Sol-Ark

INSTALLATION GUIDE
AND USER MANUAL

Sol-Ark 60K-3P-480V

COMMERCIAL & INDUSTRIAL
NORTH AMERICA

READ THE INSTRUCTIONS COMPLETELY BEFORE OPERATING THE EQUIPMENT

Verify the utility voltage before turning ON the unit.

For proper operation, this unit REQUIRES closed-loop communications with a compatible high voltage battery. Visit www.sol-ark.com/battery-partners for a complete list of compatible partners.

Verify Output Voltage and "Grid Type" before connecting to the utility.

DISCLAIMER

UNLESS SPECIFICALLY AGREED TO IN WRITING:

Sol-Ark assumes no responsibility or liability for any damages, property loss, personal injury, or any adverse consequences resulting from improper use and installation of the product or the failure to adhere to the guidelines provided in this document. Users are expressly advised to follow the instructions and guidelines outlined in the documentation accompanying the product. Sol-Ark shall not be liable for any damages or losses incurred due to deviations from recommended usage, installation, or maintenance procedures. By using the product, users acknowledge their understanding of these disclaimers and agree to use the product at their own risk. Sol-Ark reserves the right to update or modify product information, specifications, and guidelines without prior notice.

Sol-Ark retains the right to final interpretation of this document and all related materials pertaining to this product. This document is subject to modifications, updates, revisions, or termination without prior notice. For the latest product information, please visit Sol-Ark's official website. www.sol-ark.com

This manual is only for the **60K-3P-480V Hybrid Inverter**.

For support, contact:

(USA) +1 (972) 575-8875 ext. (2)

support@sol-ark.com

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IMPORTANT INSTRUCTIONS

This manual provides crucial information for the installation and operation of the 60K-3P-480V Hybrid Inverter System. Qualified and authorized personnel are required to conduct the installation and maintenance procedures adhering to all safety standards and system requirements outlined in this document.

This manual is applicable to countries that comply with the certification requirements. Standards and legal requirements of other countries might differ from the specifications outlined in this manual.

SYMBOLS THAT APPEAR IN THIS DOCUMENT

⚠️ **WARNING:** This symbol indicates information that, if ignored, could cause serious injury, equipment damage, or death.

⚠️ **CAUTION:** This symbol indicates information that, if ignored, could result in minor injury or equipment damage.

🛈 **NOTE:** This symbol indicates relevant information that is not related to hazardous situations.

NOTICES

ATTENTION: Read all instructions and cautionary markings in this document and on the equipment before installing the 60K-3P-480V. Failure to do so may result in equipment damage, electric shock, serious injury, or loss of life. Failing to follow any of these instructions may also void the warranty.

All installations must conform to the laws, regulations, codes and standards applicable in the jurisdiction of installation. Before starting an installation, consult a local building or electrical inspector for current requirements. Local codes may vary but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work.

When installed in the US electrical installations are required to follow the National Electrical Code (ANSI/NFPA 70) adopted by their local AHJ (Authority Having Jurisdiction) including any local amendments.

General

WARNING: Risk of electric shock. Risk of fire. Only qualified electrical personnel should install, troubleshoot, service, or replace the equipment.

WARNING: Risk of electric shock. Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices during installation and service. Turn off all power supplying this equipment before working on or inside equipment. Always use a properly rated voltage sensing device to confirm power is off. Replace all devices, covers, and doors before turning on power to the equipment.

WARNING: Inspect the equipment for damage before installing. Do not install the equipment if it has been damaged in any way.

WARNING: Do not insert foreign objects into any part of the equipment.

WARNING: Do not expose the equipment or any of its components to direct flame.

WARNING: Do not attempt to open, disassemble, repair, tamper with, or modify the equipment other than what is permitted in this manual. The equipment contains no user-serviceable parts. Contact the installer who installed the equipment for any repairs.

WARNING: Do not connect life-support systems, other medical equipment, or any other use where product failure could lead to injury to persons or loss of life.

CAUTION: Do not use solvents to clean the equipment or expose the equipment to flammable or harsh chemicals or vapors. Do not allow petroleum-based paints, solvents, or sprays to contact nonmetallic parts of the equipment.

CAUTION: Do not use parts or accessories other than those specified for use with the equipment.

Installation and Use

WARNING: Risk of electric shock. Risk of fire. Only use electrical system components approved for dry locations.

WARNING: Risk of electric shock. Risk of fire. Ensure that all wiring is correct and that none of the wires are pinched or damaged.

WARNING: Risk of electric shock. Risk of fire. Before making any connections verify that the DC disconnect(s) are in the off position. Double check all wiring before applying power.

WARNING: Risk of electric shock. Improper servicing of the equipment or its components may result in a risk of shock or fire. To reduce these risks, disconnect all wiring before attempting any maintenance or cleaning.

WARNING: Risk of electric shock. Always de-energize the equipment before servicing.

WARNING: Risk of electric shock. Do not use equipment in a manner not specified by the manufacturer. Doing so may cause injury or loss of life, or damage to equipment.

CAUTION: Risk of damage. DO NOT connect the grid to the "LOAD" output terminal.

CAUTION: Risk of damage. Do not exceed 1,000Voc on any MPPT on the 60K-3P-480V.

CAUTION: Risk of damage or electric shock. All inverter inputs should only have one conductor connected to them.

NOTE: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Environmental Conditions

WARNING: This equipment is intended for operation in an environment having a minimum temperature of -40°C (-40°F) and a maximum temperature of 60°C (140°F).

WARNING: Install the equipment in a location that prevents damage from flooding. Ensure that no water sources are above or near the equipment, including downspouts, sprinklers, or faucet.

Transportation and Handling

WARNING: To protect the equipment and its components from damage when transporting, handle with care. To help prevent damage, leave all equipment in its shipping packaging until it is ready to be installed.

WARNING: Risk of physical injury or death. Use caution when using lifting equipment to move battery modules and components.

WARNING: Risk of physical injury or death. Boxed battery modules

Product Recycling

You must not attempt disposal via normal waste collection or abandon the inverter at a public facility. Please reference our website or call us for more details as soon as you know your inverter has reached the end of its usable life

For more information on locating recycling resources in your area, please visit our website at sol-ark.com/recycling.

Requirements for Installation Personnel

All work MUST comply with local code, regulations, and industry standards. The installation of the 60K-3P-480V can only be completed by qualified people with appropriate qualifications as determined by the local AHJ.

1. Sol-Ark: At a First Glance

INSPECT SHIPMENT

The box should include all items shown in the component guide. If there is damage or missing parts, immediately call the phone number (USA) +1 (972) 575-8875 Ext. 2.

COMPONENT GUIDE

The Sol-Ark 60K-3P-480V system includes the following components:
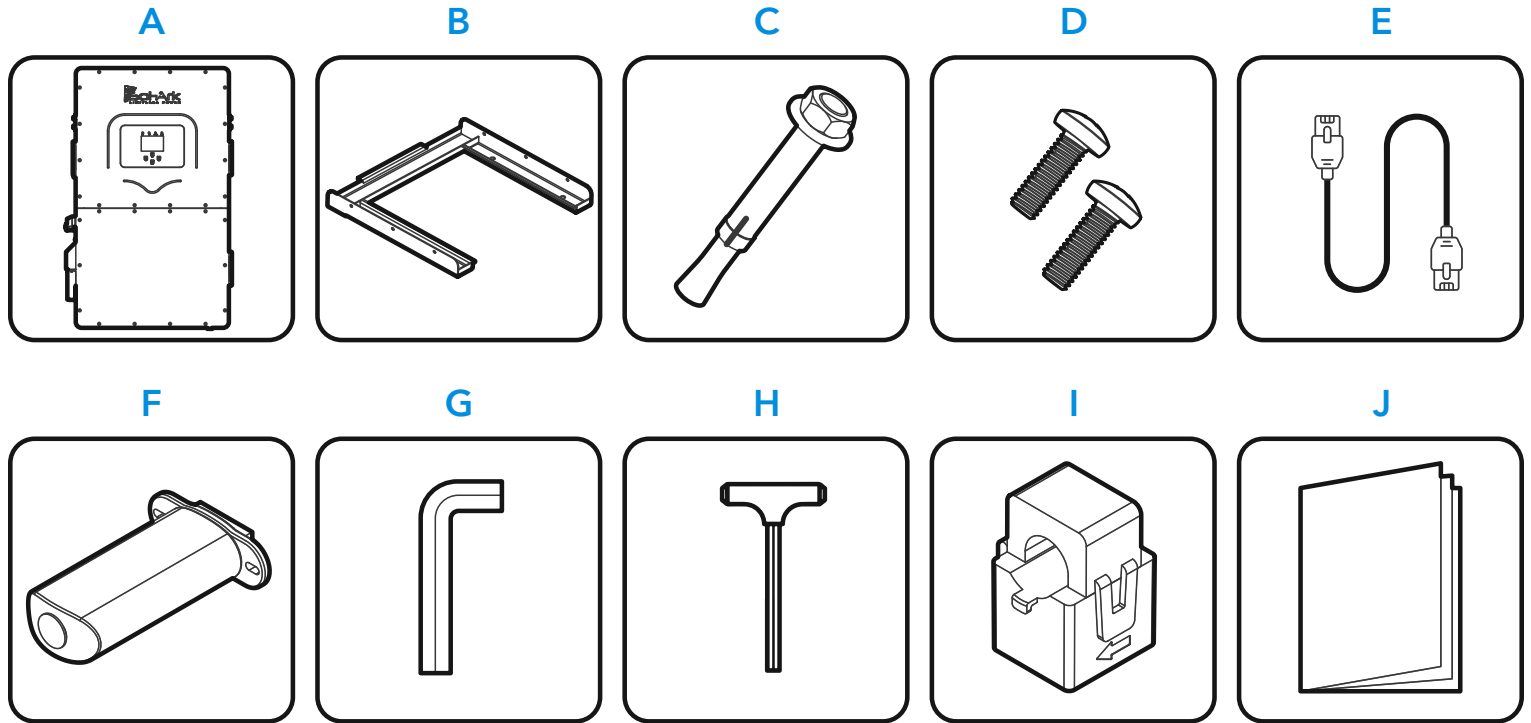
Component	Description	Quantity
A	Sol-Ark 60K-3P-480V inverter	1
B	Inverter Mounting Cleat	1
C	M12x60mm expanding anchors for masonry anchoring	4
D	M4x12mm screws – Set screws for mounting carrier	9
E	Inverter Parallel Cable - CAT 5 Communication cable	1
F	Wi-Fi / Ethernet Gateway (dongle)	1
G	3mm L-type hex key for front panel screws	1
H	8mm T-type hex key for AC terminals	1
I	300A Current transformers (CT sensors)	3
J	User Manual (may not be included on all units)	1

1.1 General Description
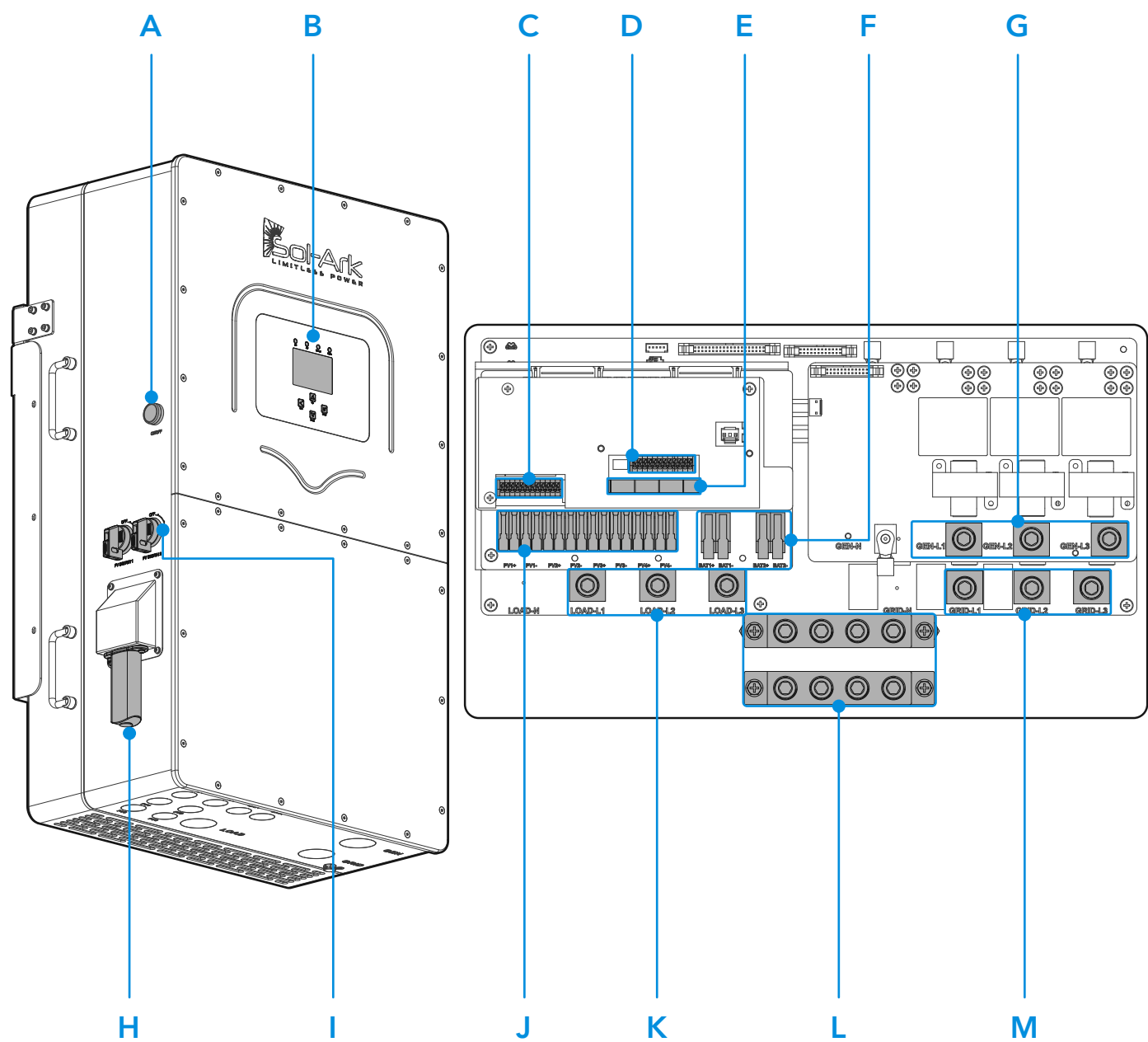
Component	Name	Component	Name
A	ON / OFF Button	H	Wi-Fi / Ethernet Gateway
B	LCD touch screen	I	2x PV DC disconnects
C	CN1 - Terminal block for sensors and accessories	J	4x MPPT inputs terminals
D	CN2 - Terminal block for sensors and accessories	K	(200A) LOAD terminal
E	Communication Ports	L	NEUTRAL / GROUND Busbars
F	2x (50A) Battery port	M	(200A) GRID terminal
G	(200A) GEN terminal		

1.2 Specifications
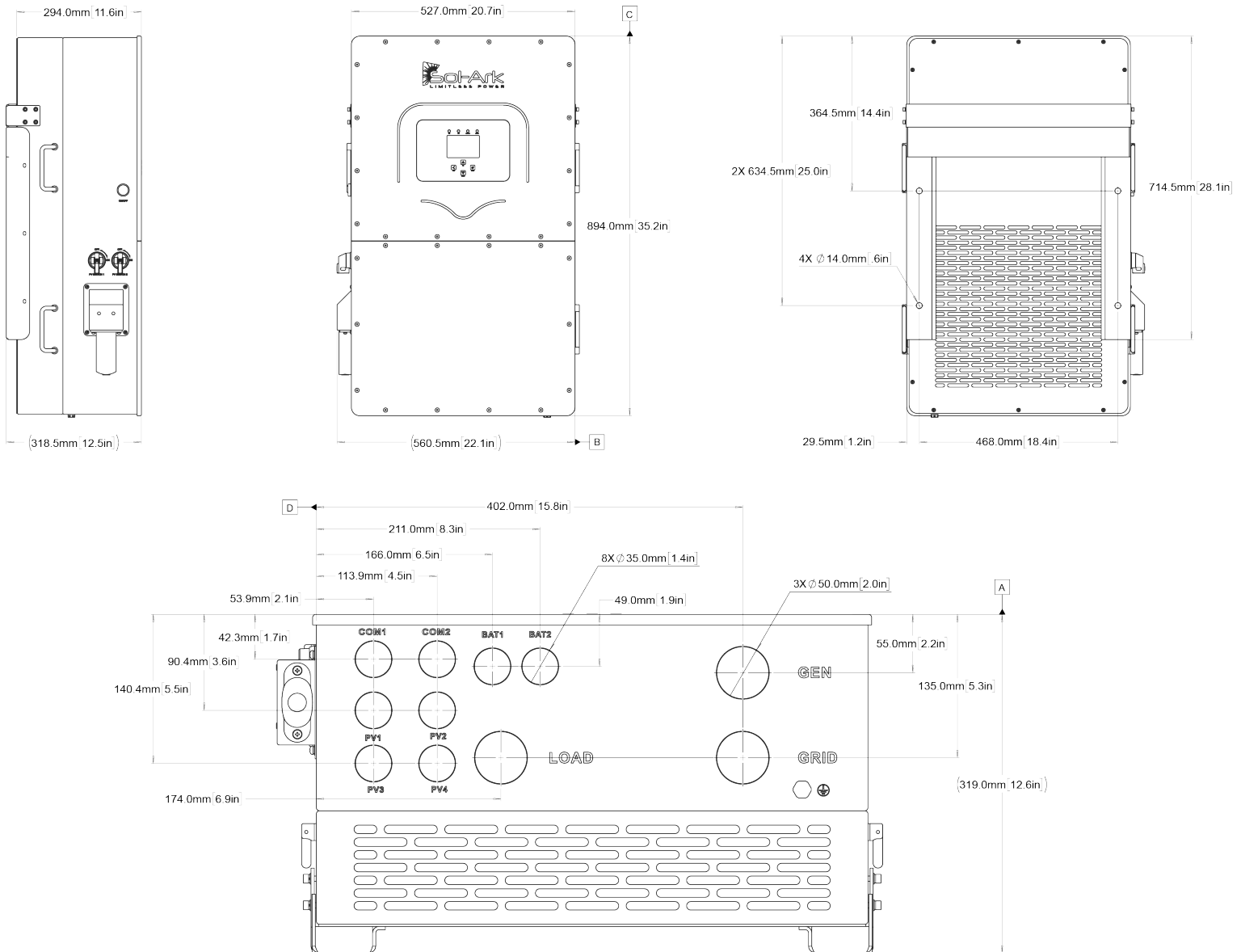
NOTE: Temperature Derating
Starts at 75°C with inverter shutdown at 82°C

SOL-ARK 60K-3P-480V FASTENER TORQUE TABLE

⚠️ Do not use impact drivers to tighten any fasteners on the inverter

Terminal / Breaker	Torque [ft-lb]	Torque [Nm]
"LOAD"	18.75 ft-lb	25.5 Nm
"GRID"	18.75 ft-lb	25.5 Nm
"GEN"	18.75 ft-lb	25.5 Nm
Neutral / Ground (Busbar)	18.75 ft-lb	25.5 Nm
Cover Screws	15.5 in-lb	1.75 Nm
Battery Terminals	Push-in Cage Clamp	Push-in Cage Clamp

DATASHEET
60K-480V
C&I Hybrid Inverter

Inverter Model Name:	60K-3P-480V
Sol-Ark Product SKU:	60K-3P-480V

Input Data (PV)	
Max. Allowed PV Power (STC)	78,000W
MPPT Voltage Range	150-850V
Startup Voltage	180V
Max. Input Voltage [1]	1,000V
Max. operating input current per MPPT	36A
Max. short circuit current per MPPT	55A
No. of MPP Trackers	4
No. of PV Strings per MPPT	2
Max. AC Coupled Input	60,000W

Output Data (AC)	
Nominal AC Voltage (3Φ)	277/480V
Grid Frequency	50 / 60Hz
Real Power, max continuous (3Φ)	60,000W
Max. Output Current	72.3A
Peak Apparent Power (10s, off-grid, 3Φ)	90,000VA
Max. Grid Passthrough Current (10min)	200A
Continuous Grid Passthrough Current	180A
Power Factor Output Range	+/- 0.8 adjustable
Backup Transfer Time	5ms (adjustable)
CEC Efficiency	96.5%
Max Efficiency	97.5%
Design (DC to AC)	Transformerless DC
Stackable	Up to 10 in parallel

Battery Input Data (DC)	
Supported Battery Chemistry	Lithium-ion
No. of Battery Inputs	2
Battery Input Terminal Rating	50A
Nominal DC Voltage	≥ 600V
Operating Voltage Range	160 - 700V
Battery Capacity Range	50 – 9900Ah
Max. Battery Charge / Discharge Current	100A (50A per input)
Charge Controller Type	CC/CV - BMS Controlled
Grid to Battery Charging Efficiency	96.0%
Automatic Generator Start (AGS)	2 Wire Start - Integrated
BMS Communication [2]	CAN (Controller Area Network)

General Data	
Dimensions (H x W x D)	894 x 528 x 295 mm (35.2 x 20.8 x 11.6 in)
Weight	80 Kg / 176 lb.
Enclosure	IP65 / NEMA 3R
Operating Temperature	-40 – 60°C, >45°C Derating
Noise Level @ 1m	< 30 dB @ 25°C (77°F)
Idle Consumption - No Load	60W
Communication and Monitoring	Wi-Fi & LAN Hardware Included
Warranty [3]	10 Years

Category	
Certifications and Listings (Grid Support Interactive Inverter)	UL 1741-2021 (UL1741SB), CSA C22.2 No 107.1-16, IEEE 1547-2018 & 1547a-2020 & 1547.1-2020 (SRD V2.0), UL 1741 CRD-PCS, UL1699B, CEC, SGIP, CSIP
PV DC Disconnect Switch – NEC 240.15	Integrated
Ground Fault Detection – NEC 690.5	Integrated
PV Rapid Shutdown Control – NEC 690.12	Integrated
PV Arc Fault Detection – NEC 690.11	Integrated
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
Surge Protection	DC Type II / AC Type III

1. See Installation Guide for more details on sizing array strings. The highest input voltage is based on the open-circuit voltage of the array at the minimum design temperature.
2. Active BMS communication is required for all lithium batteries. A list of compatible battery partners can be found on our website.

Sol-Ark has a policy of continuous improvement and reserves the right to modify its specifications at any time and without prior notice. Please visit sol-ark.com for the latest information.

1.3 Connection Requirements
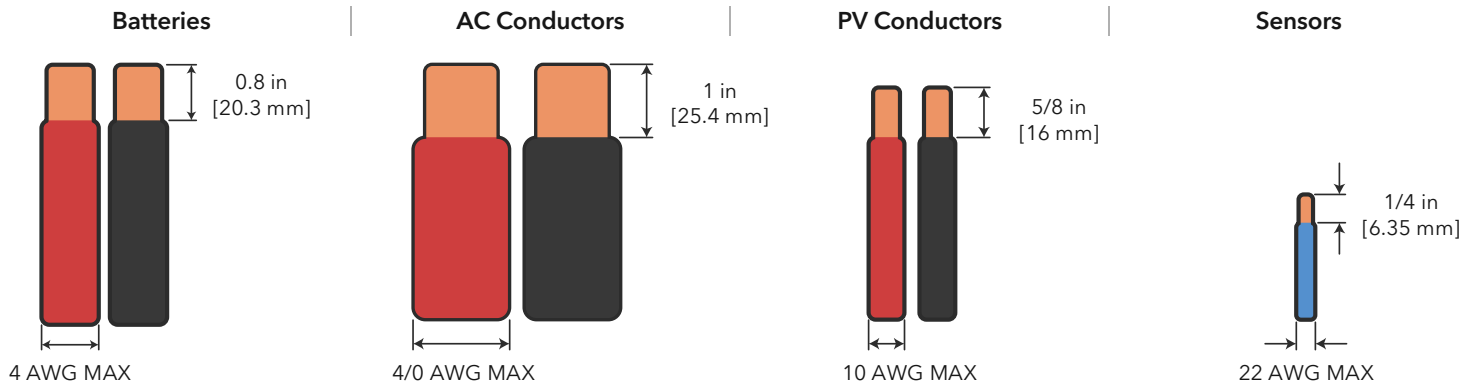
1. AC / DC Connection Requirements

> ⚠️ All wire runs should be sized to be at or below a 2.5% voltage drop at full load. Equipment wire sizing must comply with the NEC or local electrical code.
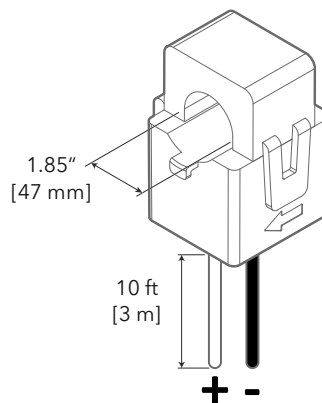
Port	Max. Terminal Rating	Terminal Wire Size Range (min-max)
GRID	200Aac	2AWG – 4/0 AWG
LOAD	200Aac	2AWG – 4/0 AWG
GEN	200Aac	2AWG – 4/0 AWG
MPPT	55AIsc	12 – 10 AWG
Battery Port A	50Adc	6 – 4 AWG
Battery Port B	50Adc	6 – 4 AWG

2. Sensors and Communications Requirements

Component	Wire Size Range	Max Distance
CT Sensor	16 - 22 AWG	0' – 10' [3 m]: 16 AWG included 10' – 50' [15.3 m]: 14AWG twisted pair extension
Communications	16 – 22 AWG	0' – 100' [30 m]: 24 AWG 100' – 400' [120 m]: 23 AWG
RJ45 Parallel Communication	CAT 5E or better	0' – 7' [2.1 m]: Included 7' – 20' [6m]: Extendable

Batteries

0.8 in [20.3 mm]

4 AWG MAX

AC Conductors

1 in [25.4 mm]

4/0 AWG MAX

PV Conductors

5/8 in [16 mm]

10 AWG MAX

Sensors

1/4 in [6.35 mm]

22 AWG MAX

CT Sensors (Included)

1.85" [47 mm]

10 ft [3 m]

+ -

2. Installation

Backup Circuits

A. The "LOAD" connected service panel will be referred to as the **Essential Loads Panel**.
B. You must keep the essential loads panel within the limitations of the unit:
- Three phase power in a Wye configuration is calculated as follows → Real Power (W) = $\sqrt{3}$ x V_L x I_L x PF
  Assuming a unity power factor (PF=1) then the following represents the maximum power levels for each condition.
- Grid Tie Pass Through → 149.6kW cont. = 1.73 * 480V * 180A * 1.0
- Off-Grid → 60.1kW cont. (batteries or PV) = 1.73 x 480V x 72.3A x 1.0
C. Verify that any individual load circuit power or the aggregate rating of the whole panel does not surpass the above limits.

Single System Install

A. **FOR PARTIAL BACKUP:** Use a supply side connection or a load side connection with PCS as point of interconnection to integrate the utility grid to the Sol-Ark inverter through the "GRID" terminal.
- An external service rated disconnect must be installed between the interconnection and the Sol-Ark. Size the disconnect according to code.
- Connect the "LOAD" output to the Essential Loads Panel. Follow electric code to select proper wire gauge.
B. **FOR WHOLE-SITE BACKUP:** Connect the utility grid feed to the "GRID" terminal.
- An external service disconnect must be installed between the grid and the Sol-Ark. Size the disconnect according to code.
- Connect the "LOAD" output to the Main Service Panel. Follow electric code to select proper wire gauge.

It is possible to connect a generator, or an AC coupled source such as grid-tie string or micro inverters to the "GEN" terminal of the inverter. Only one AC source can be connected to the "GEN" terminal at a time.
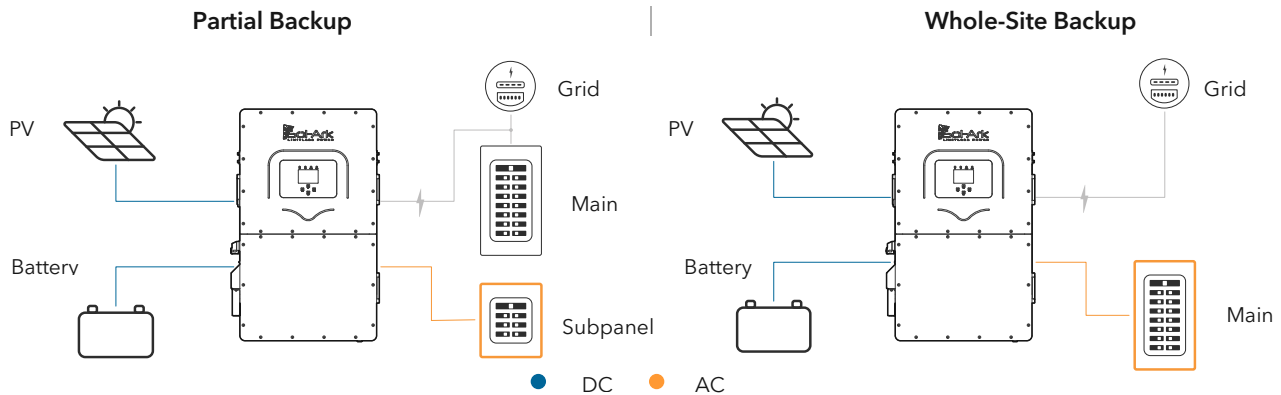
2.1 Mounting the Inverter

A. Considering the dimensions of the inverter, find a suitable location for the system. There must be at least 6 in [15 cm] of vertical clearance and 2 in [5 cm] of side clearance for proper heat dissipation.
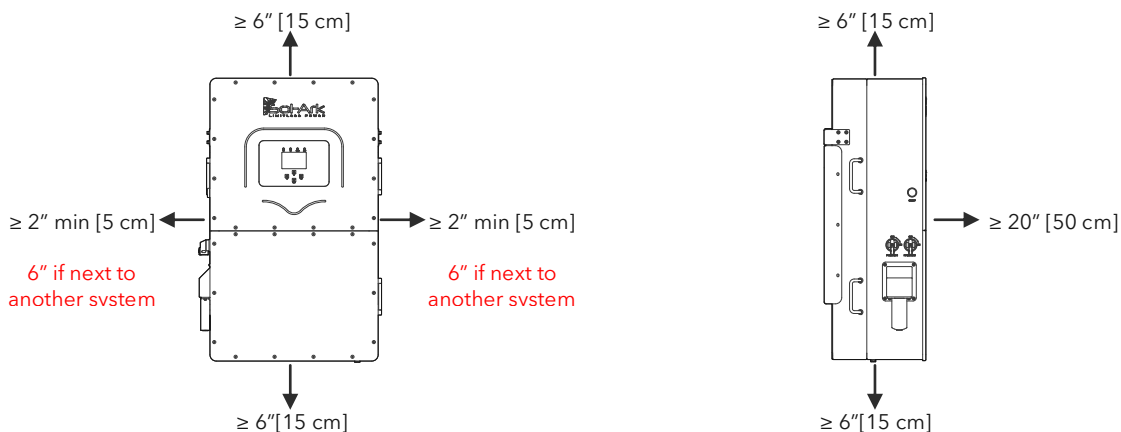

Figure 1: Inverter Clearances Overview

NOTE: Inverter has a Max. Heat Dissipation of 2,100W or 7,165BTU/hr

B.   Under certain conditions, the National Electrical Code® specifies greater clearances. Ensure that the prescribed clearances in accordance with the National Electrical Code®, paragraph 110.26 and Canadian Electrical Code® CSA C22.1 are adhered to.

C.   The Sol-Ark 60K-3P-480V is a NEMA 3R - IP65 enclosure that is rated for outdoor installation but can also be installed indoors.

D.   Use screws or anchors suitable for the support surface and capable of supporting the weight of the inverter (176 lb / 80kg).
   a.   For Concrete or Masonry Mounting: Use a minimum of four (4) M12x60mm expanding anchors (included).
   b.   For Wood Frame Mounting: Use a minimum of four (4) 1/2in lag screws with flat washers (not included), making sure to anchor into at least 2 framing members.
   c.   For Metal Framing Mounting: Use a minimum of four (4) 1/4in self-tapping metal screws with flat washers (not included).
   d.   In the case a different anchorage is required, calculate the number of anchor points needed to properly hold the weight of the equipment.

E.   Secure the inverter to the French Cleat with six (6) of the M4x12mm socket head screws provided.
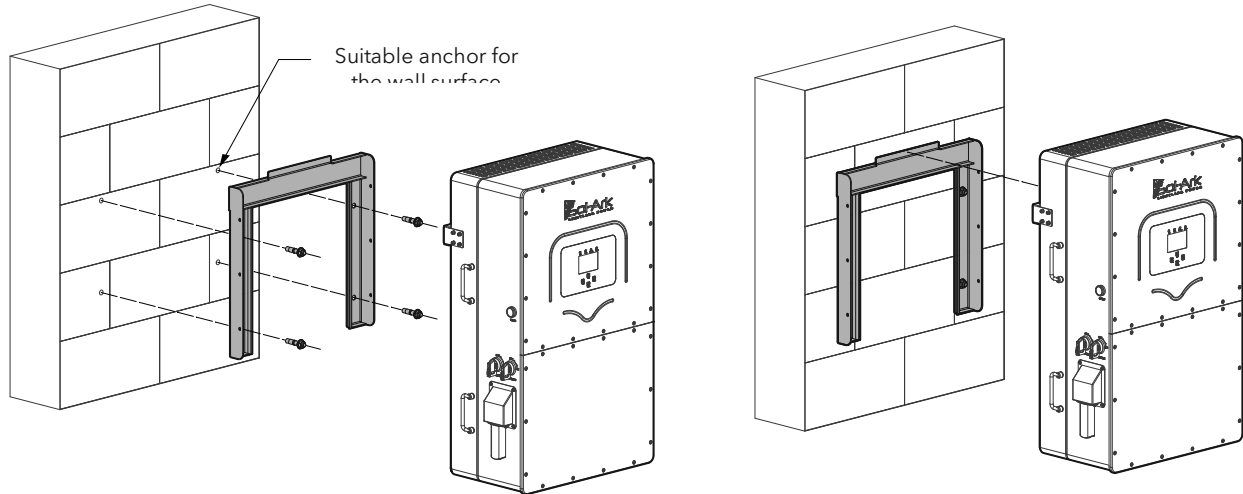

Figure 2: Inverter Mounting Diagram

> ⚠️ **CAUTION:** Damage to the LCD Screen due to prolonged direct UV or sunlight exposure will not be covered by warranty

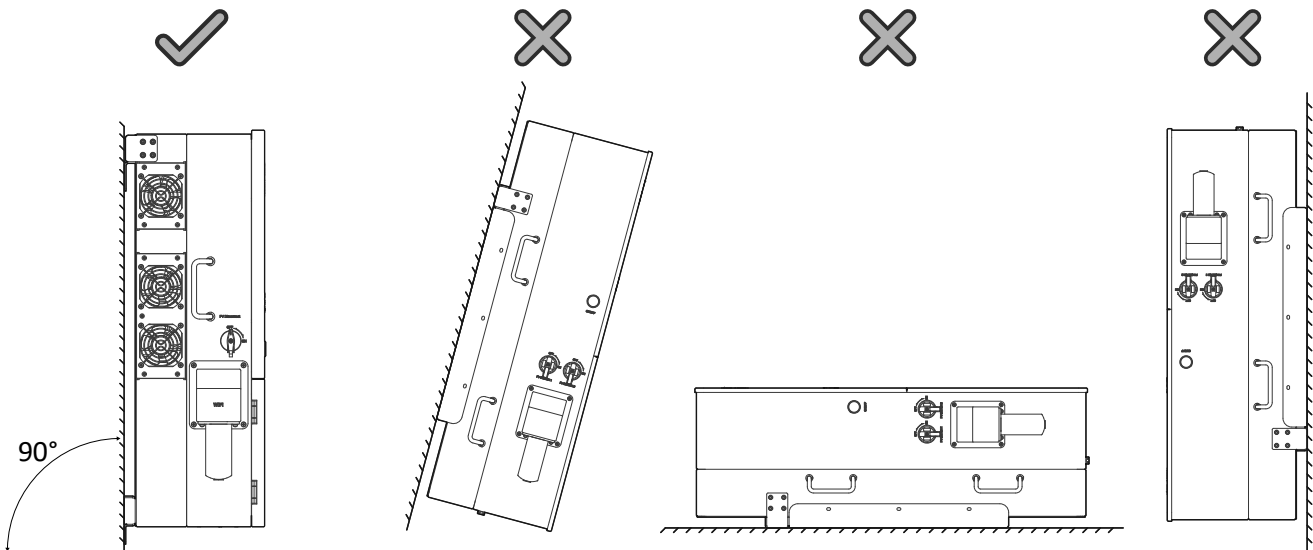F.   Mount the inverter in the optimal orientation as shown below.

Figure 3: Inverter Mounting Orientation

2.2 Integrating Batteries

A. ⚠️ Sol-Ark 60K-3P-480V must be OFF while the batteries are being connected.

B. Ensure the external battery disconnect is **OFF** or arcing may occur. If your battery bank does not have a built-in disconnect, maintain the necessary safety measures when handling the connections.

C. 🔵 The 60K-3P-480V reaches a max battery charge/discharge of **50A** per terminal for a total max of **100A** if using both sets of battery terminals. If only one set of terminals is used, the battery charge/discharge will be limited to **50A**.

⚠️ Sol-Ark 60K-3P-480V is a **HIGH VOLTAGE BATTERY** system**.** You **MUST NOT** exceed **800V**$_{DC}$ as shown below. The HV battery must stay within the **160V**$_{DC}$ **- 700V**$_{DC}$ operating voltage range. **DO NOT** connect to any battery whose max voltage that exceeds this limit.

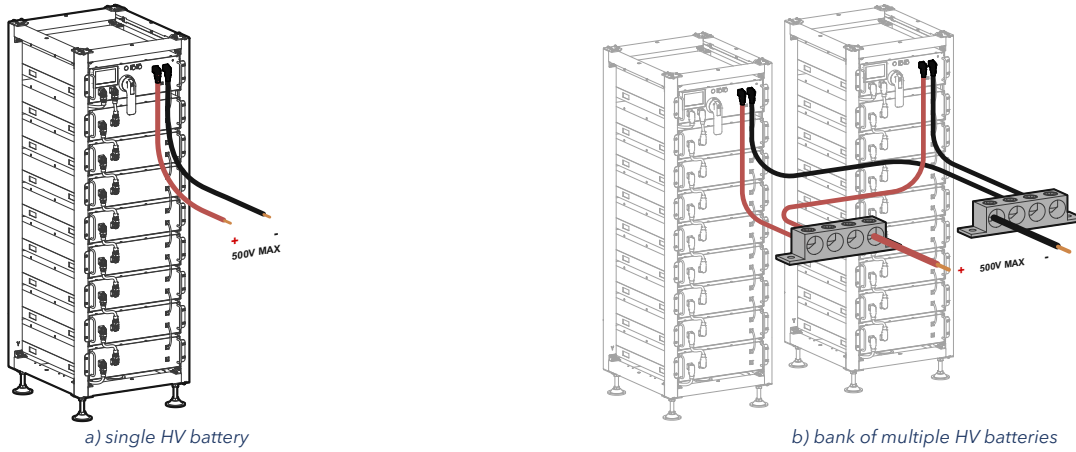*a) single HV battery*

b) bank of multiple HV batteries

Figure 4: Battery Wiring Output Diagram

The Sol-Ark inverter has two input battery terminals for single or dual battery connections. To wire a battery to the inverter, lift the actuation levers and insert the **6-4 AWG** battery conductor fully into the terminal. **DO NOT** force open the battery actuation levers more than 90°.
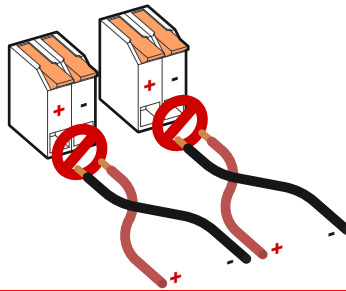
> ⚠️ **DANGER: Reverse Polarity**
> DO NOT reverse the battery input wires, the system will be damaged, and the warranty voided.

1. Multi-Terminal Installation

The two battery input terminals of the 60K-3P-480V can be configured for parallel battery stacks in settings screens. If the charge/discharge rate of 100A is needed, the battery must be connected to both input terminals. If connecting more than one battery to a single inverter input terminal, you must use an external busbar or combiner to combine batteries positive and negative outputs before connecting to the inverter terminals.

a) single battery

b) parallel battery bank

c) dual battery bank
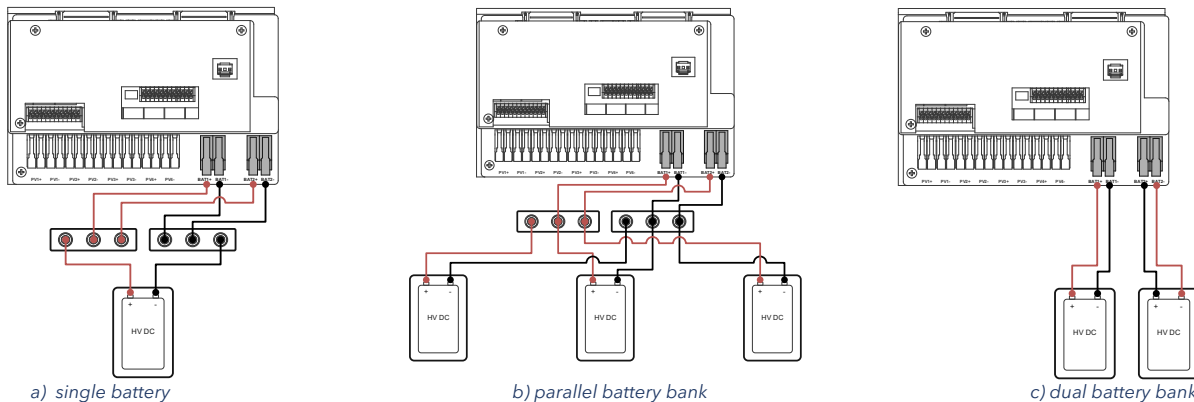
> ⓘ **NOTE:** If a single battery is capable of charge/discharge currents above 50A, connect the battery to both input terminals. Otherwise, the charge and discharge rate will be limited to 50A max. Only connect batteries of the same model to the terminals

2. Parallelled Battery Installations

> ⓘ **NOTE: Multi-Inverter Installations**
> Please reach out to Sol-Ark at: support@sol-ark.com or +1 (972) 575-8875, Ex. 2 for assistance with commissioning multiple parallelled inverters

A. **ALL** systems **MUST** be connected to their own battery bank.
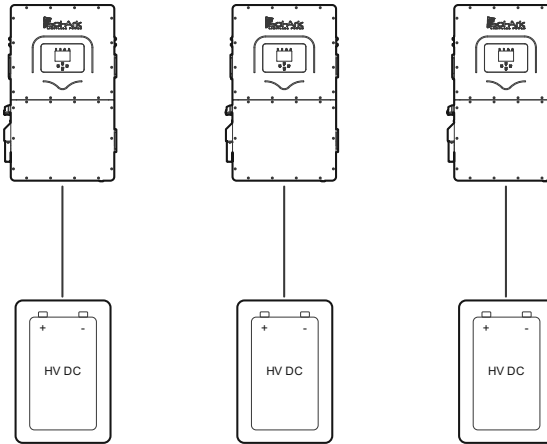B. **DO NOT** parallel batteries between inverters.

Figure 5: Inverter to Battery Ratio Diagram

2.3 Battery Communications

The Sol-Ark 60K-3P-480V inverter can establish closed-loop battery communication through one or two separate RJ-45 ports labeled "BMS1" and "BMS2". Communication with battery BMS will depend on the wiring of the battery bank and the wiring to the Sol-Ark inverter. The following two methods show how communications can be established:

3. Single Battery Bank Communication

Configure and wire the HV batteries so that there is one battery bank with a single communication source. Closed-loop communication is established by connecting the com cable to the **"BMS1"** port of the Sol-Ark inverter.

ⓘ **"☑ Parallel Bat1&Bat2"** setting on the Batt setup menu **MUST** be enabled and batteries must be connected in parallel on the DC side. See previous section "Multi-Terminal Installation" for detailed wiring of multi-terminal, single battery bank installation.
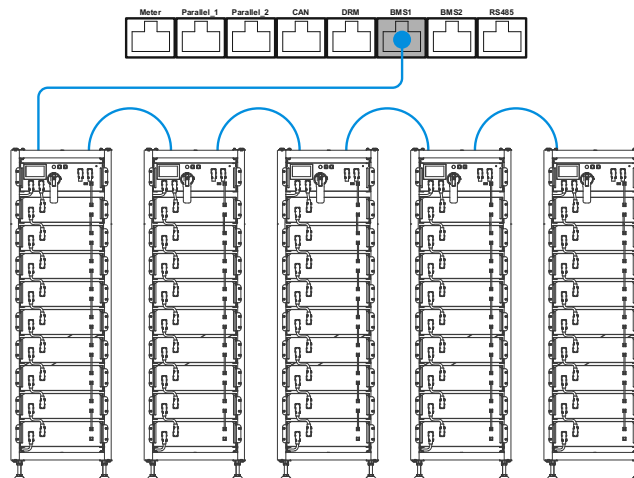

Figure 6: Single battery bank communication

Parallel bat1&bat2: Must be checked when using both battery inputs for the same battery bank. When enabled, the inverter will expect a single battery communication source.

4. Separate Battery Banks Communications

Configure and wire the HV batteries so that there are two battery banks, each with their separate communication source. Closed-loop communications are established by connecting each communication cable to a BMS port of the Sol-Ark **("BMS1"** and **"BMS2")**.

⚠ **"☐ Parallel Bat1&Bat2"** setting on the Batt setup menu **SHOULD NOT** be enabled, the dual battery bank wiring configuration shown earlier **MUST** be carried out. See previous section "Multi-Terminal Installation" for detailed wiring of parallel battery bank and dual battery bank installation.
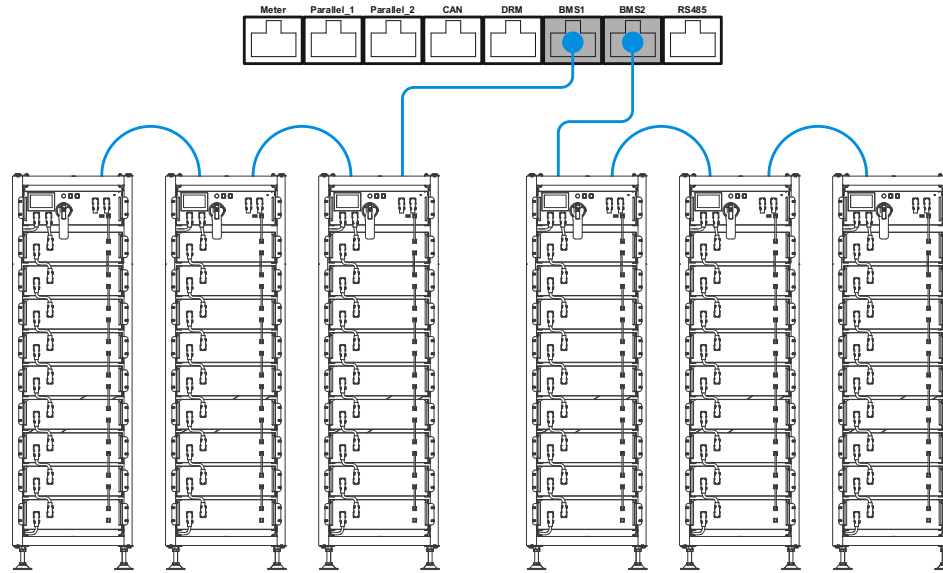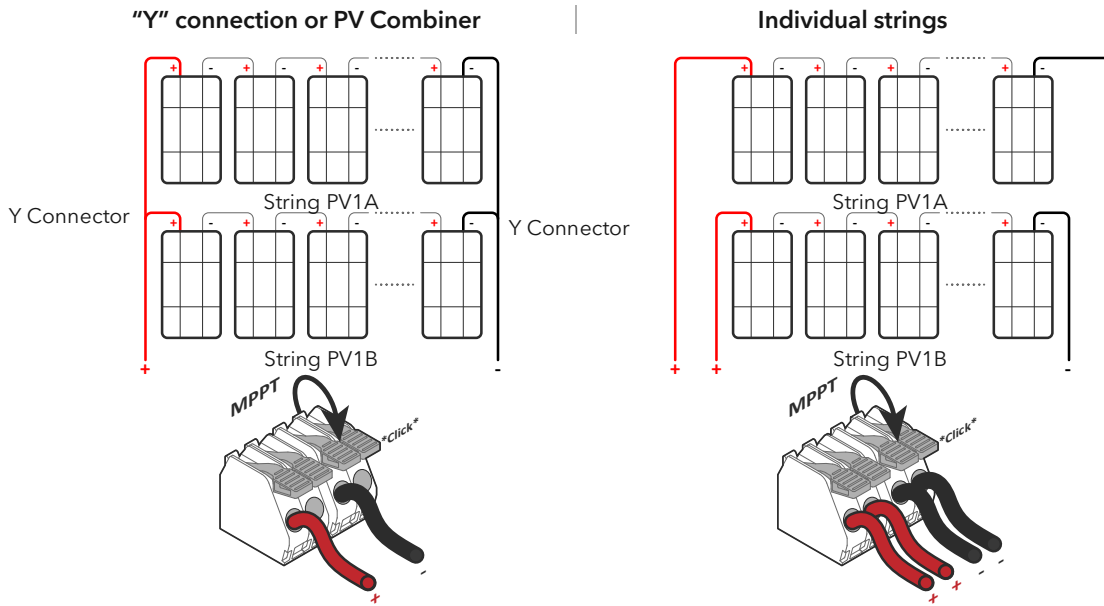

Figure 7: Multi-Battery Bank Communications

2.4 Connecting Solar PV to the Inverter

> ⓘ **NOTE:** 60K-3P-480V has 4 independent MPPTs that support up to 2 PV strings each. The MPPTs can handle a maximum V_{OC} of 1,000V and an I_{SC} of 55A but will self-limit and operate at I_{mp} of 36A max.

A. Max DC solar input = 78 kW (± 5%) | Max input power per MPPT = 19.5 kW | Max recommended input voltage per MPPT = 850 V_{OC} | Max input current per MPPT = 36A (self-limiting).

B. ⚠ Design for an input current of 36A per MPPT. The inverter will self-limit beyond 36A. If I_{SC} exceeds 55A, damage will occur.

C. ⚠ **PV Source Circuit max voltage of 1,000V$_{OC}$**

D. **Damage can occur with PV strings whose open-circuit voltage exceeds 1,000V$_{OC}$**

E. ⓘ Strings in parallel on the same MPPT must have the same designed open-circuit voltage (Voc), otherwise the system will be limited to the lowest string voltage.
   i. PV1 A/B must have the same Voc.
   ii. If the solar panels are oriented in different directions and connected in the same MPPT, there will be a loss in PV efficiency.

F. ⓘ Per NEC Art 690.43, exposed non-current-carrying metal parts of PV module frames, electrical equipment, and conductor enclosures of PV systems shall be connected to an equipment grounding conductor. All grounding conductors and grounding electrodes should be installed according to NEC Art 690.47 or as required by the AHJ.

G. For ground mounted arrays, Sol-Ark recommends installing an auxiliary grounding electrode placed near the array to ensure optimal earth-to-ground resistance of the grounding system. This auxiliary electrode would need to follow the requirements of NEC Art. 250.54.

H. Connect the solar panel strings using either of the following configurations:

"Y" connection or PV Combiner | **Individual strings**

String PV1A

Y Connector

String PV1B

MPPT

Click

String PV1A

Y Connector

String PV1B

MPPT

Click

AC Coupling

The Sol-Ark 60K-3P-480V supports the addition of grid-tied solar inverters, this allows the systems total solar power input to be expanded by coupling 3Φ micro or string inverters into the "GEN" terminals of the inverter.

An entirely AC-coupled solar system is not recommended as power control and monitoring is limited but is supported. Having DC-coupled modules, or a combination of DC-coupled modules and AC-coupled inverters is always preferred. AC-coupled inverters used in this application need to be either UL 1741SA or SB certified. This certification confirms the inverters' ability to disconnect from the grid based on frequency and ensures that the Sol-Ark will safely be able to frequency shift to control the AC coupled production.

In off-grid systems or during grid-forming operation, the 60K-3P-480V uses frequency shifting to curtail and shutdown AC-coupled inverters when the battery is full, allowing AC-coupled solar to produce power in an outage scenario. When the 60K-3P-480V is connected to the grid any AC-coupled inverters connected will always sell all excess solar power back to the grid. Selecting "Limited to Load" will NOT limit production when AC coupled.

Maximum allowed AC coupling input: $60,000W_{AC}$

AC Coupling on the GRID Side

Installing AC coupled inverters upstream of the GRID port of the 60K-3P-480V, such as with a load or supply side connection, is supported for grid connected systems but has some notable limitations when using the inverter for backup or grid-forming mode:

- Does NOT allow the usage of grid-tied inverter production during grid outages to charge batteries or power loads.
- Does NOT allow monitoring of PV production in inverter and MySolArk monitoring.

AC Coupling on the GEN Terminal

AC Coupling via the GEN Terminal is the preferred method for integrating AC-coupled solar on the 60K-3P-480V. This method offers several key advantages:

- Allows the usage of grid-tied inverter production during grid outages.
- Allows the integration of grid-tie inverters in off-grid systems.

Using the GEN terminal also allows for comprehensive monitoring of solar production, giving users valuable insights into the system's performance. See **Section 3.4 - AC Coupling Settings** for details on programming the 60K-3P-480V for this mode of operation.

AC Coupling on the LOAD Terminal

⚠ **NOTICE:** Sol-Ark does not support AC-coupling on the LOAD terminal with the 60K-3P-480V.

2.5 Integrating a Generator

Generators Smaller than 149kW → On "GEN" Input

1. **ONLY** supports three-phase 480Vac generators.
2. 200A rated "GEN" terminal. 🛈 180A continuous.
3. A THD (Total Harmonic Distortion) of less than 15% is required for stable operation.

Generators Greater than 149kW → On "GRID" Input

1. **ONLY** supports three-phase 480Vac generators.
2. Optimal way to integrate generators for Off-Grid or Grid-Tied systems with automatic or manual transfer switches.
3. 🛈 Programming **"GEN Connect to Grid Input"** is required: ⚙ → *Limiter → Other → ☑ GEN Connect to Grid Input*.
4. ⚠ **DO NOT** use **"Grid Sell"** when generator is connected to the GRID input, can cause potential damage the generator. Installation of CT sensors on generator lines is only required if **"Peak Shaving"** is intended to be used.

Improve the Generator & Sol-Ark Compatibility

Navigate to Settings → *Grid Setup → Grid Selection → Grid Mode* and program the following values to improve the Sol-Ark and generator compatibility and operating range to avoid frequent disconnections.
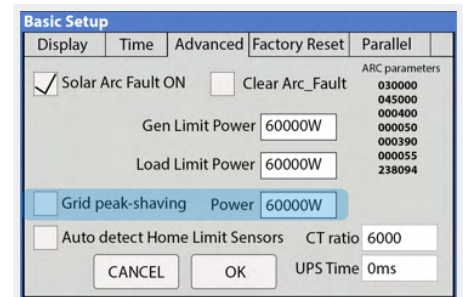
1. Change the grid mode to General Standard: ⚙ → *Grid Setup → Grid Selection → Grid Mode*.
   a. Tap and use the navigation arrows to cycle through the different grid modes. Choose **"General Standard"**.
2. Increase the frequency range of operation: ⚙ → *Grid Setup → Connect → Reconnect*
   a. Increase **"Grid Hz High" to 65Hz.**
   b. Decrease **"Grid Hz Low" to 55Hz.**
   c. Replicate changes for the "Normal Connect" settings.
3. Increase the voltage range of operation:
   a. Increase **"Grid Volt High" to 528V.**
   b. Decrease **"Grid Volt Low" to 432V.**
   c. Replicate changes for the "Normal Connect" settings.

2.6 Grid Peak Shaving
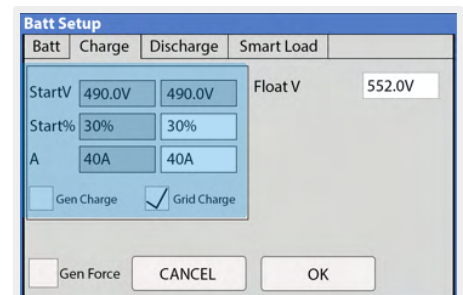
1. 🛈 To use Peak-Shaving on a generator, the equipment **MUST** be connected to the "GRID" terminal of the inverter.
2. Peak-Shaving helps reduce grid consumption during peak demand by utilizing battery backup power. It can also be used to prevent generator overload above a specified power threshold.
3. Install the CT sensors on grid / generator lines L1, L2, L3. The arrows on the CTs **MUST** point toward the inverter.
4. The Sol-Ark supplies power from the batteries whenever the **"Power"** threshold is met.
5. This mode will automatically adjust the "Grid Charge" amperage **(A)** to avoid generator overloads during battery charging.
6. Grid Peak-Shaving will automatically enable "Time of Use" and **MUST** be configured.

2.7 Automatic Generator Start

1. " ☑ **Gen Charge"** is used when the generator is connected to the **"GEN"** terminal.
   a. **"Start V" or "Start %"** is the set-point/condition that must be fulfilled to automatically start the generator.
   b. To charge from the "GEN" source, "☑ Gen Charge" must be enabled.
   c. 🛈 Batteries will charge from a generator until the battery bank accepts 5% of its programmed capacity in Amperes (A). This is equivalent to around 95% of the state of charge (SOC).

Grid peak-shaving settings

2. **"☑ Grid Charge"** is used to charge the battery from the **"GRID"** source (grid or a generator).
   a. **"Start V" or "Start %"** is the set-point/condition that must be fulfilled to start the battery charge from the "GRID" source. This will auto-start a generator as well.
   b. To charge the battery from the "GRID" source, "☑ Grid Charge" must be selected: ⚙ → *Battery Setup → Charge.*
   c. 🛈 From utility grid: the batteries will be charged to 100% SOC.

Generator and grid charge settings

d. ⚠ From generator: the batteries will charge until the battery bank accepts 5% of its rated capacity in Amperes (A). This is equivalent to around 95% SOC.

> ⚠ **NOTE:** If "Time of Use" (TOU) is enabled, a time to charge from that GRID or GEN source MUST be designated. "☑ Charge" must be checked on desired time intervals, otherwise the generator will not start automatically even if the Start V or Start % condition has been met.

Gen Charge / Grid Charge "A"

"A" is how many amps **(DC)** are supplied to the battery from the "GRID" or "GEN" source. Adjusting and limiting the Gen or Grid **"A"** value will ensure that small generators are not overloaded when charging the battery bank.

If connecting more than one HV battery in parallel to the Sol-Ark inverter, divide the Gen or Grid **"A"** value by the **# of batteries** to estimate the current (A) flowing to each HV battery.

2.8 Integrating Sensors and Accessories
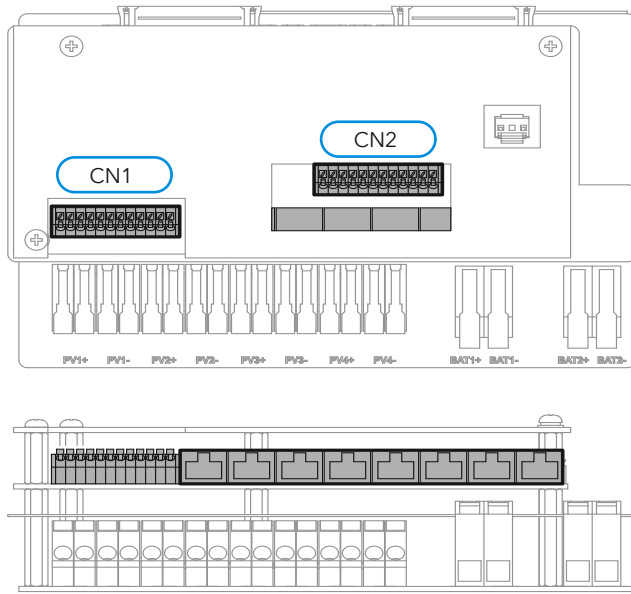
Figure 8: Overview of Inverter Pinouts
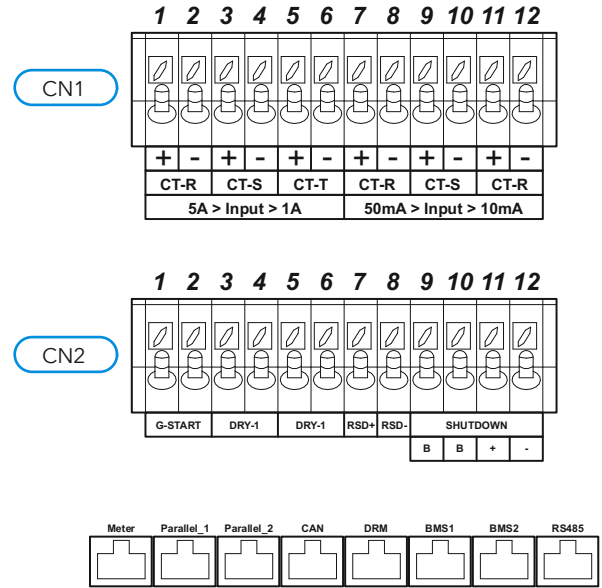
Figure 9: Inverter Terminal Blocks

1. Sensor Pin Out (Located in Sol-Ark user area)

CN1:

Max. 5A Secondary CTs ONLY:

- **(1,2) 5A to 1A Input - CT-R:** Current transformer (L1). **Polarity sensitive.**
- **(3,4) 5A to 1A Input - CT-S:** Current transformer (L2). **Polarity sensitive.**
- **(5,6) 5A to 1A Input - CT-T:** Current transformer (L3). **Polarity sensitive.**

Max. 50mA Secondary CTs ONLY:

- **(7,8) 10mA to 50mA Input - CT-R:** Current transformer (L1). **Polarity sensitive.**
- **9,10) 10mA to 50mA Input - CT-S:** Current transformer (L2). **Polarity sensitive.**
- **(11,12) 10mA to 50mA Input - CT-T:** Current transformer. (L3). **Polarity sensitive.**

CN2:

- **(1,2) G-Start:** Normally Open (NO) relay for generator two-wire start
  - (⚠ **12V, 100mA max**)
- **(3,4) Dry-1 and (5,6) Dry-2: Reserved**
- **(7,8) RSD+/-: Reserved**, DO NOT CONNECT ANY RSD TRANSMITTER
- **(9,10) Emergency Stop Button:** Normally Open (NO) dry contact for emergency stop button
- **(11, 12) +/- : Reserved**, not used at this time.
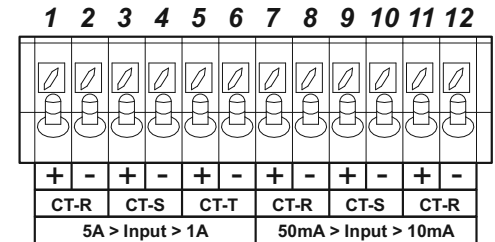
Figure 10: CT Sensor Input Pinout
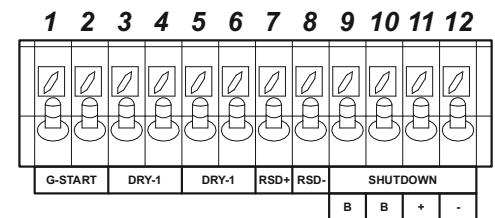
2. Communication Ports

- **Meter:** For external Revenue Grade energy meter communication.
- **Parallel_1 & Parallel_2:** Inverter parallel communications ports 1 and 2.
- **CAN:** Reserved.
- **DRM:** Reserved.
- **RS-485:** RS-485 port
- **BMS1 & BMS2:** BMS ports 1 and 2 for battery communications

Figure 11: CN2 Pinout
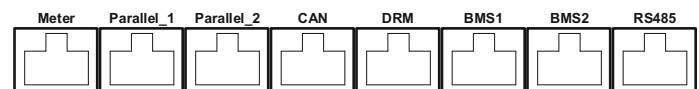
Figure 12: Communication Ports

3. CAN & RS485 Ports

- CAN port data is in a proprietary format. Sol-Ark does not support 3rd party usage currently.
- The RS485/RTU port utilizes the MODBUS protocol, data is in a proprietary format. Please contact Sol-Ark to request the MODBUS register map if it is required for your application.

Pin	RS485	CAN
1	B-	B-
2	A+	A+
3	--	--
4	--	CAN High
5	--	CAN Low
6	GND	GND
7	A+	A+
8	B-	B-

8 7 6 5 4 3 2 1
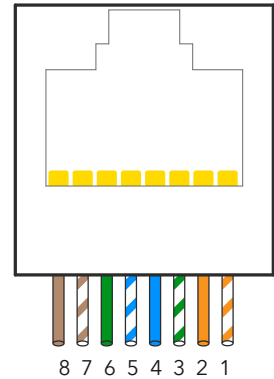
4. BMS Communication Ports

Pin	BMS1	BMS2
1	--	--
2	--	--
3	--	--
4	CAN High	CAN High
5	CAN Low	CAN Low
6	GND	GND
7	--	--
8	--	--

5. GEN Start Signal (Two-wire start)

- Gen start relay: CN2, pins 1 & 2.
- The signal comes from a normally open relay that closes when the generator **"Start"** condition is met.

6. Wi-Fi / Ethernet Antenna (Dongle)

- Remote monitoring and software updates require an internet connection through the Wi-Fi / Ethernet Gateway (Dongle).
- Supports with 2.4GHz Wi-Fi or Ethernet connections.
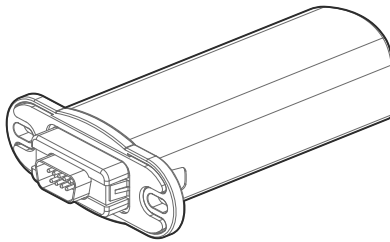
Figure 13: WiFi Gateway

2.9 Connecting Current Transformers (CTs)

The CT sensors (or limit sensors) enhance system capabilities by enabling the use of the system work modes known as **"Limited Power to Home"** (Meter Zero) and **"Grid Peak-Shaving"**. The CTs will measure and calculate total load demand which the Sol-Ark 60K-3P-480V will then use to accurately supply and offset all existing loads (Meter Zero).
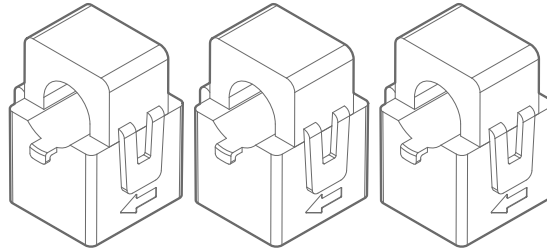
Figure 14: CT Sensors

1. CT Sensor Installation

> ⚠️ **DANGER: RISK OF ELECTRIC SHOCK**
> Before installing CT sensors around current-carrying conductors, you MUST:
> 1. Connect the CT outputs to the designated inverter input terminals, OR
> 2. Short the CT output wires using a CT shorting block
>
> This step is crucial to prevent the generation of dangerously high voltages in the CT secondary winding when this circuit is open and current is flowing through the primary.

- To begin, install sensors on incoming electrical service wires (L1, L2, L3).
- The marked arrows on the CT sensors must point **towards** the inverter.
- To ensure proper fit, check incoming wire diameters (grid or generator). If the sensors are too small, larger CTs can be purchased.
- **"Limited Power to Home"** (Meter Zero) and **"Grid Peak Shaving"** require CT sensors.
- See section 3.5 "Limiter" for more information about the different work modes.
- See section 7 "Wiring diagrams" for more information on CT installation.
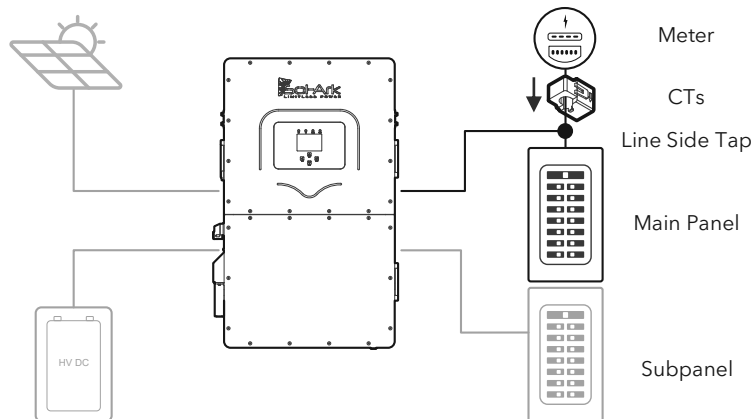
Figure 15 Overview of CT Placement

2. CT Sensor Size

- The 60K-3P-480V inverter includes three **300A** CT sensors with a 1.85x2" (47x52mm) opening.
- The inverter should be programmed to use a ratio of **6000:1** if using the included 300A CT's.
- For sites with services larger than 300A see **Section 4. Selecting Current Transformers for Larger Services**

3. Wiring the CT sensors

- Connect CT1 of line L1 to pins 1+ (white) & 2- (black) of CN1 pin board as shown in Fig. 13.
- Connect CT2 of line L2 to pins 3+ (white) & 4- (black) of CN1 pin board.
- Connect CT3 of line L3 to pins 5+ (white) & 6- (black) of CN1 pin board.
- Keep the wires twisted throughout the run 1rand only separate 1in (25mm) when making the termination at the inverter.
- If the wires need to be extended, use a minimum of 16AWG twisted pair shielded cable to make the extension.
  - Max CT extension length is 50ft using 14AWG twisted pair cable, for longer runs contact Sol-Ark for design assistance.
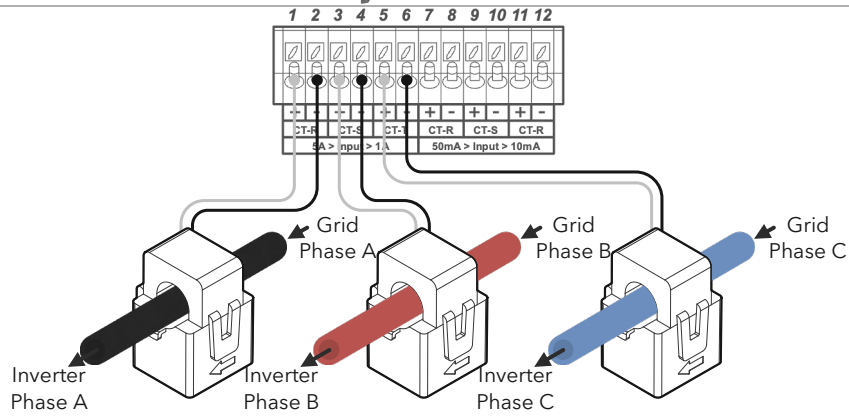
Figure 16: CT to Inverter Wiring

CT Sensors with Parallel Inverters

- Only one set of CT sensors need to be wired to the designated "Master" inverter.
- ❗ CT sensors are required for multi-inverter systems.

4. Selecting Current Transformers for Larger Services

If the included CTs are not suitable for the installation service larger CTs can be purchased separately. When selecting the CT the primary rating should be sized as close to the service size of the panel as practical. This ensures accurate measurements and proper system operation. For example, for a site with a 400A service panel, choose a CT with a 400A primary rating or the next available higher rating. Selecting a CT with a primary rating significantly higher than the service size may result in reduced accuracy for lower current measurements.

The following devices have been thoroughly to comply with Power Control System (PCS) operation per UL1741 CRD with the 60K-3P-480:

Manufacturer	Model	Current Rating	Inverter CT Ratio	Window Size	Datasheet
AccuEnergy	AcuCT-3135R	600A:5A 800A:5A 1200A:5A	12000:1 16000:1 24000:1	80.0mm x 90.0mm (3.10" x 3.50")	**Brochure**
AccuEnergy	AcuCT-4161R	600A: 5A 800A:5A 1200A:5A	12000:1 16000:1 24000:1	105.0mm x 155.0mm (4.10" x 6.10")	**Brochure**

❗ **NOTE:** These CTs are compatible with Sol-Ark HV inverters only. Do not use with Sol-Ark LV inverters.

Programming CT Ratios

To program the inverter with the correct CT ratio, begin by going to the ⚙ → **Basic Setup** → **Advanced** screen of the inverter, as shown in Fig. 14. The correct CT ratio can be calculated by dividing the primary side current by the secondary side output current, the resulting number should be multiplied by 100 before entering it into the CT Ratio setting on the inverter.

Example: 800A primary with a 5A secondary output, 800A / 5A = 160 or 16,000 ratio on the inverter.

> ❗ **NOTE:** The maximum value that can be programmed on the inverter is 40,000
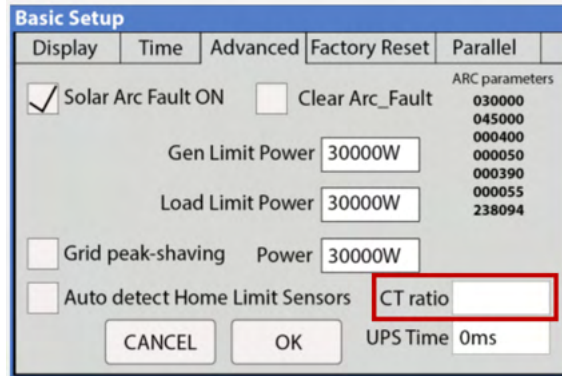
Figure 17: Settings Screen of the inverter for modifying CT Ratio

5. Automatic CT Limit Sensors Configuration

This function **REQUIRES** batteries to auto detect and auto correct CT orientation. AC coupled inverters need to be **OFF** during the detection test. If this test is done with connected AC-coupled systems, a factory reset of the Sol-Ark must be performed. Install the CT sensor as described previously. A battery connection and grid power are required before starting the automatic configuration.

⚙ → *Basic Setup* → *Advanced* → ☑ *Auto detect Home Limit Sensors*

Wait at least 10 to 15 seconds while the inverter performs the test. The inverter will alternate the current distribution in all lines, determining the correct orientation of the sensor.

Operational Notes

- On "Limited power to Home" mode (no Grid Sell), HM values will read close to zero (0). Keep in mind that many sensors can have a 1-3% error.
- To avoid selling power to the utility use "Zero Export Power" equal to or greater than 20W.
- Buying power from the grid will display positive (+) HM values, while selling to the grid displays negative (-) HM values

2.10 PV Rapid Shutdown

Rapid shutdown is a critical safety feature required by the National Electrical Code (NEC) for solar photovoltaic systems located on buildings. It allows first responders to quickly de-energize the DC and AC conductors of a solar system in an emergency.

The 60K-3P-480V inverter implements rapid shutdown through the use of the emergency stop pins located in the CN2 wiring area. Pins 7/8 are a normally open (NO) contact that will trigger rapid shutdown (RSD) when closed. Closing this contact using an external e-stop button (not included) will disable all power flows from the inverter, including the LOAD output when off-grid. When this same button is wired to the RSD device power supply it will also trigger module level shutdown at the solar module using module level shutdown or optimizer modules.

- Connect an emergency stop button connects to CN2, (B, B) pins 9 & 10 of the Sol-Ark.
- ❗ Rapid Shutdown Transmitters placed inside the user area of the Sol-Ark can cause interference.
- ❗ On parallel inverter installations, the emergency stop button must be wired to the designated "Master" inverter.

> ⚠ **CAUTION:** The 12Vdc power supply on Pins 7 & 8 of the 60K-3P-480V is not rated to power Rapid Shutdown Transmitters. DO NOT CONNECT any device to these terminals

Third party rapid shutdown transmitters should be powered by the 60K-3P-480V through an external power supply connected to the "LOAD" output, as illustrated in Fig 15. Pressing the e-stop button will disconnect all AC outputs, cutting power to the "LOAD" connected service panel which will initiate rapid shutdown.
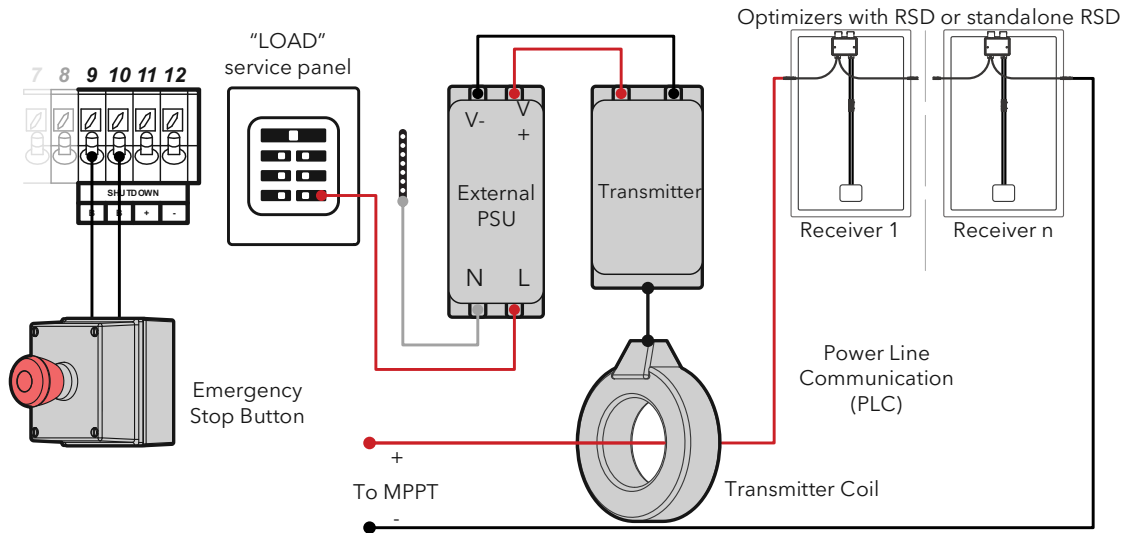
Figure 18: Example Rapid Shutdown Wiring Configuration

Compatible Rapid Shutdown Devices

The following Rapid Shutdown Devices (RSDs) are compatible with the 60K-3P-480 inverter:

| TIGO TS4-A-O | TIGO TS4-A-F | TIGO TS4-O | APsmart RSD S-PLC / RSD-D |

RSDs must be installed according to both manufacturer specifications and local electrical codes. For detailed installation procedures and troubleshooting of Rapid Shutdown Devices, consult that device manufacturers installation manual.

2.11 Inverter Startup and Commissioning

> **NOTE:** TURN ON the inverter with at least one of the following power sources:
> 1) Battery, 2) PV or 3) Grid/Generator

1. Verify the Battery Input

A. ⚠ Voltage of the battery must be between 160V_{DC} - 800V_{DC}.

B. Turn **ON** battery modules and ensure appropriate voltage on each battery. Verify nominal voltage of battery bank according to the battery installation manual.

C. Turn **ON** the external battery disconnect. Verify that the voltage at the Sol-Ark terminals is within 2% of the voltage measured at the battery bank output.

D. ⚠ **DO NOT** reverse polarity. **DO NOT** turn **OFF** battery disconnect if any current is flowing in or out of the battery.

2. Verify the PV Input

A. ⚠ Input voltage must not exceed 1,000V_{DC}.

B. Input voltage must be above the startup voltage of 150V_{DC}.

C. ⚠ Do not ground PV+ or PV-.

D. ⚠ Verify polarity in each PV string. Backward polarity will measure 0Vdc by the Sol-Ark and will cause long term damage.

E. ⚠ PV alone turns LCD screen only. Inverter requires **grid** and/or **batteries** to operate, otherwise an "OFF" message will appear.

F. PV DC disconnect switches on the side of the inverter turn the PV ON or OFF.
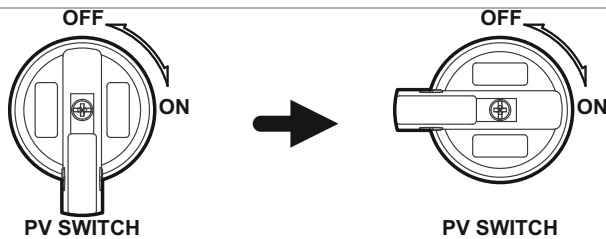
Figure 19: PV Disconnect Operation

3. Verify the GRID Input

A. Verify that voltage between Neutral and Ground is $0V_{AC}$.
B. Verify that voltage between "**GRID**" **L1** and "**LOAD**" **L1** is 0V. Do the same for L2 and L3.
C. Verify the AC voltage on the **"GRID"** terminals using digital multimeter.

For 277/480V Wye Services

D. Measure line (L) to neutral (N) voltages on **"GRID"** terminals.
E. Ensure $277V_{AC}$ on all phases to neutral or ground and $480V_{AC}$ between all phases to each other.

For 480V Delta Services

F. Measure line (L) to line (L) voltages on **"GRID"** terminals. Ensure $480V_{AC}$ between all phases to each other.

4. Powering on the 60K-3P-480V

A. Turn **ON** the external "GRID" disconnect. Wait for the **"AC"** LED indicator to turn on.
B. Turn **ON** the PV DC disconnect switches. Wait for the **"DC"** LED indicator to turn on.
C. **PRESS** down the power button to the **ON** position. Wait for the **"Normal"** LED indicator to turn on. This may take a few minutes.
D. Turn **ON** the external battery disconnect if the system has batteries.
E. Turn **ON** any external "LOAD" and "GEN" breakers.
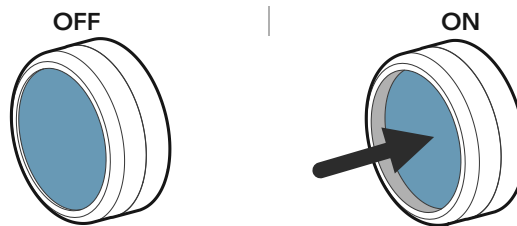
Figure 20: Inverter Power Button Operation

2.12 Power Cycle Sequence

1. **TURN OFF** the external battery disconnect if the system has batteries.
2. **PRESS** the power button, making sure it is in the **OFF** position. An "OFF" message will appear after the **"Normal"** LED turns off.
3. **TURN OFF** the built-in PV DC disconnect switches on the side of the inverter.
4. **TURN OFF** all AC breakers / disconnects ("GRID", "GEN" and "LOAD").
5. Wait a moment (~1 min) to ensure the inverter is completely de-energized.
6. Make sure that the Sol-Ark is properly connected to the batteries, solar panels, "GRID", "GEN", and "LOAD".
7. Reverse the steps to turn **ON** the Sol-Ark.

3. User Interface

3.1 LED Indicators
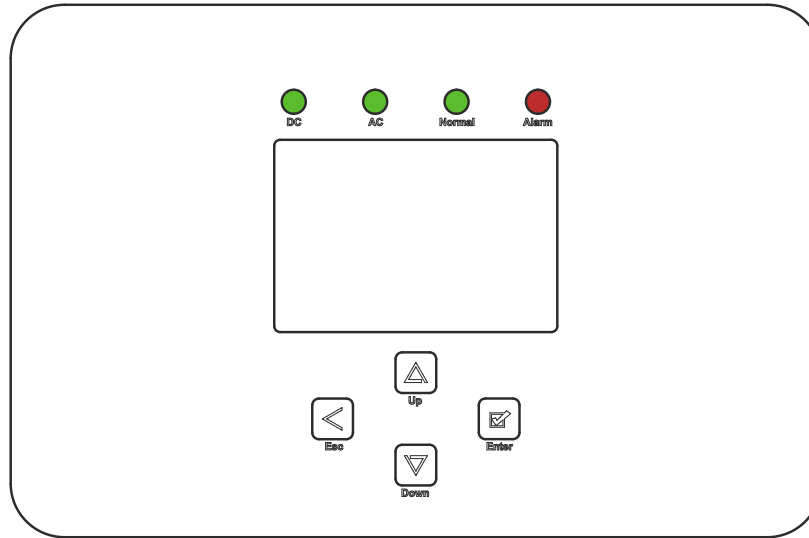
Figure 21: Inverter Front Panel

DC	AC	Normal	Alarm
Green → DC PV input connected and providing voltage.	Green → Grid is connected and providing voltage.	Green → Sol-Ark is **fully energized*** and operating.	Red → Alarm state. Check the alarms menu. Home Screen→ ⚙ → "System Alarms"
OFF → Minimum MPPT voltage not met, wrong polarity or no PV$_{DC}$.	OFF → Grid voltage out of range or Off-Grid system.	OFF → Not fully energized*, in fault state or in passthrough mode.	OFF → No alarms / error codes / setting change notifications

> **NOTE:** Fully energizing the inverter requires having at least one of the following:
> a) DC PV and Grid or b) Batteries

3.2 Main Menus
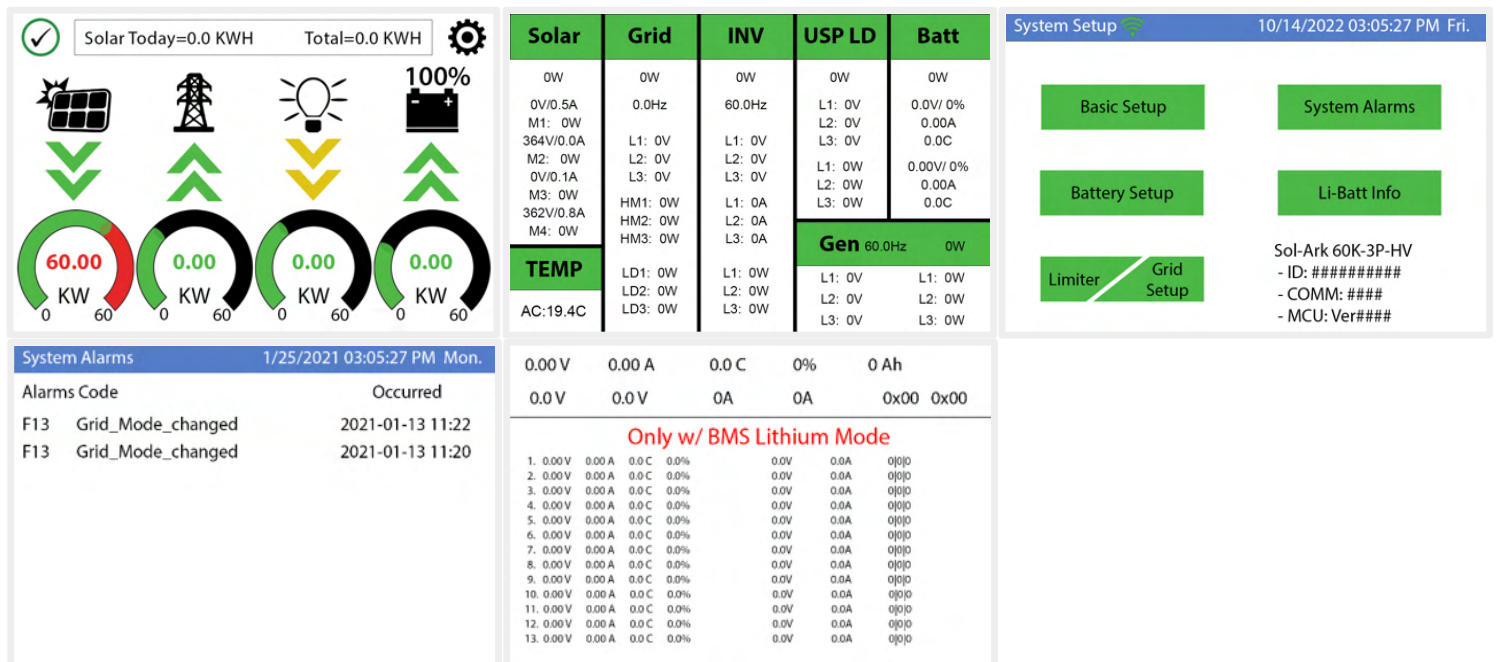
Figure 22: Main Menu Screens Overview

1. Main Screen Overview

PV power generation graph   Grid usage graph   Hold 4 s to force Smart Loads

Settings

Details Screen

Solar power production

Grid power
Sell (-) / Buy (+)

Load power
consumption

Battery power
Charge (-) / Discharge (+)
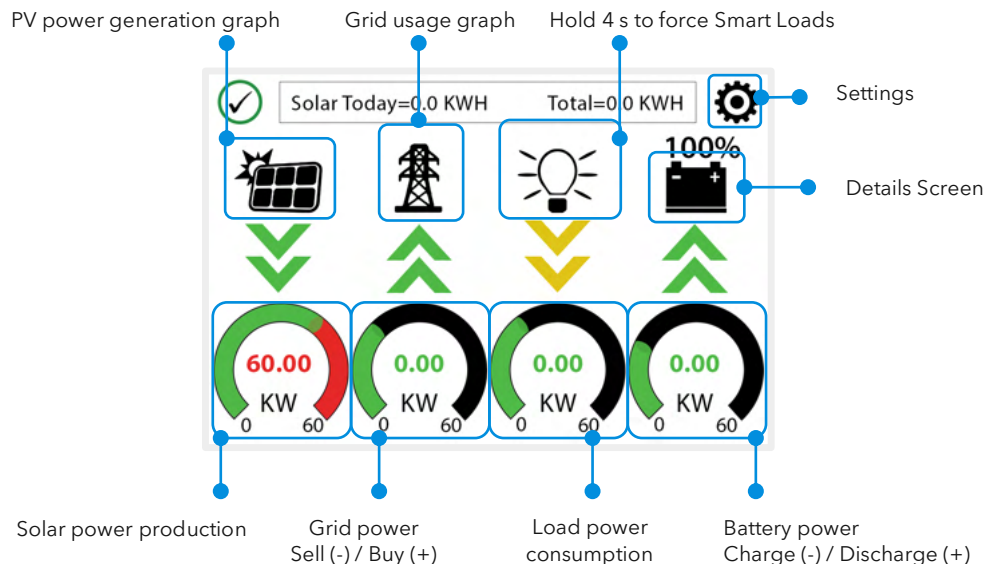
Figure 23: Home Screen Overview

2. Details Screen Overview

GRID Vφ & *f*   Output Vφ, Iφ, Pφ & *f*   LOAD Vφ, & Pφ

Total P & P3φ

V, I & P of MPPT1

V, I & P of MPPT2

V, I & P of MPPT3

V, I & P of MPPT4

Internal AC temperatures

Battery 1:
V / %, I and T

Battery 2:
V / %, I and T

GEN source V φ, P φ & *f*

Pφ measured by external sensors   Pφ measured by internal sensors
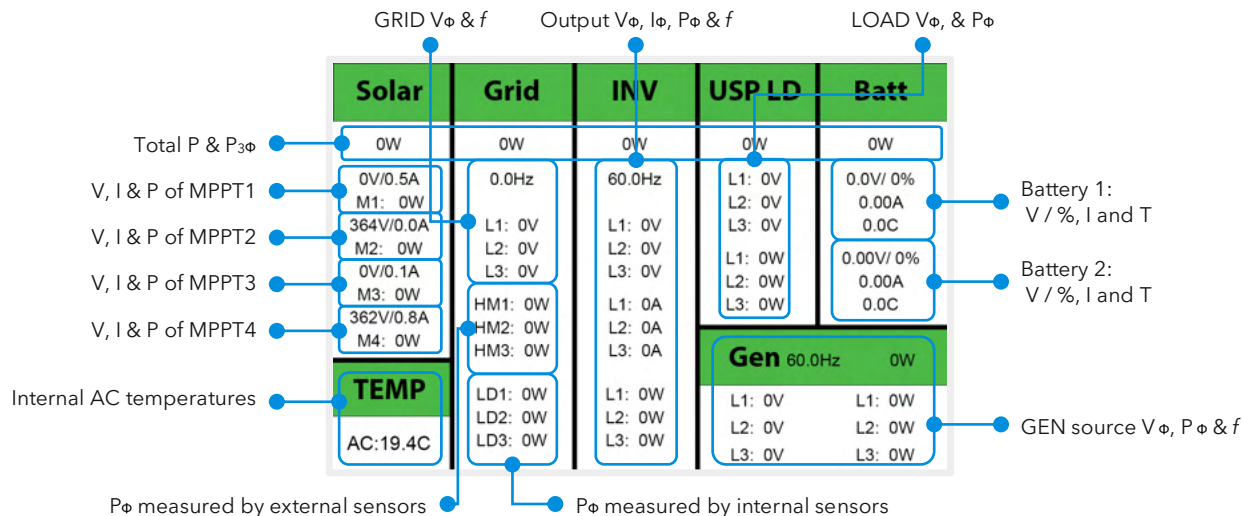
Figure 24: Parameters Screen Overview

- ⚠ MPPT voltages **MUST NOT** exceed 1,000V.
- "TEMP" measures the internal temperatures of the AC conversion power electronics.
- "Grid" column measures: Voltage, Current, Power and frequency of the utility grid.
  - o If selling to the Grid: Watts = negative (-)
  - o If buying from the Grid: Watts = positive (+)
  - o HM: power measured by the external CT sensors. (L1, L2 & L3).
  - o LD: power measured by the internal sensor on "GRID" terminal. (L1, L2 & L3).

> 🛈 **NOTE:** Opposing "Grid" or "HM" values indicate an incorrect installation of CT. See section 2.9 "Limit Sensor"

3. PV power Generation Graph

- A. Tap the solar panel icon to display the PV power generation graph.
- B. Displays power production over time for the PV array.
- C. Use up/down arrows (↑, ↓) to navigate between days.
- D. Month view/year view/total production.

4. Grid Usage Graph

A. Tap the grid icon to display the grid usage graph.
B. Displays power drawn from grid (+) / sold to the grid (-).
C. Values above the line indicate "power bought" from the grid.
D. Values bellow the line indicate "power sold back" to the grid.
E. This view can help to determine when the peak power is used from the grid.

5. System Setup Menu

Figure 25: System Setup Screen Overview
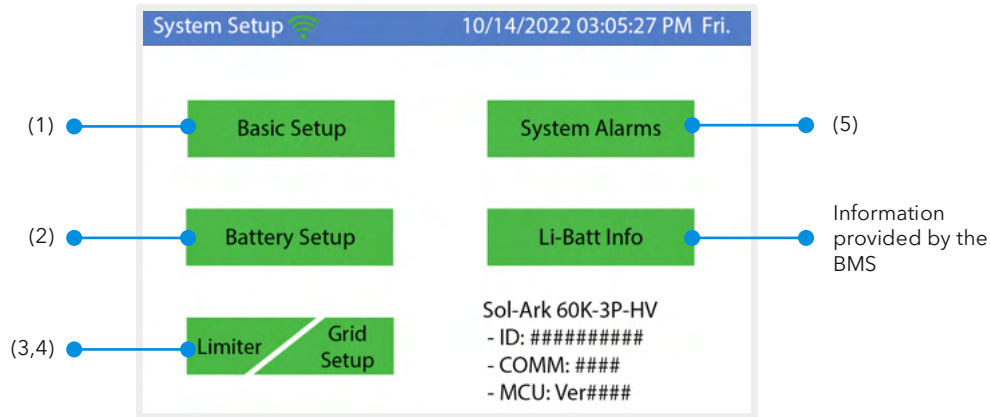
3.3 Basic Setup
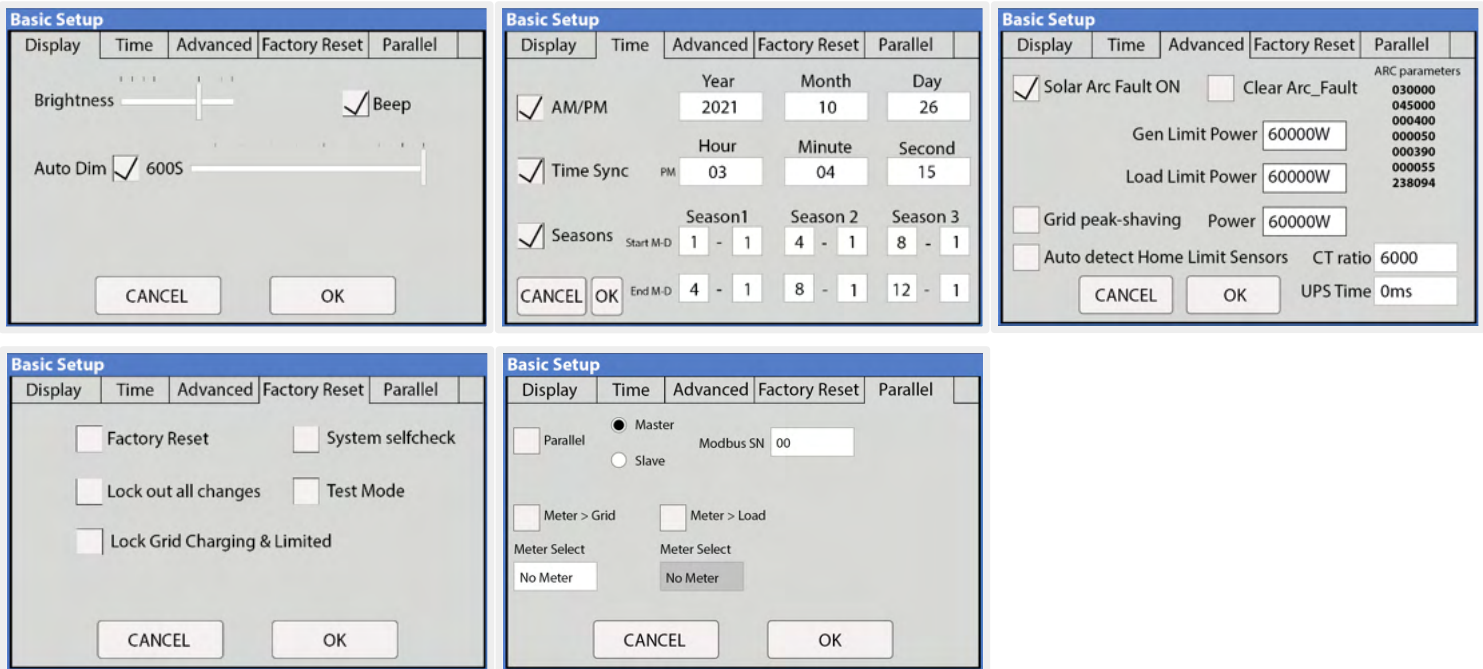
Display

Brightness: Brightness adjustment (+, -).
Auto Dim: ⚠ Must be always enabled to maintain the warranty of the LCD screen.
Beep: Enable / disable the alarm beep.

Time

Time Sync: Automatically syncs with the internet for daylight saving time changes (Enabling "Time sync" is recommended).
Seasons: Setup and customize the seasons for TOU. **NOTE**: Must be programmed using the touchscreen, currently not supported in MySolArk.

Advanced

Solar Arc Fault ON: Enables Arc fault detection algorithm on the MPPTs.

Clear Arc Fault: Command to clear an Arc Fault. ❗ It must be executed manually after the system detects an F63 Arc Fault alarm. See section 8.1 "Sol-Ark Warnings and Fault Codes" for more detail.

Gen Limit Power: Limits the power drawn from the "GEN" AC source. The inverter will reduce battery charge when value is reached.

Load Limit Power: Sets a limit to the total "LOAD" output power. The max output power of the inverter is programmed by default.

Grid-Peak Shaving: Sets a "GRID" consumption threshold that allows use of battery backup power during peak demand. External CT sensors are required. Peak shaving can be used on a generator provided it is wired to the "GRID" terminal.

Auto detect home Limit Sensor: Detects and auto-corrects the polarity of the CTs. See section 2.9 for details.

CT Ratio: Specifies the transformation ratio of the CT. Default value of 6000:1 for the 300A/5A sensors included with the inverter

UPS Time: Backup transfer time to essential loads upon grid disconnection. Default value of 5ms.

Factory Reset

Restrictions: Changes to these settings must be previously authorized by Sol-Ark technical support agents.

Parallel
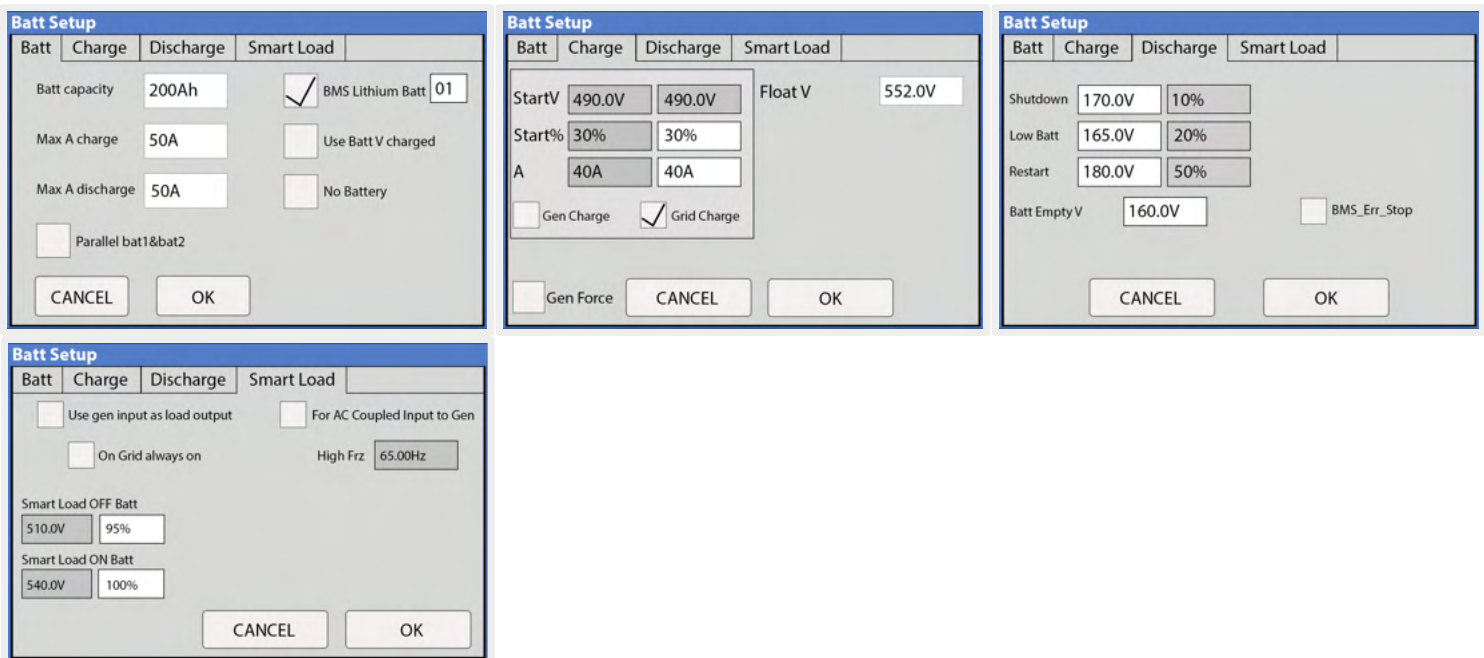
Parallel: Enables communications between parallel inverters. "Master" and "Slave" inverters must be programmed.

MODBUS SN: Identification number for each system configured in parallel (1,2,3,4, n).

> ❗ **NOTE:** See section 5 "Parallel Systems" for more information

3.4 Battery Setup

Batt

Batt Capacity: Specifies the capacity of the battery bank. Value expressed in Amp Hour (Ah).

> ❗ Batteries in series → Voltage adds up (V).

> ❗ Batteries in parallel → Capacity adds up (Ah).

Max A Charge: Sets the maximum charge current (A) rate to the batteries when charged from solar power → 50 max allowed. 100A max total if using both battery terminals.

Max A Discharge: Sets the maximum discharge current (A) rate from the batteries → 50A max per port. 100A total if using both battery terminals.

> For off-grid systems, the battery bank will discharge 120% of this value for a 10 second surge before the inverter faults to prevent battery damage.

BMS Lithium Batt (required): Enables closed communications with lithium batteries. Serial Number (01,02, ...) must be specified according to communication protocol.

Use Batt V Charged: Displays battery charge in terms of voltage.

Parallel bat1&bat2: Must be checked when using both battery inputs for the same battery bank. When enabled, the inverter will expect a single battery communication source. Follow Battery Communication instructions from section 2.3.

Charge

Float V: Lower steady voltage at which the battery is maintained after being fully charged. ⚠ Not supported for Li-ion batteries.

Gen Charge: Uses the "GEN" AC source to charge the battery bank.

    a.   **Start V:** Voltage at which the system will auto-start and allow a generator or AC source to charge the battery.

    b.   **Start %:** SOC at which the system will auto-start and allow a generator or AC source to charge the battery.

    c.   **A:** Maximum rate of charge to the batteries (per terminal) from the generator or AC source (DC amps). Set value according to the generator size.

Grid Charge: There are two scenarios in which this option is used:

    a.   **Grid connected to "Grid" input:** The inverter will limit the charge rate to the set value in "A" and the battery will charge to 100% SOC.

    b.   **Generator connected to "Grid" input:** It will be necessary to select **"☑ GEN connect to Grid input"**. The system will use "Start V", "Start%" and "A" conditions to charge the battery and stop charging at 95% SOC. ⚠ Adjustable upper limit if Time of Use is enabled.

Gen Force: Test function for generator auto-start. Enable and press OK to close normally open relay (CN2, pins 1,2) and force the generator on. Disable and press OK to disengage. The generator will not provide power during this test if grid power is available.

> ⓘ **NOTE:** The genset must be in automatic mode if applicable and must have a two-wire start (dry-contact, normally open) connected to the Sol-Ark.

Discharge

Shutdown: Battery voltage or % at which the inverter will shut down to protect the battery from an over discharge situation (battery symbol on the home screen will turn red).

Low Batt: Low battery voltage or % (battery symbol on the home screen will turn yellow). Stopping point for TOU.

Restart: Battery voltage or % at which AC output will resume after previously reaching "shutdown".

Batt Empty V: Sets the empty voltage and associates this voltage to 0% SOC. This value determines the lowest % SOC limit.

BMS_Err_Stop: Enables system stop when there is loss of battery communications.

> ⚠ **CAUTION:** Do not exceed GEN port input/output current limit of 180Aac continuous.

Smart Load

A.   This mode uses the **"GEN"** input as a load output that delivers power when the battery exceeds a user programmable threshold or when the Sol-Ark is connected to the grid.

B.   When **"☑ Use gen input as load output"** is enabled, the "GEN" input turns into an output to power high-power loads such as a water heater, irrigation pump, AC unit, pool pump, or any other load.

C.   When **"☑ On Grid always on"** is enabled, the "GEN" terminal will always output power as long as the grid is connected, regardless of battery charge.

    Smart Load OFF Batt: Battery voltage or % at which the "GEN" terminal will stop outputting power.

    Smart Load ON Batt: Battery voltage or % at which the "GEN" terminal will start outputting power.

    Solar Power (W): Amount of PV production needed before "GEN" terminal starts outputting power.

AC Coupling Settings - (For AC Coupled Input)

A.   ⚠ Grid-tied systems with AC coupled solar arrays must have **"☑ Grid Sell"** enabled. Ensure you are allowed to sell back to the grid.

B.   To use the "GEN" terminal as an AC coupling input for micro inverters or string inverters, enable **" ☑ For AC Coupled Input to Gen"**.

C.   ⚠ In off-grid systems, the Sol-Ark will use frequency shifting to control the AC coupled solution based on the battery SOC.

3.5 Limiter
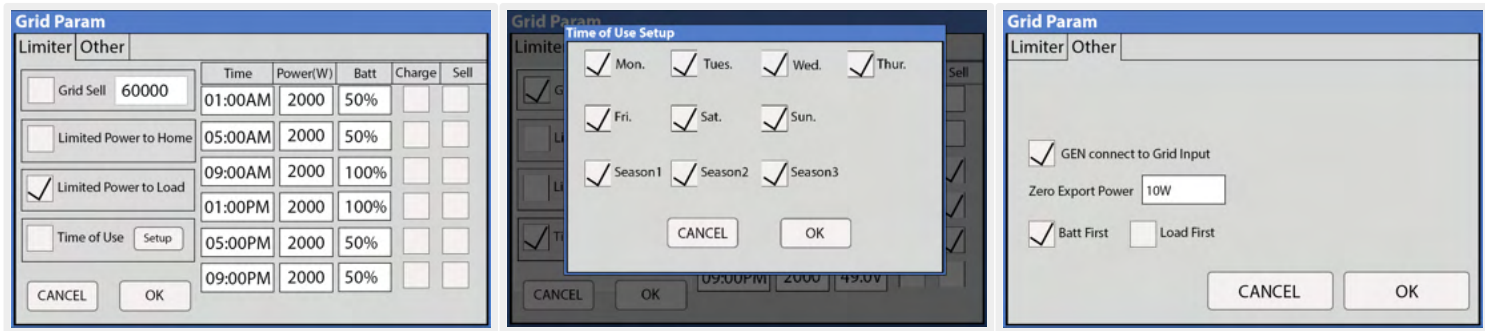
Limiter

The Sol-Ark 60K-3P-480V inverter will simultaneously utilize different available power sources to satisfy load demand in the electrical service panels (essential loads panel / main service panel). The following work modes allow the user to determine how power is generated and utilized.

Grid Sell

Grid Sell: The inverter will produce as much power as it has available from PV array according to the programming. The maximum power that can be generated from DC coupled arrays and sold to the grid is 60,000W.

Description:
    a.   This mode allows the inverter to sell back power generated from the solar arrays up to a programmable limit.
    b.   The inverter will only measure loads connected to the "LOAD" terminal.
    c.   The inverter will measure all power in / out of the "GRID" terminal as grid either consumption (+) or grid sell back (-).
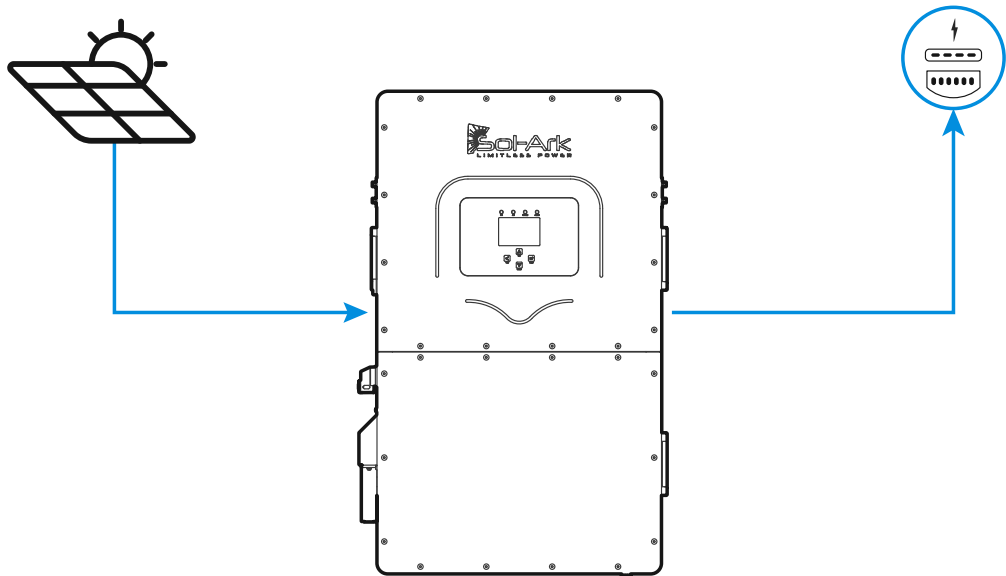
Figure 26: Operating Mode Diagram - Limited Power to Home

Limited Power to Home

> **NOTE:** This operating mode REQUIRES batteries

Limited Power to Home (Meter Zero): This mode limits the energy produced by the inverter to satisfy the total demand (essential loads panel + main service panel). In this mode, the inverter delivers power to the "LOAD" terminal (essential loads panel) + the "GRID" terminal (main service panel). CT sensors **MUST** be installed. These sensors measure load consumption in the main service panel to offset total load demand and prevent selling to the utility. This system work mode is useful for users that don't have a permit to sell back. See section 2.9 "Limit Sensors" for proper external CT installation.

General description:
  a. Power is delivered to all home loads without selling excess solar to the grid. This mode is suitable for systems where selling to the utility grid is not allowed.
  b. External CT sensors are **required** for proper operation.
  c. Monitored loads will be the addition of the main service panel + essential loads panel.
  d. **Energy Priority**: 1. Solar PV Power | 2. Grid Power | 3. Batteries | 4. Generator
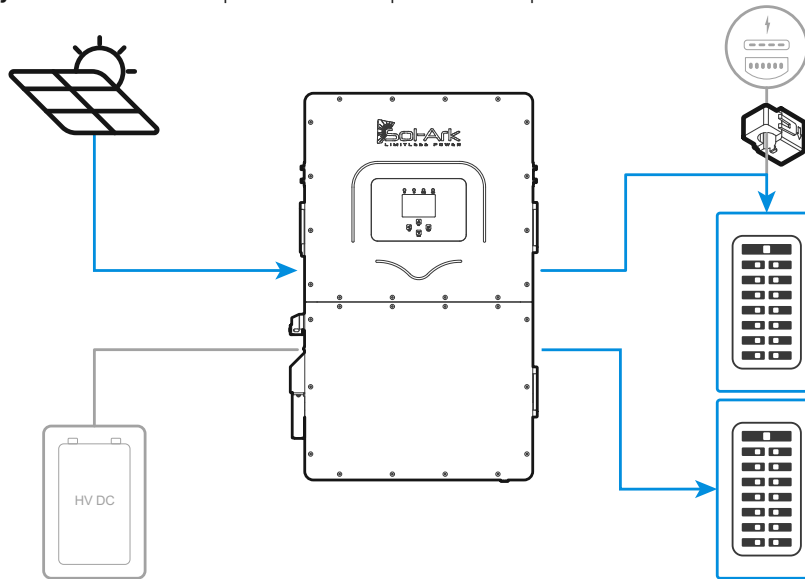
Figure 27: Operating Mode Diagram - Limited Power to Home

Limited Power to Home + Grid Sell: This mode will NOT limit solar production to home demand. In this mode, the inverter delivers power to the "LOAD" terminal (essential loads panel) + excess power to the "GRID" terminal (main service panel AND grid). The Sol-Ark will monitor grid sell and load consumption simultaneously (with +/ - 3% error from CT sensors). The CT sensors **MUST** be installed. The inverter will sell excess solar power up to a programmable limit. See section 2.9 "Limit Sensors" for proper external CT placement.
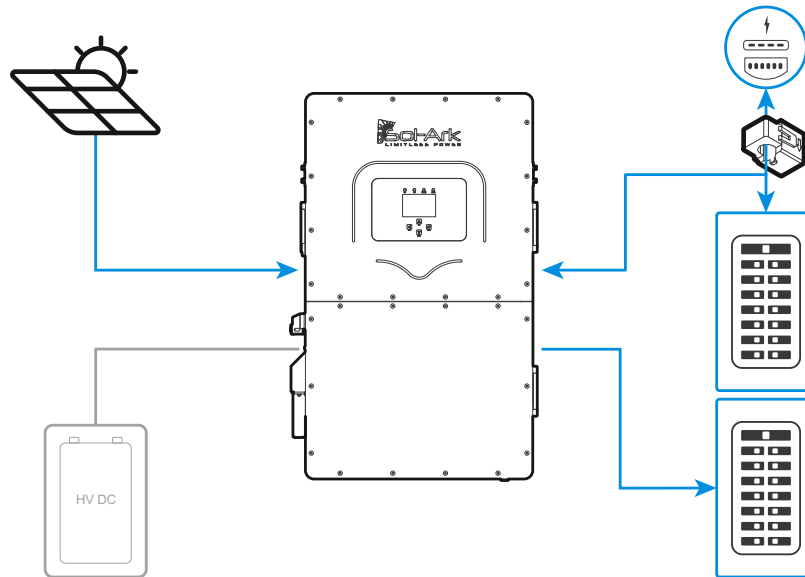
Figure 28: Operating Mode Diagram - Limited Power to Home + Grid Sell

Limited Power to Load

> **(!)** **NOTE:** This operating mode REQUIRES batteries

Limited Power to Load: This mode limits the solar production to cover "LOAD" demand (essential loads panel) exclusively. In this mode, the system disregards loads in the main service panel and will not deliver power to the "GRID" terminal.

Description:
   a. Power is limited to the "LOAD" demand. It will **NOT** produce more power than necessary.
   b. Power will **NOT** be delivered to the "GRID" terminal (NO grid sell).
   c. Monitored loads will be exclusive to the essential loads panel.
   d. This mode is recommended for off-grid applications.
   e. **Energy Priority**: 1. Solar PV Power | 2. Grid Power | 3. Batteries | 4. Generator
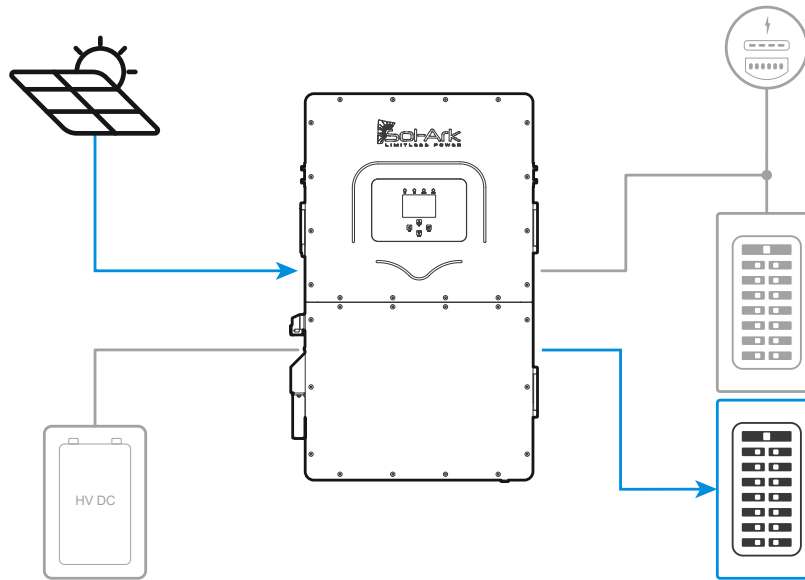
Figure 29: Operating Mode Diagram - Limited Power to Load

Limited to Load + Grid Sell: This mode will NOT limit solar production to "LOAD" demand. The inverter delivers power to the "LOAD" terminal (essential loads panel) + excess power to the "GRID" terminal (main service panel AND grid), however it will ONLY track "LOAD" demand and sell excess solar up to a programmable limit. "GRID" loads cannot be measured, only the total output through the "GRID" terminal. This mode is recommended for single inverter systems or for whole-site backup installations.
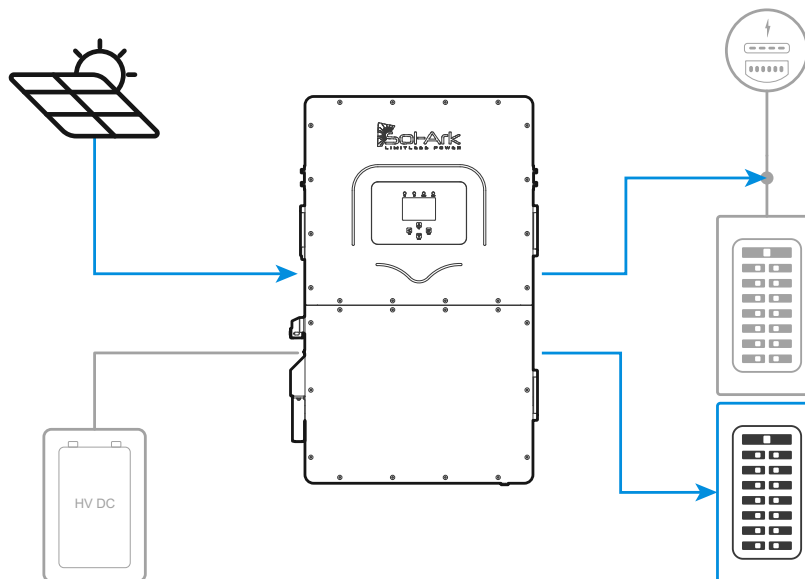
Figure 30: Operating Mode Diagram - Limited Power to Load + Grid Sell

Time of Use

Time Of Use (TOU): This mode combined with "Limited Power to Home" or "Limited Power to Load" allows the use of battery backup power to reduce consumption from the grid during specific time intervals. Battery power will cover load demand at a programmable power rate "**Power(W)"** down to a programmable **"Batt (V / %SOC)"**. You can configure six different time intervals over a 24-hour period to cover a wide range of battery discharge or charge behaviors.

Description:
   a. Uses battery power to reduce the power consumption during user defined time intervals.

b.   Power (W) dictates the rate at which the battery discharges to assist with load demand.
c.   Batt (V or %) dictates the lower discharge limit or upper charge limit.
d.   **Energy Priority**: 1. Solar PV Power | 2. Batteries (down to programmed discharge V or %) | 3. Grid Power | 4. Generator.
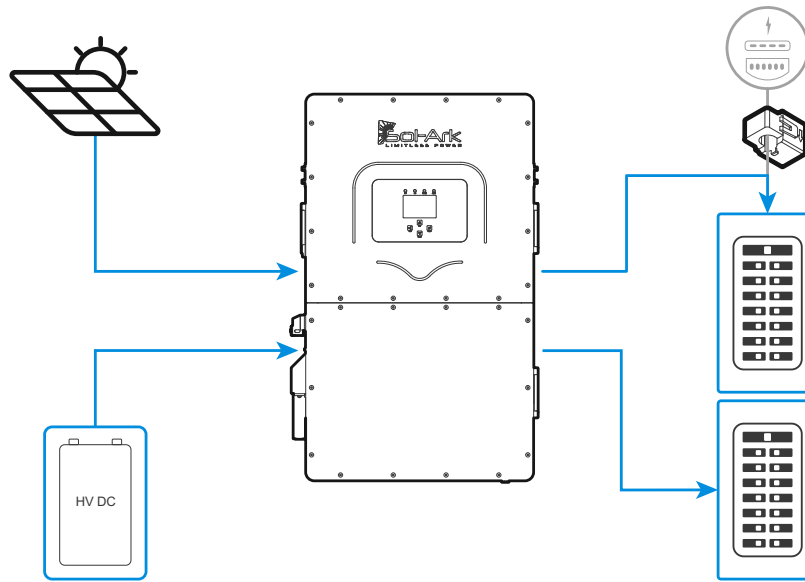
Figure 31: Operating Mode Diagram - Limited Power to Home + TOU

Time: Programable time intervals over a 24h period. All time slots **MUST** follow chronological order and must be programmed.
Power(W): Sets the maximum discharge rate of the battery during the corresponding time slot.

Batt: V or % used to specify a lower discharge limit or upper charge limit whenever **"☑ Charge"** is enabled. 🛈 Grid-tied systems will not allow TOU to discharge lower than **"Low Batt V/%"**. Off-grid systems allow TOU discharge down to **"Shutdown V/%"**.

☑ Charge: During the hours selected, it is allowed to charge batteries from an external AC source up to a programmed voltage or %. If the external AC power source is a generator, the "Start V" or "Start %" condition must be fulfilled first. If available, the solar array will always charge the batteries at 100% regardless of **"☑ Charge"** in TOU.

☑ Sell: Allows batteries to discharge and sell power to the grid at the programable "Power(W)" rate. **"☑ Grid Sell" MUST** be enabled.

> 🛈   **NOTE:** Do not enable "Charge" and "Sell" at the same time

Other

GEN Connect to Grid Input: Specifies when a generator is connected to the "GRID" terminal.
Zero Export Power: Minimum power imported from the grid. Helps avoid selling back by ensuring constant grid consumption. The value can be set between 1 – 100W (recommended 20W).

Batt First: 🛈 Default and recommended option. Sets the solar power priority of the system to charge batteries first. Do NOT change unless instructed by Sol-Ark technical support.

Load First: Sets the solar power priority of the system to cover loads demand first and deliver remaining power to batteries. ⚠ Only recommended for very specific situations.

3.6 Grid Setup

Grid Param — Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Grid Mode 3/3	SRD-UL-1741	Grid Reconnect Time	300s
Grid Frequency	50Hz / 60Hz	Power Factor	1.000
		Grid Level	LN:120V/LL:208V(AC)
		Phase Type	0/240/120
		IT system-neutral is not GND	

CANCEL   OK

Grid Param — Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Reconnect		Normal connect	
Grid Vol High	504.0V	Grid Vol High	576.0V
Grid Vol Low	422.4V	Grid Vol Low	240.0V
Grid Hz High	60.1Hz	Grid Hz High	65.0Hz
Grid Hz Low	59.5Hz	Grid Hz Low	50.0Hz
Reconnect Ramp rate	300s	Normal Ramp rate	300s

CANCEL   OK

Grid Param — Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over Voltage U>(10 min. running mean)   239.2V

HV3	576.0V			HF3	65.00Hz		
HV2	576.0V	--	0.16s	HF2	65.00Hz	--	0.16s
HV1	528.0V	--	13.00s	HF1	63.00Hz	--	180.00s
LV1	422.4V	--	21.00s	LF1	57.00Hz	--	180.00s
LV2	240.0V	--	2.00s	LF2	50.00Hz	--	0.16s
LV3	240.0V			LF3	50.00Hz		

CANCEL   OK

Grid Param — Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over frequency				
Start freq F	60.04Hz	Droop F	42%PE/Hz	F(W) ✓
Start delay	0.50s	Stop freq F	60.04Hz	
		Stop delay	0.50s	
Under frequency				
Start freq F>	59.96Hz	Droop F>	42%PE/Hz	
Start delay F>	0.50s	Stop freq F>	59.96Hz	
		Stop delay F>	0.50s	

CANCEL   OK

Grid Param — Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

✓ V(W)   ✓ V(Q)

Response_T	5S	L.in:5.0%	L.out:20.0%
V1:106.0%	P1:100%	V1:92.0%	Q1:44%
V2:110.0%	P2:0%	V2:98.0%	Q2:0%
V3:110.0%	P3:0%	V3:100.0%	Q3:0%
V4:110.0%	P4:0%	V4:106.0%	Q4:-44%

CANCEL   OK

Grid Param — Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

P(Q)   P(F)

		L.in:5.0%	L.out:100.0%
P1:20%	Q1:-100%	P1:50.0%	F1:1.000
P2:50%	Q2:-100%	P2:100.0%	F2:0.800
P3:100%	Q3:-100%	P3:100.0%	F3:0.800
P4:100%	Q4:-100%	P4:100.0%	F4:0.800

CANCEL   OK

⚠️	**WARNING:** Consult with your utility before changing grid interconnection settings.
⚠️	**DANGER! SHOCK HAZARD:** Ensure inverter settings for are correctly configured for 480V Delta or 277/480V Wye Service. Failure to configure the inverter correctly could lead to equipment failure, shock hazard, and/or serious injury.
⚠️	**DANGER! DO NOT USE WITH 240V DELTA HIGH LEG SERVICES:** Delta High Leg, or "Wild Leg" 3-phase systems have an unbalanced phase-to-neutral voltages that can severely damage the 60K inverter if connected, leading to equipment failure and/or serious injury.

Grid Selection

Grid Mode: Tap and use navigation arrows to cycle through different grid modes:
1. **General Standard**: Applies general grid interconnection standards. Enables grid frequency and voltage adjustments. (Useful for off-grid applications with backup generators).
2. **UL1741 & IEEE1547:** Applies UL 1741 and IEEE 1547 grid interconnection requirements and standards.
3. **CPUC RULE21:** Applies California's grid interconnection requirements and standards.
4. **SRD-UL-1741:** Applies UL 1741SB grid interconnection requirements and standards.

Grid Frequency: Frequency of the AC sine wave.

Grid Reconnect Time: The amount of time in seconds the inverter will wait before reconnecting to the grid.

Fixed PF: Allows for power factor correction, ±0.8 to 1.0

Fixed Q: Allows for power factor correction based on desired reactive power percentage.

Grid Level: Tap and use navigation arrows to cycle through different nominal grid voltage levels. ⚠️ Grid level must be selected according to nominal grid voltage.
1. **Most Common:** LN:277VAC LL:480VAC
2. LN:230VAC LL:400VAC
3. LN:220VAC LL:380VAC

Phase Type: Tap and use navigation arrows to specify phase sequence.
1. **Most Common:** 0/240/120: Positive sequence A-B-C
2. 0/120/240: Negative sequence A-C-B

IT system-neutral is not GND: Configures an inverter to operate in either a Wye or Delta configuration (See Fig: 29)
1. **480V Delta** Configuration (3W **no** neutral): **Checked**
2. **277/480V Wye** Configuration (3W **with** neutral): **Un-Checked**
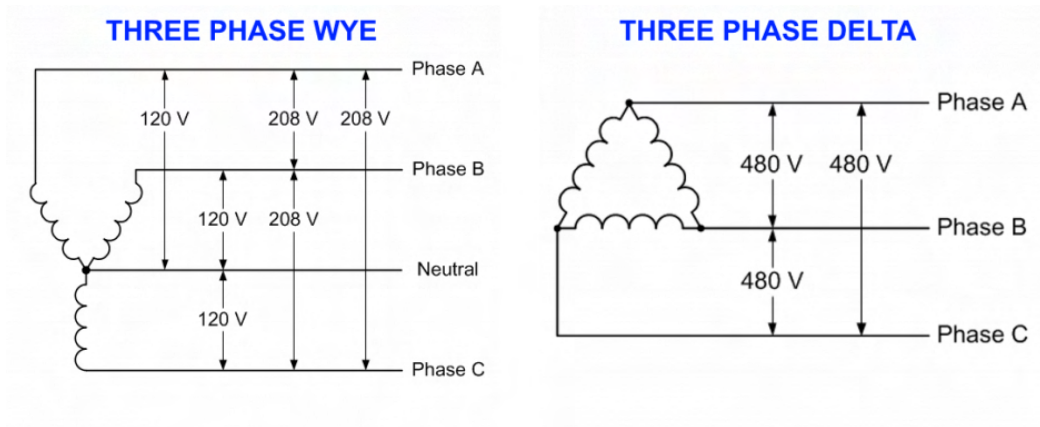
Figure 32 Wye vs Delta Voltage Configuration

Connect

Reconnect: Parameters used to determine an allowable range of frequency and voltages to dictate a reconnection to the grid after initial grid loss. Frequency and voltages must be within these margins during Grid Reconnect Time to allow grid reconnection.

⚠️ Parameters will be set automatically based on selected grid mode compliance, unless "General Standard" is selected.

Normal connect: Parameters used to determine an allowable range of frequency and voltages to retain connection to the grid following a reconnect and normal operation.

⚠️ Parameters will be set automatically based on selected grid mode compliance, unless "General Standard" is selected.

Reconnect Ramp Rate: Reconnection power ramp time in seconds.

Normal Ramp Rate: Startup power ramp time in seconds.

IP

HV1/HV2/HV3: Overvoltage protection point.
LV1/LV2/LV3: Undervoltage protection point.
HF1/HF2/HF3: Over frequency protection point.
LF1/LF2/LF3: Under frequency protection point.

F(W)

F(W): Enables the use of Frequency-Watt. The Sol-Ark regulates its power output to the grid as a function of the frequency to support grid stabilization during over and under-frequency conditions.

Droop F: Percentage of inverter's nominal power increase / decrease per Hert (Hz).

Start freq F: Frequency at which the inverter will start decreasing active power by the programmed Droop F percentage.

Stop freq F: Frequency at which the inverter will stop decreasing active power by the programmed Droop F percentage.

V(W) / V(Q)

V(W): Enables the use of Volt-Watt. The Sol-Ark regulates active power output to the grid as a function of voltage to support stabilization during over and under-voltage conditions.

V(Q): Enables the use of Volt-VAr. The Sol-Ark regulates reactive power output to the grid as a function of the voltage to support stabilization during over and under-voltage conditions.

V, P & Q: Percentage of nominal grid voltage (V) to which the Sol-Ark will reduce its active power (P) or reactive power (Q).

P(Q) / P(F)

P(Q): Enables the use of Watt-VAr to regulate reactive power output according to programable active power parameters.

P(F): Enables PF regulation according to programmable active power parameters.

4. Installation Tips

Off-Grid Installation Tips

1. Limit sensors (CTs) are not required for completely off-grid installations unless using **"Grid Peak Shaving"** for a generator connected to the **"GRID"** terminal.
2. Connecting generators to the **"GRID"** terminal is recommended to facilitate the integration "GEN" connected service panel. This setup enables the utilization of the **"Smart Load"** function.
3. There is no need for a transfer switch. Connect the "LOAD" output to the main panel.
4. **DO NOT** use "Grid Sell" mode when Off-Grid. **ONLY "Limited Power to Load"** (default).
5. When using a Generator in an Off-Grid situation, it is recommended to change the "Grid Mode" to **"General Standard"** and a **"Grid Reconnect Time"** to 30 seconds. See section 2.5 "Integrating a Generator" for detailed instructions.
6. The Auto Gen-Start activates when the battery voltage (V) or percentage (%) reaches the pre-set "Start V / %" value. Subsequently, the generator will sustain the charging process until the batteries reach approximately 95% capacity. ⓘ This is a non-modifiable upper limit unless Time of Use is enabled and programmed.
7. Remember to set the battery capacity and reasonable charge/discharge rates.

Grid-Tie PV Only, No Battery Configuration

1. Check the **"☑ No Battery"** setting: ⚙ → *Battery Setup* → *Batt* → *No Battery* . The inverter will fault momentarily.
2. ⓘ A complete **Power Cycle IS REQUIRED** when changing the battery mode to **"No Battery"** (see section 2.12 "Power cycle Sequence" for detailed instructions).
3. Enable **"☑ Grid Sell"**: ⚙ → *Limiter* → *Grid Sell*. Make sure to disable all other modes.
4. Tap the battery Icon to access the "Details Screen" and verify grid parameters and power import / export.

4.1 Battery Charge Controller

2-Stage Charging

The MPPT charge controller is 2 stage (CC/CV) type controlled by the BMS when in closed loop mode for optimized and safe charging. Fig 33 shows the charging stage sequence.

Constant Current (CC) Stage

In the Constant Current stage, the battery is not at a 100% state of charge and has not yet reached the Constant Voltage setpoint. The controller will deliver 100% of available solar power to recharge the battery.

Figure 33: Lead Acid Charge Controller Stages

Constant Voltage (CV) Stage

When the battery has reached the Constant Voltage setpoint, the Sol-Ark inverter will regulate charging current to maintain the batteries voltage at the CV setpoint, preventing overcharging. The battery is allowed to come to a full state of charge at the CV setpoint. Constant Voltage lasts until the BMS sets the Charge Current Limit to 0A.

4.2 Grid Compliance Settings

> ⚠️ **CAUTION:** Do not exceed continuous GEN port input/output of 180Aac.

> ⚠️ **CAUTION:** Settings below are illustrative, exact values should be confirmed with your respective utility.

HECO Grid Compliance Verification for Sol-Ark

In cases where HECO compliance requirements are mandated, it is essential to program the following grid parameters in accordance with the HECO specifications. Follow the next GUI screens, program the settings, and verify alignment with HECO compliance.

Grid Param

Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Grid Mode	1/3	Grid Reconnect Time	300s
SRD-UL-1741		✓ Fixed PF	☐ Fixed Q
Grid Frequency		-0.900	0%
☐ 50Hz		Q_Response_T	10S
✓ 60Hz		Grid Level	LN:277V/LL:480V(AC)
		Phase Type	0/240/120

CANCEL | OK

Grid Param

Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Reconnect		Normal connect	
Grid Vol High	504.0V	Grid Vol High	576.0V
Grid Vol Low	422.4V	Grid Vol Low	240.0V
Grid Hz High	60.1Hz	Grid Hz High	65.0Hz
Grid Hz Low	59.5Hz	Grid Hz Low	50.0Hz
Reconnect Ramp rate		Normal Ramp rate	
300s		300s	

CANCEL | OK

Grid Param

Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over Voltage U>(10 min. running mean) 239.2V

HV3	576.0V			HF3	65.00Hz		
HV2	576.0V	--	0.16s	HF2	65.00Hz	--	0.16s
HV1	528.0V	--	13.00s	HF1	63.00Hz	--	180.00s
LV1	422.4V	--	21.00s	LF1	57.00Hz	--	180.00s
LV2	240.0V	--	2.00s	LF2	50.00Hz	--	0.16s
LV3	240.0V			LF3	50.00Hz		

CANCEL | OK

Grid Param

Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over frequency		Droop F	42%PE/Hz	✓ F(W)
Start freq F	60.04Hz	Stop freq F	60.04Hz	
Start delay	0.50s	Stop delay	0.50s	

Under frequency		Droop F>	42%PE/Hz
Start freq F>	59.96Hz	Stop freq F>	59.96Hz
Start delay F>	0.50s	Stop delay F>	0.50s

CANCEL | OK

Grid Param

Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

✓ V(W)   ✓ V(Q)

Response_T	5S	L.in:5.0%	L.out:20.0%
V1:106.0%	P1:100%	V1:92.0%	Q1:44%
V2:110.0%	P2:0%	V2:98.0%	Q2:0%
V3:110.0%	P3:0%	V3:100.0%	Q3:0%
V4:110.0%	P4:0%	V4:106.0%	Q4:-44%

CANCEL | OK

Grid Param

Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

☐ P(Q)   ☐ P(F)

		L.in:5.0%	L.out:100.0%
P1:20%	Q1:-100%	P1:50.0%	F1:1.000
P2:50%	Q2:-100%	P2:100.0%	F2:0.800
P3:100%	Q3:-100%	P3:100.0%	F3:0.800
P4:100%	Q4:-100%	P4:100.0%	F4:0.800

CANCEL | OK

5. Parallel Inverters

5.1 Before Enabling Parallel Operations

A. Make sure all units in parallel have the same firmware version by verifying the **"COMM"** and **"MCU"** numbers on Settings screen, Fig 32. (highlighted in blue).

B. To ensure you have the latest firmware visit https://www.sol-ark.com/resources/software-updates/ to schedule an update or call/email Tech Support for assistance at support@sol-ark.com

C. ⚠ Parallel systems **REQUIRE** that each inverter has its own HV battery / battery bank.

D. If you do not have batteries on all inverters only parallel the units which have a battery bank. All other units should be set to **"Grid Sell"** under **Settings→Limiter**.

E. All GRID, GEN, and LOAD ports must be electrically parallelled with **ALL** parallel inverters.
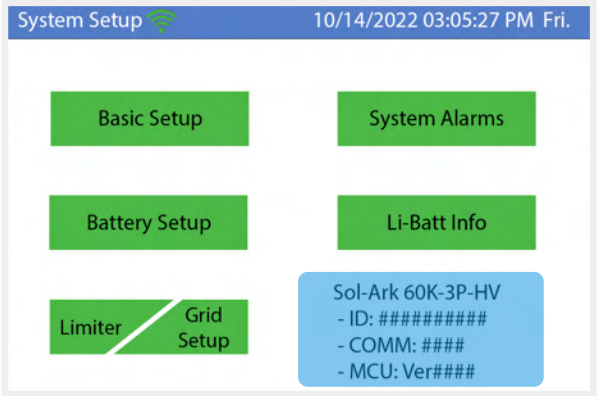
Figure 34: Software Version

DIP Switch Configuration for Parallel Systems

In parallel systems, set the "DIP Switches" shown in Fig 33, according to the table below.
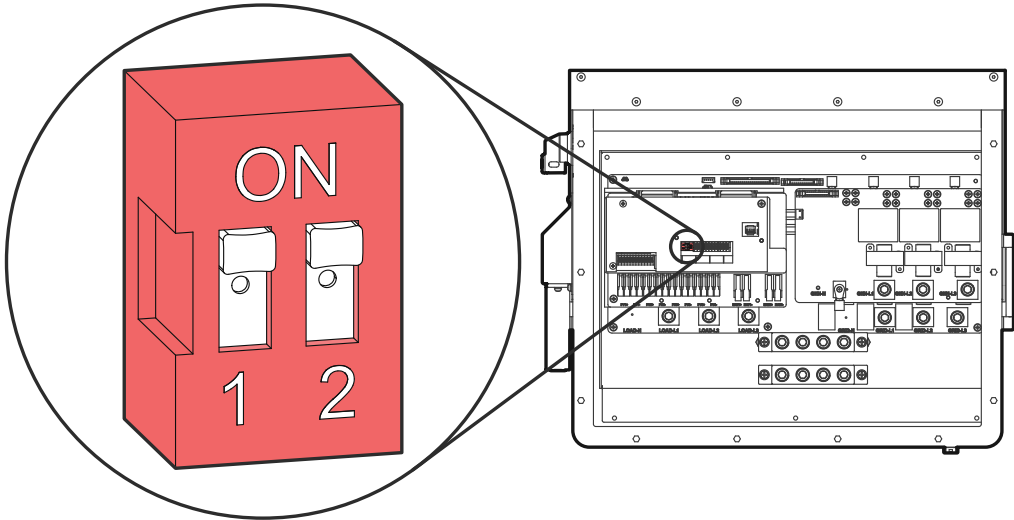
Figure 35 Inverter Communication Settings DIP Switch

Inv 1 (Master)	Inv 2	Inv 3	Inv 4	Inv 5	Inv 6	Inv 7	Inv 8	Inv 9	Inv 10
OFF									
ON	ON								
ON	ON	ON							
ON	ON	ON	ON						
ON	ON	ON	ON	ON					
ON	ON	ON	ON	ON	ON				
ON	ON	ON	ON	ON	ON	ON			
ON	ON	ON	ON	ON	ON	ON	ON		
ON	ON	ON	ON	ON	ON	ON	ON	ON	
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

Parallel System Output Specifications @ 277/480V 3-Phase

# of inverters in parallel	Continuous output power (kW)	Cont. Grid Pass Through Current (A)	Peak power 10 sec (kVA)
1	60	180	90
2	120	360	180
3	180	540	270
4	240	720	360
5	300	900	450
6	360	1080	540
7	420	1260	630
8	480	1440	720
9	540	1620	810
10	600	1800	900

5.2 Parallel Systems Programming

1. Program each inverter for parallel operation: ⚙ → *Basic Setup* → *Parallel* → *"☑ Parallel"*
2. Assign a **"Master"** inverter, **Modbus SN: 1**
3. Assign all other units as **"Slave" | Modbus SN: 02, 03, 04**…etc.
4. Connect communication cables between the inverters using the included RJ45 cable in daisy-chain configuration between ports: "Parallel_1" or "Parallel_2" from Master to Slave and then from Slave to Slave thereafter.
5. Perform a power cycle (see section 2.12 "Power Cycle Sequence" for power cycle sequence instructions).
6. Once the power cycle is completed, turn on the "Slave" units **FIRST**. Then turn ON the "Master" **LAST**.
7. Inverters will likely fault momentarily with F29 and F41 codes until all inverters are ON.

> ⊘ **NOTE:** When integrating a generator, it must be connected to all the systems in parallel. The inverter assigned as "Master" will control the two-wire start feature so the generator contacts should be connected to this inverter only.
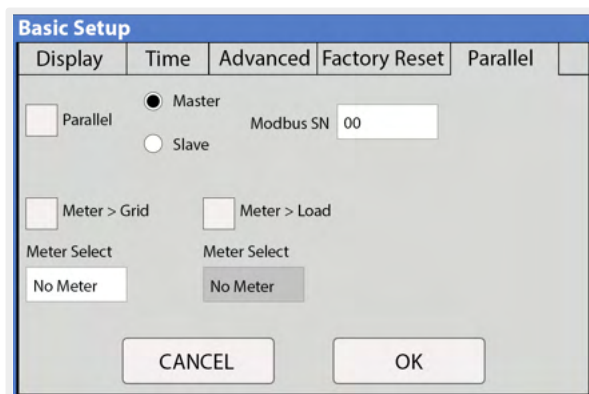
Figure 36 Parallel Setup Tab

> ⊘ **NOTE:** If an inverter goes into a fault state, all other units will stop and the system will automatically try to restart. If the system faults 5 consecutive times, it will stop completely and it will require a manual restart. See section 2.12 "Power cycle sequence" for detailed instructions.

5.3 Troubleshooting Phase Sequence

⚠ If the screen of the Sol-Ark inverter shows the error in Fig 35, ensure the phase sequence follows the **"Phase Type"** programmed under ⚙ → *Grid Setup* → *Grid Selection.* The message "Grid Phase Wrong" is displayed when the inverter does not detect the correct phase sequence. This situation can cause overloads faults in the system (F18, F26, F34) even with the "LOAD" disconnected and **WILL CAUSE DAMAGE** to the equipment if it is not corrected.

If the programmed phase type is **"0/240/120"**, ensure the wiring follows a positive sequence **A-B-C.** If the programmed phase type is **"0/120/240"** ensure the wiring follows a negative sequence **A-C-B**.
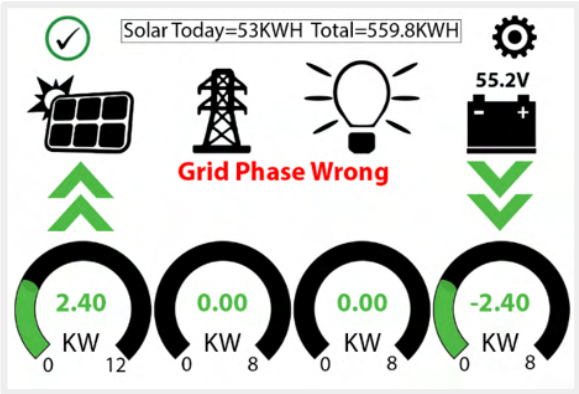
Figure 37 Grid Phase Wrong Error

Troubleshooting "Grid Phase Wrong"

- Measure L-L voltages from "GRID" to "LOAD" terminals.
- Voltage between lines should be 0Vac.
- Measuring a voltage different than 0Vac means the lines are not the same phase.

Be sure to check both "GRID" and "LOAD" terminal connections; both must be correct. If the error persists you will need to check your AC connection beyond the inverter and you will need to verify that the phases are correctly labeled from your meter.
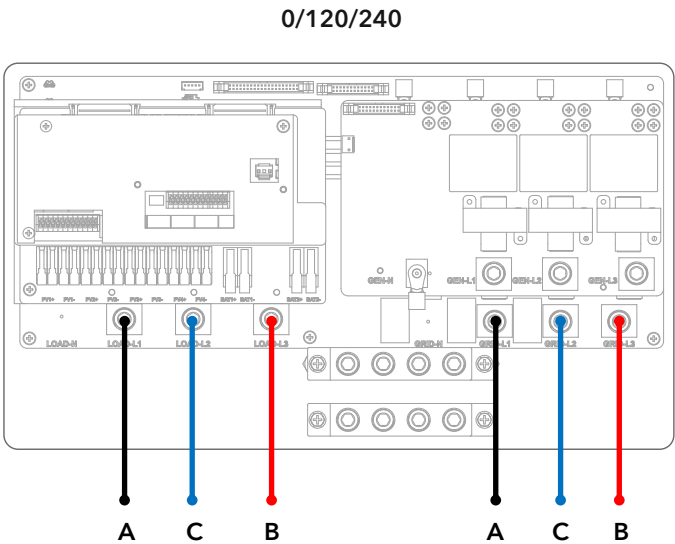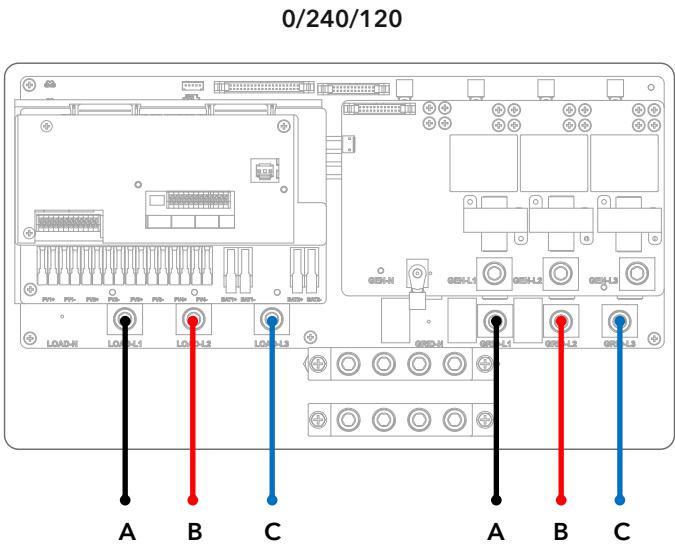
"MySolArk" is a powerful and comprehensive tool designed for remote system monitoring of Sol-Ark inverters and solar systems. This remote monitoring solution offers detailed insights into energy generation and power consumption, allowing users to track system performance with great precision. MySolArk displays all relevant electrical data on easy-to-understand energy generation graphs, providing a comprehensive overview of electrical usage.

Beyond its monitoring capabilities, MySolArk offers users the flexibility to remotely adjust inverter settings, allowing them to seamlessly configure their system from any location. This ensures that users can fine-tune parameters to optimize performance effortlessly. With MySolArk, users can confidently manage their solar systems and inverters to always ensure peak performance and efficiency. Visit www.mysolark.com to access the desktop version of MySolArk.

6.1 MySolArk Setup Instructions

Connection to MySolArk through Ethernet

A. Remove the plastic enclosure of the dongle by pressing the plastic latches with a flat screwdriver as shown in the figure below.
B. Insert the ethernet cable through the plastic enclosure and connect the cable to the RJ45 port.
C. Reassemble the dongle housing and plug the dongle into the Sol-Ark, securing it with screws. You will see solid red and green lights after a couple of minutes.
D. Follow "STEP 1" instructions on the following page in order to create a plant on MySolArk.
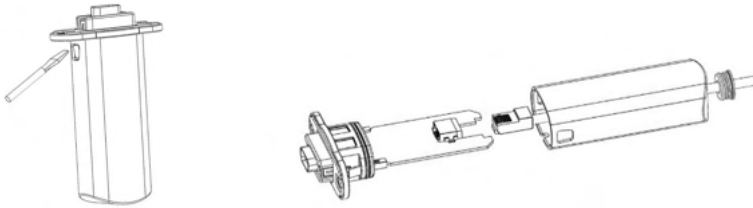
Connection to MySolArk through Wi-Fi

A. Plug the Wi-Fi dongle into the Sol-Ark DB-9 port.
B. Use two M4X10 screws to secure the dongle to the port.
C. Follow "STEP 1" through "SETP 3" in order to:
    a. Create a plant on the MySolArk monitoring platform.
    b. Connect the dongle to MySolArk through a Wi-Fi network.
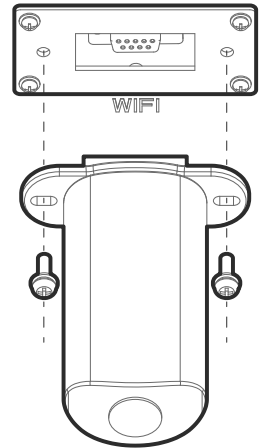
STEP 1: Create a "Plant" on MySolArk

A. Download and install the **"MySolArk"** app for android or apple smartphones. QR codes are provided below.

Google Play Store	*MySolArk*	*Apple App Store*

B.   Create a MySolArk account and login.

Sign Up   E-mail & verification Code   Login

1

2

3

4

5
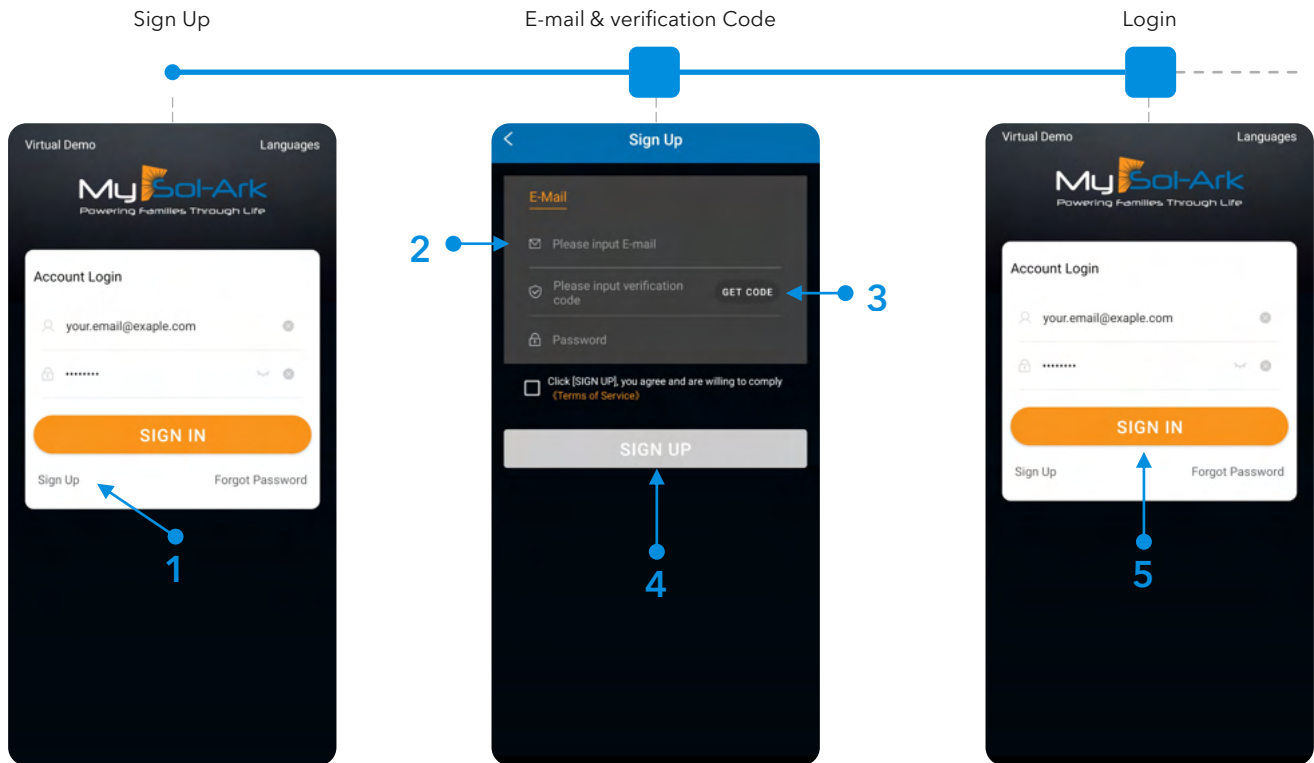
C.   Create Plant.

> **NOTE: FOR INSTALLERS** Installers are advised to first create the plant and configure the system before sharing it with the owner. Once the plant has been created and configured, the installer can share and grant manager permissions to the owner by navigating **to "My Plants" → "…" → "Share" → "Add Account"**. The homeowner must create their own MySolArk account first

Create plant   Scan QR code or type manually   Plant information   Configure network

6

7

8

9
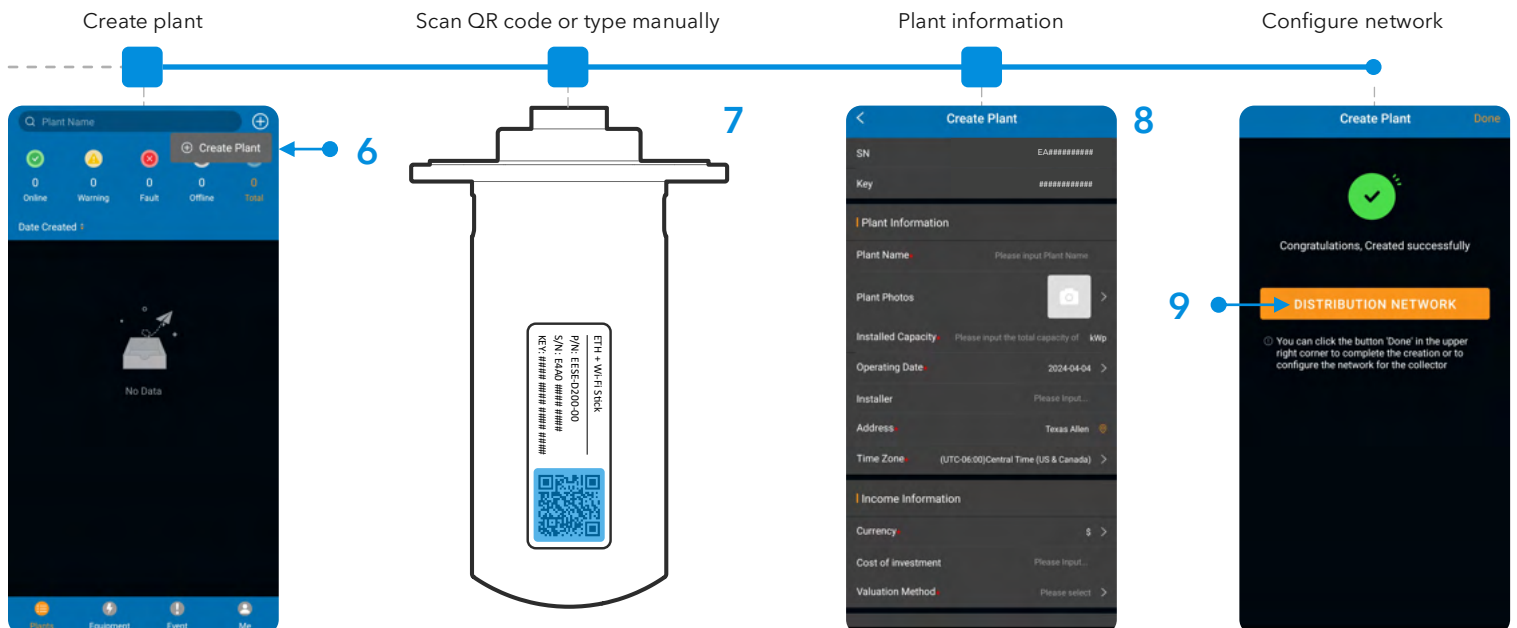
STEP 2: Configure Wi-Fi network though MySolArk

D.   Configure Wi-Fi network.

Turn inverter ON to power dongle   Accept conditions   Connection   Password

10

11

12

13

Connect   Confirm Wi-Fi network

14

15

16

17
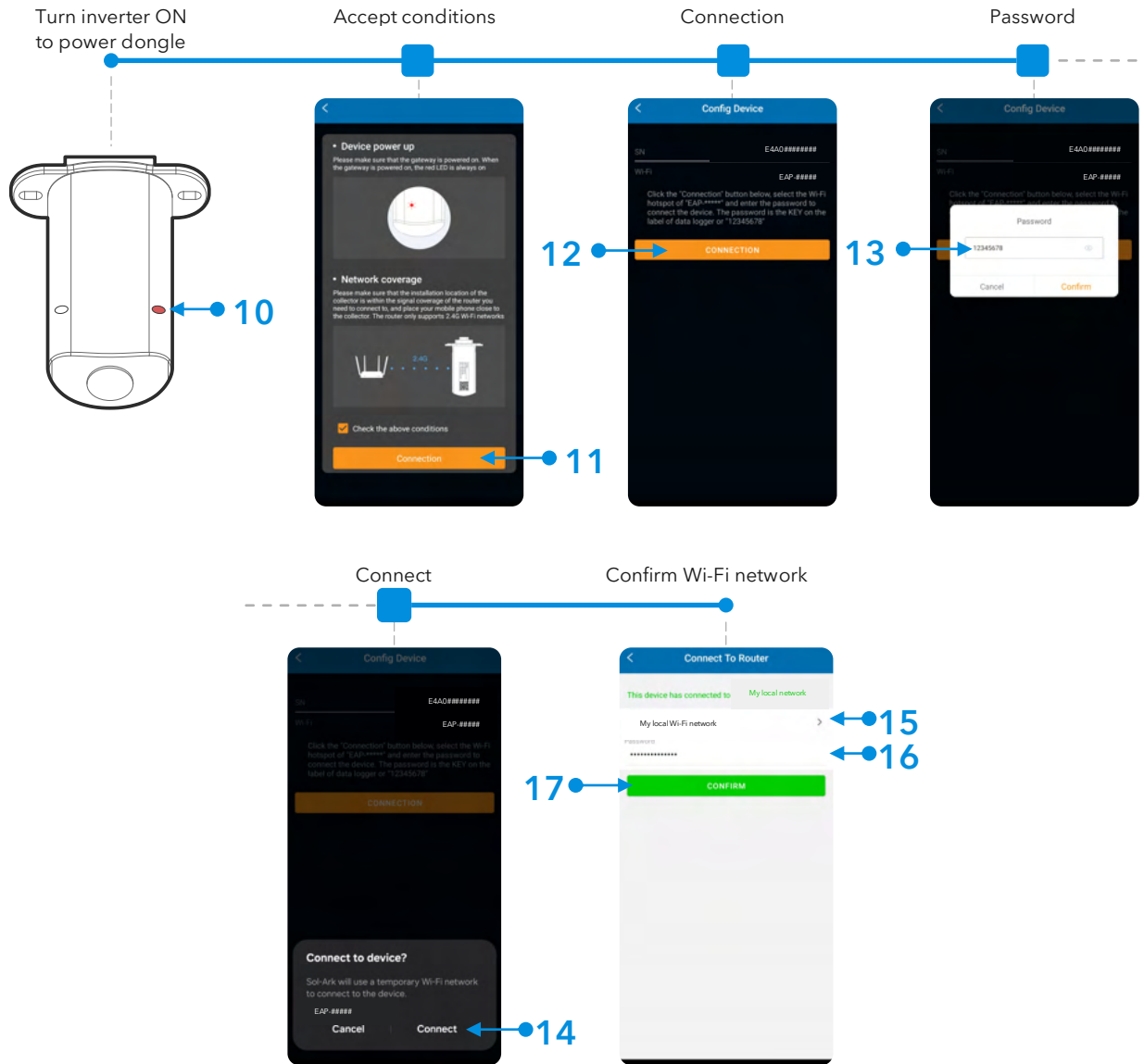
🛈 NOTE: The Wi-Fi configuration tool can be accessed at any other time by tapping "Me" at the bottom right corner, then "Tools" and finally "Wi-Fi configuration". STEP 3 shows an alternative method of connecting the Wi-Fi dongle to a local network through an IP address.

1

2
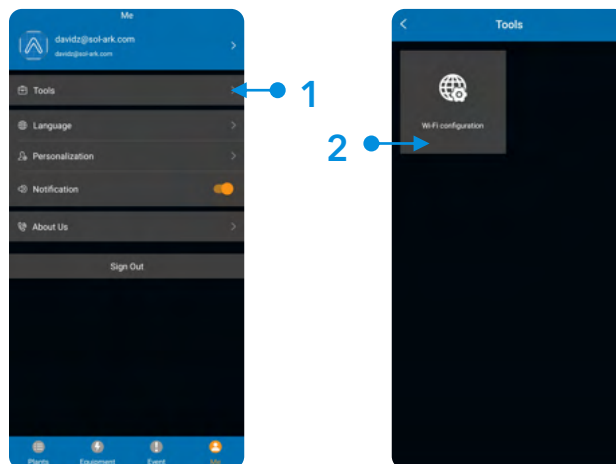
STEP 3 (alternate method): Configure Wi-Fi Network Through an IP Address

A. An alternative to the "Distribution Network" configuration at the end of step C or the use of the "Wi-Fi configuration" tool, is by configuring a Wi-Fi network through an IP address.

B. On a Smart Phone or Computer connect to the EAP-##### network. You can do this by going to: **Settings → Wi-Fi →** Select the **EAP-#####** network → **Password= 12345678**. The EAP-##### network contains the last 5 digits of the Dongle Serial Number. You can find this number on the label.

C. A message such as "Connected without internet" will appear once the device is connected to the EAP-#####.
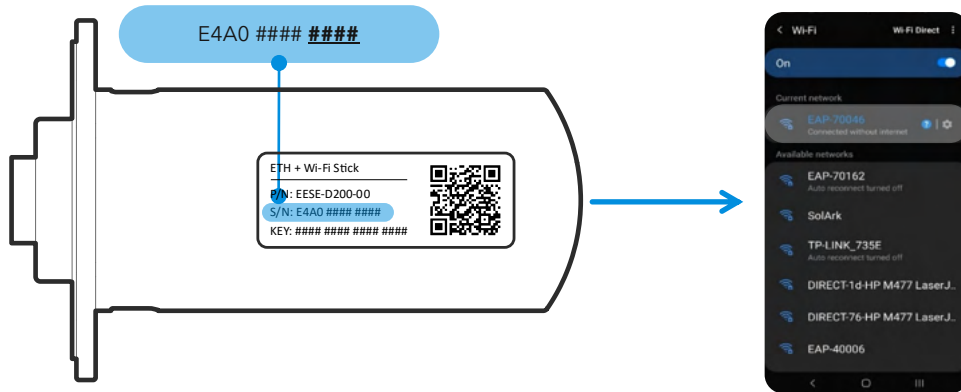
Figure 38: Locating the Dongle Network Name

> **NOTE:Network Password**
> *Network Password= 12345678*
> **NOTE:** *The Wi-Fi dongle does NOT provide internet access. It needs an external internet provider to connect to.*
> The dongle is compatible with Wi-Fi signal broadcasted at 2.4 GHz (it is not compatible with 5 GHz networks)

D. Once connected, open an internet browser on that same device such as Safari, Chrome, Firefox, Edge, or another browser.

E. On the address bar, type the following IP address: **10.10.10.1** as shown in the figure below. If you cannot access the configuration page, try again on a different device.

F. Scroll down to the "Wlan Connection" section and press the "Scan" button to scan for local Wi-Fi networks.

G. Nearby Wi-Fi networks will appear. Select the local network you would like to connect to, input your credentials, and tap "Connect".

H. Once connected, a "Connection Successful" message will appear. Press the "Save" button next to "Scan" to save settings.

I. Wait a moment (~5 minutes). The dongle will then connect to the Wi-Fi network and will now have access to MySolArk.

NOTE: **DO NOT** connect to the **EAP-#####** network as that is the Wi-Fi dongle itself. The device does not provide internet access.
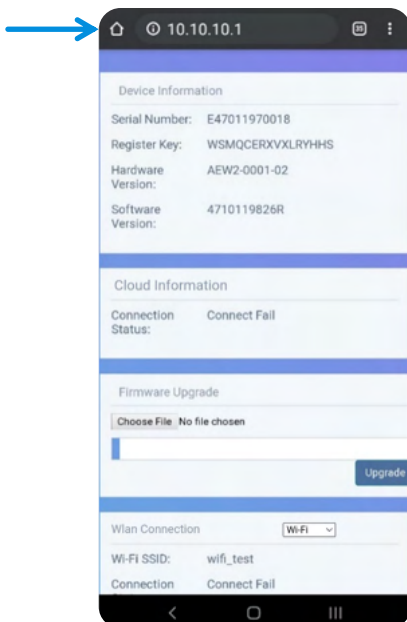
a) Internet browser IP address
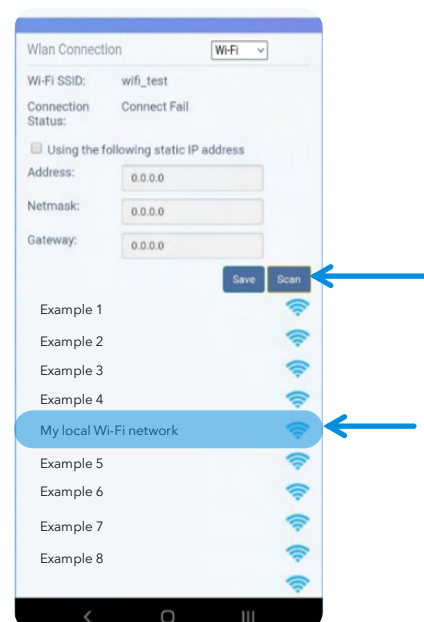
b) Wi-Fi network scan

If the connection is a success, you will see the following LED indicators.

- o **SOLID** 🔴 **:** Connected and powered by the Sol-Ark inverter.
- o **SOLID** 🟢 **:** Connected to the router and to MySolArk.
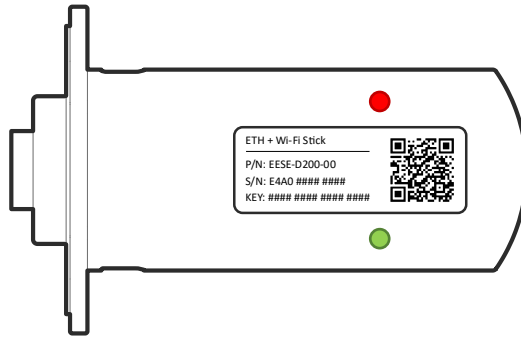
Figure 39: Wi-Fi dongle LED indicators

> **NOTE: Local Dongle Connection**
> Connecting through the local hotspot broadcast by the dongle is only meant to provide access to the Wi-Fi dongle for troubleshooting or firmware updates.
> Users must still create a MySolArk account and must create a Plant to access monitoring data.

6.2 LED Indicator and troubleshooting

When both the red and green LEDs on the Wi-Fi dongle are consistently illuminated, it signifies normal operation, while flashing indicates data transmission. If this isn't the case, reference the next table of LED indications for troubleshooting and corrective measures.

🔴 **RED LED**: Device communication indicator.

🟢 **GREEN LED**: MySolArk server communication indicator.

LED	State	Indication
🔴	Initial flashing, then constant illumination	Normal communication.
	Initial flashing but no further illumination	Communication failure. Check proper device connection.
	LED not illuminating	Power supply or device is abnormal. Contact technical support.
🟢	5 second illumination interval	Normal communication.
	1 flash every minute	Router not connected.
	3 flashes every minute	Connected to router but no internet access. Usually, a VPN or firewall issue. Ports 80 and 51100 must be enabled.
	4 flashes every minute	Device communication error. Contact support.
🔴🟢	2 synchronized flashes	Ethernet cable inserted
🔴🟢	3 synchronized flashes	Ethernet cable disconnected

7. Wiring Diagrams

Sol-Ark 60K-3P-480V
Standard Wiring Diagram

Diagram 01

Diagram 02

Sol-Ark 60K-3P-480V
Standard Wiring Diagram – **Off Grid**

78 kW
MAX.

BATTERY COMM #1

BATTERY COMM #2

HV DC

HV DC

MAIN SERVICE PANEL

N-G BOND (1)

SIZE OF DISCONNECT WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS
LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE
THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

(1)
(2)
(3)

SENSORS / COMMUNICATIONS

L1 - (AC)
NEGATIVE - (DC)

L2 - (AC)
POSITIVE - (DC)

L3

NEUTRAL

GROUND

SMART LOAD SUB-PANEL

200A BREAKER

GRID

GEN

LOAD

TWO-WIRE START

CT1
CT2
CT3

CT1
CT2
CT3

WIRE GAUGE GUIDE (COPPER)		
LABEL	CONDUCTOR	
A	MAX. 4 AWG	
B	MAX. 10 AWG	
C	MAX. 4 AWG	
D	24 - 23 AWG CAT6	

GENERATOR

50

Sol-Ark 60K-3P-480V
Standard Wiring Diagram - **AC Coupling**

Diagram 03

Legend:

- ▬ L1 - (AC) NEGATIVE - (DC)
- ▬ L2 - (AC) POSITIVE - (DC)
- ▬ L3
- ▬ NEUTRAL
- ▬ GROUND
- ▪▪ SENSORS / COMMUNICATIONS

Notes:

(1) SIZE OF DISCONNECT WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS

(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE

(3) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

⏚ (green ground symbol)
Ⓝ (orange neutral symbol)

WIRE GAUGE GUIDE (COPPER)

LABEL	CONDUCTOR
A	MAX. 4 AWG
B	MAX. 10 AWG
C	MAX. 4 AWG
D	24 - 23 AWG CAT6

Diagram labels:

- 78 kW MAX.
- BATTERY COMM #1
- BATTERY COMM #2
- HV DC +/-
- HV DC +/-
- MAIN SERVICE PANEL
- COMMON GROUND (3)
- N-G BOND (2)
- COMMON NEUTRAL (3)
- LOAD
- GRID
- GEN
- CT1 / CT2 / CT3
- 200A BREAKER
- 57.6 kW MAX.
- AC COUPLED INVERTERS
- JUNCTION BOX
- 200A FUSED DISCONNECT(1)
- UTILITY METER 277/480V
- GRID

Sol-Ark 60K-3P-480V
Standard Wiring Diagram – **Bypass Transfer Switch**

Diagram 04

78 kW MAX.

BATTERY COMM #1

BATTERY COMM #2

HV DC + –

HV DC + –

LOAD

GRID

GEN

N

200A DISCONNECT[1]

200A BREAKER

TWO-WIRE START

GENERATOR

N

CT1

CT2

CT3

BYPASS TRANSFER SWITCH[1]

LINE SIDE TAP

200A FUSED DISCONNECT[1]

UTILITY METER 277/480V

GRID

COMMON GROUND

N-G BOND[2]

COMMON NEUTRAL

N

Legend:

- L1 - (AC) / NEGATIVE - (DC)
- L2 - (AC) / POSITIVE - (DC)
- L3
- NEUTRAL
- GROUND
- SENSORS / COMMUNICATIONS

(1) SIZE OF DISCONNECT WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS

(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE

(3) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

MAIN SERVICE PANEL

WIRE GAUGE GUIDE (COPPER)

LABEL	CONDUCTOR
A	MAX. 4 AWG
B	MAX. 10 AWG
C	MAX. 4 AWG
D	24 - 23 AWG CAT6

Sol-Ark 60K-3P-480V
Standard Wiring Diagram – **Standby Generator**

Diagram 05

WIRE GAUGE GUIDE (COPPER)

LABEL	CONDUCTOR
A	MAX. 4 AWG
B	MAX. 10 AWG
C	MAX. 4 AWG
D	24 - 23 AWG CAT6

(1) SIZE OF DISCONNECT WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS

(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE

(3) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

L1 - (AC)
NEGATIVE - (DC)

L2 - (AC)
POSITIVE - (DC)

L3

NEUTRAL

GROUND

SENSORS / COMMUNICATIONS

78 kW MAX.

BATTERY COMM #1

BATTERY COMM #2

HV DC

HV DC

200A DISCONNECT[1]

MAIN SERVICE PANEL

COMMON GROUND

N-G BOND[2]

COMMON NEUTRAL

TRANSFER SWITCH

TWO-WIRE START

UTILITY METER 277/480V

GRID

GENERATOR

CT1
CT2
CT3

Diagram 06

Sol-Ark 60K-3P-480V
Standard Wiring Diagram – **Grid-Tide Only with Standby Generator**

L1 - (AC)
NEGATIVE - (DC)

L2 - (AC)
POSITIVE - (DC)

L3

NEUTRAL

GROUND

SENSORS / COMMUNICATIONS

78 kW
MAX.

LOAD-N
LOAD-L1
LOAD-L2
LOAD-L3

CT1
CT2
CT3

LOAD

B

N

GRID-N

GRID-L1
GRID-L2
GRID-L3

GEN-N
GEN-L1
GEN-L2
GEN-L3

GRID

GEN

(1) SIZE OF DISCONNECT WILL DEPEND ON REQUIRED PASSTHROUGH
CURRENT AND LOCAL CODE REQUIREMENTS

(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND
ON LOCAL CODE

(3) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND
CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

200A DISCONNECT[(1)]

C

D

COMMON
GROUND

(3)

N-G
BOND[(2)]

LINE SIDE TAP

CT3
CT2
CT1

TRANSFER
SWITCH

UTILITY METER
277/480V

MAIN SERVICE PANEL

COMMON
NEUTRAL

N
(3)

N

GENERATOR

TWO-WIRE START

GRID

WIRE GAUGE GUIDE (COPPER)		
LABEL	CONDUCTOR	
A	MAX. 4 AWG	
B	MAX. 10 AWG	
C	MAX. 4 AWG	
D	24 - 23 AWG CAT6	

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Sol-Ark 60K-3P-480V
Standard Wiring Diagram – **2 Parallel Inverters, Standard Wiring**
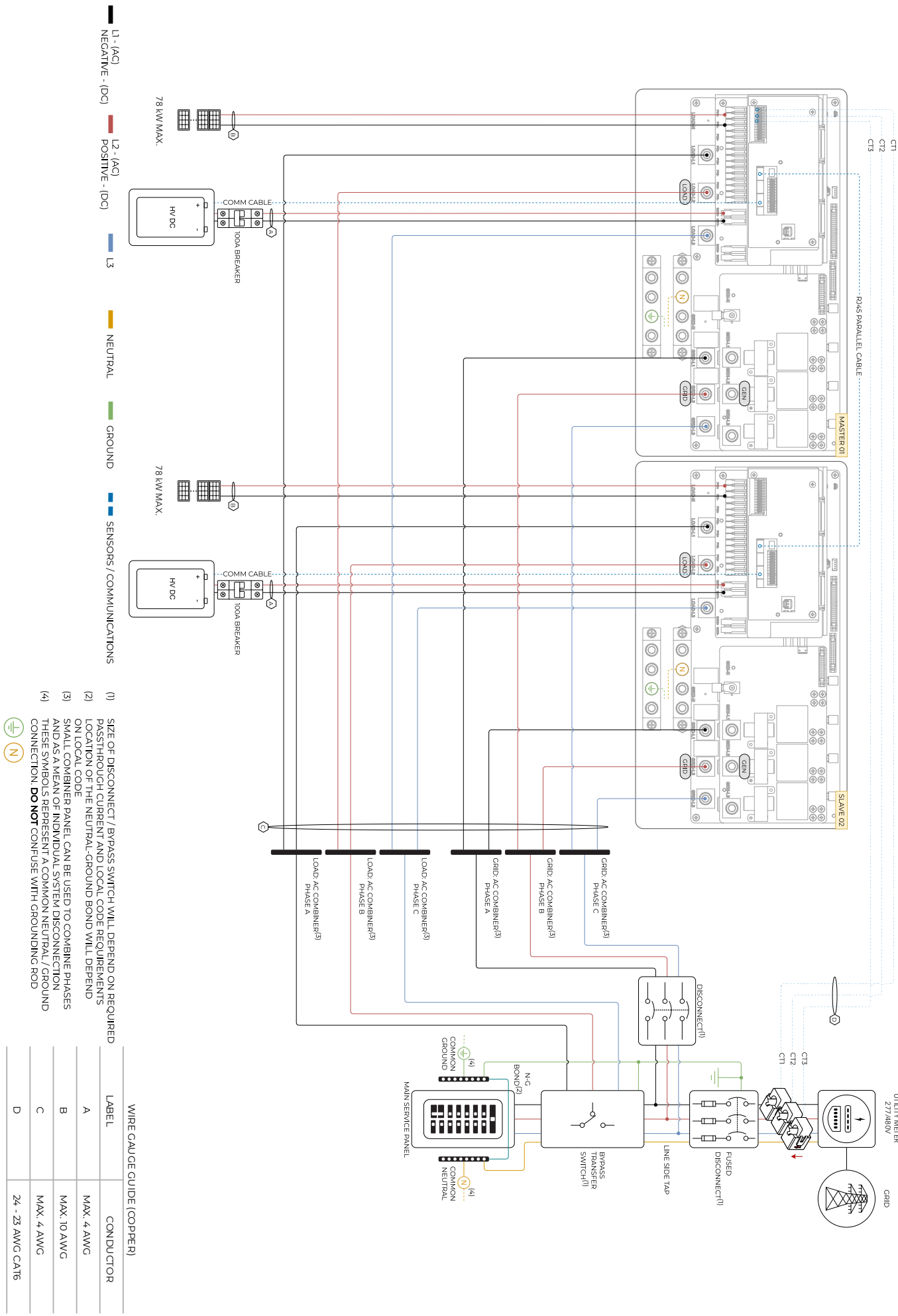
Diagram 07

Before powering up Parallel System installs, please see section 5 "Parallel Systems"

L1 - (AC)
NEGATIVE - (DC)

L2 - (AC)
POSITIVE - (DC)

L3

NEUTRAL

GROUND

SENSORS / COMMUNICATIONS

(1) SIZE OF DISCONNECT / BYPASS SWITCH WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS

(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE

(3) SMALL COMBINER PANEL CAN BE USED TO COMBINE PHASES AND AS A MEAN OF INDIVIDUAL SYSTEM DISCONNECTION

(4) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

WIRE GAUGE GUIDE (COPPER)

LABEL	CONDUCTOR
A	MAX. 4 AWG
B	MAX. 10 AWG
C	MAX. 4 AWG
D	24 - 23 AWG CAT6

Sol-Ark 60K-3P-480V
Standard Wiring Diagram - 3 Parallel Inverters, Standard Wiring

Legend:
- L1 - (AC) NEGATIVE - (DC)
- L2 - (AC) POSITIVE - (DC)
- L3
- NEUTRAL
- GROUND
- SENSORS / COMMUNICATIONS

Notes:
(1) SIZE OF DISCONNECT / BYPASS SWITCH WILL DEPEND ON REQUIRED PASSTHROUGH CURRENT AND LOCAL CODE REQUIREMENTS
(2) LOCATION OF THE NEUTRAL-GROUND BOND WILL DEPEND ON LOCAL CODE
(3) SMALL COMBINER PANEL CAN BE USED TO COMBINE PHASES AND AS A MEANS OF INDIVIDUAL SYSTEM DISCONNECTION
(4) THESE SYMBOLS REPRESENT A COMMON NEUTRAL / GROUND CONNECTION. **DO NOT** CONFUSE WITH GROUNDING ROD

Diagram labels: 78 kW MAX., HV DC, 100A BREAKER, COMM CABLE, RJ45 PARALLEL CABLE, MASTER 01, SLAVE 02, SLAVE 03, CT1 CT2 CT3, LOAD AC COMBINER[3] PHASE A, LOAD AC COMBINER[3] PHASE B, LOAD AC COMBINER[3] PHASE C, GRID AC COMBINER[3] PHASE A, GRID AC COMBINER[3] PHASE B, GRID AC COMBINER[3] PHASE C, DISCONNECT[1], BYPASS TRANSFER SWITCH[1], LINE SIDE TAP, FUSED DISCONNECT[1], UTILITY METER 277/480V, GRID, MAIN SERVICE PANEL, COMMON GROUND, COMMON NEUTRAL, N-G BOND[2], GRID, LOAD, GEN

WIRE GAUGE GUIDE (COPPER)	
LABEL	CONDUCTOR
A	MAX. 4 AWG
B	MAX. 10 AWG
C	MAX. 4 AWG
D	24 - 23 AWG CAT6

Before powering up Parallel System installs, please see section 5 "Parallel Systems"

Diagram 08

8. Common Troubleshooting Steps

LCD is not powering on
- Check all connections – at least one of the following power sources is required: PV/Grid/Battery
- Try pressing the power button, touchscreen, or navigation buttons

Panels are connected, but "DC" LED indicator is not on
- Startup voltage is 180V. Voltage must be above 180V and below 1,000V
- Wrong polarity. Check string polarity on MPPT
- PV DC disconnect switches are not on the ON position

Panels are not producing
- Check for proper wiring on all solar panel connections
- Turn PV disconnect switches "ON"
- Check that the PV input voltage is not greater than 1,000V
- If the system measures 0V even when PV DC disconnect is ON, polarity might be wrong. Check PV polarity

Panels are not producing much power
- PV Wire Strip Length: 5/8". Your batteries are charged and is limited to house loads; you can test Grid Sell to verify.

The system does not keep batteries charged
- Verify there is proper communication between the Sol-Ark and the battery. : ⚙ → *Li-Batt Info*
- Verify proper Charge and Voltage settings according to battery manufacturer and battery bank arrangement

Auto Gen-Start is not working
- Make sure the generator has a compatible Two-Wire
- Verify adequate connection to the Sol-Ark auto-start input pins

"Normal" LED indicator is not on
- Sol-Ark is in pass-through mode (only Grid connection and no other power source)
- Not fully energized (DC Solar panels AND Grid or batteries only)
- In alarm state.
- Sol-Ark is not working correctly (Call technical support +1 (972) 575-8875 Ext. 2)

The "Alarm" LED indicator is on
- Check the system alarms menu to identify the alarm

Grid HM value is negative when it should be positive (only applies in Limited to Home mode)
- Limiter Sensors are backwards, L1/L2/L3 sensors are swapped, or incorrectly wired. Execute the "Auto Learn Home Limit Sensors" command described in section 2.9 "Limit Sensors, Automatic CT Limit Sensors Configuration"

AC Overload Fault or Bus Unbalance Fault
- Check Transfer Switch/Subpanel wiring
- Check for large loads that consume more than the inverter rating

The system connects to grid and quickly disconnects
- Verify Neutral wire connection (0Vac referenced to GND)
- Check the programmed frequency, and verify the Sol-Ark measures 277V between L and N
- If the system is overloading: verify that proper phase sequence between "GRID" and "LOAD" terminals

DC Overload Fault
- Check PV voltage. Ensure no more than 1,000V
- Make sure you have not wired more than two (2) solar strings in parallel per MPPT

System is beeping
- Check the System Alarms menu to see which alarm has been triggered. Most alarms will self-reset
- Do a Power Cycle as described in section 2.12 "Power Cycle Sequence"

Battery cable sparks when connected
– If applicable, flip the built-in breakers of the battery bank before connecting or disconnecting batteries

Battery symbol on the home screen is red
– The battery is below the empty voltage
– Battery is over-voltage or under-voltage

Battery symbol on the home screen is yellow
– The battery is low, or the charge/discharge current is close to the programmed limit

Grid symbol on the home screen is yellow
– Grid parameters are out of specified operating range
– There is a grid outage and there is no voltage on the "GRID" terminal
– System is Off-Grid

System has restarted
– Occurs when the system has overloaded, battery voltage has surpassed 800V
– There was a Software update

Batteries were connected backwards
– ⚠ System may be damaged and warranty will be void.

Why is the LCD screen still on when the power button is off?
– Occurs when the power button is in the "OFF" position
– Occurs when the system is not fully energized: PV or Grid only

The Batt SOC% is not reaching 100%
– BMS communication is not working properly. Verify with battery integration and communication steps

Generator setup is reading 0Hz
– Generator is operating at a frequency outside the permissible range. Select " General Standard " grid mode. Widen the frequency range to 55Hz-65Hz as described in section 2.5 "Integrating a Generator"

Color Touchscreen is Frozen
– Press and hold the escape button [◄] for 7-10 seconds
– Perform a power cycle sequence in case the above suggestion does not work. See section 2.12 "Power Cycle Sequence"

Grid Phase Wrong
– ⚠ If the Sol-Ark screen shows a "Grid Phase Wrong" message, it means there is a phasing issue in the wiring. If left unchecked it may cause overload faults and **DAMAGE**. See section 5.3 "Troubleshooting Phase Sequence"

8.1 Sol-Ark Warning and Fault codes

FAULT	DESCRIPTION	COMMON CAUSE / REMEDY
W03	Grid_Phase_Warn	Grid phasing sequence error. Verify order of the three phases of the GRID input are in the order ABC, or change the phase setting value on the LCD.
W04	Meter_Offline_Warn	Communication failure with external revenue grade meter. Verify that the meter is powered on and the RJ45 connection is secure.
W31	BMS_LostComm_Warn	Contact Sol-Art Support.
W32	Parallel_Comm_Warn	The quality of parallel inverter communication is poor. Communication is possible but there may be packet loss. Verify if the DIP switch of each inverter is set to 'ON'. Check the length of the parallel communication cables, the length should not be more than 16ft (5m) between inverters.
F1	DC_Inversed_Failure	Verify that the PV input wires are not reverse polarity.\nIf you have parallel systems and turn one system off, you will get this notification.
F8	GFDI_Relay_Failure	Check for continuity on the inverter's neutral and ground. Ensure there is only ONE neutral-to-ground bond in the system. Current Leakage from inverter AC output to Ground, check Ground and neutral are connected at the main panel.
F13	Grid_Mode_change	It can happen when not using batteries or if Grid Input settings are changed. This is a notification, **NOT** a fault. If you switch from No Batt to Battery mode, power the system down completely to restart.
F15	AC_OverCurr_Failure	It is usually caused by Loads too large for the inverter. If Off-Grid, the battery discharge Amps are programmed too low. Overloads can result in F15, F18, F20, or F26.
F16	GFCI_Failure	Ground fault. Check PV+ or PV- wiring (which must be ungrounded). Exposed PV conductors + rain can also cause. Check that the neutral line and Ground are not double-bonded (common with portable generators).
F18	HW_Ac_OverCurr_Fault	Overloaded the Load Output (reduce loads) or overloaded a generator (reduce Gen Start A). Wiring Short on the AC Side can also cause this error. Overloads can result in F15, F18, F20, or F26.
F20	Tz_Dc_OverCurr_Fault	It is typically caused by DC current from the battery that is too large (ex: 4 Ton AC Unit) or too much PV current (3 or more strings in parallel). Overloads can result in F15, F18, F20, or F26.
F22	Tz_EmergStop_Fault	Initiated emergency stop by opening the B/B circuit. Reset e-stop button (close contacts) to clear fault.
F24	DC_Insulation_Fault	An exposed PV conductor combined with moisture is faulting (can cause F16, F24, and F26).
F25	DC_Feedback_Fault	No battery connection to the Inverter and Activate Battery is enabled. Disable Activate Battery in settings while no battery is connected.
F26	BusUnbalance_Fault	Too much load on one leg (L1 or L2) vs. the other leg or DC loads on the AC output when Off-Grid. Grounded PV+/- wire can cause F20, F23, or F26.
F29	Parallel_CANBus_Fault	Usually, a communication error for parallel systems. Check cables, and MODBUS addresses.
F31	AC_SlaveContactor_Fault	Soft Start of the large motor failed.
F34	AC_Overload_Fault	AC Overload or load shorted. Reduce heavy loads.
F35	AC_NoUtility_Fault	Grid connection lost.
F37	DCLLC_Soft_Over_Cur	Software DC overcurrent.
F39	DCLLC_Over_Current	Hardware DC overcurrent.
F40	Batt_Over_Current	Batteries exceeded their current discharge limit.
F41	Parallel_System_Stop_Fault	If one system faults in parallel, this normal fault will register on the other units as they disconnect from the grid.
F45	AC_UV_OverVolt_Fault	Grid under voltage causes a disconnect. This will self-reset when the grid stabilizes.
F46	Battery_Backup_Fault	Cannot communicate with other parallel systems. Check Master = 1, Slaves = 2-9 and that ethernet are connected.
F47	AC_OverFreq_Fault	Grid over Frequency (common in power outages) causes disconnect. Will self-reset when grid stabilizes.
F48	AC_UnderFreq_Fault	Grid under Frequency (common in power outages) causes a disconnect. Will self-reset when grid stabilizes.
F52	DC_VoltHigh_Fault	
F54	BAT2_VoltHigh_Fault	PV may be higher than 500V. Battery voltage should not be above 59V or 63V (depending on the model).
F55	BAT1_VoltHigh_Fault	
F56	BAT1_VoltLow_Fault	Batteries are overly discharged, the inverter is Off-Grid and exceeded the programmed batt discharge current by 20%, or Lithium BMS has shut down. If battery settings are incorrect, this can also happen.

F57	BAT2_VoltLow_Fault	
F58	BMS_Communication Fault	Sol-Ark is programmed to BMS Lithium Battery Mode but cannot communicate with a BMS. BMS_Err_Stop is enabled, but cannot communicate with a battery BMS
F59	BAT_OverCurr_Fault	Excessive load is drawing too much current from the battery The battery voltage is too low for the inverter to operate
F60	Gen_Volt_or_Fre_Fault	Generator Voltage or Frequency went outside the allowable range.
F61	Button_Manual_OFF	The parallel Slave system turned off without turning off the Master.
F63	Arc_Fault	It can be a poor PV connector / Connection. Or sometimes a false alarm due to powerful lighting storms.
F64	Heatsink_HighTemp_Fault	Check that the built-in fans are running; the ambient temperature may be too high. Ensure proper clearances.

9. Warranty Verification Checklist

MUST complete this form **AFTER** the system is operational. To register the product warranty, this verification checklist must be filled out and submitted to Sol-Ark. Visit https://www.sol-ark.com/register-your-sol-ark/ to register warranty.

SCAN ME

Installer/Company:_____ Date: (YYYY-MM-DD) _____

Inverter SN: _____ Gateway SN:_____

Mark ✓ for all that apply

Indicate the type of system (all that apply):

☐ Grid-Tied only | ☐ Grid-Tied with battery backup | ☐ Off-Grid | ☐ Parallel system: #_____ inverters

Indicate integrated components (all that apply):

☐ Utility grid	☐ DC solar panels	☐ AC coupled solar panels	☐ Generator
☐ "LOAD" installed service panel	☐ "GRID" installed service panel	☐ "GEN" installed service panel	☐ Batteries
☐ Lead-Acid batteries	☐ Wind Turbine		

⚠️ It is strongly recommended to send a **Wiring Diagram** of the installation to support@sol-ark.com for verification, otherwise Sol-Ark expressly disclaims any responsibility for performance issues arising from improper installation. Installers and users are solely responsible for following proper installation procedures outlined in provided documentation. Sol-Ark disclaims any liability for changes in the installation that might result in electrical malfunctions or any other issues related to the Sol-Ark product.

🛈 Circle **N/A (Not Applicable)** if the verification step is not relevant to the type of system or does not apply to the integrated components.

1.	A wiring diagram of the installation was sent to Sol-Ark for verification	☐ Y ☐ N	
2.	Setup for remote system monitoring through Wi-Fi / Ethernet is completed. Gateway SN:_____	☐ Y ☐ N	
3.	The inverter is installed in a location where the LCD screen is always protected from direct sunlight	☐	
4.	The inverter has the minimum specified vertical and lateral clearance for proper heat dissipation	☐	
5.	The maximum DC input voltage does not surpass 1,000V_{DC}	☐	
6.	The HV Battery bank voltage does not surpass 700V_{DC}	☐	
7.	All battery conductors are properly connected and secured to the (+, -) terminals of the inverter	☐	N/A
8.	Battery communication was successfully established	☐	N/A
9.	All Battery Setup parameters are programmed according to battery manufacturer specifications	☐	N/A
10.	The Sol-Ark properly generates power from the solar panels to charge the batteries	☐	N/A
11.	Grid / Generator is properly connected to the Sol-Ark and the phase sequence was verified	☐	N/A
12.	"☑ Grid / Gen Charge" settings are programmed correctly. Grid / Generator adequately charge the batteries	☐	N/A
13.	For Off-Grid systems: The mode "General Standard" is programmed and the *V* & *f* ranges are increased	☐	N/A
14.	When "☑ Grid Sell" is enabled, the Sol-Ark sells power back to the grid (negative HM measurements for L1, L2, L3)	☐	N/A
15.	CT sensors are correctly installed on Grid / Generator lines	☐	N/A
16.	Only when "☑ Limited Power to Home" is enabled, the Sol-Ark matches total load demand (Meter Zero)	☐	N/A
17.	Disconnect the grid: during Off-Grid operation, the inverter properly supplies "LOAD" demand for PV and batteries	☐	N/A
18.	Disconnect the grid AND solar panels: during Off-Grid operation, the inverter properly draws power from batteries	☐	N/A

In the event of system-related issues, forward a comprehensive description of the problem via email to support@sol-ark.com. Ensure the addition of images, including the "Details Screen" with all electrical measurements, as well as images of the inverter, wiring configuration, user area, batteries, and any other integral components constituting the power system.

_____   _____   _____
Installer name and signature   Customer name and signature   Date

Limited Warranty: Sol-Ark 60K-3P-480V

10-Year Limited Warranty for **Sol-Ark LLC** Products. Sol-Ark LLC provides a Ten-year (10) limited Warranty ("Warranty") against defects in materials and workmanship for its Sol-Ark LLC products ("Product"). The term of this warranty begins on the Product(s) initial purchase date, or the date of receipt of the Product(s) by the end user, whichever is later. This must be indicated on the invoice, bill of sale from your installer. This warranty applies to the original Sol-Ark LLC Product purchaser and is transferable only if the Product remains installed in the original use location. Please call Sol-Ark LLC to let us know if you are selling your Home and give us name and contact of the new owner.

Contact: (USA) +1-972-575-8875

For Info/Purchasing:

sales@sol-ark.com | ext.1

For Tech Support/Warranty Claim:

support@sol-ark.com | ext.2

The warranty does not apply to any Product or Product part that has been modified or damaged by the following:

- Installation or Removal (examples: wrong voltage batteries, connecting batteries backward, damage due to water/rain to electronics, preventable damage to solar wires.)
- Alteration or Disassembly.
- Normal Wear and Tear.
- Accident or Abuse.
- Unauthorized Firmware updates/software updates or alterations to the software code.
- Corrosion.
- Lightning: unless using EMP hardened system, then Sol-Ark LLC will repair the product.
- Repair or service provided by an unauthorized repair facility.
- Operation or installation contrary to manufacturer product instructions.
- Fire, Floods, or Acts of Nature.
- Shipping or Transportation.
- Incidental or consequential damage caused by other components of the power system.
- Any product whose serial number has been altered, defaced, or removed.
- Any other event not foreseeable by Sol-Ark LLC

Sol-Ark LLC liability for any defective Product, or any Product part, shall be limited to the repair or replacement of the Product, at Sol-Ark LLC discretion. Sol-Ark LLC does not warrant or guarantee workmanship performed by any person or firm installing its Products. This warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of Products or parts of Products. LCD screen and fans are covered for 5 years from date of purchase.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO SOL-ARK LLC PRODUCTS. SOL-ARK LLC EXPRESSLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES OF ITS PRODUCTS. SOL-ARK LLC ALSO EXPRESSLY LIMITS ITS LIABILITY IN THE EVENT OF A PRODUCT DEFECT TO REPAIR OR REPLACEMENT IN ACCORDANCE WITH THE TERMS OF THIS LIMITED WARRANTY AND EXCLUDES ALL LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR LOST REVENUES OR PROFITS, EVEN IF IT IS MADE AWARE OF SUCH POTENTIAL DAMAGES.

Return Policy - No returns will be accepted without prior authorization and must include the Return Material Authorization (RMA) number. Please call and talk to one of our engineers to obtain this number at 972-575-8875.

Return Material Authorization (RMA) A request for an RMA number requires all the following information: 1. Product model and serial number; 2. Proof-of-purchase in the form of a copy of the original Product purchase invoice or receipt confirming the Product model number and serial number; 3. Description of the problem; 4. Validation of problem by Technical Support, and 5. Shipping address for the repaired or replacement equipment. Upon receiving this information, the Sol-Ark LLC representative can issue an RMA number. Any product that is returned must be brand new, in excellent condition and packaged in the original manufacturer's carton with all corresponding hardware and documentation. Returns must be shipped with prepaid freight and insured via the carrier of your choice to arrive back at Sol-Ark LLC within 30 days of your initial delivery or pick-up. **Shipping charges will not be refunded.** All returns are subject to a 35% restocking fee. **No returns will be accepted beyond 30 days of original delivery.** The value and cost of replacing any items missing (parts, manuals, etc.) will be deducted from the refund. If you have any questions regarding our return policy, please email us at sales@sol-ark.com or call us at the number above during regular (Monday to Friday) business hours.

Sol-Ark 60K-3P-480V Install Operational Verification Checklist Questionnaire must be filled out, signed, and dated to secure full warranty coverage.

10. Inverter UI Screens

The user interface (UI) screens shown in the following pages represent the current version of the Sol-Ark inverter firmware as of the date of this manual's publication. Sol-Ark continually improves its products through firmware updates, which may alter the appearance, layout, or functionality of the UI screens.

1. Main Menu

2. Basic Setup

3. Batt Setup

Batt Setup
Batt | Charge | Discharge | Smart Load

- Batt capacity: 200Ah
- ☑ BMS Lithium Batt: 01
- Max A charge: 50A
- ☐ Use Batt V charged
- Max A discharge: 50A
- ☐ No Battery
- ☐ Parallel bat1&bat2

CANCEL   OK

Batt Setup
Batt | Charge | Discharge | Smart Load

- StartV: 490.0V | 490.0V | Float V: 552.0V
- Start%: 30% | 30%
- A: 40A | 40A
- ☐ Gen Charge | ☑ Grid Charge
- ☐ Gen Force

CANCEL   OK

Batt Setup
Batt | Charge | Discharge | Smart Load

- Shutdown: 170.0V | 10%
- Low Batt: 165.0V | 20%
- Restart: 180.0V | 50%
- Batt Empty V: 160.0V
- ☐ BMS_Err_Stop

CANCEL   OK

Batt Setup
Batt | Charge | Discharge | Smart Load

- ☐ Use gen input as load output
- ☐ For AC Coupled Input to Gen
- ☐ On Grid always on
- High Frz: 65.00Hz
- Smart Load OFF Batt: 510.0V | 95%
- Smart Load ON Batt: 540.0V | 100%

CANCEL   OK

4. Limiter

Grid Param
Limiter | Other

- ☐ Grid Sell: 60000
- ☐ Limited Power to Home
- ☑ Limited Power to Load
- ☐ Time of Use [Setup]

Time	Power(W)	Batt	Charge	Sell
01:00AM	2000	50%		
05:00AM	2000	50%		
09:00AM	2000	100%		
01:00PM	2000	100%		
05:00PM	2000	50%		
09:00PM	2000	50%		

CANCEL   OK

Grid Param
Limiter | Other

Time of Use Setup
- ☑ Mon. | ☑ Tues. | ☑ Wed. | ☑ Thur.
- ☑ Fri. | ☑ Sat. | ☑ Sun.
- ☑ Season1 | ☑ Season2 | ☑ Season3

CANCEL   OK

09:00PM 2000 49.0V
CANCEL   OK

Grid Param
Limiter | Other

- ☑ GEN connect to Grid Input
- Zero Export Power: 10W
- ☑ Batt First | ☐ Load First

CANCEL   OK

5. Grid Setup

Grid Param
Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

- Grid Mode: 1/3 — UL1741 & IEEE1547
- Grid Frequency: ☐ 50Hz | ☐ 60Hz
- Grid Reconnect Time: 300s
- ☐ Fixed PF | ☐ Fixed Q
- 1.000 | 0%
- Q_Response_T: 5.0S
- Grid Level: LN:277V/LL:480V(AC)
- Phase Type: 0/240/120

CANCEL   OK

Grid Param
Grid Selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Reconnect
- Grid Vol High: 504.0V
- Grid Vol Low: 422.4V
- Grid Hz High: 60.1Hz
- Grid Hz Low: 59.5Hz
- Reconnect Ramp rate: 300s

Normal connect
- Grid Vol High: 576.0V
- Grid Vol Low: 240.0V
- Grid Hz High: 65.0Hz
- Grid Hz Low: 50.0Hz
- Normal Ramp rate: 300s

CANCEL   OK

Grid Param
Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over Voltage U>(10 min. running mean): 239.2V

HV3	576.0V		HF3	65.00Hz	
HV2	576.0V	-- 0.16s	HF2	65.00Hz	-- 0.16s
HV1	528.0V	-- 13.00s	HF1	63.00Hz	-- 180.00s
LV1	422.4V	-- 21.00s	LF1	57.00Hz	-- 180.00s
LV2	240.0V	-- 2.00s	LF2	50.00Hz	-- 0.16s
LV3	240.0V		LF3	50.00Hz	

CANCEL   OK

Grid Param
Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

Over frequency
- Start freq F: 60.04Hz
- Start delay: 0.50s
- Droop F: 42%PE/Hz
- Stop freq F: 60.04Hz
- Stop delay: 0.50s
- ☑ F(W)

Under frequency
- Start freq F>: 59.96Hz
- Start delay F>: 0.50s
- Droop F>: 42%PE/Hz
- Stop freq F>: 59.96Hz
- Stop delay F>: 0.50s

CANCEL   OK

Grid Param
Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

☑ V(W) | ☑ V(Q)

- Response_T: 5S
- Lin:5.0% | Lout:20.0%

V(W)		V(Q)	
V1:106.0%	P1:100%	V1:92.0%	Q1:44%
V2:110.0%	P2:0%	V2:98.0%	Q2:0%
V3:110.0%	P3:0%	V3:100.0%	Q3:0%
V4:110.0%	P4:0%	V4:106.0%	Q4:-44%

CANCEL   OK

Grid Param
Grid selection | Connect | IP | F(W) | V(W)/V(Q) | P(Q)/P(F)

☐ P(Q) | ☐ P(F)

Lin:5.0% | Lout:100.0%

P(Q)		P(F)	
P1:20%	Q1:-100%	P1:50.0%	F1:1.000
P2:50%	Q2:-100%	P2:100.0%	F2:0.800
P3:100%	Q3:-100%	P3:100.0%	F3:0.800
P4:100%	Q4:-100%	P4:100.0%	F4:0.800

CANCEL   OK