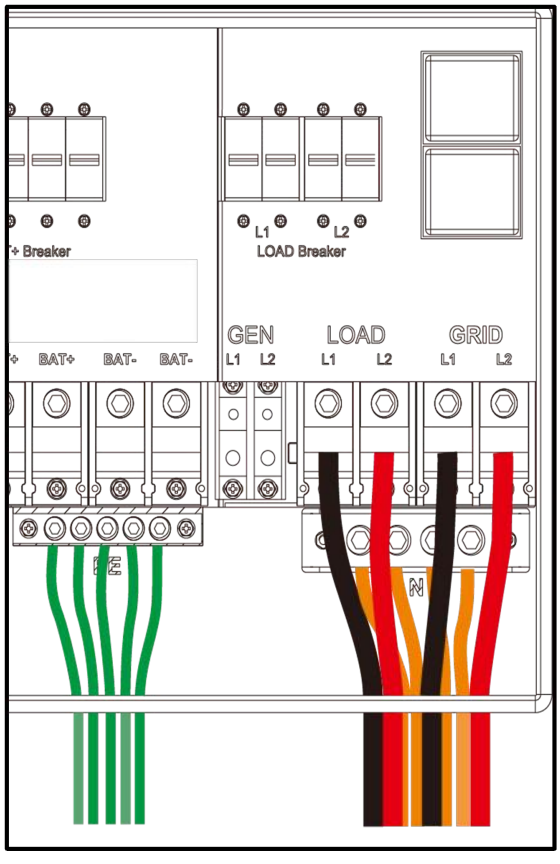
The system should have only one ground-neutral bond (this is typically the Main Bonding Jumper located at the first grid system disconnect).

After connecting all AC wiring, put the build in LOADS breaker back to the ON position before providing power to the load.

AC Connection

1. Before connecting or disconnecting AC wires, ensure all breakers are in the OFF position. Check that there is no voltage present with a voltmeter.
2. Strip off 5/16 – 3/8 in. (8 – 10 mm) insulation from the AC cables.

   Note: Use wire ferrules if the cables are made of fine stranded wires.
3. Secure the conduit fitting to the enclosure using the counter nut of the fitting.
4. Fasten the GRID and LOAD cables to the terminal block in accordance with the terminal labels using an M8 hex wrench (For ground terminal, use an M5 hex wrench.).
5. Secure conduit to the conduit fitting.
6. Check that the cables are connected properly. Take appropriate measures to ensure that the conduit and conduit fitting are properly secured and seal the cable entry holes.



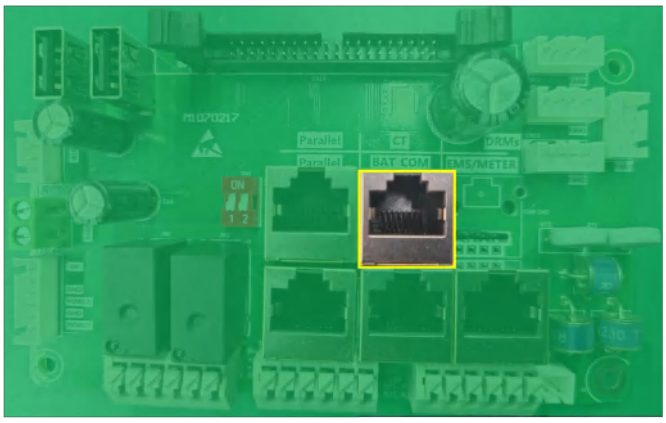
CT/Meter Connection

To measure the power imported from and exported to the grid, a pair of CTs or one three-phase meter must be installed at the service entry point in or near the main service panel. Two CTs are provided with each inverter.

CT Port Pin Definition

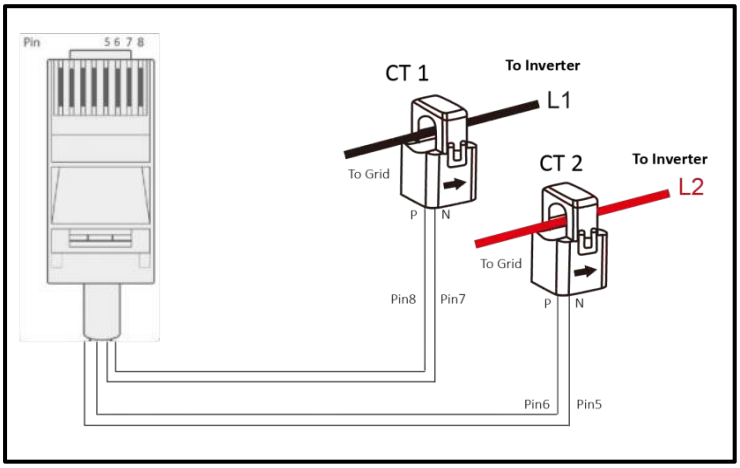
The CT interface for the two (2) CT connections is an RJ45 port. The two (2) CTs come with premade plugs that can be connected directly to the port.

Pin	Description
1 – 4	Reserved
5	CT2N
6	CT2P
7	CT1N
8	CT1P



Refer to the connection diagram to the right for the correct position of the CTs. Clamp the 2 CTs onto the L1 and L2 wires at the service entry point in the main service panel.

The arrows on the CTs must point toward the inverter and be placed on the proper line based on their number. (CT 1 for L1, CT 2 for L2)



CT Clamp Ratio:

The inverter supports three ratios of CT clamps: 1000:1, 2000:1, and 3000:1. The included CT is 3000:1.

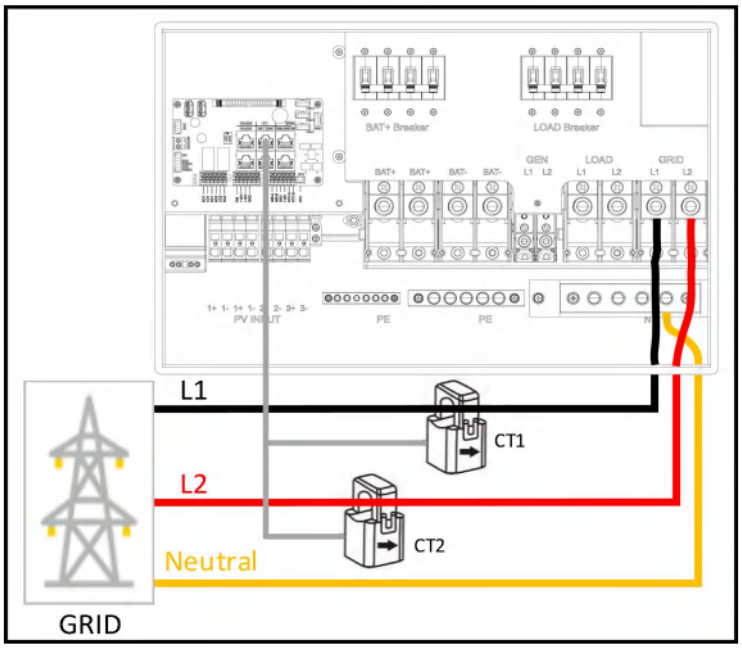
If using a 3rd party CT, ensure that the CT ratio is of the supported types. Be sure to select the correct CT ratio setting on the inverter.

Black= L1

Red= L2

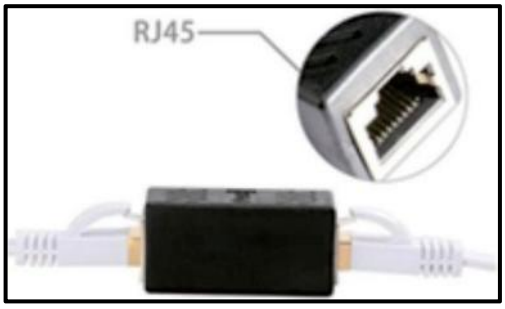
Orange= Neutral

Grey= Communication Cable



Extending the CT Clamp Cable

The CT wires can be extended with a common ethernet cable if they are not long enough. An RJ45 adapter is needed for the extension. The CT wires can be extended up to 300 ft. (around 90 m).



6.3 WORKING WITH A GENERATOR

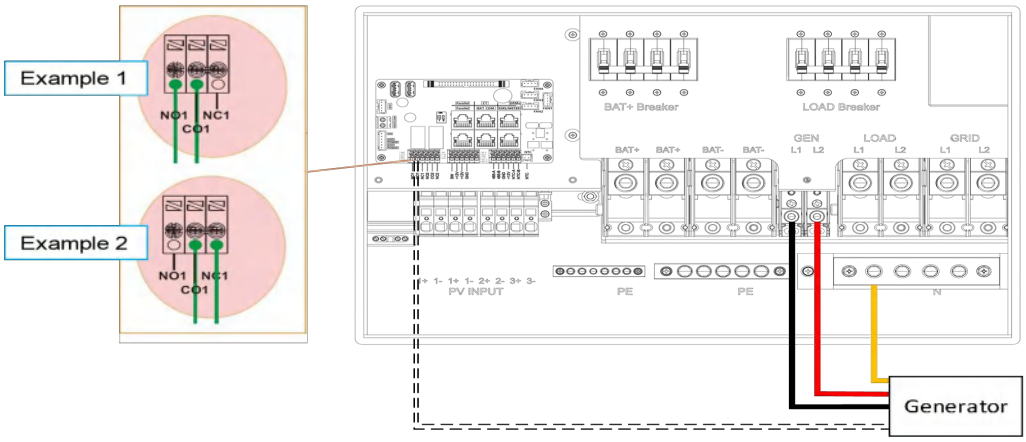
Generator System Connection

This hybrid inverter can work with a generator by connecting it to the GEN terminals on the inverter. When the generator is started, it will supply the inverter with the generator's maximum power. If the generator's power is not adequate to power all loads, the inverter will pull from the battery bank as supplemental power.

Generator requirements:

1. Generator should be a 120/240VAC, 60Hz generator.
2. Generator capacity should be **between** 6kW – 21.6kW.
3. Generator THD should be <3%.

Connecting the Generator Start Signal (2-Wire Start)



When the generator is started, all the loads connected to the LOAD terminals will be supplied by the generator while still charging batteries; the generator will become the primary source of power for the inverter. The pass-through relay on the generator terminal is 90A. When the generator is on, ensure the total load and charge current does not exceed 90A. The generator start signal will be connected to the COM board GEN Normally Open (NO1 and CO1), or Normally Closed (NC1 and CO1) terminals, if users want to start generator remotely. See diagram above for 2 examples.

Generator 2-Wire Start Specs:

- Maximum Voltage 30VDC, 277VAC.
- Maximum NO Contact Current: 5A
- Maximum NC Contact Current: 3A

Generator Start and Stop Settings

The “Generator Parameters” setting will determine whether the system will use battery SOC or battery voltage to start or stop the generator.

Generator Start Conditions

The generator will start when utility fails and one of the following conditions is met:

- When battery bank is discharged to the cut-off setting OR
- There is a force charge request from battery bank OR
- When the battery voltage or SOC is lower than the generator “Charging start Volt/SOC” setting.

Generator Stop Conditions

When battery voltage or SOC is higher than the “Charge cutoff Volt/SOC” settings.

6.4 OFF-GRID WIRING

The hybrid inverter can fully function in off-grid only mode. It does not need the utility or generator to function. Purely off-grid systems that do not have access to the utility should strongly consider having a 2-wire start backup generator for extended cloudy periods (8 – 12kW diesel recommended per inverter, 21kWs max. per inverter). Off-grid systems should have robust battery banks sized to ensure multiple days of power and to reduce generator run time.

The hybrid inverter can also utilize AC coupled solar input through the GEN port in purely off-grid systems.

The hybrid inverter can accept up to 90Amps (21kWs) of generator power and will pass through all available power to the loads. Therefore, the LOADS subpanel can be sized up to the size of the backup generator with a 60 amp minimum per inverter.

6.5 AC COUPLING INSTALLATION CONNECTION

The inverter can accept PV solar inputs to both MPPT channels and AC coupled solar input at the same time. The AC coupled solar input can be up to 90A of AC power or 21.6kW of solar. The MPPT channels can handle up to 18kW of solar, with 12kW available to feed back to the grid. Therefore, up to 33.6kW of AC power could be sent back to the grid. For this amount of back feed, users will need either a feeder tap or supply side tap as the point of utility interconnection. The existing solar system

is connected to the inverter's GEN terminal.

After the AC couple function is enabled:

When the grid is on, the hybrid inverter sends the AC power of the grid-interactive inverter to the loads and battery bank. Any remaining energy will be exported to the grid.

When the grid is off, the hybrid inverter enables the grid-interactive inverter to provide PV power to loads and battery bank. Loads will be supplied by PV first, then battery power. When solar power exceeds the sum of loads' power consumption and maximum battery charging power, the inverter will signal the grid interactive inverter to reduce power via the frequency-shifting, power-reduction mechanism.

What is frequency-shifting power reduction?

All UL1741SA compliant grid-interactive inverters have the Frequency-Watt feature, which requires the grid-interactive inverter to reduce power with increasing grid frequency. The power will drop to zero before the over-frequency trip threshold is reached.

When the grid is down and the hybrid inverter requires an AC coupled inverter to reduce power, it simply shifts the output frequency up slightly, and the grid-interactive inverter will limit its output power accordingly after sensing this frequency shift.

When the grid is up, the frequency is dictated by the grid and the hybrid inverter will reduce exported power if the frequency goes up.

AC Coupling Settings: The “AC couple” setting must be enabled when connecting an existing on-grid system to the GEN terminal.

Start SOC/Voltage (%/V): The SOC or Voltage at which the AC coupled inverters are turned on when in off-grid mode (50% to 70% recommended).

End SOC/Voltage (%/V): The SOC or Voltage at which the AC coupled inverters are shut down when in off-grid mode (90% recommended).

When on-grid and export to grid is enabled, the AC coupled inverter will always be on, and it will sell any extra power back to the grid. Ensure “Grid Sell Back” is allowed with the utility provider when using AC coupled PV arrays on-grid.

NOTE:

It is recommended to keep the Start V/SOC and the End V/SOC within 5 – 10% of each other for optimal operations when utilizing AC coupling.

If looking to frequency shift when AC coupling, it is recommended to set the Start SOC to 99% and the End SOC to 100%.

6.6 PARALLEL SYSTEM CONNECTION

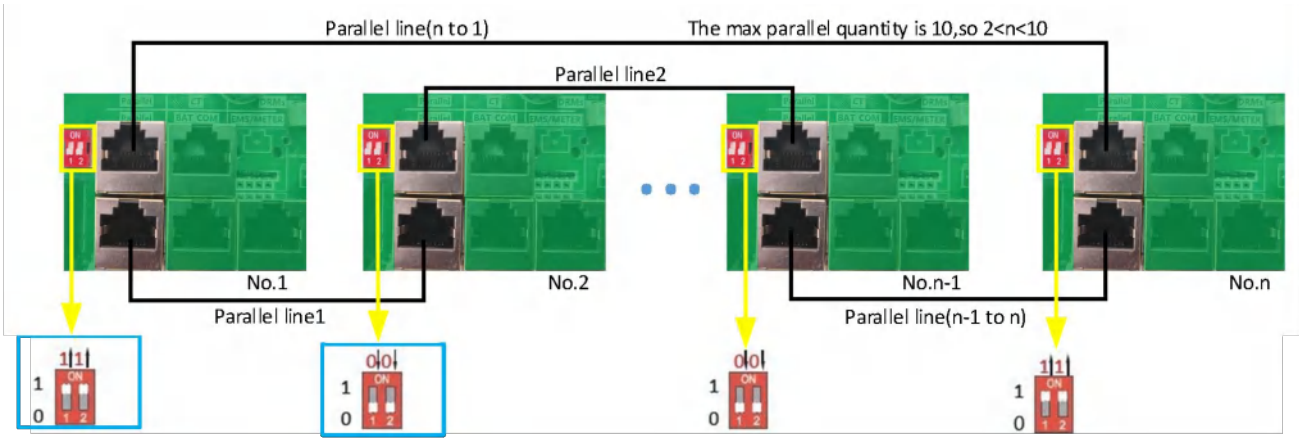
Connections for Parallel System

The hybrid inverter supports parallel connection to expand power and energy capacity to suit different usage scenarios. **Up to 10 units can be paralleled to reach a capacity of 120kW.**

The parallel wiring diagrams are as follows. The manual bypass switch connects the loads to LOAD panel as default. If the inverters fail, users can switch the loads to utility. **Contact the inverter supplier for more detailed guidance on paralleling the system.**

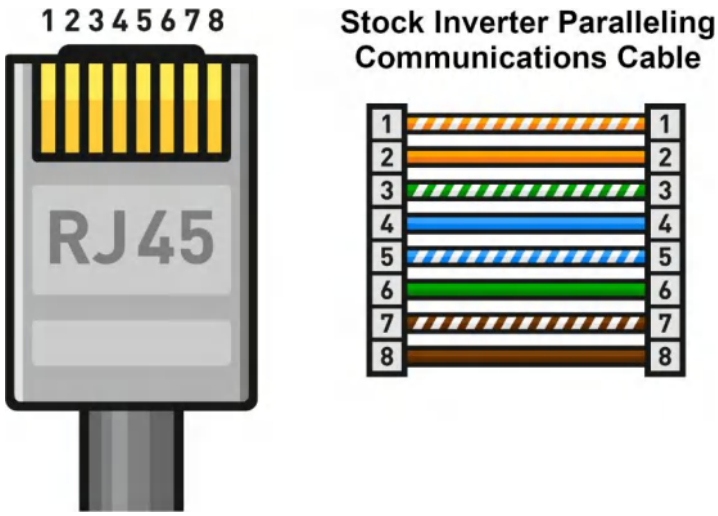
REMINDER:

Put the CAN communication pin to ON status for the first and the last inverter and OFF for inverters in between. Both switches in the “ON” position translates to address 1. Both switches in the “OFF” position translates to address 0.

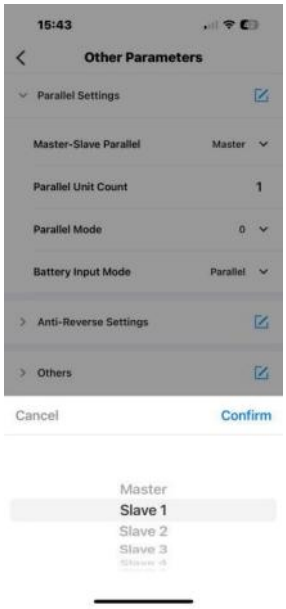


REMINDER:

If the inverter-to-inverter paralleling cable needs to be extended, ensure the cable is a straight-through CAT5 and up cable. See image below for reference



Parallel Information Setting



Notices for parallel system:

- Ensure that the generator is connected to all inverters in parallel (if available).
- If the number of PV panels connected to each inverter cannot be divided evenly, it is recommended to have more PV panels on the master inverter.
- The values shown on the LCD of each inverter represent the inverter's contribution to the system, **not the system's total**.

Parallel Configuration:

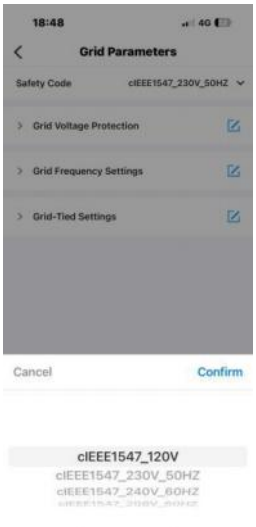
1. Confirm that all inverters have been updated to the latest firmware. Contact the dealer to confirm the latest version.
2. Ensure that the power cables and parallel communication cables are connected correctly, and the DIP switch configuration is correct.
3. Power on the inverter and set it to the "Stop" state through the "Basic" page in the settings.
4. Confirm that the inverter status is "Initialization."
5. In the "Parallel" settings, select the device to be the master unit by choosing "Master/Slave," and set the rest as "Slave."
6. In the battery input mode, select "Shared Battery" or "Independent Battery," and ensure that the communication cable from the battery to the master unit is connected.

Commissioning Steps:

1. Turn on the battery to ensure that communication is normal for all units.
2. View parallel information through the home page.
3. Enable the "EPS" function on the "Basic" page.
4. Before connecting the load to the load output terminals, check the output status between L1 and L2, and L1 and N.
5. Connect a small load to the load output terminals to verify power output.
6. Complete the debugging.

6.7 GRID, LOAD, AND AC CONNECTION

This inverter can be used in 120/240V or 120/208V phase systems. This inverter has passed the main grid connection regulations in the U.S. Users can choose the different grid type and regulation in the “Grid Parameters” program.



IMPORTANT:

Make sure the safety standard and grid type configurations are consistent.

6.8 GRID AND LOAD CONNECTIONS FOR SPLIT- PHASE SERVICE

The inverter can withstand up to 8kW of imbalance between L1 and L2. However, the loads should be balanced as much as possible to avoid damaging the load side equipment.

The inverter can be connected to the load side of the service disconnect. This means if the busbar rating in the main panel must meet the NEC705.12(B)(3) requirements. Otherwise, a Line side

connection can be made to avoid an expensive main panel upgrade.

The default setting for split-phase is 120/240; the inverter is capable of 120/208 under electrician or installer advisement.

DANGER:

There is a very real danger of overloading the service entrance wires with supply side taps (refer to NEC 220). Users could essentially be adding loads to a possibly already fully loaded service entrance.

DO THIS ONLY UNDER ADVISEMENT OF AN ELECTRICIAN AND/OR INSPECTOR.

6.9 WIRING DIAGRAMS

For specific use cases,scan the following codes:

System Wiring Diagrams

7. MONITOR SYSTEM SETUP

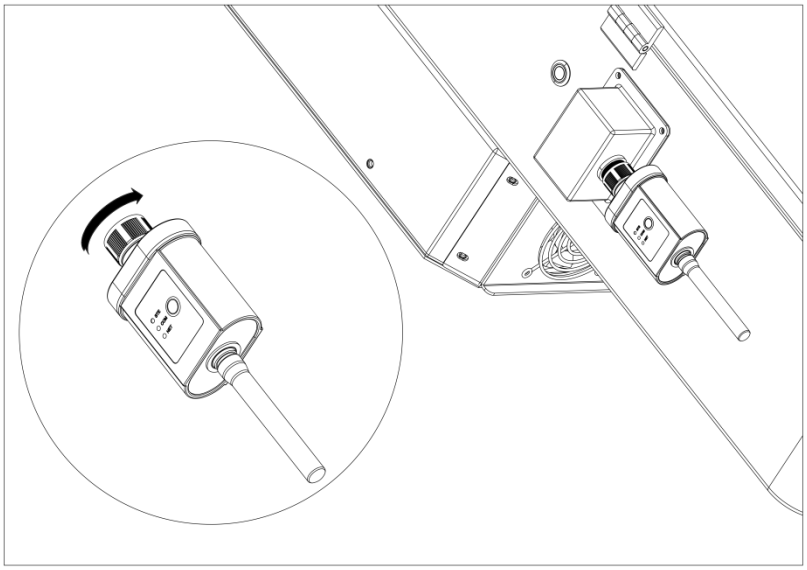
Besides the LCD screen, the inverter can be programmed and monitored with the NEP Monitor Center Website (user.nepviewer.com) and the NEP Monitor App.

iPhone Download

Android Download

7.1 WI-FI/4G DONGLE CONNECTION

A Wi-Fi/4G dongle can be used to monitor the inverter and remotely view the monitoring data on a computer or smart phone. Attach this module by plugging it in to the side of the inverter and tighten the Wi-Fi/4G dongle. (see image below).

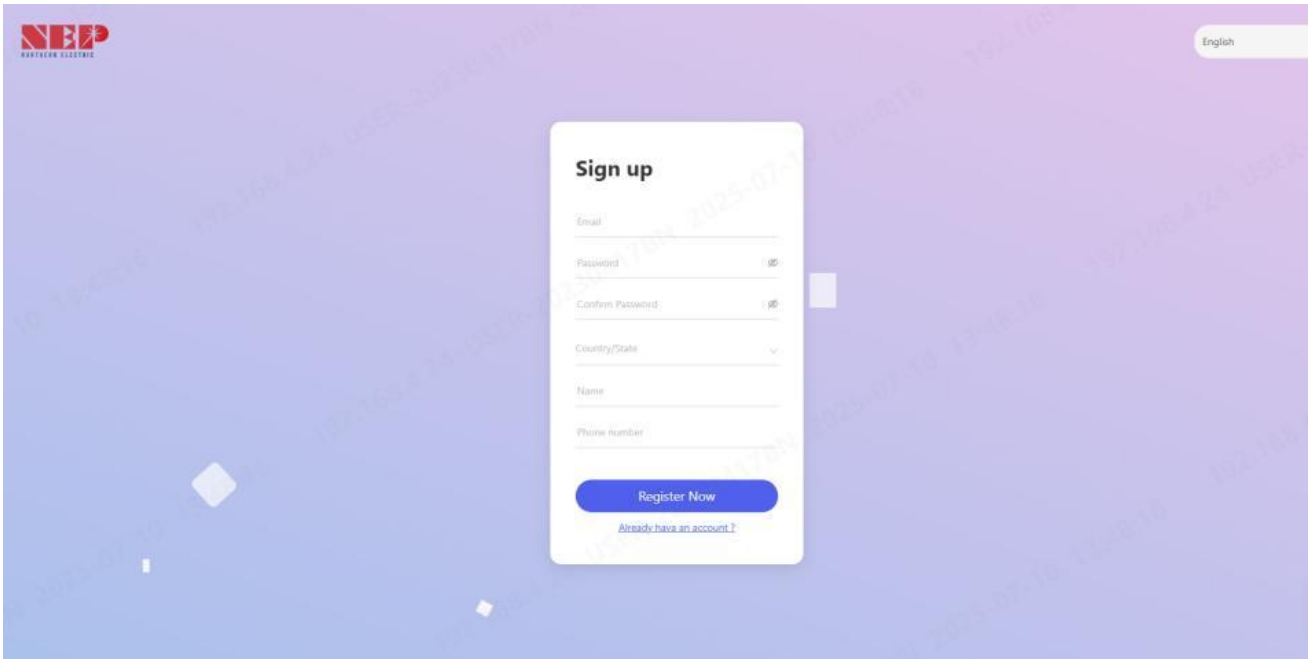


7.2 ONLINE MONITORING SYSTEM USER INTERFACE

NOTE:

The monitoring system may change due to updates, the following UI descriptions may vary from the current pages on the site. For any questions, or to create distributor or installer accounts, contact support@northernep.com for assistance.

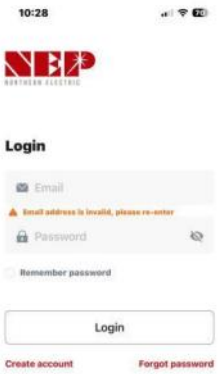
After connecting the Wi-Fi dongle, create an account by registering at user.nepviewer.com.



7.3 SMARTPHONE APP SETUP

Register a monitoring account and set the Wi-Fi password for the Wi-Fi dongle before using NEP's monitoring system.

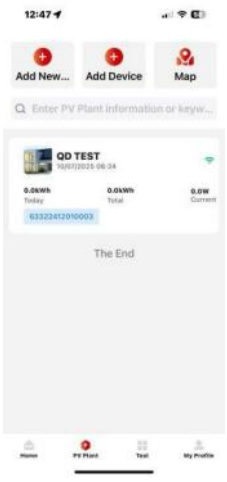
1. **Register an account:**
   Visit user.nepviewer.com or download the “NEPviewer” app to register for an end-user account. Contact support@northernep.com for distributor or installer accounts.

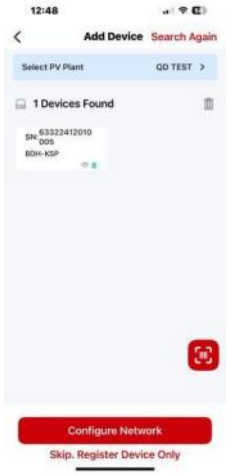


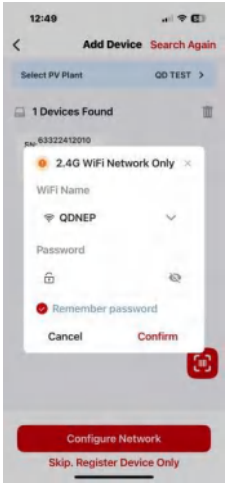
2. **When registering the account, provide the following information:**

3. **Set the Wi-fi password:**

a. Plug in the Wi-Fi dongle, and power on the inverter.
b. Wait until the INV LED on the Wi-Fi module is solid on.
c. Open the app. Click “Add Devices”.
d. Select a site to add device.
e. Enter WiFi Name and Password.
f. Click “Configure Network”.







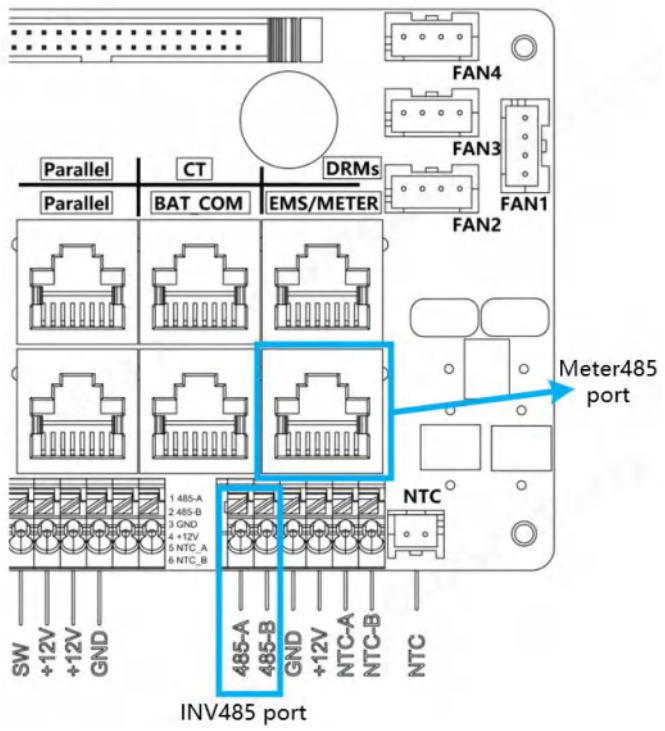
7.4 LOCAL MONITORING SETUP WITH THE NEP MONITOR APP

If there is no Wi-Fi available at the location, use the local function to monitor or set up the system:

1. Download the NEP Monitor app.
2. Connect the mobile device to the Wi-Fi hotspot after the INV LED on the Wi-Fi module is solid on. The name of the hotspot is the same as the serial number on the Wi-Fi module shell.
3. Select “Local Connect.” Now the system can be monitored and set up either through Bluetooth or through the hotspot connection.

7.5 THIRD-PARTY RS485 COMMUNICATION

Meter485 port can be used when a meter is not connected. These two pins can be used to communicate with the inverter using the RS485 Modbus protocol.
INV485 port: This interface is shared with the Wi-Fi module. If the Wi-Fi module is not in use, this interface can be used to communicate with the inverter.
Contact distributor to get the Modbus protocol for third-party app development.



Pin	Meter485 Description
1	RS485A
2	RS485B
3-6	/
7	RS485A
8	RS485B

8. OPERATION GUIDE

8.1 INVERTER START-UP AND SHUTDOWN PROCEDURE

Starting up the inverter

1. If equipped, turn on (close) the DC breaker between battery and inverter first. Turn on the BAT breaker located in the cable box of the inverter and then power on the battery system.
2. Make sure the PV voltages of the strings are within operating parameters. Turn on (close) PV isolator switches between the inverter and array and then on the side of the inverter.
3. Make sure Steps 1 and 2 are running properly before turning on the grid power or generator breaker.
4. Power on the load breakers in the cable box of the inverter and then in the load panel.

DANGER:

NEVER disconnect the battery, PV, or AC input power under load. If there is an emergency and users must shut down the inverter, follow the steps outlined below or use the RSD safety feature.

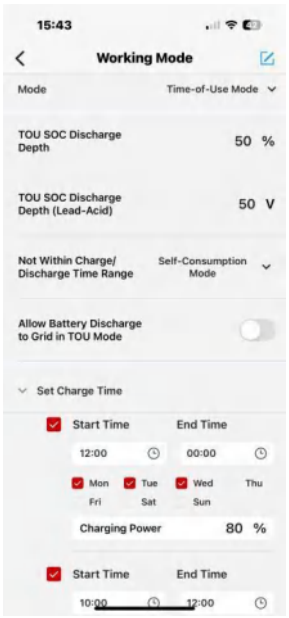
Shutting down the inverter

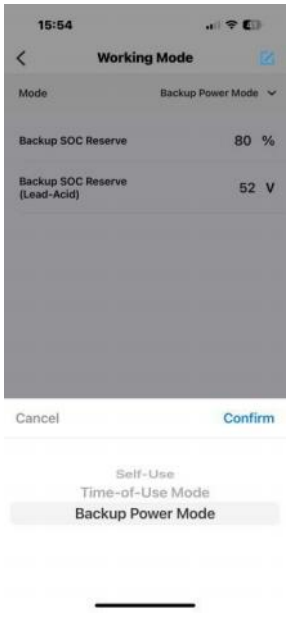
1. Turn off the grid breaker feeding the inverter.
2. Switch off the load breaker.
3. Turn off the PV Isolator switch and then battery breaker. Wait for the LCD to go off.

8.2 WORKING MODES AND RELATED SETTINGS

Working Modes:

Working modes are pre-set priority systems that allow users to configure the system to meet their demands through extensive customizations. These modes can be found under the Maintenance tab by selecting “Working Mode.” Scroll past “Application Setting” to the “Working Mode Setting” section.





Self Used Mode

Working Mode Definitions:

Prioritize solar power generation for self-generation and self-consumption, and charge batteries with excess power; use batteries to supply power to loads at night when there is no solar power generation; increase the rate of self-generation and self-consumption of solar power generation systems to save electricity costs.

Suitable for areas with high electricity prices and little or no subsidized feed-in tariffs for solar power.

Working Mode Introduction:

• Daytime：

When the power generated in the PV system is sufficient, the power generated in the PV system is prioritized to power the household loads and the excess power is given to the battery charge and sell the remaining power to the grid.

When the power generated in the photovoltaic system is insufficient, priority is given to the use of battery power for the load, such as the battery power is insufficient, the power grid to the negative load-powered.

• Evening or night：

If the battery is fully charged, the load will be powered by the battery. If the battery is low, the load will be powered by the grid.

Back-up Mode

Working Mode Definitions:

Back-up mode is mainly applicable to the unstable power grid and important loads, when the power grid is disconnected, the inverter turns to off-grid mode to supply power to the loads; when the power grid is restored, the inverter switches to grid-connected mode.

When the battery is discharged to the cut-off SOC, it is no longer discharged, and when there is light the next day to charge the battery to a certain level, the battery starts to supply power to the load.

Working Mode Introduction:

• When there is sufficient power generated in the PV system:

• When the grid is normal and the battery SOC > cutoff SOC,the power generated in the PV system is prioritized for use by the loads, the excess power is charged to the batteries, and the remaining power is sold to the grid.

• When the grid is normal and the battery SOC≤cutoff SOC, the power generated in the PV system is prioritized for charging to the batteries, the excess power is used by the loads，, and the remaining power is sold to the grid.

• When there is no PV in the PV system to generate power:

• When the grid is normal and the battery SOC > cutoff SOC, the battery is prioritized to power the load and the excess energy is supplied by the grid.

• When the grid is normal and the battery SOC≤cutoff SOC, the load is powered by the grid.

• When the grid is abnormal, the inverter enters off-grid mode operation and the battery supplies power to the load.

Force Time Use Mode

Working Mode Definitions:

The force time use model is mainly suitable for use in scenarios where there is a large difference in electricity prices between peaks and valleys.

The charging time can be set flexibly, and charging from the grid can also be selected according to local regulations.

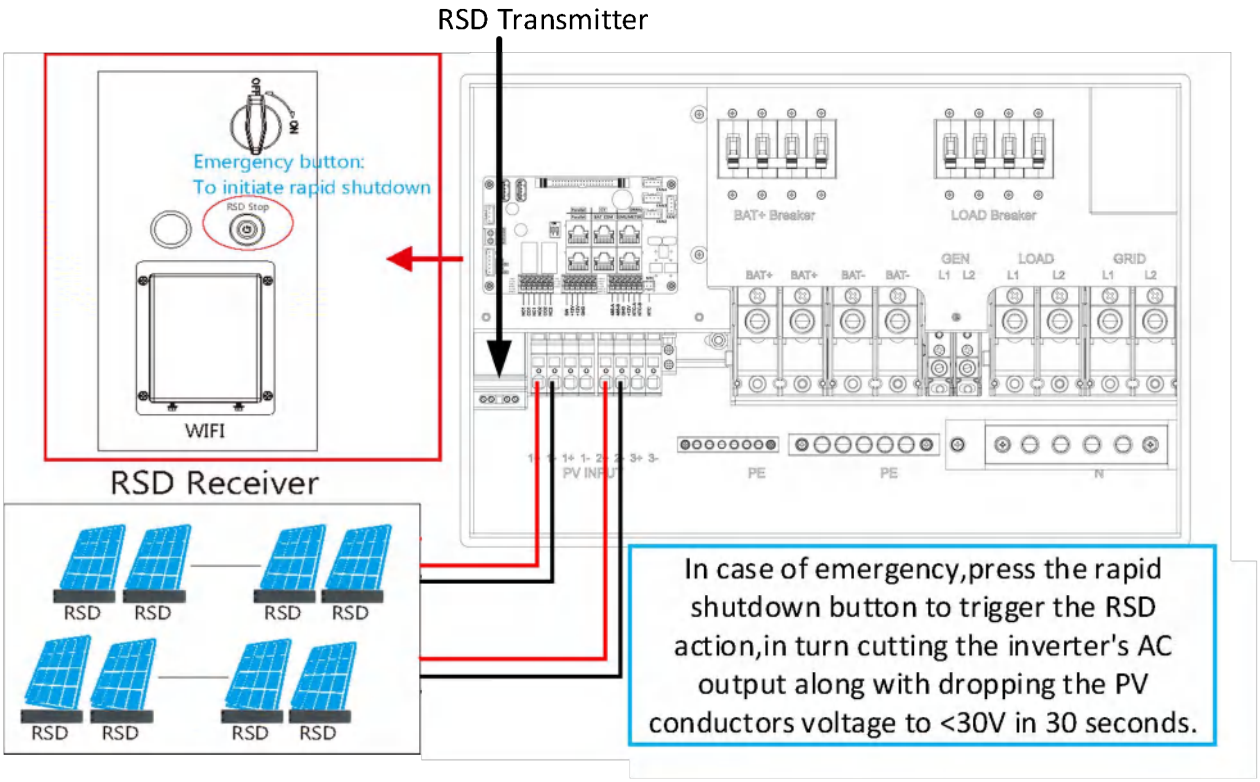
Working Mode Introduction:

• During the charging time period, when the power generated in the PV system is sufficient, the power generated in the PV system is prioritized to charge the batteries, the excess power is given to the loads to use, and the remaining power is sold to the grid.

• During the discharge time period, when there is no PV generating power in the PV system, the battery is prioritized to supply power to the load and the excess energy is provided by the grid.

8.3 RAPID SHUTDOWN (RSD)

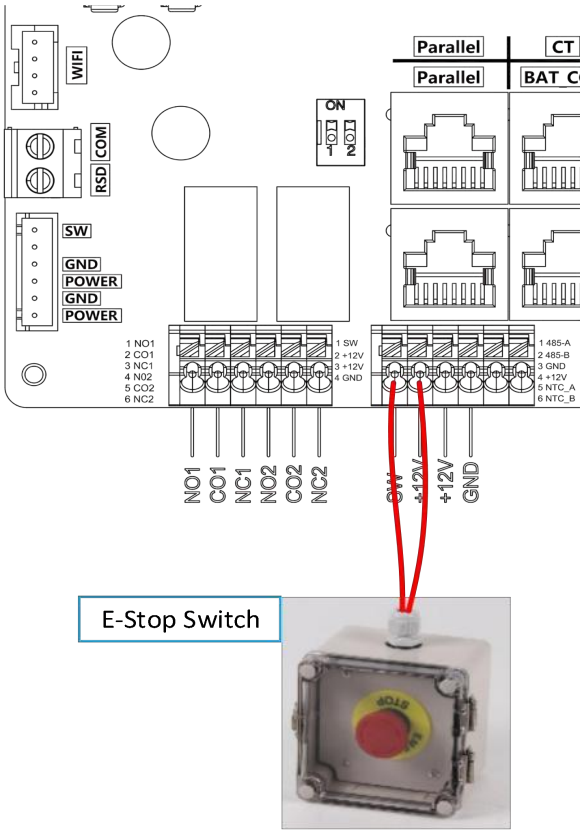
The inverter includes a rapid shutdown system that complies with 2017 and 2020 NEC 690.12 requirements. A rapid shutdown switch should be connected to the RSD terminals on the inverter and mounted on a readily accessible location outdoors (check with the local AHJ for requirements).



External RSD

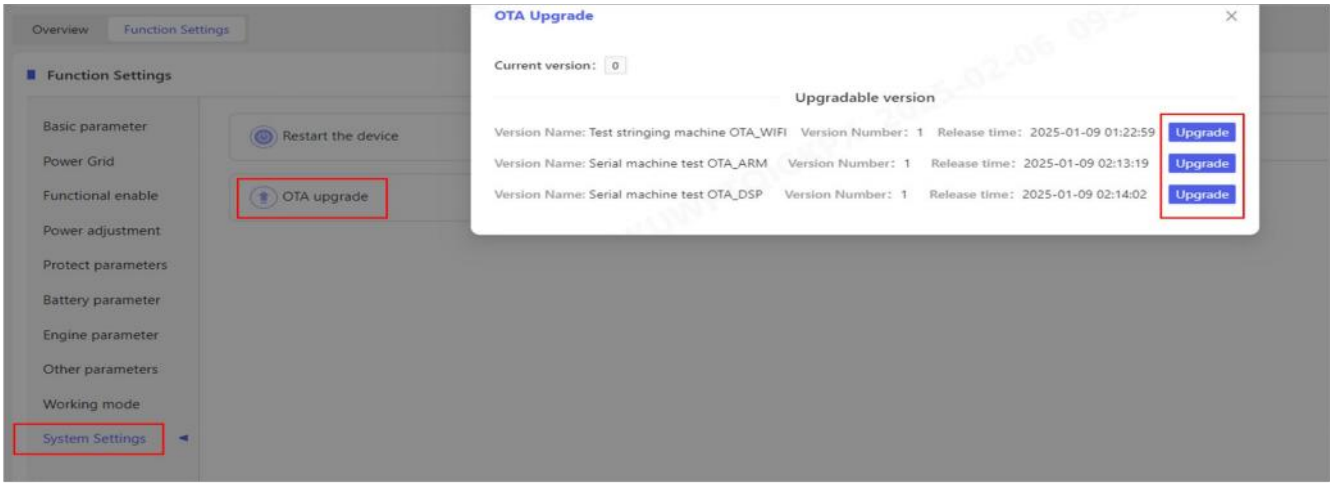
The system can also utilize an External E-Stop Switch if the local AHJ deems it necessary.

The external switch must have normally closed contact type for emergency shutdown.



9. FIRMWARE UPDATE VIA MONITOR CENTER (WEBSITE)

1. Distributors and installers can update the firmware for their inverters by using the NEP Monitor Center Website (user.nepviewer.com). Contact NEP to confirm the files are most up to date.
2. Log into the NEP Monitor Center Website. Choose the inverter to update and then select “System Setting,” and then select “OTA Upgrade.”
3. Choose the files that need to be upgraded, and then click the corresponding upgrade button. The Monitor Center will begin updating firmware files in the inverter. The latest version of the firmware will be displayed in the bottom right window.



IMPORTANT:

Throughout the update, the inverter will automatically cycle power as it moves from one update to the next; however, if at any time an “Update Failed” alert appears, restart the full update from the first task. The “Update Failed” alert will only appear in the monitoring center. The software may need more than one attempt to update. If unable to successfully update the firmware, contact the distributor.

10. TROUBLESHOOTING AND MAINTENANCE

10.1 REGULAR MAINTENANCE

Inverter Maintenance

- Inspect the inverter every 6 months to check for any damaged cables, accessories, or terminals, and inspect the inverter itself.
- Inspect the inverter every 3 months to verify if the operating parameters are normal and there is no abnormal heating or noise from all components in the system.
- Inspect the inverter every month to confirm nothing covers the inverter heat sink. If there is, shut down the inverter and clear the heat sink to restore proper cooling.

Battery Maintenance

- Follow the manufacturer's requirements for maintenance. When users carry out maintenance on batteries, make sure to fully shut down the inverter for safety.

10.2 LED DESCRIPTION

LED	Display	Description	Action
Green LED	Solid lit	Working in On-Grid mode	No action needed
	Flashing	Working in Off-Grid mode	No action needed
	Flashing	Working in Bypass mode	No action needed
Yellow LED	Solid lit	No Grid	No action needed
	Flashing	Grid Fault	Needs Check Grid
	Flashing	No Barrtery or Battery Fault	Needs Check Battery
Red LED	Solid lit	Fault, inverter will stop working	Needs troubleshooting

10.3 TROUBLESHOOTING

Once there is any warning or fault occurring, users can troubleshoot according to the LED status description and the warning/fault information on the APP Notification.

Please perform troubleshooting according to the following methods, if the troubleshooting methods cannot help you, please contact the after-sales service center. When contacting the after-sales service center, please collect the following information, so as to solve the problem quickly.

1. Inverter information, such as: serial number, software version, device installation time, failure time, failure frequency, etc.

2. Device installation environment, such as: weather conditions, whether the component is obscured, there are shadows, etc., installation environment recommendations can provide photos, videos and other documents to assist in analyzing the problem.

3. Grid conditions.

No.	Fault name	Reason for failure	Solution
1	Bus Voltage High	1. PV voltage is too high. 2. BAT voltage is too high. 3. Abnormal inverter BUS voltage sampling.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
3	Grid Phase Error	The power grid phase sequence is incorrectly connected.	1.Check the Grid cable,line sequence. 2.Restart the inverter and wait until it functions normally. 3.If the error/warning remains, please contact customer service.
4	PV Voltage High Error	The PV array is incorrectly configured with too many PV panels in series.	Check the series configuration of the corresponding PV array string to ensure that the open circuit voltage of the string is not higher than the maximum operating voltage of the inverter.
5	Islanding Error	The grid has been disconnected and due to the presence of the load maintains the grid voltage, stopping the grid connection according to the safety protection requirements.	1. Check whether the power grid is lost. 2.Contact your dealer or after-sales service center.
9	HW PV Current High	Poorly configured components. Damaged hardware.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
10	HW Inv Current High	The inverter current exceeds the normal value	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input

			side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
11	Grid NE Voltage Error	1.The inverter protection ground cable is not connected. 2. When the output of the PV string is grounded, the inverter AC output cables L and N are reversed.	1.The inverter protection ground cable is not connected. 2. When the output of the PV string is grounded, the inverter AC output cables L and N are reversed.
13	SW PV Current High	Poorly configured components. Damaged hardware.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
14	Battery Voltage High	Battery configuration error	Check the battery configuration to ensure that the maximum battery voltage is not higher than the maximum operating voltage of the inverter.
15	Battery Current High	Battery discharge over current. When the battery is loaded, the load is too large.	1.Check whether the battery parameters are correctly set , disconnect the load , repower and restart. 2.If the error/warning remains, please contact customer service.
16	Battery Charge Voltage High	The inverter or Battery may be abnormal.	1. Check whether the battery parameters are correctly set , repower and restart. 2.If the error/warning remains, please contact customer service.
17	Battery OverLoad	Battery discharge over rated power.When the battery is loaded, the load is too large.	1.Check whether the battery parameters are correctly set , disconnect the load ,repower and restart. 2.If the error/warning remains, please contact customer service.
18	Battery SoftConnect TimeOut	The inverter or Battery may be abnormal.	1.Restart the inverter and wait until it functions normally. 2.If the error/warning remains, please contact customer service.
19	Output OverLoad	BACKUP port is overloaded.	1.Check whether the BACKUP port is overloaded. 2.Disconnect the load ,Restart the inverter and wait until it functions normally. 3.If the error/warning remains, please contact customer service.
20	Battery Open Circuit Error	Battery failure.	1.Check whether the battery is connected in correct mode. 2.Check whether the battery is abnormal.

			3.Check whether the battery BMS alarm is normal
21	Battery Discharge Voltage Low	The inverter or Battery may be abnormal.	1. Check whether the battery parameters are correctly set , repower and restart. 2.If the error/warning remains, please contact customer service.
22	Lost Communication D<->C	Communication between DSP and ARM is abnormal.	1.Restart the inverter and wait until it functions normally. 2.If the error/warning remains, please contact customer service.
23	Relay Error	1.Relay abnormality (relay short circuit) 2. abnormal control circuit 3.The AC connection is abnormal (Virtual connection or short circuit may exist)	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
24	EEPROM Error	Internal memory EEPROM abnormality.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
25	Temperature High Error	The inverter is installed in an unventilated location. Ambient temperature is too high. Abnormal operation of internal fan.	Check that the installation location of the inverter is well ventilated and that the ambient temperature does not exceed the maximum permissible ambient temperature range. If there is no ventilation or the ambient temperature is too high, please improve the ventilation and heat dissipation. If the ventilation and ambient temperature are normal, please contact your dealer or after-sales service center.
26	Temperature Low Error	The ambient temperature is lower than -40℃.	If the ambient temperature is lower than -40℃, use the device within the specified operating temperature range and improve the installation environment.
27	GFCI Device Error	The inverter protection ground cable is not connected. When the output of the PV string is grounded, the inverter AC output cables L and N are reversed.	Please make sure that the protective ground wire of the inverter is not connected properly. If in the scenario where the output of the PV string is grounded, please make sure that the inverter AC output cables L and N are not reversed.
28	DCI Device Error	The DC component of the inverter output current is higher than the safety regulations or the machine default allowable range.	If the abnormality is introduced by external faults (such as power grid abnormality, frequency abnormality, etc.), the inverter automatically resumes normal work after the fault

			disappears, without manual intervention. If the alarm appears frequently and affects the normal power generation of the power station, please contact your dealer or after-sales service center.
29	Current Sensor Error	Abnormalities in current sampling.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
30	Phase1 Voltage High	The grid voltage is higher than the permissible range or the duration of the high voltage exceeds the high voltage ride-through setting.	1. If it occurs by chance, the grid may be abnormal for a short period of time and the inverter is detecting . 2. When the grid is normalized, it will resume normal operation without manual intervention. If it occurs frequently, check that the grid voltage is within the permissible range. • If the grid voltage is out of the permissible range, please contact your local power operator. • If the grid voltage is within the permissible limits, it is necessary to modify the inverter's grid over-voltage protection points or to disable the grid over-voltage protection function with the consent of the local power operator. 3. If it does not recover for a long time, check if the AC side circuit breaker and output cable are connected properly.
32	Phase2 Voltage High		
31	Phase1 Voltage Low	The grid voltage is below the permissible range or the duration of the low voltage exceeds the low voltage ride-through setting.	1. If it occurs by chance, the grid may be abnormal for a short period of time and the inverter is detecting . 2. When the grid is normalized, it will resume normal operation without manual intervention. If it occurs frequently, check that the grid voltage is within the permissible range. • If the grid voltage is out of the permissible range, please contact your local power operator.

33	Phase2 Voltage Low		• If the grid voltage is within the permissible limits, it is necessary to modify the inverter grid under-voltage protection point or disable the grid under-voltage protection function with the consent of the local power operator. 3. If it does not recover for a long time, check if the AC side circuit breaker and output cable are connected properly.
34	PV InMode Fault	PV connect fault is detected	Ensure that the PV connection method is correctly set in the APP. Restart the inverter and wait until it functions normally. If the error/warning remains, please contact customer service.
35	GEN Mode Fault	GEN port Mode Fault is detected	Ensure that the GEN Mode is correctly set in the APP. Restart the inverter and wait until it functions normally. If the error/warning remains, please contact customer service.
37	Off Grid Voltage Low	BACKUP Voltage is Low in Off Grid mode .	1.Check whether the BACKUP port is overloaded. 2.Disconnect the load ,Restart the inverter and wait until it functions normally. 3.If the error/warning remains, please contact customer service.
38	Grid Frequency High	Grid anomaly, Grid Actual Frequency higher than required by local grid standards.	If it occurs by chance, it may be a short time anomaly in the power grid, the inverter will resume normal operation after detecting the power grid is normal, no manual intervention is required. If it occurs frequently, check that the grid frequency is within the permissible range. If the grid frequency is outside the permitted range, please contact your local power operator. If the grid frequency is within the permitted range, it is necessary to modify the inverter's grid over-frequency protection point or disable the grid over-frequency protection function with the consent of the local power operator.
39	Grid Frequency Low	Grid anomaly, Grid Actual Frequency lower than required by local grid standards.	If it occurs by chance, it may be a short time anomaly in the power grid, the inverter will resume normal operation after detecting the power grid is normal, no manual intervention

			is required. If it occurs frequently, check that the grid frequency is within the permissible range. If the grid frequency is outside the permitted range, please contact your local power operator. If the grid frequency is within the permissible range, it is necessary to modify the inverter grid under-frequency protection point or disable the grid under-frequency protection function with the consent of the local power operator.
40	Phase1 DCV Error	The DC component of the inverter output voltage is higher than the safety regulations or the machine default allowable range.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
41	Phase2 DCV Error		
43	No Grid Error	Grid outage. AC line or AC switch disconnected.	Alarm disappears automatically when grid power is restored. Check if AC line or AC switch is disconnected.
44	GFCI Error	Input-to-ground insulation impedance becomes low during inverter operation.	If it occurs by chance, it may be caused by the external wiring abnormalities by chance, after the fault is cleared, it will return to normal operation without manual intervention. If it occurs frequently or fails to recover for a long time, please check whether the insulation impedance of the PV string to ground is too low.
45	Phase1 DCI Error	The DC component of the inverter output current is higher than the safety regulations or the machine default allowable range.	1. If the abnormality is introduced by external faults (such as power grid abnormality, frequency abnormality, etc.), the inverter automatically resumes normal work after the fault disappears, without manual intervention. 2. If the alarm appears frequently and affects the normal power generation of the power station, please contact your dealer or after-sales service center.
46	Phase2 DCI Error		
47	Generator output Error	Generator is abnormal	1.Check if Generator is worked correctly; 2.Restart the inverter and wait until it functions normally.

48	ISO Error	1. PV string to ground short circuit. 2.The PV string is installed in a humid environment for a long period of time and the line to ground insulation is poor. The PV string is installed in a humid environment for a long period of time and the wiring is poorly insulated to ground.	1. Check the impedance of the PV string to the protective ground, the resistance value is more than 250kΩ normal, if the check resistance value is less than 250kΩ, please investigate the short circuit point and rectify. 2. Check whether the protective ground wire of the inverter is connected correctly. 3. If it is confirmed that the impedance is lower than the default value under cloudy and rainy days, please reset the "insulation impedance protection point" of the inverter through the app.
49	Bus Voltage Balance Error	BUS voltage is abnormal.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
51	BMS Fault	The BMS detects alarm from battery.	Restart the battery and check whether the alarm is cleared.
52	BMS Lost Communication	Communication between lithium battery and inverter is abnormal.	1.Check the cable, RJ45 header, line sequence. 2.Checking the Battery switch.
53	ARM Lost Communication	Communication between ARM and DSP is abnormal.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
54	ARM EEPROM Fault	Internal memory EEPROM abnormality.	Disconnect the AC output side switch and DC input side switch, close the AC output side switch and DC input side switch after 5 minutes, if the fault still exists, please contact your dealer or after-sales service center.
55	ARM RTC Fault	The RTC may be damaged.	1.Restart the inverter and wait until it functions normally. 2.If the error/warning remains, please contact customer service.
57	Fan1 Error	Cooling fan(s) are stuck	1.Restart the inverter and wait until it functions normally. 2.If the error/warning remains, please contact customer service.
58	Fan2 Error		
59	Fan3 Error		
60	Fan4 Error		
62	Para Set Err	Incorrect setting in parallel	1. confirm the wiring for the parallel system is correct. 2. confirm the setting on APP for the parallel system is correct. 3. If the error/warning remains, please contact customer service.
63	RSD Active	Rapid shutdown activated	Check if the RSD switch is pressed.
64	AFCI Error	PV arc fault is detected.	Check each PV string for correct open

			circuit voltage and short circuit current. If the PV strings are in good condition, the inverter automatically resumes normal work after the fault disappears, without manual intervention.
67	CT Lost Communication	Communication between CT and inverter is abnormal.	1.Check the cable, RJ45 header, line sequence. 2.Restart the inverter and wait until it functions normally. 3.If the error/warning remains, please contact customer service.
68	CT DIR Err	CT is installed in the wrong direction.	1.Check CT is installed in the correct direction. 2.Restart the inverter and wait until it functions normally. 3.If the error/warning remains, please contact customer service.
71	CLASSB Check Fault	CLASSB Check is abnormal..	1. Restart the inverter and wait until it functions normally. 2.If the error/warning remains, please contact customer service.
72	Generator Over Load Fault	Overload on GEN port.	1.Check if Generator power on inverter GEN port is within inverter specification. 2.Restart the inverter and wait until it functions normally.
73	Output Connect Err	BACKUP port Fault is detected	1.Confirm the wiring for the BACKUP port is correct. 2.Restart the inverter and wait until it functions normally.

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