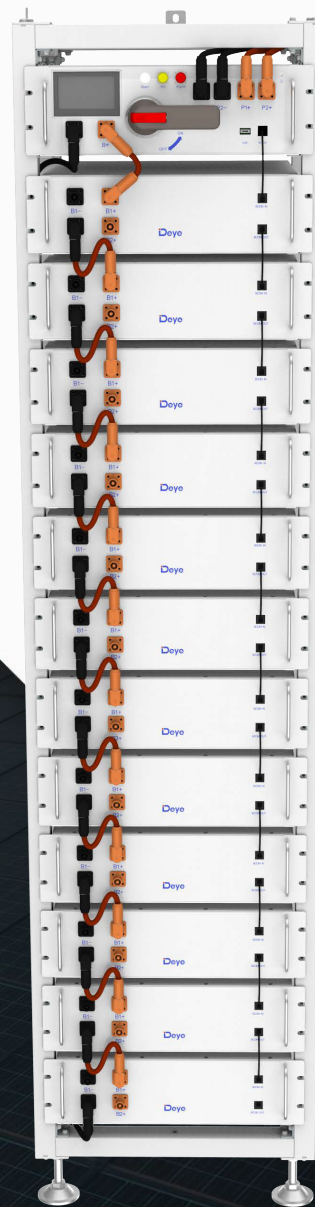


COMMERCIAL

# BOS-GH60-S60-C16-US

480V

INSTALLATION GUIDE | USER MANUAL



# BOS-G H 60-S60-C16-US OUTDOOR

## UL Model “60K-3P-480V” INSTALL GUIDE & OWNER’S MANUAL

|   |           |
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## Disclaimer

UNLESS SPECIFICALLY AGREED TO IN WRITING, SOL-ARK:

(a) MAKES NO WARRANTY REGARDING THE ACCURACY, SUFFICIENCY, OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION.

(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, CONSEQUENTIAL, OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.




Sol-Ark cannot be responsible for system failure, damages, or injury resulting from improper installation of their products.

The information included in this manual is subject to change without notice.

### Contact Us:

|         |  |
|---------|--|
| PHONE   | 1-972-575-8875 ext 2   |
| EMAIL   | <a href="mailto:SUPPORT@SOL-ARK.COM">SUPPORT@SOL-ARK.COM</a> |
| WEBSITE | <a href="http://WWW.SOL-ARK.COM">WWW.SOL-ARK.COM</a>         |

## Warning Symbols

|   |  |
|---|--|
|  | This symbol indicates information that, if ignored, could result in minor injury or damage to the equipment.           |
|  | This symbol indicates information that, if ignored, could result in serious injury, damage to the equipment, or death. |
|  | This symbol indicates information that is important but not hazard-related.  |

## Warnings



Read this entire document before installing or using the Sol-Ark 60K-3P-480V Inverter. Failure to follow the instructions or warnings in this document can result in electrical shock, serious injury, or death. Damage to the Sol-Ark Inverter is also possible, potentially rendering it inoperable.



High Life Risk Due to Fire or Electrocution – **ONLY** qualified personnel should install the Sol-Ark 60K-3P-480V Inverter.



The system must have Ground connections and Neutral connections. Ground **MUST** be bonded to Neutral **ONLY ONCE** in the circuit.



Solar PV+/PV- are **UNGROUND**. Note, you may ground **PV Racking/Mounts**, but doing so directly to the Sol-Ark will likely result in damage in the case of a direct lightning strike to the PV array. We recommend grounding the frames outside of the Sol-Ark circuit.



**DO NOT** connect the grid to the Load Output Terminal Block.



**DO NOT** reverse the polarity of batteries. Damage **WILL** occur.



**DO NOT** exceed 800Voc on any MPPT on the Sol-Ark.



**DO NOT** turn off the battery breaker if any amount of current flows in or out of the battery.



**DO NOT** use impact drivers to tighten any fasteners on the Sol-Ark.



**MUST** use Strain Reliefs **ON ALL** wires entering/exiting the Sol-Ark 60K-3P-480V user area.



**MUST** use conduit (or double insulated wire) for AC Wires entering/exiting Sol-Ark 60K-3P-480V user area.



**ALL** terminals/breakers, including battery, MPPT, and AC Terminal Block inputs, should only have one conductor connecting to them.

# Upon Receiving Shipment

## Inspect Shipment

- A. Compare the package condition to the condition of the package in the photo we sent you before it left our facility.

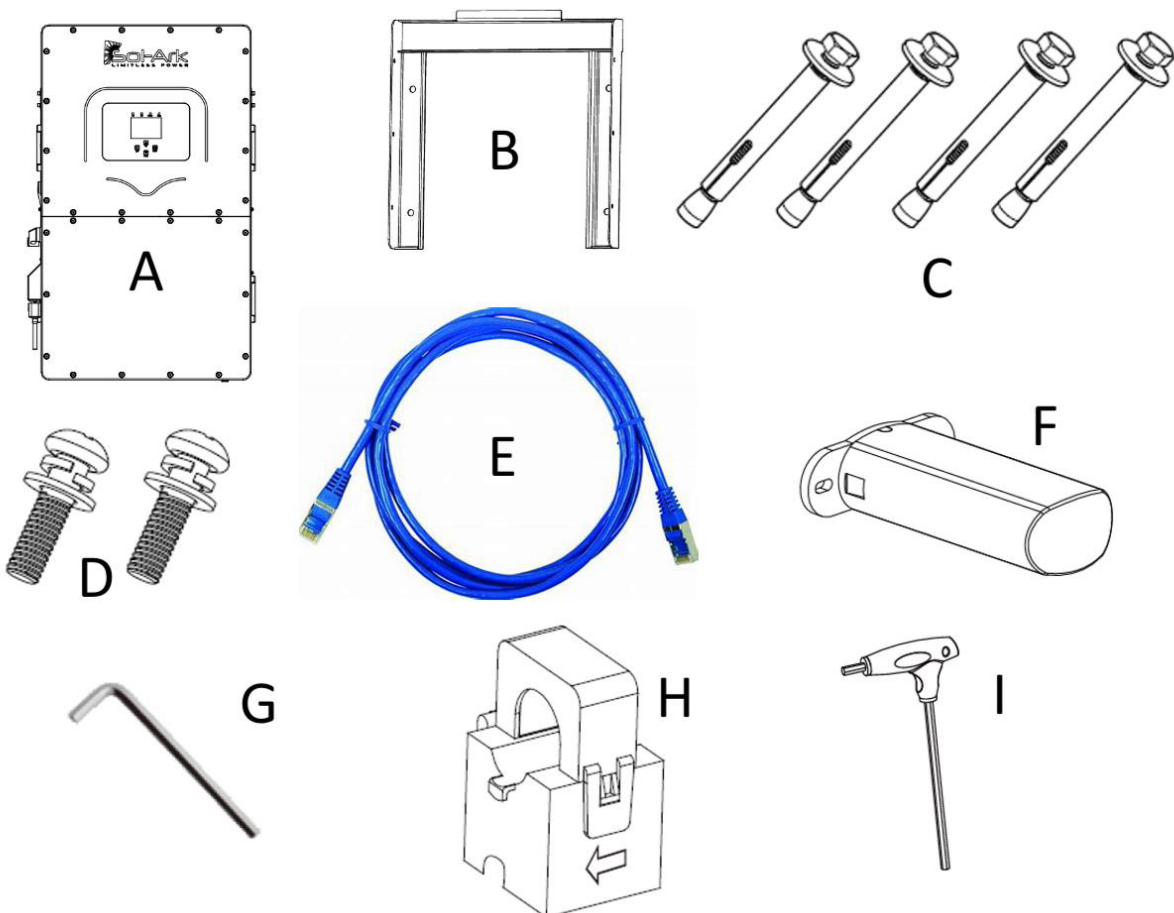


**You must note any damage due to shipping with delivery driver before accepting the package otherwise the shipping company will deny any claim.**

- B. If damaged, contact us immediately at 972-575-8875 Ext. 3

**Component Guide**— the following items are included in the package:

- A. Sol-Ark 60K-3P-480V inverter (x 1)
- B. Mounting Bracket: For wall mounting the Sol-Ark 60K-3P-480V (x 1)
- C. Bolts M12x60 (x 4)
- D. Bolts M4x12 (x 9)
- E. CAT 5 cable for parallel communications (x 2)
- F. WIFI Dongle: For software updates and remote monitoring (use M4x10 screws to hold in)
- G. L-Type Hex Key (3mm): For opening and closing the user wiring area (x 1)
- H. Included Limiter Sensors: 1 3/8" CT sensors (x 3)  
[Larger sensors available: email [sales@sol-ark.com](mailto:sales@sol-ark.com)]
- I. T-Type Hex Key: For tightening the AC connections (x 1)



# 60K-3P-480V-N

## Spec Sheet



### Battery (optional) Output Power 60,000W

|   |                         |
|---|-------------------------|
| Type   Number of Inputs                     | Li-Ion   2 Inputs       |
| Nominal DC Input                            | >600V                   |
| Capacity                                    | 50 — 9,900Ah            |
| Voltage Range                               | 160V ~ 800V             |
| Continuous Battery Charging Output          | 100A (50A Per Input)    |
| Charging Curve                              | 3-Stage w/ Equalization |
| Grid to Batt Charging Efficiency            | 96.0%                   |
| Battery Fuse                                | Integrated              |
| Current Shunt for Accurate % SOC            | Integrated              |
| External Gen Start Based on Voltage or %SOC | Integrated              |
| Required communications to Lithium Battery  | CanBus & RS485          |

### General

|  |                          |
|--|--------------------------|
| Dimensions (H x W x D)                       | 35.2" x 20.8" x 11.6"    |
| Weight                                       | 172 lbs                  |
| Enclosure                                    | IP65 / NEMA 3R           |
| Ambient Temperature                          | -40~60°C, >45°C Derating |
| Installation Style                           | Wall-Mounted             |
| Wi-Fi & LAN Communication                    | Included                 |
| Standard Warranty (verified by HALT Testing) | 10 years                 |

### Protections & Certifications

|  |                          |
|--|--------------------------|
| Electronics Certified Safety by SGS Labs to NEC & UL Specs - NEC 690.4B & NEC 705.4/6                        | pending                  |
| Grid Sell Back — UL1741-2010/2018, IEE-E1547a-2003/2014, FCC 15 Class B, UL1741SB, CA Rule 21, HECO Rule 14H | pending                  |
| 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 |

\* Software Limitation: 144.4A x 277V x 3

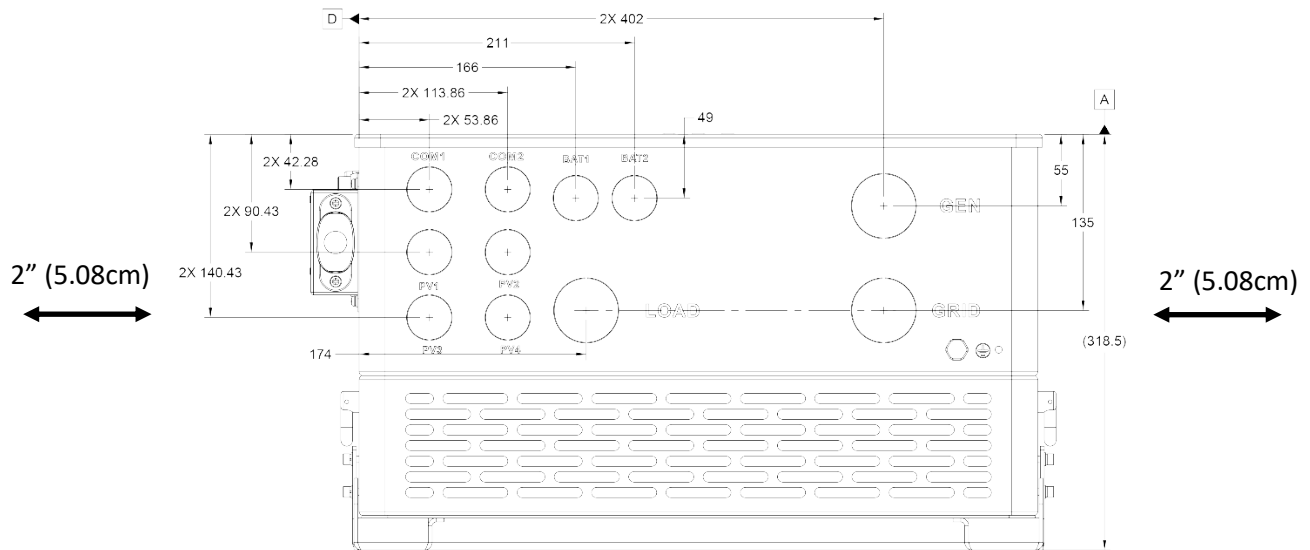
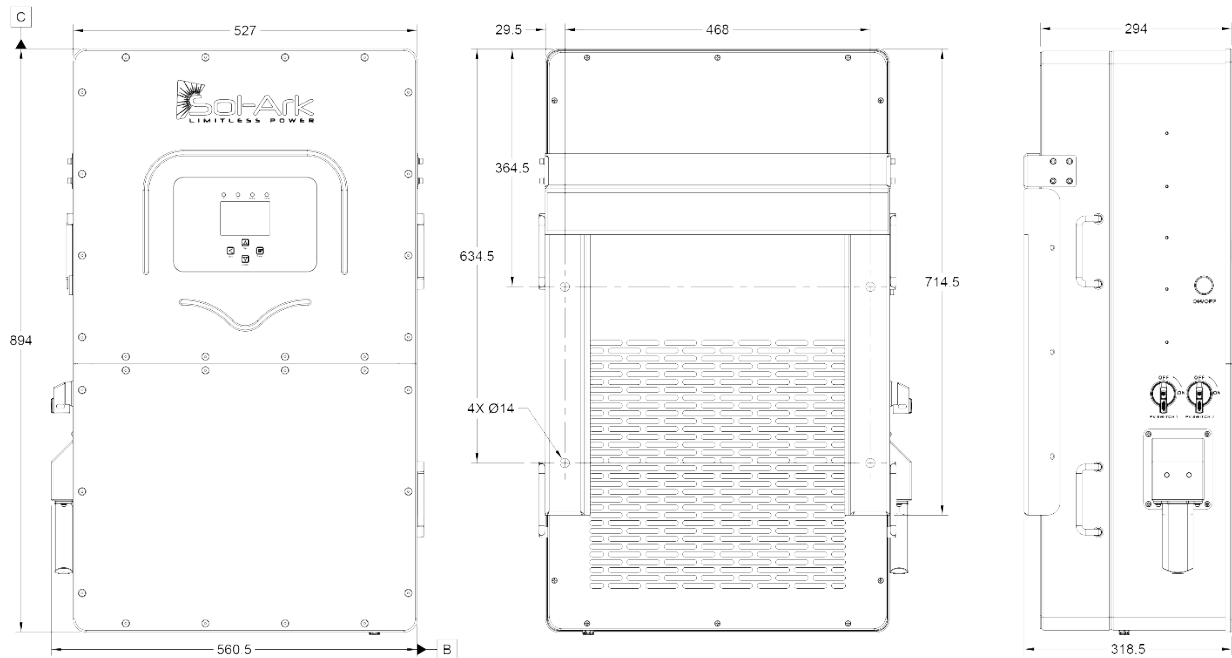
\*\*Pending. Please contact Sol-Ark before designing or installing a parallel system.

### Solar Input Power 78,000W

|   |  |
|---|--|
| Max Allowed PV Power                            | 78,000W                                |
| Max PV Power Delivered to Battery & AC Outputs  | 60,000W                                |
| Max DC Voltage (Voc)                            | 1,000V @ 36A                           |
| MPPT Voltage Range                              | 200-850V                               |
| Starting Voltage                                | 180V                                   |
| Number of MPPT                                  | 4                                      |
| Max Solar Strings Per MPPT                      | 2                                      |
| Max DC Current per MPPT (Self Limiting)         | 36A                                    |
| Max AC Coupled Input (Micro / String Inverters) | 120VA w/ no PV *<br>60kVA w/ 78kW PVdc |

### AC Output Power 60kW On-Grid & Off-Grid

|  |                                      |
|--|--------------------------------------|
| Connections                                | 277V / 480V Three Phase              |
| Continuous AC Power with PV                | 60,000W   72.2A (480V)               |
| Continuous AC Power from Batteries         | 60,000W   72.2A (480V)               |
| Surge AC Power   7 sec                     | 120,000VA   144.4A x 277V x 3        |
| Parallel Stacking                          | Yes - Up to 12**                     |
| Frequency                                  | 60/50Hz                              |
| Continuous AC Power with Grid or Generator | 132,000W   160A L-N (277V)           |
| CEC Efficiency                             | 96.5% (Peak 97.5%)                   |
| Idle Consumption Typical—No Load           | TBD                                  |
| Sell Back Power Modes                      | Limited to Household/Fully Grid-Tied |
| Design (DC to AC)                          | Transformerless DC                   |
| Response Time (Grid-Tied to Off-Grid)      | 5ms                                  |
| Power Factor                               | +/- 0.8 - 1.0                        |



**2" Minimum Horizontal Clearance | 6" Minimum Vertical Clearance**

#### Temperature Derating

DC: 90C-100C Shutdown @ 100C

AC: 75C-82C Shutdown @ 82C

### Sol-Ark 30K-3P-208V Torque Values Application Note

|                          |                              |                              |
|--------------------------|------------------------------|------------------------------|
| Load Terminal Block      | 62 IN Lbs                    | 7 NM                         |
| Grid Terminal Block      | 62 IN Lbs                    | 7 NM                         |
| Gen Terminal Block       | 62 IN Lbs                    | 7 NM                         |
| Neutral / Ground Busbars | 62 IN Lbs                    | 7 NM                         |
| Cover Screws             | 15.5 IN Lbs                  | 1.75 NM                      |
| Battery Connection       | Hand-Pressed Actuation Lever | Hand-Pressed Actuation Lever |



**Do Not Use Impact Drivers to Tighten Any Fasteners on the Sol-Ark.**

February 24<sup>th</sup>, 2023



# Wire Gauge Guide (copper)

PV input: **12** - 10 AWG

AC Inputs/Outputs: 1/0 AWG - **4/0 AWG**

All Sensors: 20 – 24 AWG

CT Sensors: 10' Wire Included

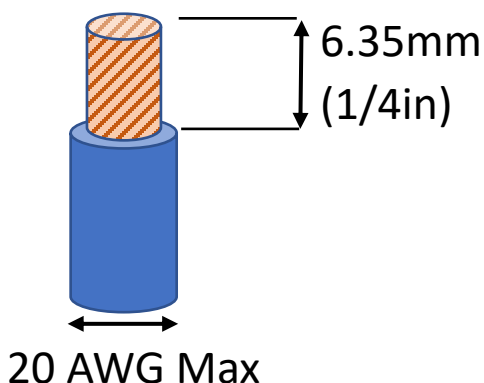
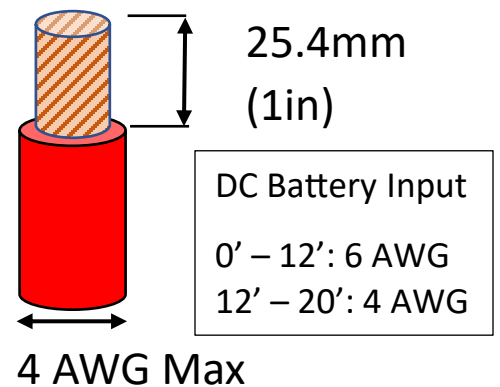
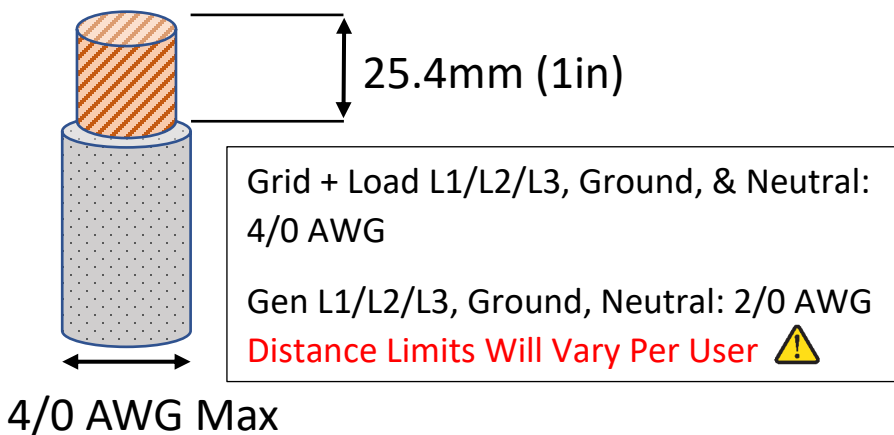
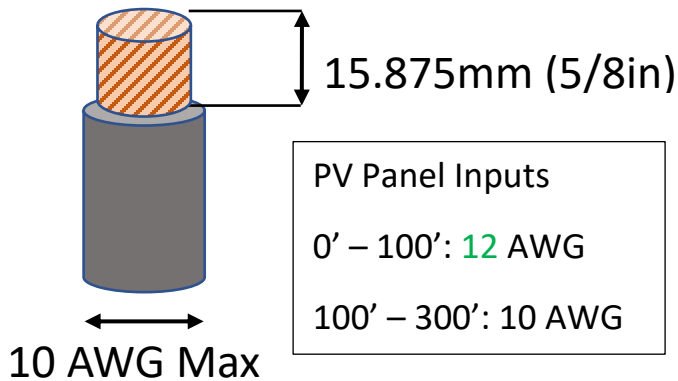
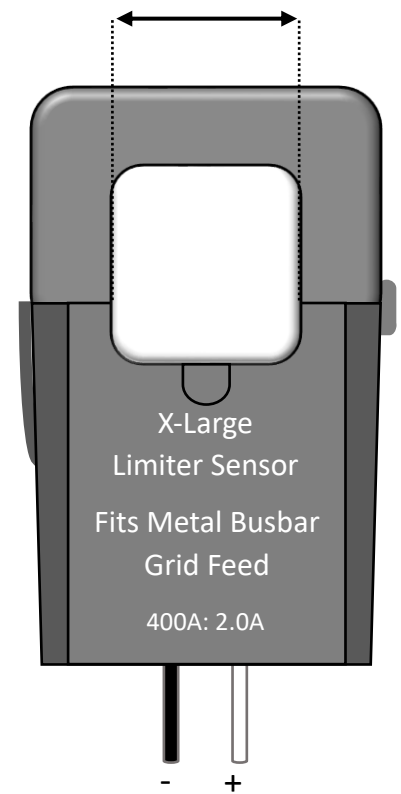
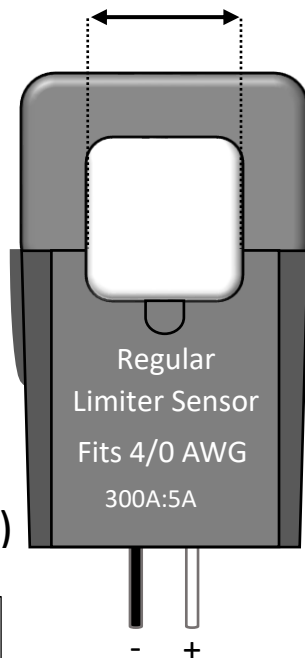
Batt Temp Sensor: 6' Wire Included

RJ45 Cable: 7' Included (Extendable up to 20')

Battery input: **6 – 4 AWG (Hand-Tightened  
Actuation Lever)**

34.93mm (1 3/8in)

50.8mm (2in)



All Sensor Inputs

0' – 100': 24 AWG (Do NOT use > 20AWG)

100' – 400': 23 AWG CAT 6

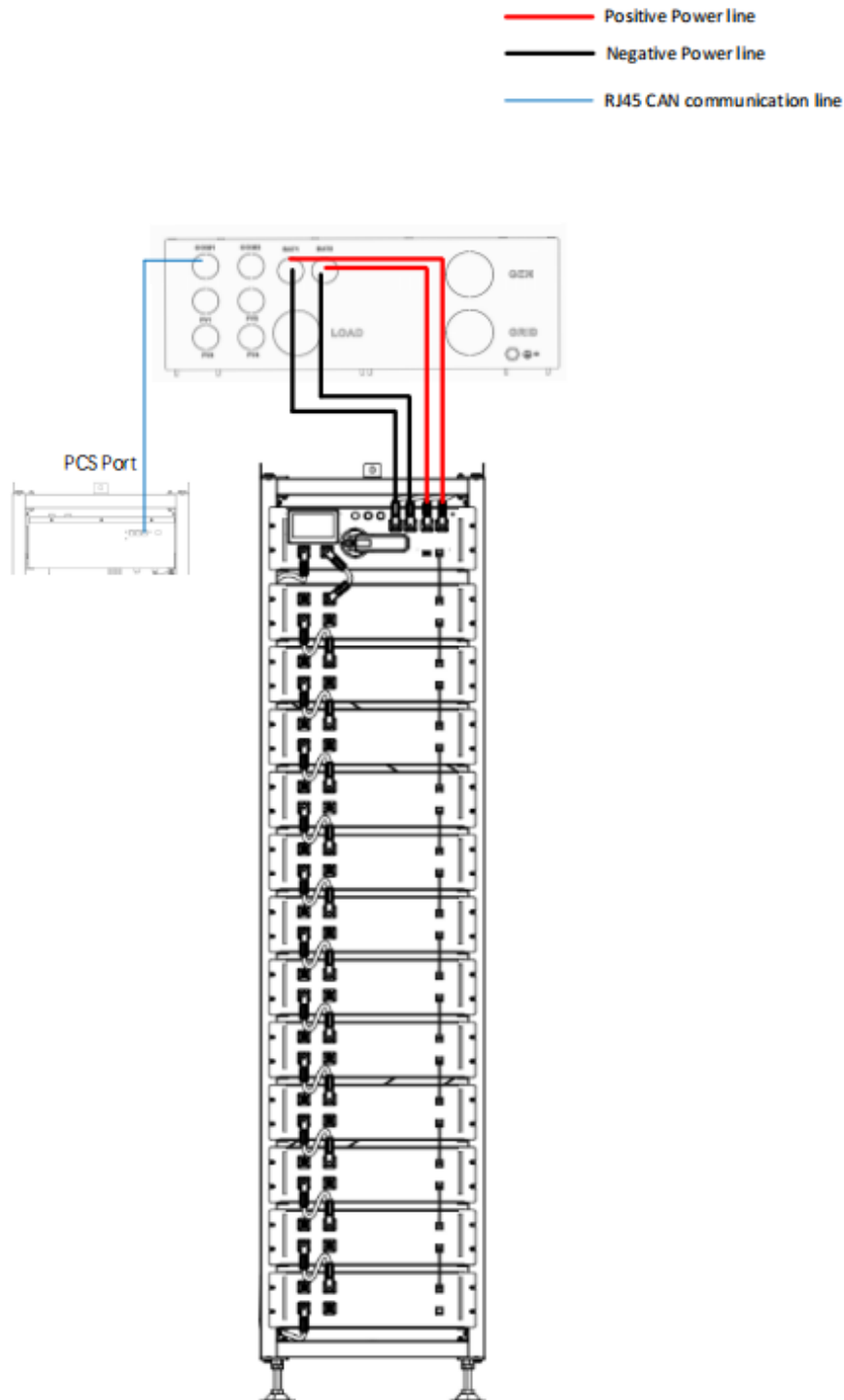
CT Wires Can Be Extended -Extensions for Limiter  
Sensors must be twisted pair (See pg. 41)

(Shielded CAT6 Recommended)

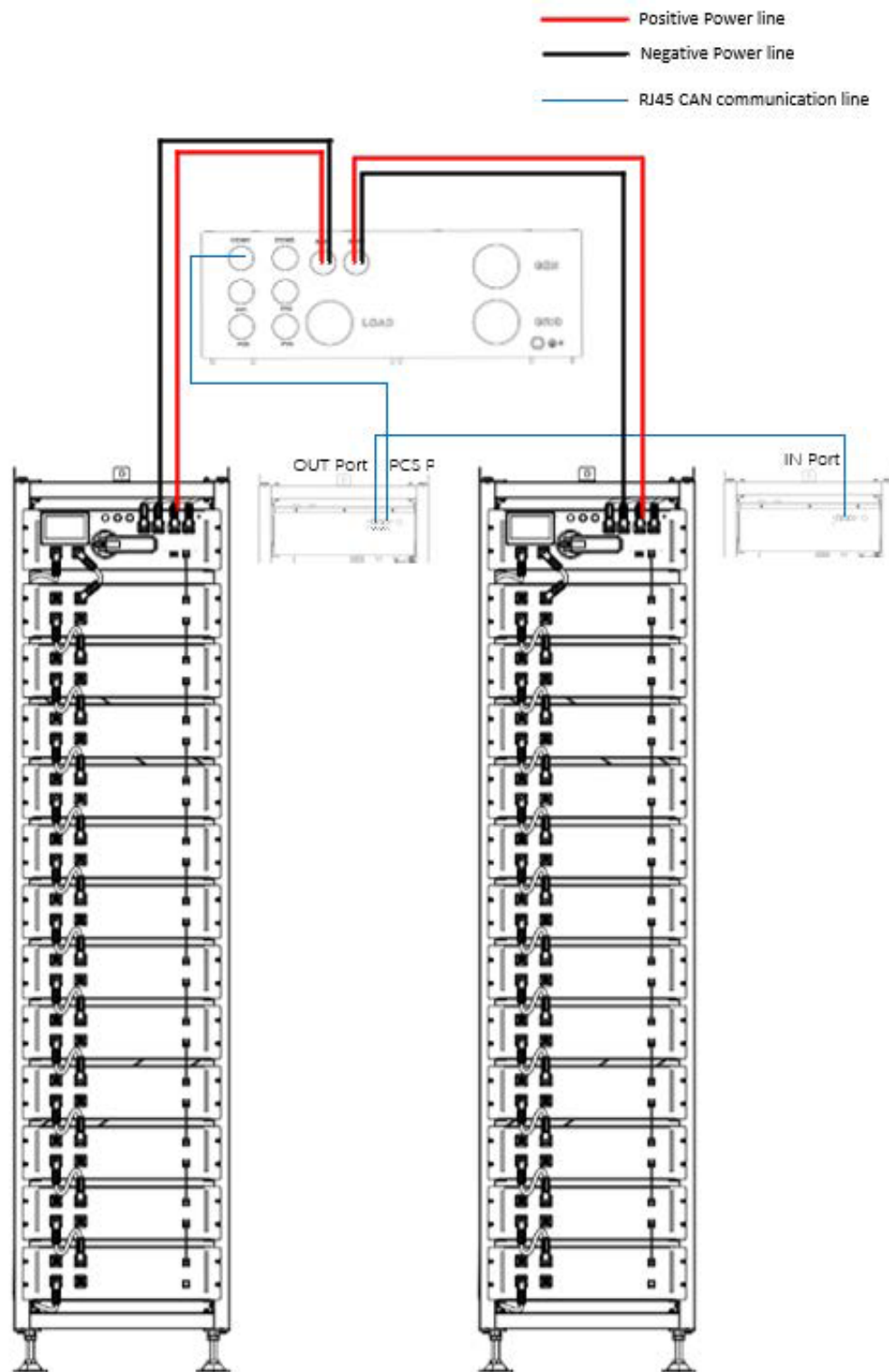
## Battery cluster connected to inverter

### Single battery cluster connected to inverter

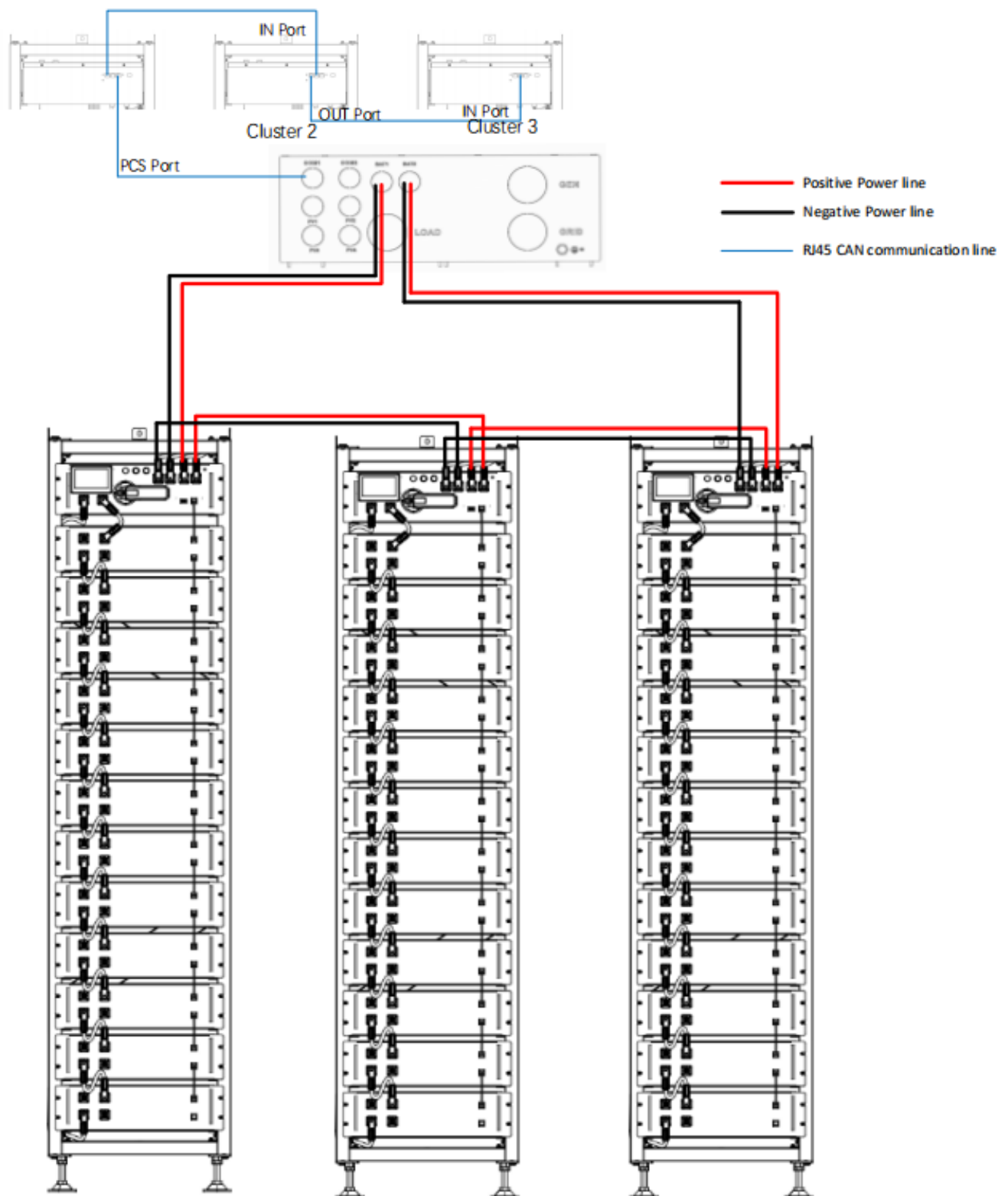
**Notice:** The length of the communication line between the inverter and the battery should not exceed 30m



Two battery clusters connected to the inverter



## Three battery clusters connected to the inverter



**Notice:** The length of the communication cable between the inverter and the inverter should not exceed 30m.

## Wiring Diagrams



These Wiring Diagrams are examples of common-use cases for Sol-Ark inverters.

Sol-Ark does not provide custom diagrams; however, you may contact [support@sol-ark.com](mailto:support@sol-ark.com) for any questions about existing Wiring Diagrams.

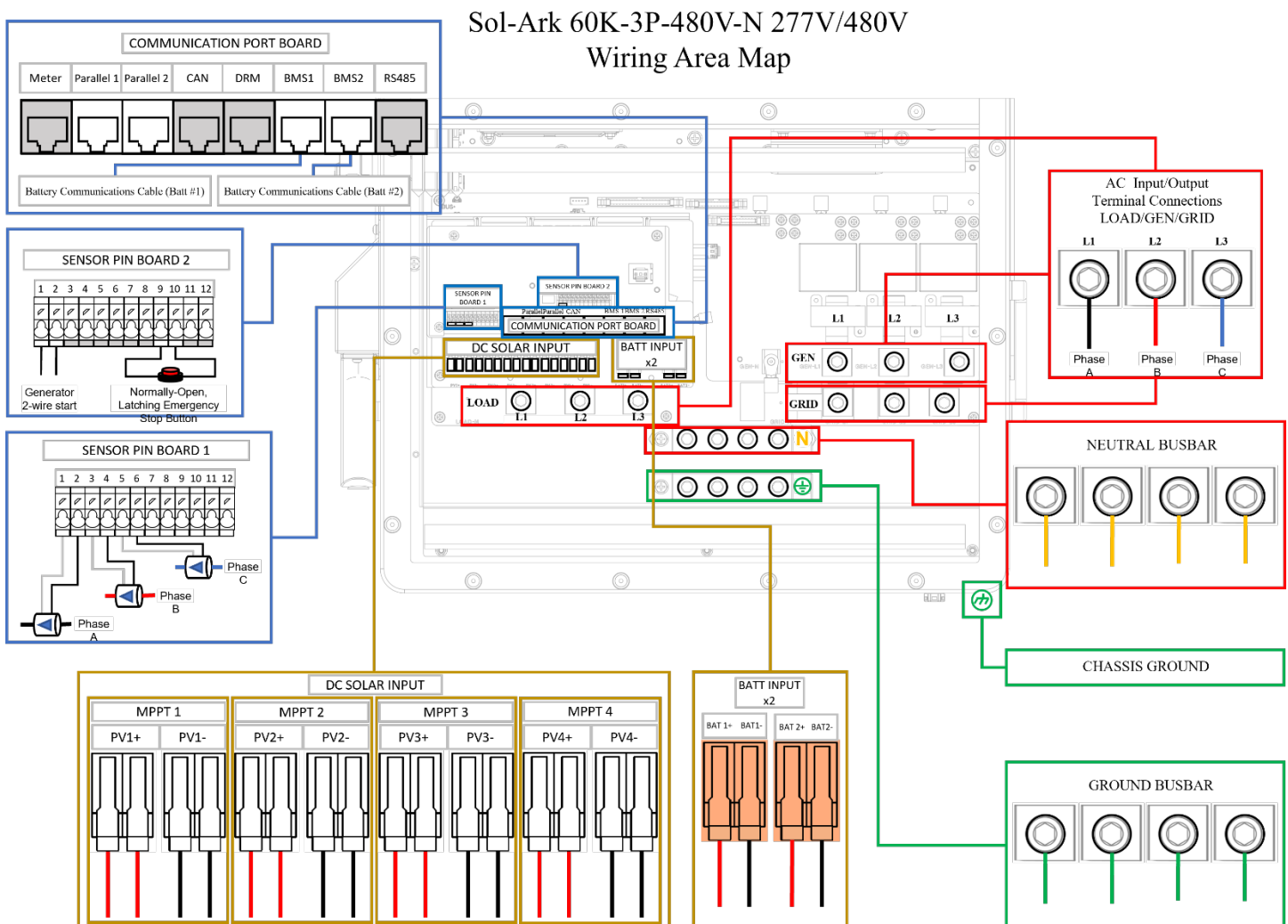


Diagram 1



**Key**

- L3 / Phase C
- L2 / Phase B / Positive
- L1 / Phase A / Negative
- Ground
- Neutral
- Sensors / Communications

**Limiter Sensors (CT) Key**




- L1: 1A to 5A: Pins +1, -2; 10mA to 50mA: Pins +7, -8
- L2: 1A to 5A: Pins +3, -4; 10mA to 50mA: Pins +9, -10
- L3: 1A to 5A: Pins +5, -6; 10mA to 50mA: Pins +11, -12

**Wire Gauge Guide (copper)**

| Label | Input Terminal      | Conductor              |
|-------|---------------------|------------------------|
| 1     | BATT                | 4 AWG max              |
| 2     | MPP                 | 10 AWG max             |
| 3     | AC IN/OUT/N/GND     | 4/0 AWG max            |
| 4     | Limiter Sensor (CT) | 24 AWG or 23 AWG CAT 6 |

February 24<sup>th</sup>, 2023

| Wire Gauge Guide (copper) |                     |                        |
|---------------------------|---------------------|------------------------|
| Label                     | Input Terminal      | Conductor              |
| 1                         | BATT                | 4 AWG max              |
| 2                         | MPP                 | 10 AWG max             |
| 3                         | AC IN/OUT/M/GND     | 4/0 AWG max            |
| 4                         | Limiter Sensor (CT) | 24 AWG or 23 AWG CAT 6 |

| Limiter Sensors (CT) Key  |  |
|---|--|
|  | L1<br>1A to 5A: Pins +1, -2<br>10mA to 50mA: Pins +7, -8   |
|  | L2<br>1A to 5A: Pins +3, -4<br>10mA to 50mA: Pins +9, -10  |
|  | L3<br>1A to 5A: Pins +5, -6<br>10mA to 50mA: Pins +11, -12 |

**Key**

- L3 / Phase C
- L2 / Phase B / Positive
- L1 / Phase A / Negative
- Ground
- Neutral
- Sensors / Communications

CT Sensors are optional but necessary to enable Peak Shaving.

See Integrating Gens and pg.41 for additional info.

## Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V

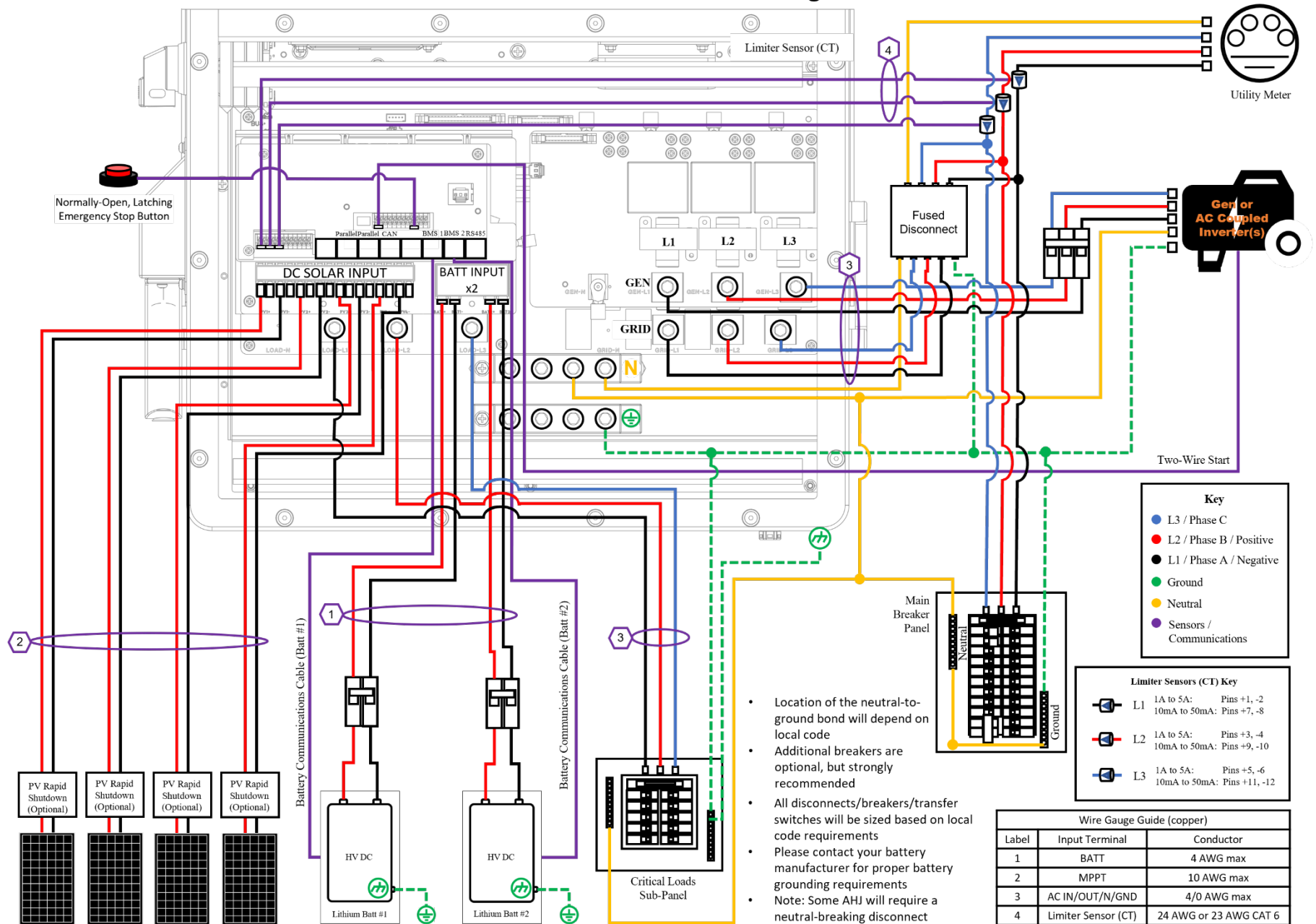
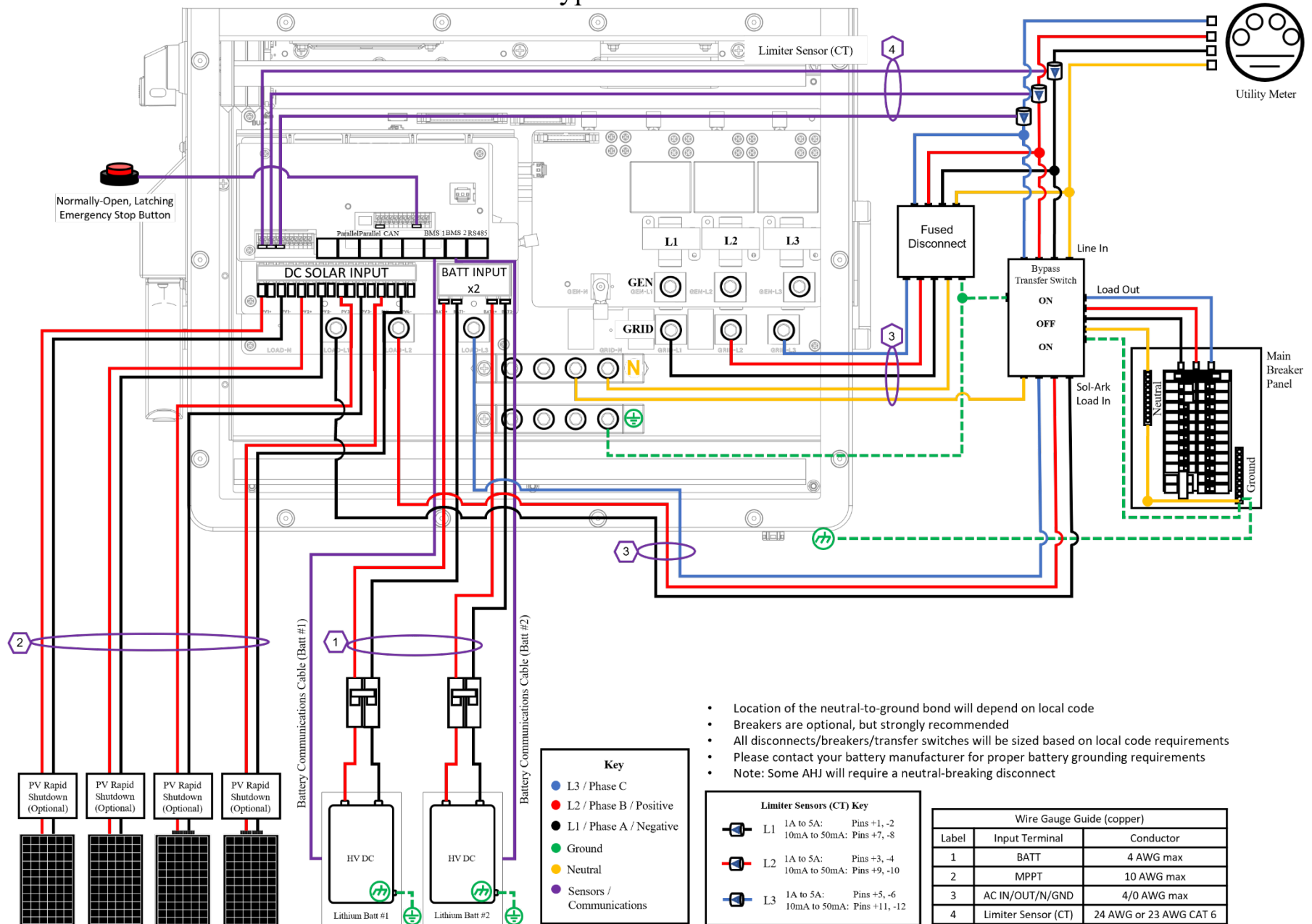


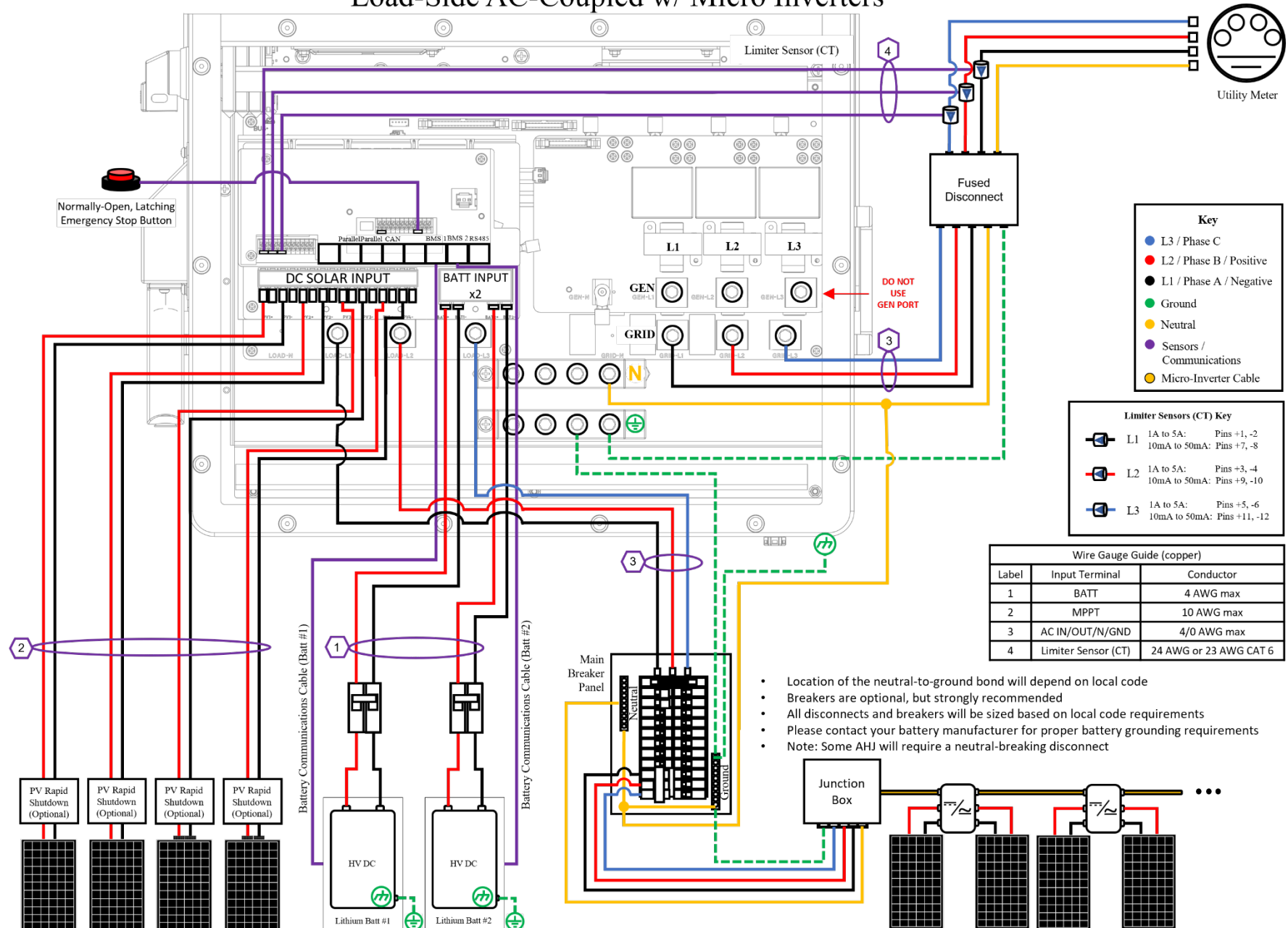
Diagram 4

# Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V with Bypass Transfer Switch



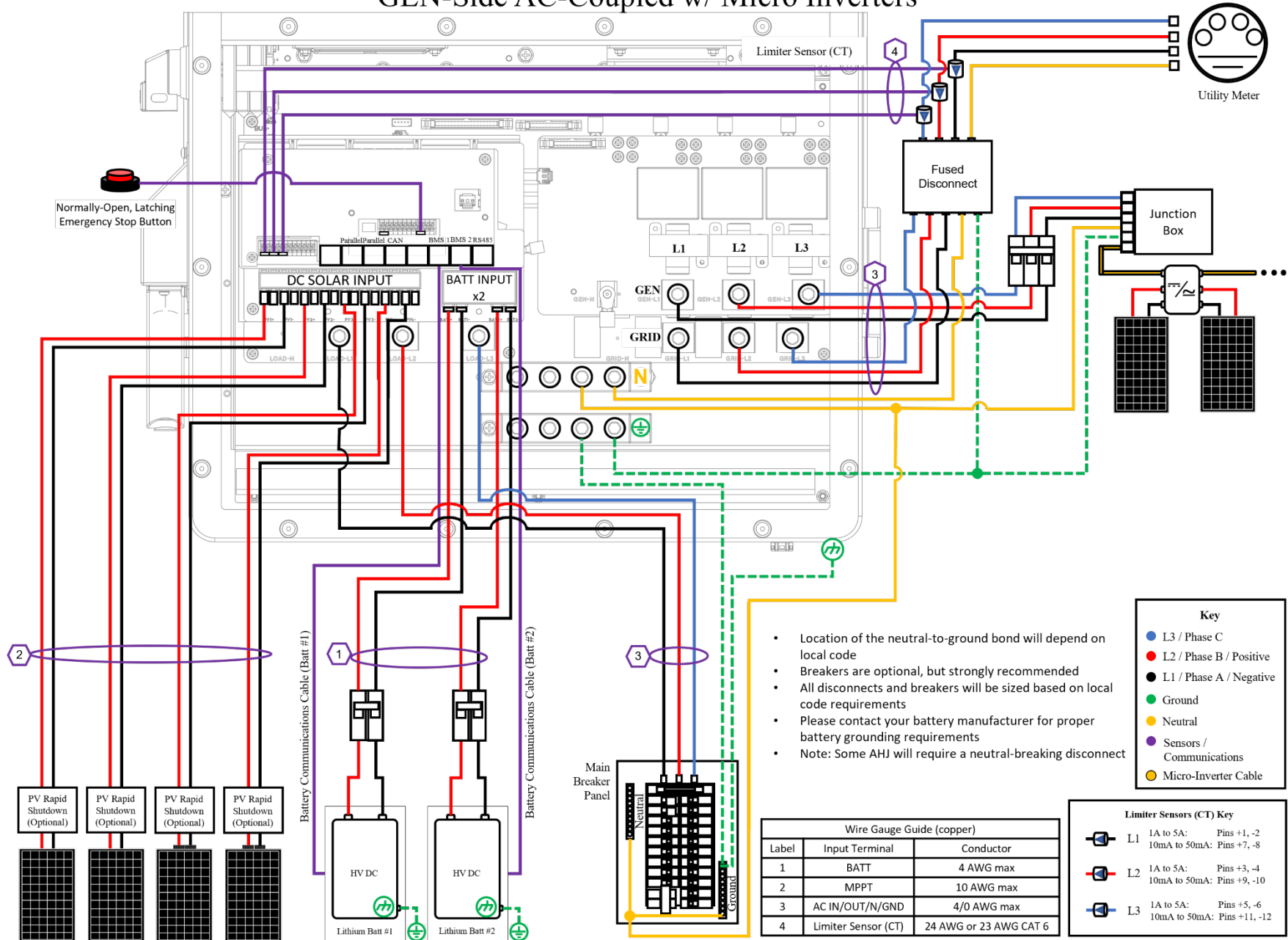
- Location of the neutral-to-ground bond will depend on local code
- Breakers are optional, but strongly recommended
- All disconnects/breakers/transfer switches will be sized based on local code requirements
- Please contact your battery manufacturer for proper battery grounding requirements
- Note: Some AHJ will require a neutral-breaking disconnect

# Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V Load-Side AC-Coupled w/ Micro Inverters



# Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V GEN-Side AC-Coupled w/ Micro Inverters

Note: PV fuses are only required for >2 strings per MPPT





# Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V Standby Generator

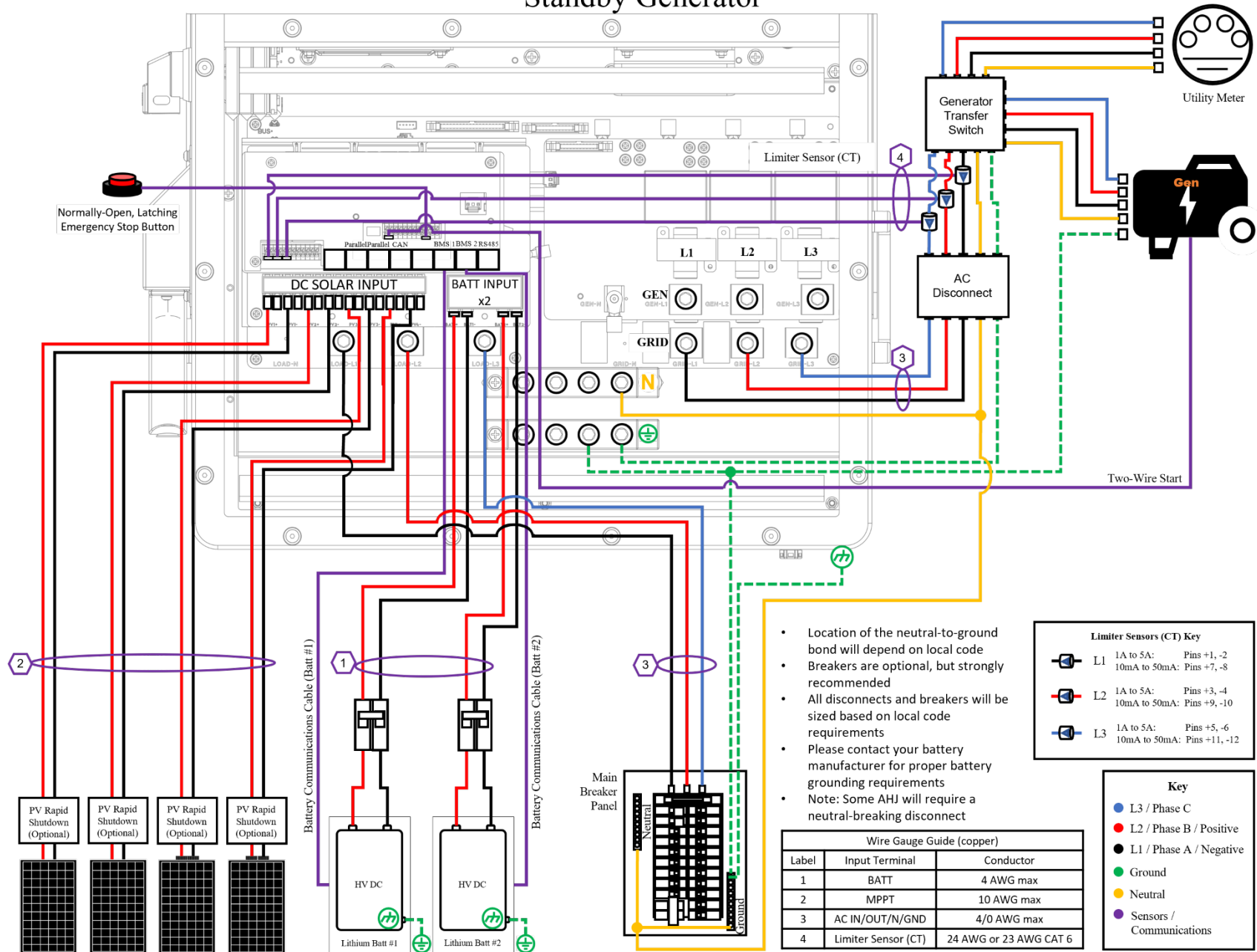
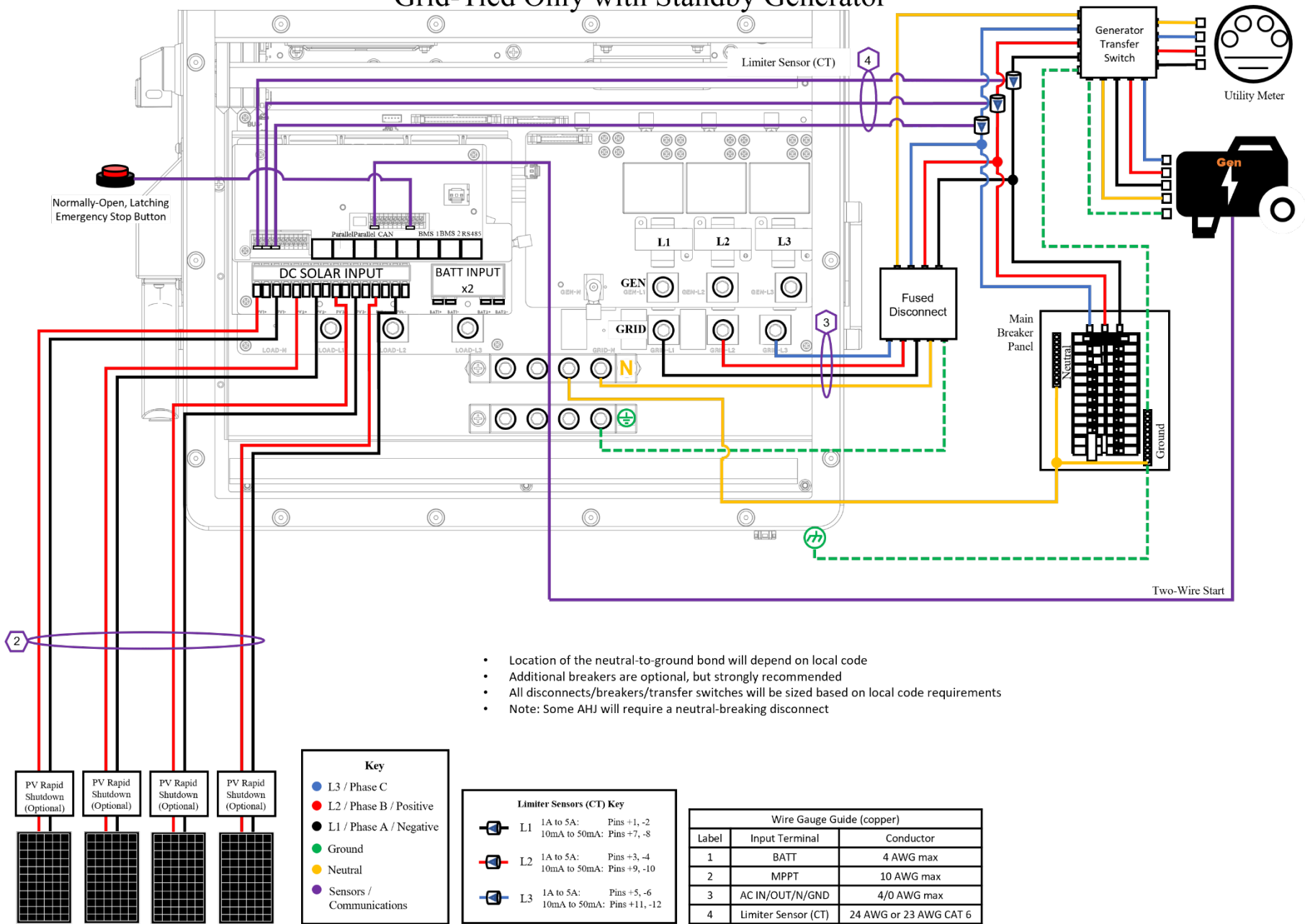
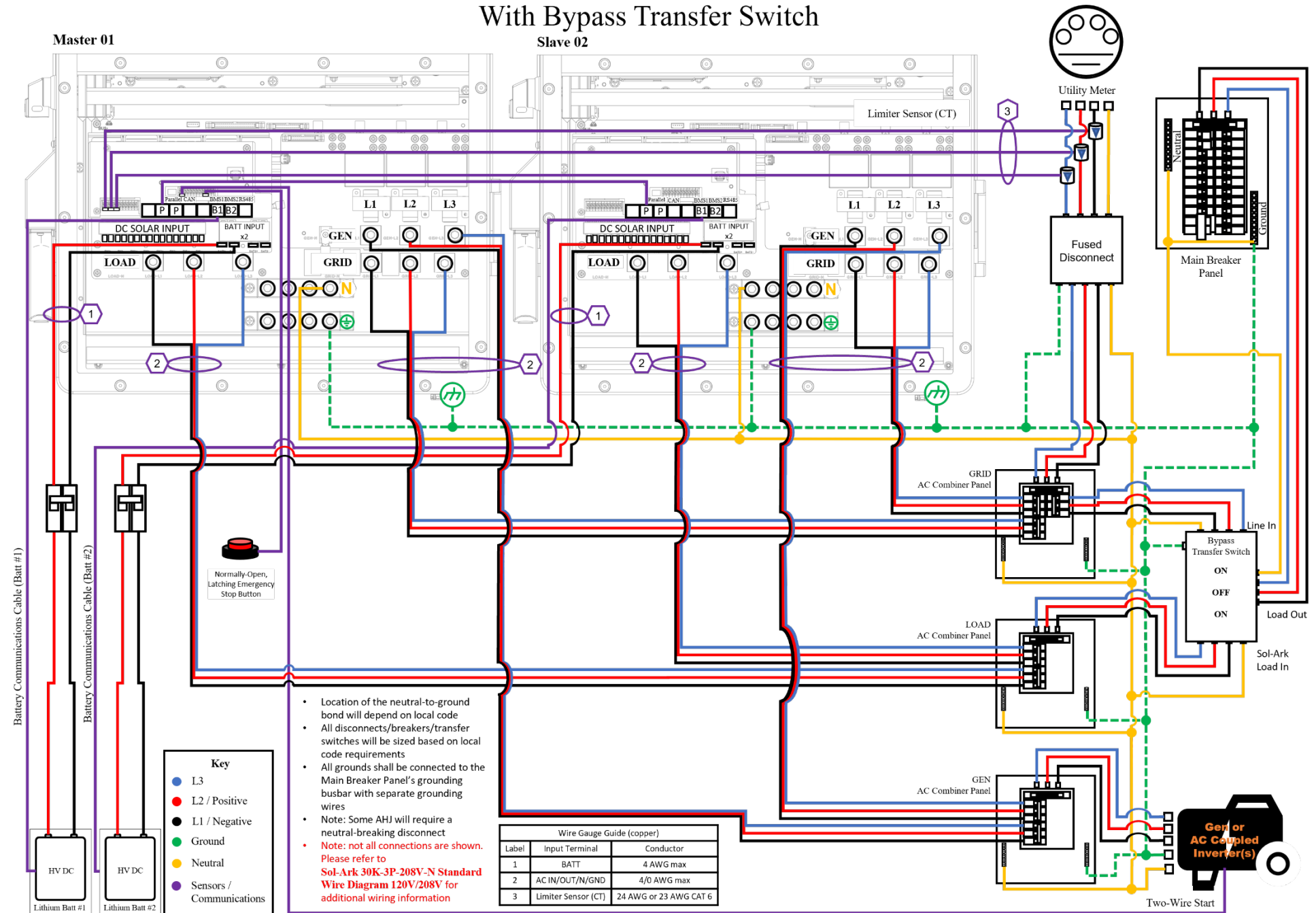


Diagram 8

Sol-Ark 60K-3P-480V-N Standard Wire Diagram 277V/480V  
Grid-Tied Only with Standby Generator



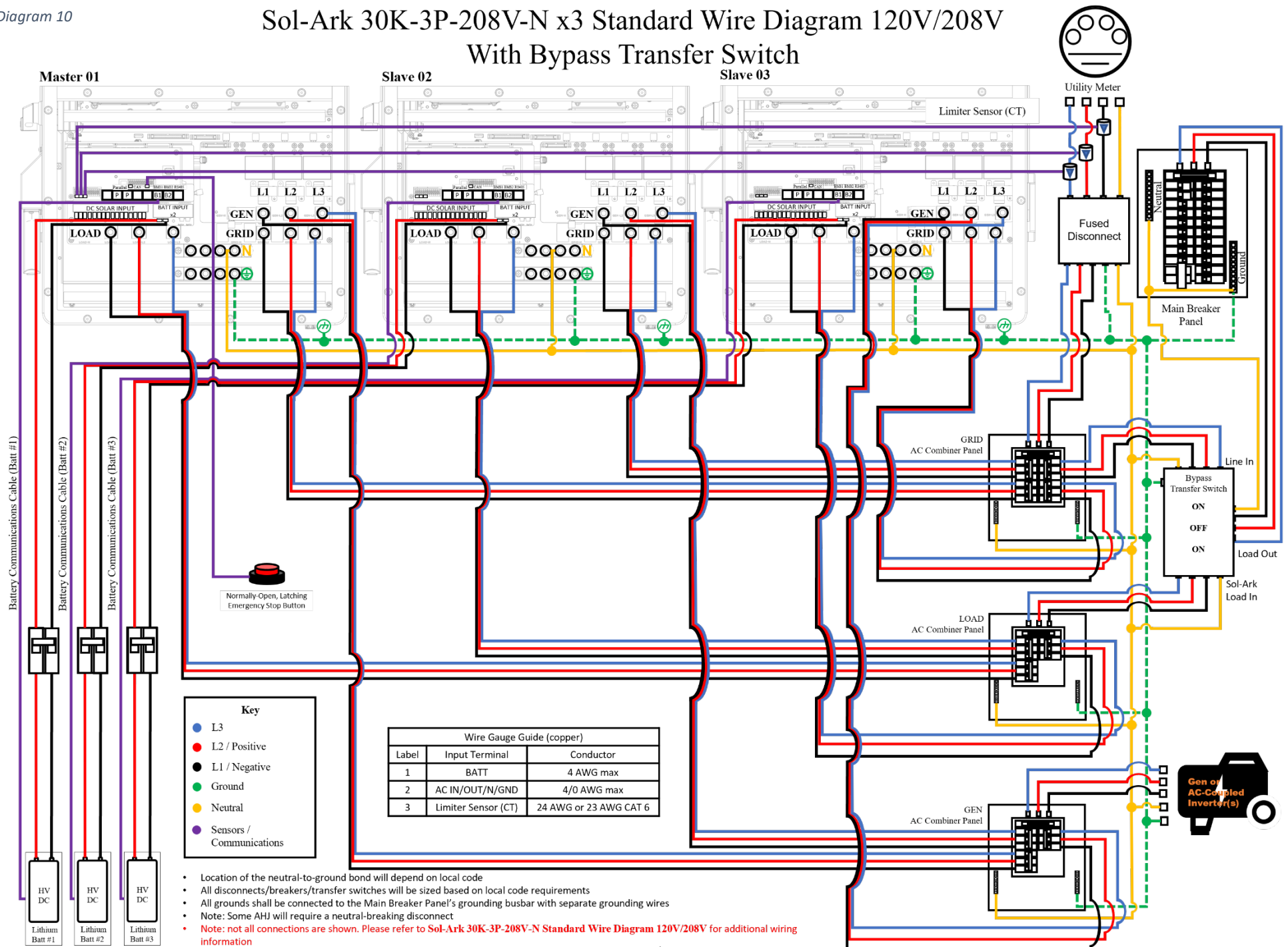
# Sol-Ark 60K-3P-480V-N x2 Standard Wire Diagram 277V/480V With Bypass Transfer Switch

January 9<sup>th</sup>, 2022

**Note: Before powering up Parallel System installs, please see Pg. 41**

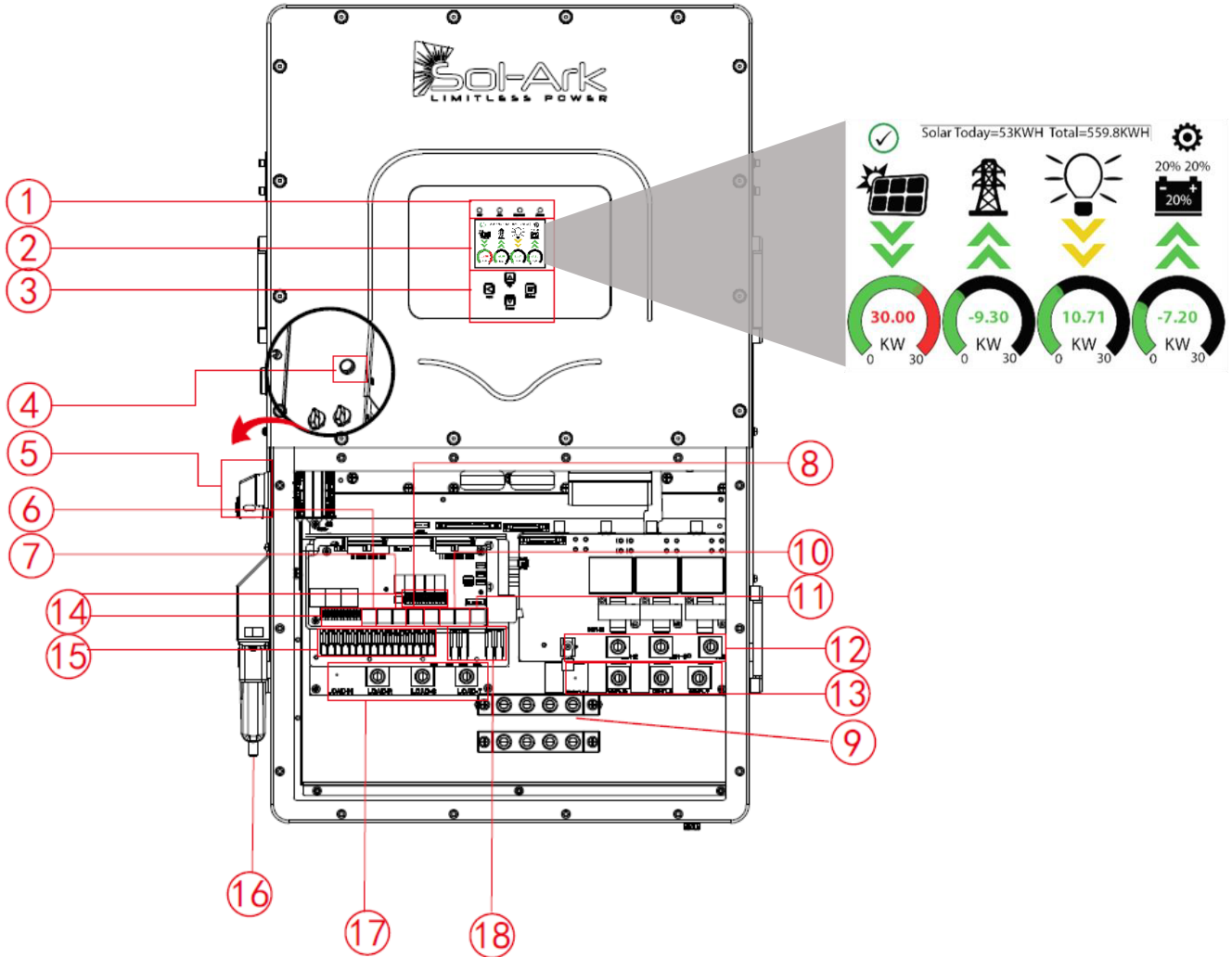
Diagram 10

# Sol-Ark 30K-3P-208V-N x3 Standard Wire Diagram 120V/208V With Bypass Transfer Switch

January 9<sup>th</sup>, 2022**Note: Before powering up Parallel System installs, please see Pg. 41**



# Physical Installation

## Inverter Components



|                        |                        |                          |
|------------------------|------------------------|--------------------------|
| 1. Inverter Indicators | 2. LCD Display (Touch) | 3. Function Buttons      |
| 4. ON/OFF Button       | 5. 2 x PV Disconnect   | 6. Meter Port (optional) |
| 7. Parallel Port       | 8. CAN Port            | 9. Ground / Neutral Bars |
| 10. BMS Port           | 11. RS485 Port         | 12. Generator Input      |
| 13. Grid Connection    | 14. Function Port      | 15. PV Input MPPTs       |
| 16. Wi-Fi Interface    | 17. Load Connection    | 18. Battery Connections  |

## Deciding the Site' Backup Circuits


- Ensure you keep the Inverter within its amperage limits
  - ☒ ON-Grid = 200A passthrough (160A software limitation)
  - ☒ OFF-Grid = 60kW = 72.2A Continuous | 120kVA = 144.4A Peak (7s)
- Verify each load circuit by measuring typical and max Amps with a clip-on Amp meter. Amps x 120V = Watts
-  Install a subpanel for backup loads if there is a chance of exceeding any amperage limits while powering the entire site off-grid; failure to do so will result in an outage and potential damage to the Inverter
-  If you have Arc-Fault / GFI breakers, DO NOT use a multi-circuit transfer switch.

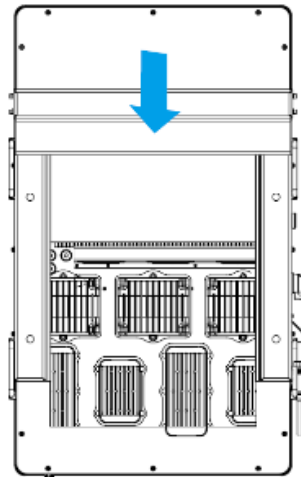
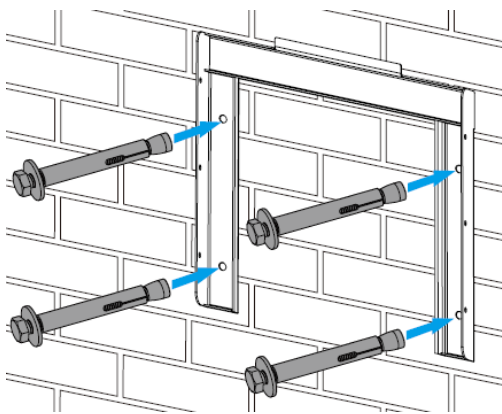


## Single System Installations (Small Commercial Backup)


- A. Use the output from 200A Fused Disconnect (from the grid) for the Grid input connection to the Sol-Ark
- B. Connect the Load output from the Sol-Ark directly to the Main Service Panel (at least 2/0 AWG)
- C. Connect a Generator (150A @ 120V x3) or AC-Coupled system to the GEN terminal blocks

## Mounting the Sol-Ark

- A. Keeping in mind Sol-Ark's dimensions, find a suitable location for the system(s)
- B. NEMA 3R rating for Outdoor installations
-  C. **PROTECT the LCD screen from excessive UV exposure**
- D. System weight = 172lbs (78kg). **Securely attach to the wall.** You may affix a mounting board to studs using 6-8 long wood screws
- E. Use the four (4) bolts + washers provided to mount the French Cleat to the board/wall
- F. Mount Sol-Ark on the installed French Cleat / Ensure Sol-Ark is level and sits properly
- G. Secure with the six (6) small screws (from 9 provided) for both sides of the French Cleat

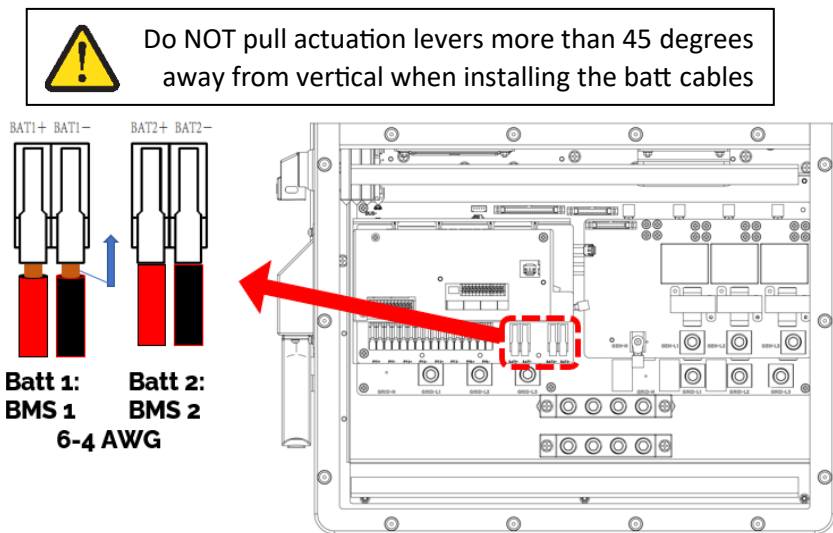


## Integrating Batteries (Sol-Ark POWERED "OFF")

- A. Connect batteries to Sol-Ark as shown below. Close loop communications are required for operations
- B. Ensure the external battery disconnect is OFF while connecting batteries, or arcing may occur
-  C. The 60K-3P reaches a maximum of 100A battery charge/discharge when using both battery terminals. When using one set of terminals, the max battery charge/discharge is **50A**

## Multi-System Installs\*

Please contact Sol-Ark technical support for parallel operation details.

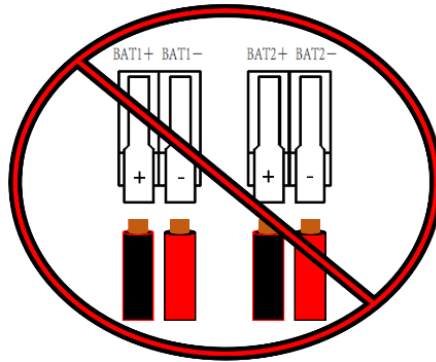


**Sol-Ark 60K-3P-480V**  
**requires BMS**  
**communication protocol**

Sol-Ark 60K-3P-480V is a **High Voltage Battery** system. Do NOT wire the battery bank to any other nominal voltage.

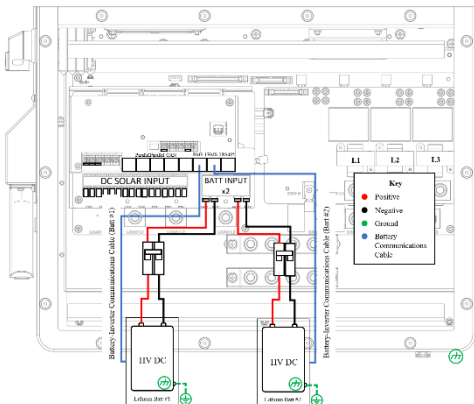
Stay within the voltage range:  
**MIN 160V-MAX 800V**

**Minimum of 600V**  
**needed to achieve 60kW**

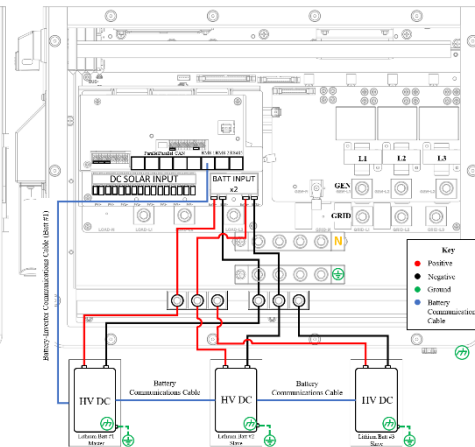


**Do NOT reverse  
polarity of batteries!**  
**Damage will occur!**

Multi-Terminal Multi Lithium Install

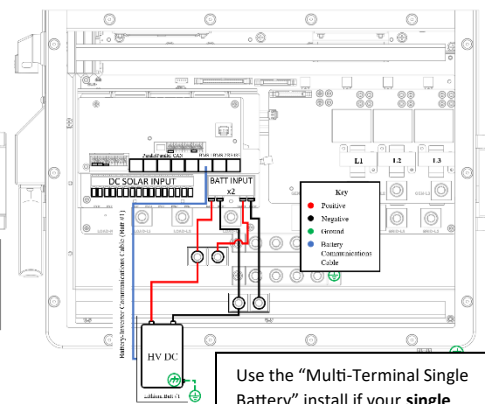


Note: Each pair of battery terminals is rated for 50A, so Lithium Batt #1 and Lithium Batt #2 will each receive up to 50A of charge and discharge



If using the paralleled Lithium Batts of the same make and model, then remove "Battery-Inverter Communications Cable (Batt #2)".

Multi-Terminal Single Battery Install



Use the "Multi-Terminal Single Battery" install if your **single** battery bank has a max charge/discharge current >40A, up to a total of 100A.

Check Battery Integration Guide for specific instructions on Closed Loop Comm Integration: [www.sol-ark.com/support/](http://www.sol-ark.com/support/)

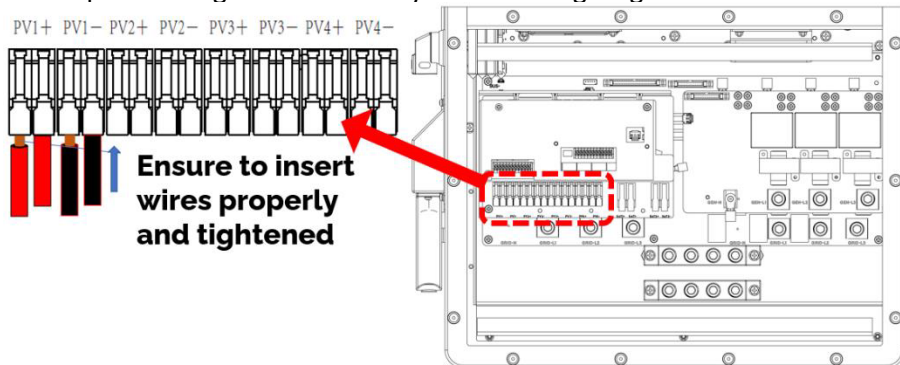
## Connecting Solar Panels

- Sol-Ark has QUADRUPLE (4) MPPTs for four separate PV input pairs (~8 strings)
- MAX PV input = 78kW ( $\pm 5\%$ ) / system | 19.5kW / MPPT | MAX 1000V<sub>oc</sub> PV | MAX I<sub>sc</sub>/MPPT 44A (limiting to 36A)



**Damage will occur if PV V<sub>oc</sub> > 1000V**

- Parallel strings per MPPT must be the same Voltage**
  - PV1 A/B must be the same voltage if using all two (2) strings
  - Arrays on the same MPPT CAN face different directions
- Ground the panel MOUNTS/FRAMES to any ground **outside** the circuit via 12AWG wire
- IF using Y-Connectors: Running two strings in parallel, totaling 36A (self-limiting)**
- Connect the solar panel strings as indicated by the following diagram:

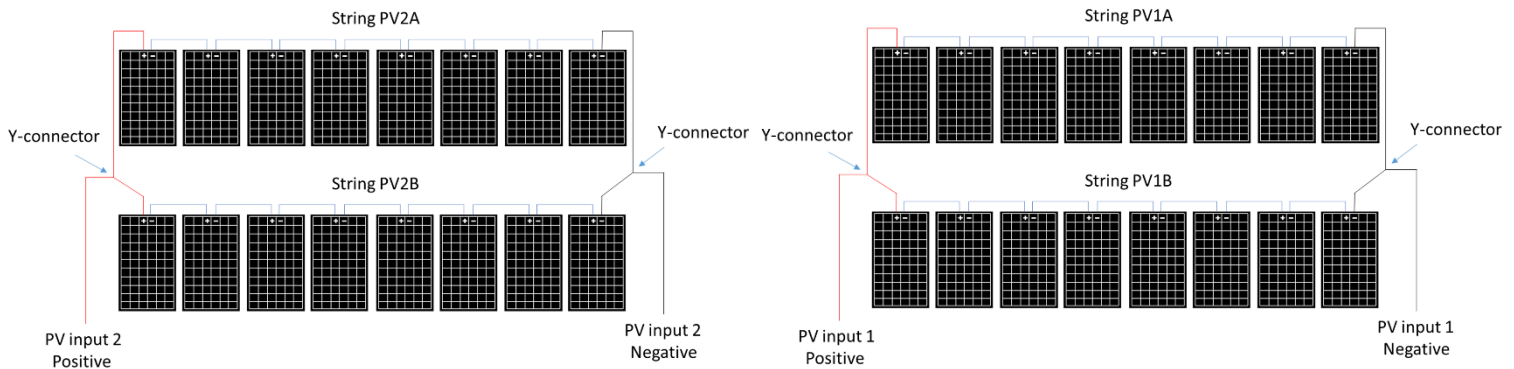


Each string **can** use separate wires  
String minimum is usually 5 panels or 180V

Maximum combined Output (AC+DC) = 72kW

54kW AC +

30kW DC



## Integrating a Generator

### Generator < 54kW (GEN Terminal)

- ONLY supports 208V<sub>AC</sub> (3-phase) generators | 200A Terminal Block [Limited to 180A@120Vx3]
- Connect the generator output to the "GEN" input terminal block in the Sol-Ark 60K-3P-480V user area.  
⚠️ **GEN input doesn't support Split-Phase Generators.**
- THD of less than 15% is preferred** but not required

**The Generator input must have a Neutral (WYE Configuration)**

### Standby Generators > 54kW (GRID Terminal) (OFF-GRID Recommendation)

- Supports 480V<sub>AC</sub> (3-phase) generators | 200A Terminal Block (up to 72kW passthrough)
- Off-Grid** / Standby Generator on ATS installations requires selecting "GEN Connected to Grid Input"  
**Home Screen → Gear Icon → Limiter → Other → GEN Connected to Grid Input**
- Off-Grid = turn "Grid Sell" off | Only need CTs (on Gen lines) if using Grid Peak Shaving (see below)



#### Increase Gen/Sol-Ark Efficiency

- Select "Limited Power to Load"
- Select "General Standard"
- Increase Grid frequency range: 55-65Hz

### Grid Peak Shaving Mode (For Gen Connected to Grid terminals)

- It prevents the Sol-Ark from overloading generators
- Must place the CT sensors so that they measure L1/L2/L3 of the generator's output, pointing arrows on the CTs towards the inverter
- Sol-Ark contributes power above the "Power" value threshold to prevent overloading the generator
- This mode will auto-adjust the Grid Charge Amperage to avoid overloads

| Basic Setup  |  |                |               |          |
|--|--|----------------|---------------|----------|
| Display  | Time                                     | Advanced       | Factory Reset | Parallel |
| <input checked="" type="checkbox"/> Solar Arc Fault ON | <input type="checkbox"/> Clear Arc_Fault | ARC parameters |               |          |
| Gen Limit Power  |  | 030000         |               |          |
| Load Limit Power                                       |  | 045000         |               |          |
| Grid peak-shaving                                      |  | 000400         |               |          |
| Auto detect Home Limit Sensors                         |  | 000050         |               |          |
| Power  |  | 000390         |               |          |
| CT ratio   |  | 000055         |               |          |
| UPS Time   |  | 238094         |               |          |
| CANCEL   |  | OK             |               |          |

## Gen Start V or % (Grid Start if Gen is on Input)

The value batteries need to reach **BEFORE** automatically starting a generator connected to the GEN terminals to charge the battery bank.



Sol-Ark will NOT charge batteries from a generator until the batteries reach this value.

## Gen Start A (Grid Start A if Gen is on Terminals)

This is how many amps (**DC**) you can push specifically from the generator to charge the batts. To ensure you do not overload a small Generator, you will want to adjust the GEN or GRID Start A value. **Multiply value by # of Sol-Arks for actual current value into batteries.**



Suppose PV production = 0W | Disabled TOU | Enabled Grid/Gen Charge: The batteries will be charged to "full" using the Grid or a Generator (if available) until the battery bank accepts only 5% of its rated capacity in Amperes. This value correlates to roughly 90-93% full for most batteries and is the generator's default "OFF" signal. If producing PV, the system will use PV to charge the batteries to 100% full instead.

## Sensors Integration and Accessory Placement

**CN1**

|             |   |   |   |                 |   |   |   |      |    |    |    |
|-------------|---|---|---|-----------------|---|---|---|------|----|----|----|
| 1           | 2 | 3 | 4 | 5               | 6 | 7 | 8 | 9    | 10 | 11 | 12 |
| CT-R        |   |   |   | CT-S            |   |   |   | CT-T |    |    |    |
| 5A>Input>1A |   |   |   | 50mA>Input>10mA |   |   |   |      |    |    |    |

**CN2**

|         |   |       |   |       |   |           |   |           |    |    |    |
|---------|---|-------|---|-------|---|-----------|---|-----------|----|----|----|
| 1       | 2 | 3     | 4 | 5     | 6 | 7         | 8 | 9         | 10 | 11 | 12 |
| G-START |   | DRY-1 |   | DRY-2 |   | RSD+ RSD- |   | SHUT DOWN |    |    |    |
| B       |   | B     |   | +     |   | -         |   |           |    |    |    |

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

**Meter** Parallel\_1 Parallel\_2 CAN DRM BMS1 BMS2 RS485

**(1,2,7,8) CT-R:** Current transformer (L1) used for Limited Power to Home mode and Peak Shaving; **Polarity matters**  
**(3,4,9,10) CT-S:** Current transformer (L2) used for Limited Power to Home mode and Peak Shaving; **Polarity matters**  
**(5,6,11,12) CT-T:** Current transf. (L3) used for Limited Power to Home mode and Peak Shaving; **Polarity matters**  
**(1,2) G-Start:** dry contact signal for startup the generator. When the "GEN signal" is active, the open contact (GS) will close (no voltage output).  
**(3,4) Dry-1 and (5,6) Dry-2:** Reserved  
**(7,8) Optional RSD:** 12V power supply for RSD transmitters; Rated for a **maximum of 1.2W (100mA @12V)**  
**(9,10) Emergency stop:** Short these pins to initiate emergency stop.

**Meter:** For external energy meter communication  
**Parallel\_1 & Parallel\_2:** 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

## Limiter Sensors (CT Sensors) [diagram to the right]

- ☒ Install sensors on incoming electrical service wires L1, L2, & L3 (see Diagrams Section)
- ☒ Limited Power to Home Mode (meter zero) and Peak Shaving Modes require CT sensors
- ☒ To ensure the sensors will fit, please check the wire size before ordering (regular CTs accommodate up to 4/0 AWG) [Larger available: sales@sol-ark.com]
- ☒ See pg. 41 for additional CT sensor information.

## GEN Start Signal (Two-Wire)

- ☒ The signal comes from a normally open relay that closes when the Gen Start state is active

## CANbus & RS485

- ☒ To connect batteries to the Sol-Ark 60K-3P-480V via RJ45, you need to splice the end connecting to the 60K
- ☒ Use the middle two conductors
- ☒ RS485 is SunSpec draft 4 (will not work with draft 3)

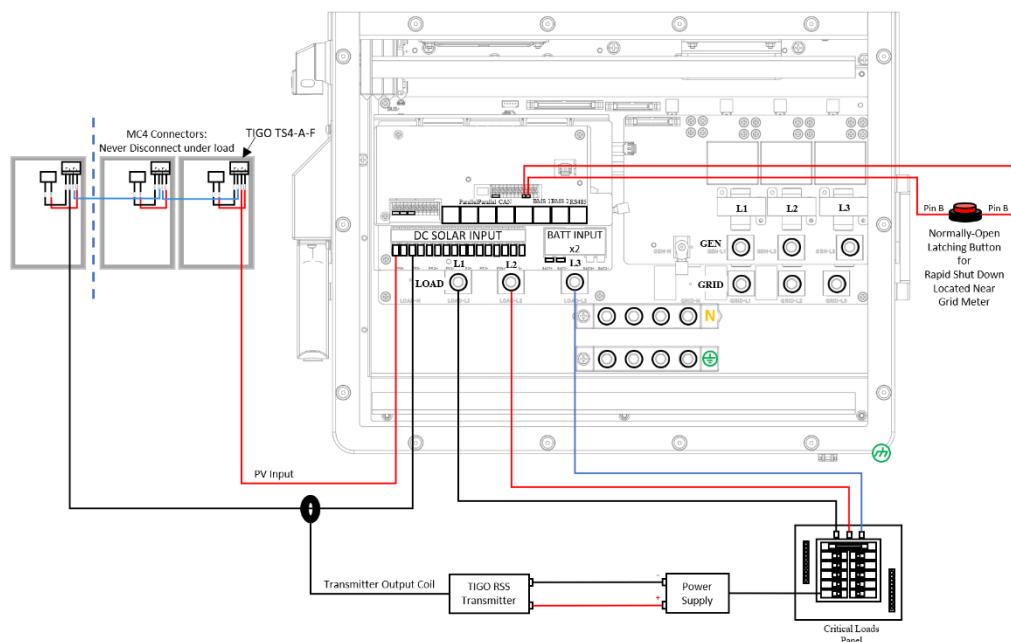
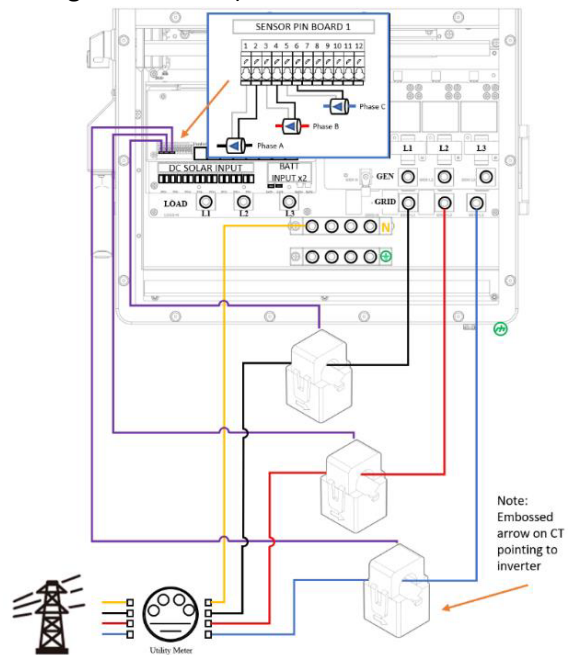
## Wi-Fi Antenna (Dongles)

Remote monitoring and software updates require an internet connection through the Wi-Fi dongle (ethernet available)

## Emergency Stop Signal & PV Rapid Shutdown Signal

Pins 9(B) and 10 (B) in the sensor pinboard 2 use an ordinarily open & latching switch to connect the two emergency stop pins that cut off the RSD power supply when triggered, thus stopping the inverter AC output.

Pins 7 and 8 in the sensor pinboard 2 provide the 12V / 100mA signal power lost when the Sol-Ark shuts down using the front button.



This diagram illustrates how to integrate the **Tigo TS4-A-F** and the corresponding **Tigo RSS Transmitter** with the Sol-Ark 60K-3P-N.

Please refer to your RSD manufacturer's website for appropriate hardware needs and compatibility.

**Rapid Shutdown** : TIGO TS4-A-O | TIGO TS4-A-F | TIGO TS4-O | TIGO TS4-O-DUO | APsmart RSD S-PLC / RSD-D

**PARALLEL SYSTEMS: Emergency Stop should be connected to the Master with address 01 and will initiate emergency stop for all paralleled systems from the one button**




- ☒ The Built-in 12V power supply in the user area of the Sol-Ark (Pins 7 and 8) is rated for 100mA (1.2W).
- ☒ Transmitter fits inside the user area of the Sol-Ark 60K-3P-480V but can cause interference (sometimes requires placing it outside of the user area).
- ☒ TIGO Optimizers are compatible with the Sol-Ark 60K-3P-480V (**Do not** use the built in 12V Power supply in the Sol-Ark user area to Power the Tigo Optimizer TX transmitter).

*If you are unsure whether the transmitter power supply is compatible with pins 7 & 8 of the inverter, contact the RSD manufacturer*

## Powering -Up & Testing the Sol-Ark 60K -3P -480 V

### Check the voltage on each PV input circuit

- A. It should be no higher than 1000V<sub>oc</sub> Temp. corrected
-  **B. DO NOT connect PV+ OR PV- to GND**
- C. Verify polarity (backward polarity shows 0V)

### Check Grid Input Voltage

- A. Measure L1, L2, & L3 to Neutral. Ensure 277V<sub>AC</sub>
- B. Measure L1/L2, L1/L3, L2/L3. Ensure 480 V<sub>AC</sub>
- C. Check Neutral and Ground are ~0 V<sub>AC</sub>
- D. Verify L1 voltage on AC in/out is 0 V<sub>AC</sub> with the main L1 connection in the panel. Same for L2 & L3

### Check Battery Voltage

- A. Turn on the battery switch (if using a Lithium battery)
- B. Turn on the external battery disconnect
- C. The voltage should be nominal 600V<sub>DC</sub> [160V<sub>DC</sub> ~ 800 V<sub>DC</sub>]

### Provide Power to Sol-Ark

- A. Turn on the Grid disconnect and Load Breaker(s)
- B. Turn **BOTH** PV disconnect switches to the "ON" position
- C. Press the ON/OFF Button on the left side, and the blue light should turn on

### Indicator LED's

#### DC

- A. Green = DC Solar Panels are producing
- B. Off = Solar Panels are not producing

#### AC

- A. Green = Grid (or Gen or AC Coupled) is Connected
- B. Off = grid is not Connected

Verify Grid, Battery, PV voltage BEFORE turning on the unit (**WHILE THE UNIT IS OFF**)



Turn ON with one of three sources of power:  
1) PV      2) Grid      3) ON/OFF Battery

### Power Cycle Sequence

1. Make sure that Sol-Ark 60K-3P-480V is properly connected to the batteries, panels, grid, etc. (see system wiring diagram)
2. Turn on the external battery disconnect
3. Turn on grid power from the disconnect
4. Make sure Solar panel inputs are not connected to Ground, then Turn on DC disconnect switches (x2)
5. Press the power button on the left SIDE of the unit
6. Turn on external load disconnect
7. Reverse the steps to turn off



**DO NOT** turn off Battery Disconnect if any current is flowing in or out of the battery.




### Normal

- A. Green = Sol-Ark is working properly
- B. Off = Sol-Ark is not working properly

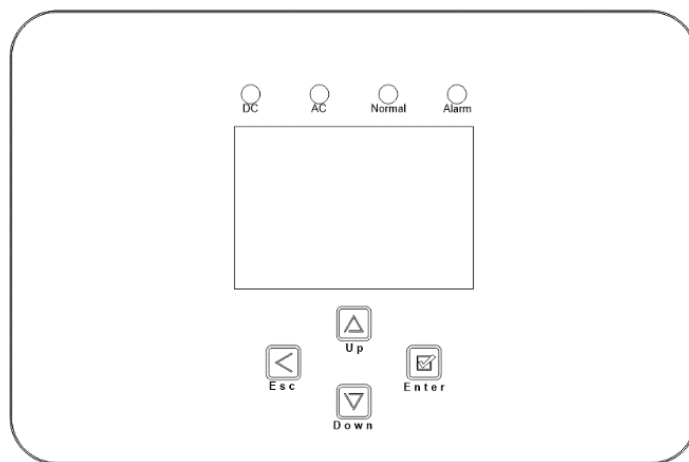
### Alarm

- A. Red = Alarm, check the alarms menu
- B. Off = No alarms

Maximum combined **OUTPUT**  
(AC Coupled+DC<sub>inverted</sub>) = 72kW



54kW AC +  
30kW DC

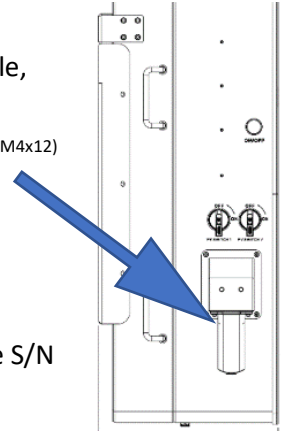




## Remote Monitoring Setup

### Ethernet Dongle

- Open the dongle (Black device) enclosure and thread the ethernet cable through the hole, and plug it into the RJ45 port
- Reassemble the dongle housing and plug dongle into Sol-Ark, and secure with screws (x2 M4x12)  
If all is well, you will see solid red and green lights
- Register the dongle via the app or [www.mysol-ark.com](http://www.mysol-ark.com)



### Wi-Fi (Via Cell Phone or computer)

- Plug the Wi-Fi dongle into the Wi-Fi port on the LEFT side of the Sol-Ark
- Using your device, look for an "EAP" network containing the last five digits of the dongle S/N
- Password: 12345678
- Follow the instructions on the upcoming pages



You can access PowerView on a computer with the following link:

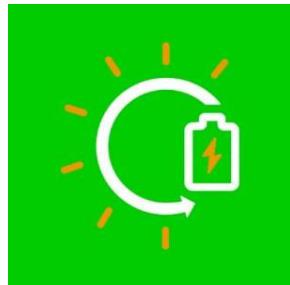
<http://www.mysol-ark.com>



### Download PV Pro App



iPhone: (Will only show up as PV Pro)  
<https://apps.apple.com/lk/app/powerview-pro/id1247121391>



Android  
[https://play.google.com/store/apps/details?id=com.elinter.app.powerview&hl=en\\_US&gl=US](https://play.google.com/store/apps/details?id=com.elinter.app.powerview&hl=en_US&gl=US)



### Attention Installers

If you plan to add an install to your installer account for monitoring multiple installs, you must first make the plant under the **customer's** account.

Once created, the customer can share the plant, with **Manager permissions**, to the installer via the app ("..." under My Plants) or webpage (press the "..." next to the plant name in Power View).

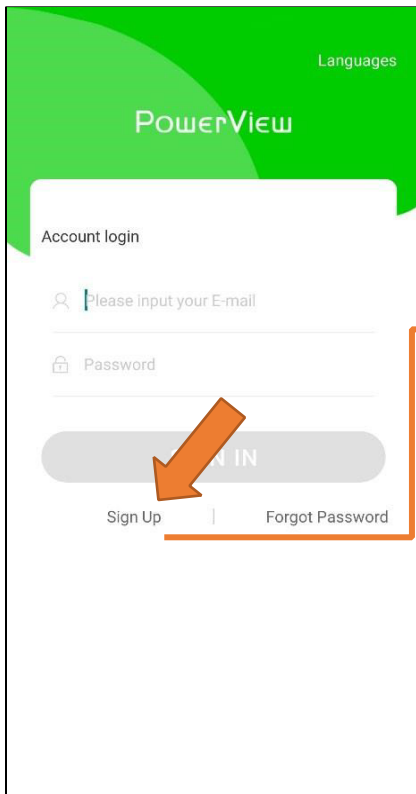
PV Pro App  
Tutorial Video



PV Pro Website  
Tutorial Video



## Create an Account and Sign In



PowerView

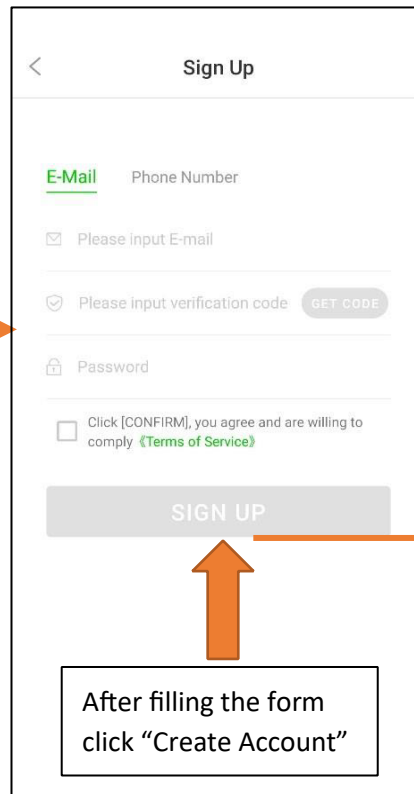
Account login

Please input your E-mail

Password

SIGN IN

Sign Up | Forgot Password



Sign Up

E-Mail | Phone Number

Please input E-mail

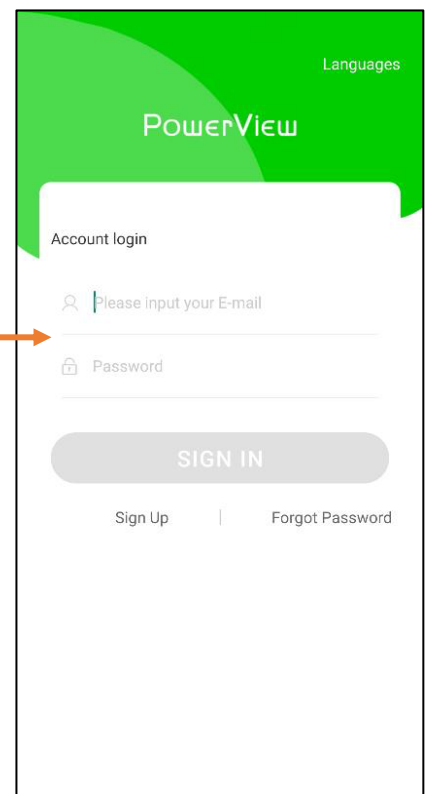
Please input verification code GET CODE

Password

Click [CONFIRM], you agree and are willing to comply (Terms of Service)

SIGN UP

After filling the form  
click "Create Account"



PowerView

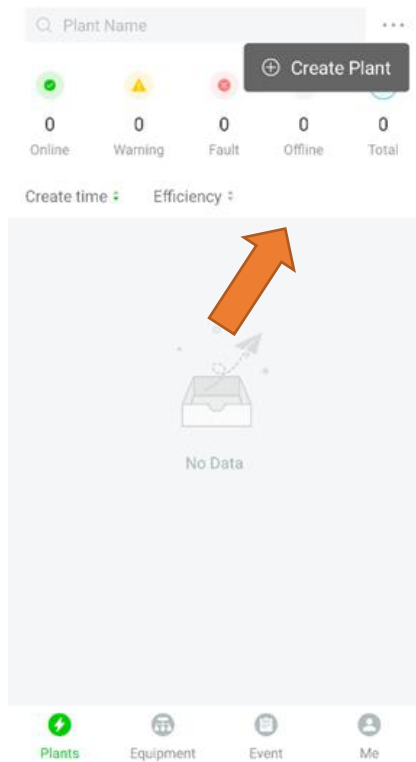
Account login

Please input your E-mail

Password

SIGN IN

Sign Up | Forgot Password



Plant Name

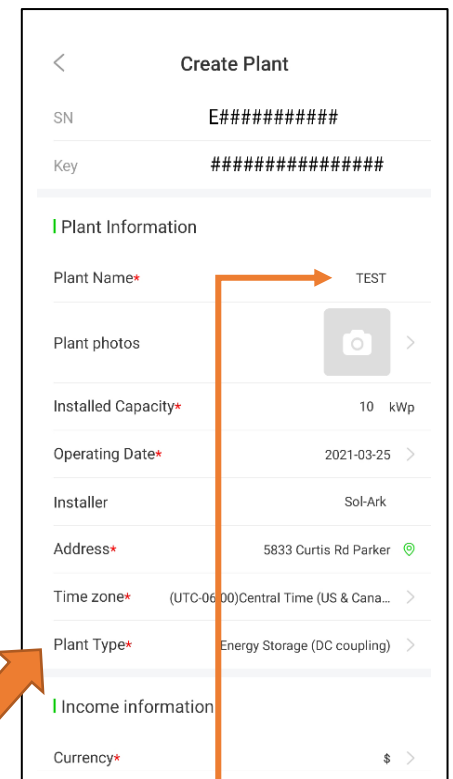
Create Plant

Online: 0 Warning: 0 Fault: 0 Offline: 0 Total: 0

Create time: Efficiency:

No Data

Plants | Equipment | Event | Me

Create Plant

SN: E#####

Key: #####

Plant Information

Plant Name\*: TEST

Plant photos

Installed Capacity\*: 10 kWp

Operating Date\*: 2021-03-25

Installer: Sol-Ark

Address\*: 5833 Curtis Rd Parker

Time zone\*: (UTC-06:00)Central Time (US & Cana...)

Plant Type\*: Energy Storage (DC coupling)

Income information

Currency\*: \$

On Plant Type, **ALWAYS**  
select Energy Storage (DC  
coupling).

Make sure to pick a unique  
plant name. (I.E. "Last Name,  
First four of Address")

## Connect the System to the Internet

Create Plant → Done

If Wi-Fi paired with 10.10.10.1, select Done

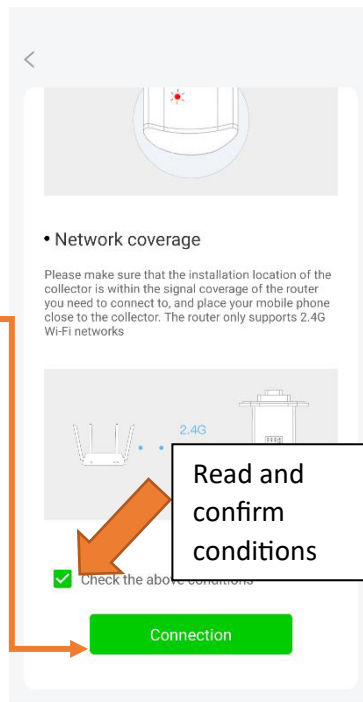


Congratulations, Created successfully

### DISTRIBUTION NETWORK

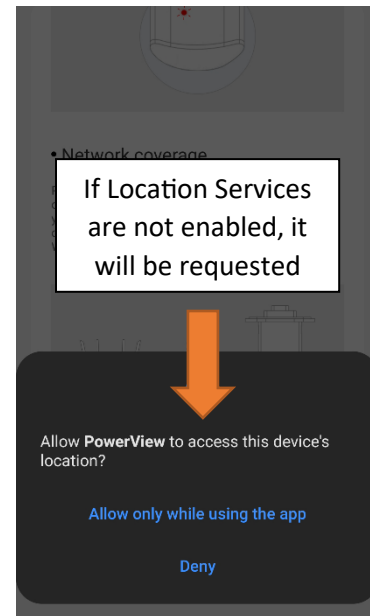
① You can click the confirm button in the upper right corner to complete the creation or to configure the network for the collector

Select Distribution Network to pair Dongle with WIFI

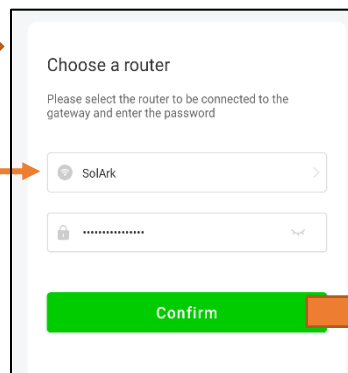


Read and confirm conditions

Connection

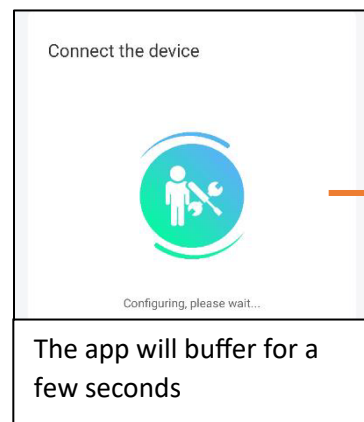


Once you see this screen, go to your **DEVICE'S** Wi-Fi settings and connect to the Wi-Fi network that starts with:  
**EAP-#####**  
Password: "12345678"  
Return to app once connected

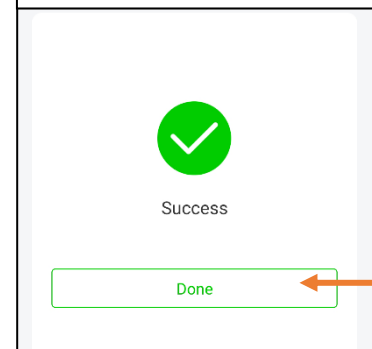


Select the local Wi-Fi network that will be providing the internet connection to the system

**Do NOT select the dongle's Wi-Fi network**



You will receive confirmation once connection is established



It takes about 60sec for the lights to turn on after setup

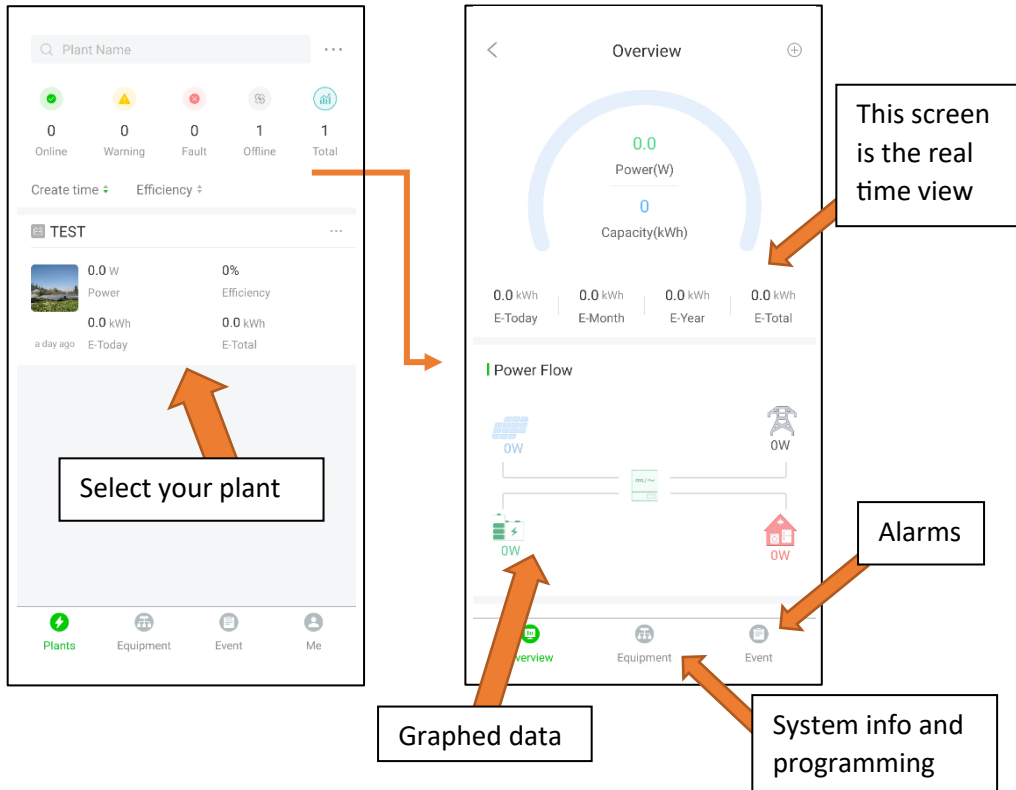
**Red LED** : Connected to Sol-Ark and has power

**Green LED** : Connected to Internet and Server

**Flashing Green LED** : Connected to router but not server (usually a VPN or firewall issue)



## StartMonitoring The Data



### Attention

If you are installing **parallel** systems, **DO NOT** create a plant for each inverter.

Create one plant for the **Master** unit and then use the browser version of PowerView (mysol-ark.com).

Click on the “...” for the **MASTER’s** plant and hit “Add Gateway” then put the S/N and Key of the **SLAVE’s** dongle.

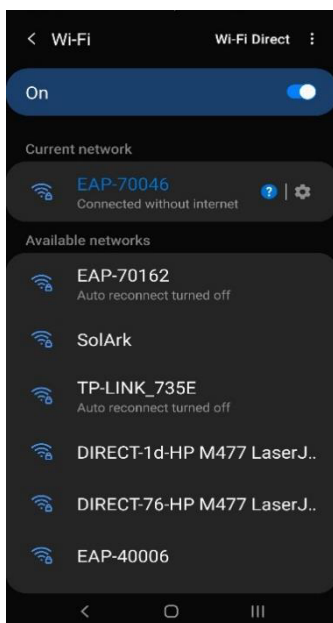
## IP Address Setup Instructions (PC or SmartPhone)



Please note that this method only achieves internet connectivity. For registration and account management, please use the app and/or [www.mysol-ark.com](http://www.mysol-ark.com)

## Connect to the Dongle Network

A. Settings → Wi-Fi → Select the Network with EAP- ##### (The last 5 digits of your SN number)



Password: 12345678

**\*Disclaimer\*:** The Wi-Fi dongle does not have internet; You still need to be connected to the dongle for this process.

## Login to Web Portal using ANY Search Browser

- Open Google or Safari → type in the search bar: **10.10.10.1**
- Scroll Down to "Wi-Fi Connection"
- Press "Scan" to search local networks

## Select Your HOME Network

- Find the home network
- Enter personal Wi-Fi Password
- DO NOT SELECT DONGLE NETWORK**
- Select "Connect"

Wlan Connection (Wi-Fi)

Wi-Fi SSID: wifi\_test  
Connection Status: Connect Fail

☐ Using the following static IP address  
Address: 0.0.0.0  
Netmask: 0.0.0.0  
Gateway: 0.0.0.0

TP-LINK\_735E  
EAP-70162  
EAP-40006  
EAP-40004  
SolArk  
DIRECT-1d-HP M477 LaserJet  
CableWiFi  
SpectrumWiFi Plus  
EAP-70070  
FreeMotion-2G

Save Scan

Wlan Connection (Wi-Fi)

Wi-Fi SSID: wifi\_test  
Connection Status: Connect Fail

☐ Using the following static IP address  
Address: 0.0.0.0  
Netmask: 0.0.0.0  
Gateway: 0.0.0.0

Save Scan

Device Information

Serial Number: E47011970018  
Register Key: WSMQCERXVXLRYHHS  
Hardware Version: AEW2-0001-02  
Software Version: 4710119826R

Wlan Connection (Wi-Fi)

Wi-Fi SSID: wifi\_test  
Connection Status: Connect Fail

### \*Disclaimer\*

Connecting the dongle via the IP address only connects the dongle to the internet

**\*YOU MUST STILL CREATE AN ACCOUNT VIA THE POWER VIEW APP\***

## Save Your Information

Wlan Connection (Wi-Fi)

Wi-Fi SSID: wifi\_test  
Connection Status: Connect Fail

☐ Using the following static IP address  
Address: 0.0.0.0  
Netmask: 0.0.0.0  
Gateway: 0.0.0.0

Save Scan

If successful, you should see a Red and Green Light on the Dongle showing a successful connection. Red light may blink at a ~ 1s rate

**Red LED** : Connected to Sol-Ark and has power.

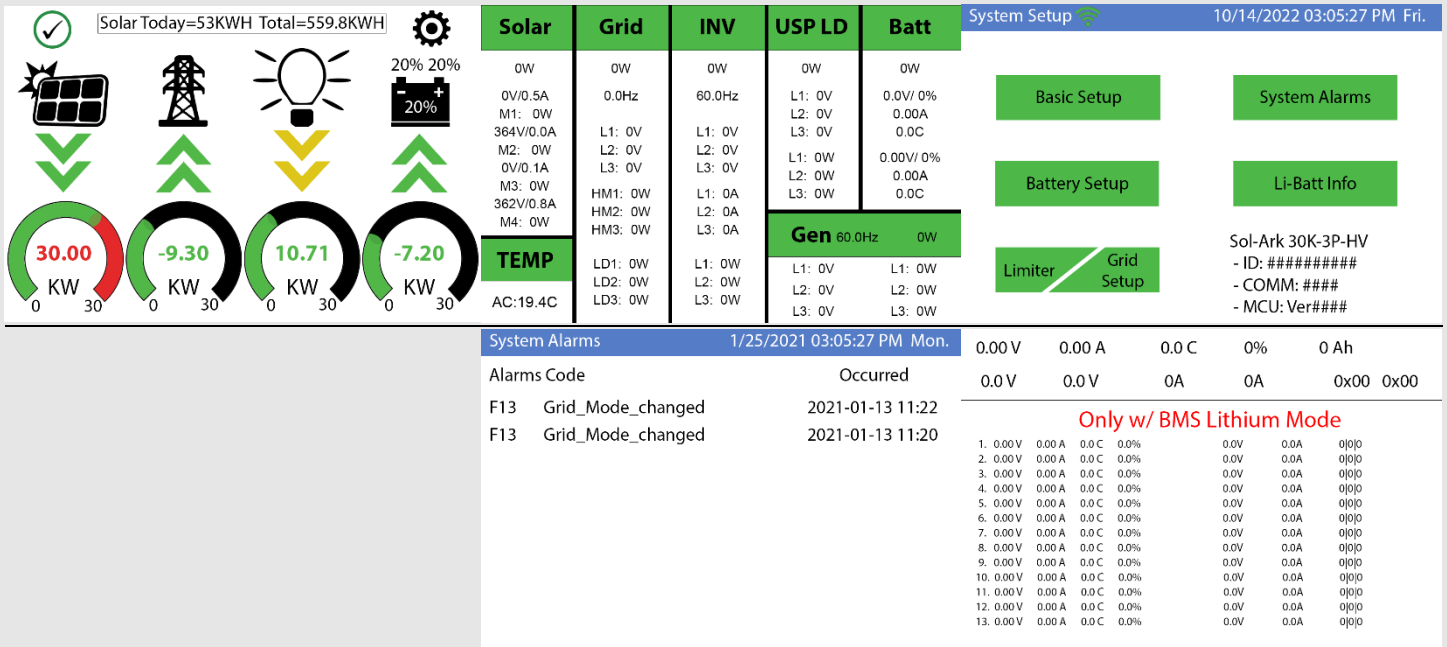
**Green LED** : Connected to Internet and Server

**Flashing Green LED** : Connected to router but not server (usually a VPN or firewall issue)



# GUI Screens

## Main Menus



## Basic Setup

**Basic Setup**

Display Time Advanced Factory Reset Parallel

Brightness  ☒ Beep

Auto Dim ☒ 600S

CANCEL OK

**Basic Setup**

Display Time Advanced Factory Reset Parallel

☒ AM/PM Year 2021 Month 10 Day 26

☒ Time Sync PM Hour 03 Minute 04 Second 15

☒ Seasons Start M-D Season1 1 - 1 Season2 4 - 1 Season3 8 - 1

End M-D 4 - 1 8 - 1 12 - 1

CANCEL OK

**Basic Setup**

Display Time Advanced Factory Reset Parallel

☒ Solar Arc Fault ON ☐ Clear Arc\_Fault

Gen Limit Power 30000W

Load Limit Power 30000W

☐ Grid peak-shaving Power 30000W

☐ Auto detect Home Limit Sensors CT ratio 2000

UPS Time 0ms

CANCEL OK

**Basic Setup**

Display Time Advanced Factory Reset Parallel

☐ Factory Reset ☐ System selfcheck

☐ Lock out all changes ☐ Test Mode

☐ Lock Grid Charging & Limited

CANCEL OK

**Basic Setup**

Display Time Advanced Factory Reset Parallel

☐ Parallel ☒ Master ☐ Slave Modbus SN 00

☐ Meter > Grid ☐ Meter > Load

Meter Select No Meter Meter Select No Meter

CANCEL OK



# Battery 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

☒

Activate Battery1

☐

Activate Battery2

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

51.0V

80%

Smart Load ON Batt

54.0V

90%

CANCEL

OK

# Limiter / Grid Setup

Grid Param

Limiter

Other

☐

Grid Sell

30000

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

☒

GEN connect to Grid Input

Zero Export Power

10W

☒

Batt First

☐

Load First

CANCEL

OK

Grid Param

Grid Selection

Connect

IP

F(W)

V(W)/V(Q)

P(Q)/P(F)

Grid Mode

3/3

Grid Reconnect Time

300s

Power Factor

1.000

Grid Level

LN:277V/LL:480V(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

Grid Vol High

292.0V

Grid Vol Low

252.0V

Grid Hz High

61.3Hz

Grid Hz Low

57.7Hz

Reconnect Ramp rate

36s

Normal connect

Grid Vol High

294.0V

Grid Vol Low

250.0V

Grid Hz High

61.5Hz

Grid Hz Low

57.5Hz

Normal Ramp rate

60s

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)

132.0V

HV3

294.0V

4.80s

HV2

294.0V

4.80s

HV1

294.0V

4.80s

LV1

250.0V

2.50s

LV2

250.0V

2.50s

LV3

250.0V

2.50s

HF3

61.50Hz

0.08s

HF2

61.50Hz

0.08s

HF1

61.50Hz

0.08s

LF1

57.50Hz

0.08s

LF2

57.50Hz

0.08s

LF3

57.50Hz

0.08s

CANCEL

OK

Grid Param

Grid selection

Connect

IP

F(W)

V(W)/V(Q)

P(Q)/P(F)

Over frequency

Start freq F

50.20Hz

Drop F

40%P/Hz

Stop freq F

51.50Hz

Start delay

0.00s

Stop delay

0.00s

Under frequency

Start freq F>

49.80Hz

Drop F>

40%PE/Hz

Stop freq F>

49.80Hz

Start delay F>

0.00s

Stop delay F>

0.00s

CANCEL

OK

Grid Param

Grid selection

Connect

IP

F(W)

V(W)/V(Q)

P(Q)/P(F)

V(W)

V(Q)

V1:109.0%

P1:100%

V2:110.0%

P2:20%

V3:111.0%

P3:20%

V4:112.0%

P4:20%

Lin:20.0%

Lout:5.0%

V1:94.0%

Q1:43%

V2:97.0%

Q2:0%

V3:105.0%

Q3:0%

V4:108.0%

Q4:-43%

CANCEL

OK

Grid Param

Grid selection

Connect

IP

F(W)

V(W)/V(Q)

P(Q)/P(F)

P(Q)

P(F)

P1:655%

Q1:0%

P2:655%

Q2:0%

P3:655%

Q3:0%

P4:655%

Q4:0%

Lin:655.3%

Lout:655.3%

V1:655%

F1:0.000

V2:655%

F2:0.000

V3:655%

F3:0.000

V4:655%

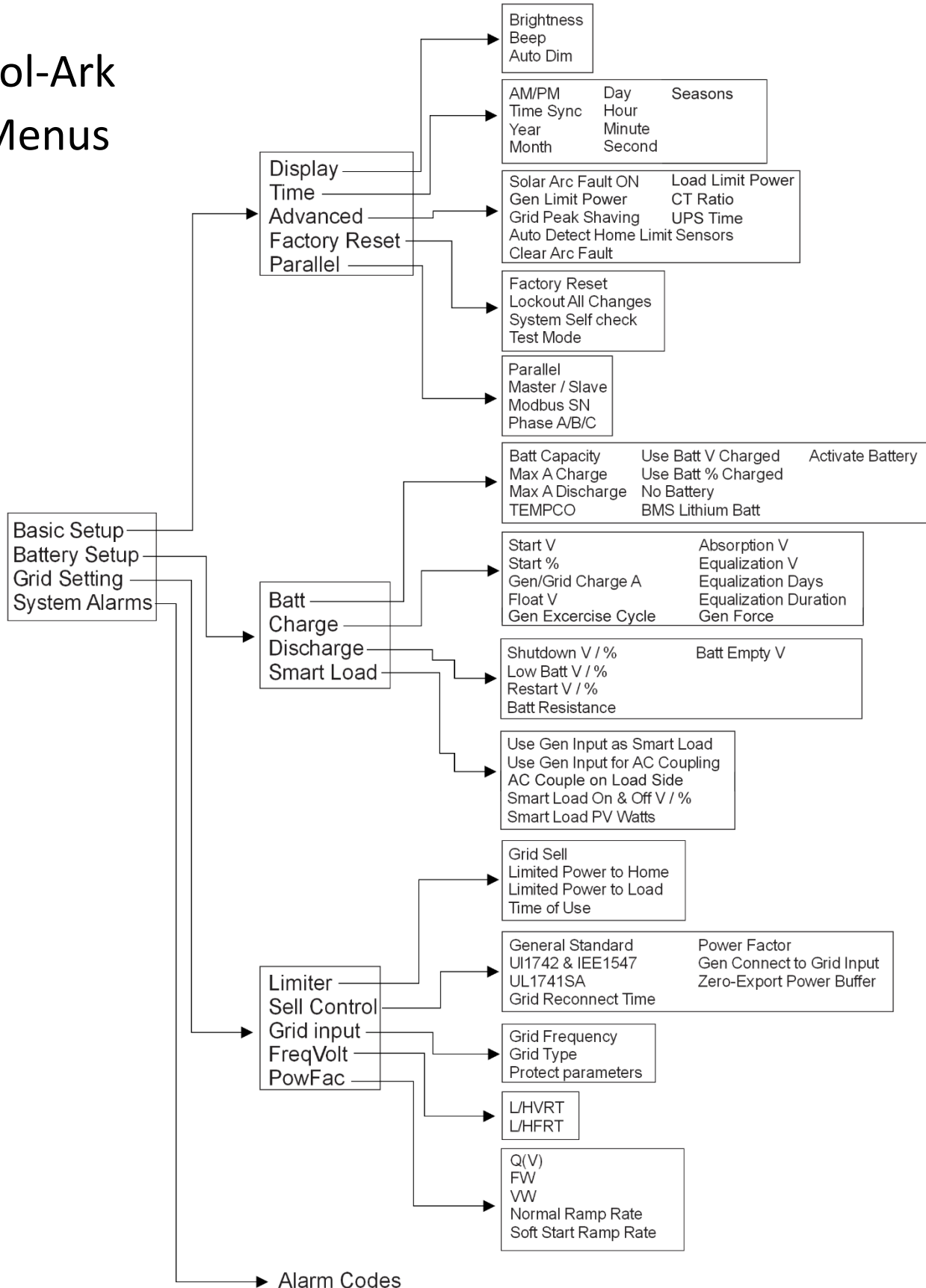
F4:0.000

CANCEL

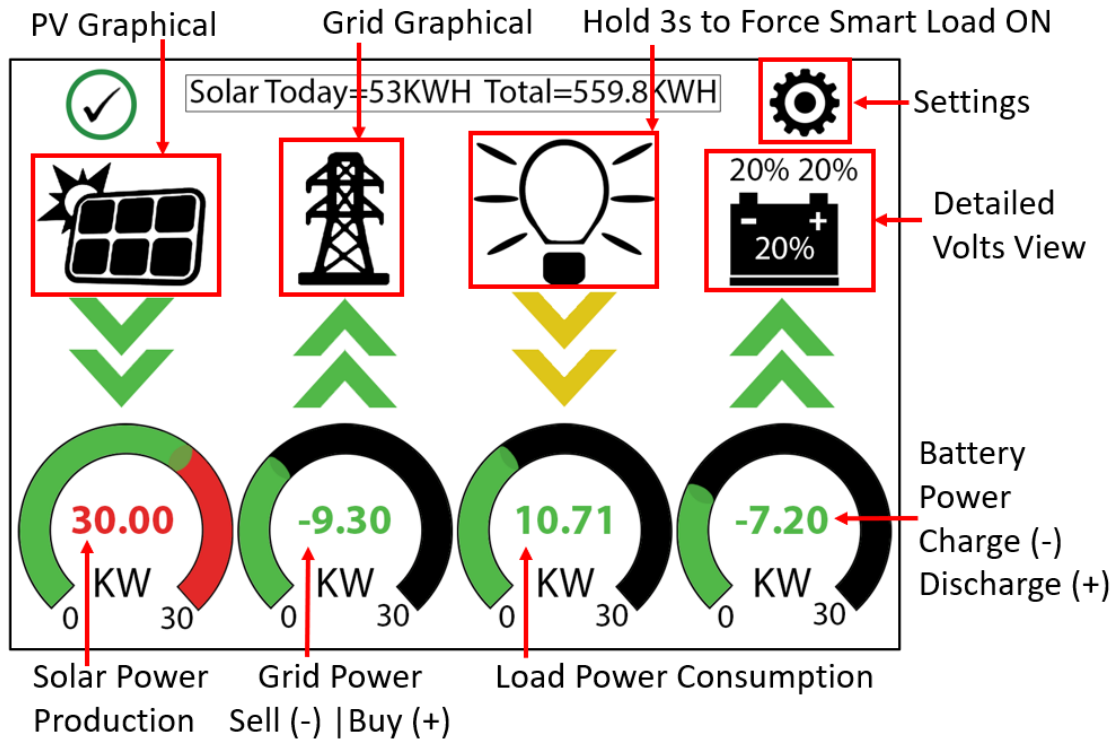
OK

# Programming Guide

## Sol-Ark Menus



## Main Screens (Touchscreen)



### Detailed Volts View (Press Batt Icon)

- ☒ Top row = Total power for the column
- ☒ Solar Column: Displays voltage and amps per MPPT
  - ⚠ (note: PV Voltage not to exceed 1000V)
- ☒ Grid Column
  - If selling to the Grid, Grid Watts = negative
  - If buying from the Grid, Grid Watts = **positive**
  - HM = power detected by the external current sensors on the entire home L1 / L2 / L3
  - LD = power detected using internal sensors
- ☒ INV Column: Voltage, Amps, and Watts for L1, L2, L3
- ☒ UPS LD Column: Load Voltage and Watts for L1, L2, L3
- ☒ Batt Column: Voltage/Percentage, Amps, and Temp for Batt 1 and Batt 2
- ☒ GEN Column: Generator or AC Coupled Input Volts and watts for L1, L2, L3
- ☒ AC Temp = Temperature of AC conversion electronics
  - Batt → AC
  - PV → AC

| Solar       | Grid    | INV    | UPS LD               | Batt      |
|-------------|---------|--------|----------------------|-----------|
| 0W          | 0W      | 0W     | 0W                   | 0W        |
| 0V/0.5A     | 0.0Hz   | 60.0Hz | L1: 0V               | 0.0V/ 0%  |
| M1: 0W      | L1: 0V  | L1: 0V | L2: 0V               | 0.00A     |
| 364V/0.0A   | L2: 0V  | L2: 0V | L3: 0V               | 0.0C      |
| M2: 0W      | L3: 0V  | L3: 0V | L1: 0W               | 0.00V/ 0% |
| 0V/0.1A     | HM1: 0W | L1: 0A | L2: 0W               | 0.00A     |
| M3: 0W      | HM2: 0W | L2: 0A | L3: 0W               | 0.0C      |
| 362V/0.8A   | HM3: 0W | L3: 0A | <b>Gen</b> 60.0Hz 0W |           |
| M4: 0W      | LD1: 0W | L1: 0W | L1: 0V               | L1: 0W    |
| <b>TEMP</b> | LD2: 0W | L2: 0W | L2: 0V               | L2: 0W    |
| AC:19.4C    | LD3: 0W | L3: 0W | L3: 0V               | L3: 0W    |

### PV Solar Graphical View

- A. Displays power production over time for the PV array
- B. Use up/down buttons to navigate between days
- C. Month view, Year view, and Total view

### Grid Graphical View

- A. Displays power drawn from and sold to the grid over time



Note: Reversed Grid Watt values may indicate incorrectly installed current sensors (reversed polarity). See Page 38.

- B. Bars above the line indicate power bought from the grid
- C. Bars below the line indicate power sold back to the grid
- D. Line Frequency: useful when using off-grid when the generator is connected to grid input to verify the generator output frequency

This view can help determine when the peak power is used in the Home and for Time of Use programming

## System Setup Menu

- A. ID = LCD serial #. Sol-Ark Technical Support uses the Wi-Fi serial #.
- B. COMM = LCD software version
- C. MCU = Inverter software version

## Basic Setup

### Display

- A. Brightness adjustment
- B. Auto dim (must be enabled for the warranty to cover the LCD screen)
- C. Enable/disable BEEP

### Time

- A. Set the date and time for the system
- B. Set up to three (3) seasons for Time of Use to follow

### Load Limit Power

Set the total AC Output of the Sol-Ark; curtails excess power. The default value is always the Maximum output of the Inverter.

### Grid Peak Shaving

Set the Sol-Ark's threshold to begin contributing power to keep the power drawn from the grid below the threshold.

### CT Ratio

Set the CT ratio; the Default value is 6000. Please **DO NOT** change this value unless you speak with support; 3<sup>rd</sup> party CT sensors require our permission not to void the warranty.

### UPS Time

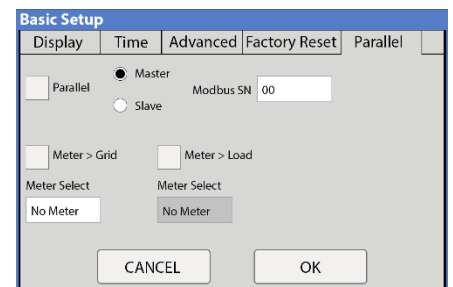
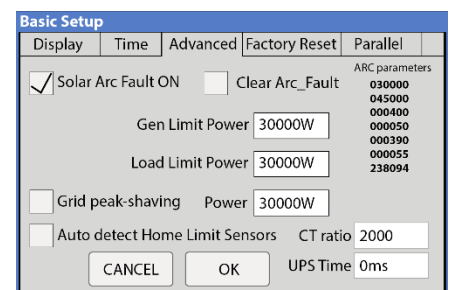
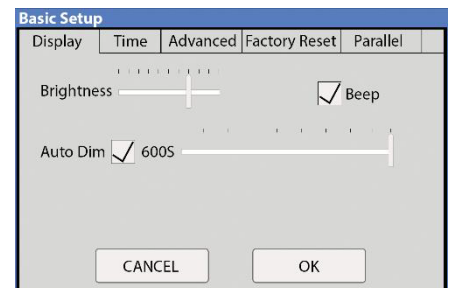
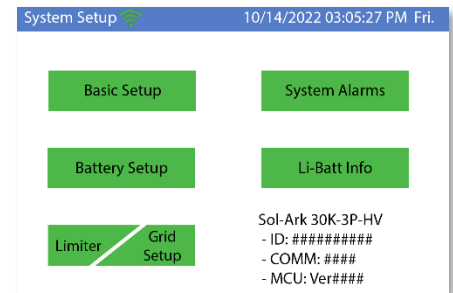
Set the UPS transfer time to the chosen value; any value below 5ms will default to a 5ms transfer time.

### Parallel (connecting multiple systems) \*

Please contact Sol-Ark technical support for parallel operation details.

## System Alarms

- A. Lists all recorded System alarms in chronological order
- B. Use this for Solar Engineering to help with troubleshooting



## Battery Setup

### Batt



Series = add Voltage | Parallel = add Amp-Hours

**Batt Capacity:** Enter the battery bank's size connected to the system

**Max A Charge :** set the max charge rate for the batteries (This also sets the PV → Battery charge rate)

**Max A Discharge:** set the max discharge for the battery bank (In off-grid mode, the battery bank will discharge 120% of this value for 10 seconds before the Inverter shuts down to prevent battery damage)

**Parallel bat1&bat2:** Select this to parallel the two battery terminals of the Sol-Ark 60K-3P-480V

**BMS Lithium Batt:** Closed-Loop Communications and ensure correct Serial Number (01,02, etc.) for the battery

**Use Batt V Charged :** Displays battery charge and other system values in terms of voltage

**Activate Battery 1&2:** KEEP ON. This feature will help recover an overly-discharged battery by slowly charging from the solar array or grid

### Charge

**Float V:** Set value according to the manual of the batteries connected to the system

**Gen Charge :** uses the gen input of the system to charge the battery bank from an attached three-phase generator

**Start V :** Set the voltage at which the system will AutoStart a connected 3P generator to charge the battery bank

**Start percentage :** Set the SOC% at which the system will AutoStart a corresponding 3P generator to charge the battery bank

**A :** Charge rate from the attached Generator in Amps (DC); **size this value according to the generator size**

**Grid Charge :** use the Grid input to charge batteries from the grid or a large 480V<sub>AC</sub> three-phase generator only

**Gen Force :** This is the test function for Gen AutoStart. Enable to trigger two-wire start (pins 1,2 on sensor pinboard 2) and turn on the generator. Disable to disengage the two-wire start and turn off the generator. If grid power is available, the generator will not provide power during this test.

## Discharge

**Shutdown V** : battery voltage at which the Inverter will shut down (battery symbol on the home screen will turn red)

**Low Batt** : Low battery voltage (battery symbol on the home screen will turn yellow)

**Restart**: battery voltage at which AC output will resume after a shutdown

**Batt Empty V** : sets reserve capacity and improves % SOC calculations. It is not Batt\_L adjusted

## Smart Load (Gen Terminal )

- This mode utilizes the Gen input connection as an **OUTPUT** that only receives power when the battery exceeds a user-programmable threshold
- Enable "Use gen input as load output" to power high-power loads such as a water heater, irrigation pump, AC unit, pool pump, etc. We call these luxury loads

### Smart Load OFF Batt

Battery voltage at which the Gen Load will stop receiving power

### Smart Load ON Batt

Battery voltage at which the Gen Load will start receiving power



Using Gen load for a water heater, we recommend that only one leg (120V) be connected to the bottom element. This significantly reduces the power consumption of the water heater while retaining core functionality (it will heat water, only slower).



Per NEC, the Gen Load is limited to 57.6kW [160A @120V x 3] (Do not exceed!)

### Solar Watts is for on Grid

- The system waits to turn on the smart load until enough PV power is produced (when on the grid)

### AC Coupling Settings ("For AC Coupled Input to Gen")

- To use the Gen input terminal as an AC coupled input, check the "For AC Coupled Input to Gen" box (this feature will also work with three-phase "Grid-Tied" Inverters)
- In this mode, the meaning of "Smart Load OFF Batt" and "Smart Load ON Batt" change

**Smart Load OFF Batt** : The SOC % or V at which the AC coupled inverter(s) are shut down when in off-grid mode



90% recommended

**Smart Load ON Batt** : The SOC % or V at which the AC coupled inverter(s) are turned on when in off-grid mode



60%-80% recommended

When On-Grid, the AC-coupled Inverter will always be on, selling any extra power back to the grid

**Ensure you can (are allowed) sell power to your utility provider when using AC Coupled PV Arrays on-grid**

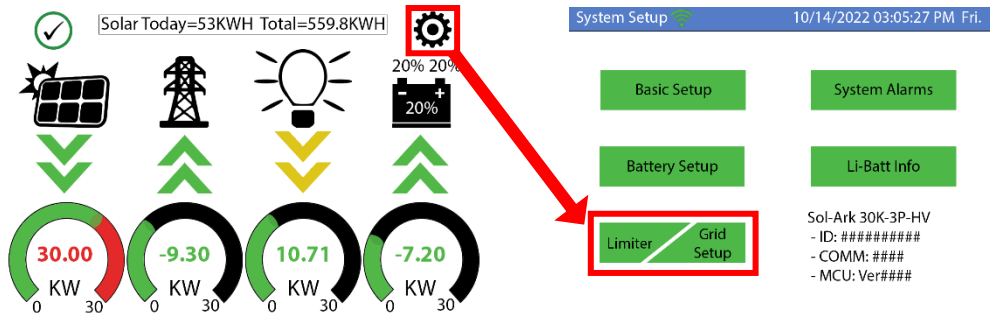
To use the LOAD terminal for AC coupling grid-tied Inverter (s)

- You must select "AC couple on load side"
- The Gen terminals is not used (even though the GEN terminals are not physically being used for this mode, AC coupling on the LOAD side prevents the use of the GEN terminals)
- Wire as shown in the preceding example diagram labeled "Load side AC coupling example"



Some load-side AC coupling installations will require a line-side tap instead of landing on a service panel.

## Limiter Tab / Grid Setup



## Limiter Tab / Other Tab

**Grid Sell** maximum watts sold to the grid

**Limited Power To Home** : Limits power produced by the system to match the demand of the Home (CTs Required, see pg. 41)

**Limited Power To Load** : Limits power produced by the system to match the demand of connected loads

**Time Of Use** : Use the batteries while the grid is ON

**Time**: When the System will sell batt/PV power to the Grid or Home

**Power(W)**: Max watts called from the battery only at each time slot

**Batt**: The battery voltage or % at which the system will limit selling to the Grid or Home from the battery. The system will drain the battery until reaching that percent/voltage.

**Charge**: Enables grid/gen charging up to the voltage or percentage specified on the line during a selected period. PV will always charge 100%. If using a generator, select the charge box for the times that may need the generator, and the Gen will charge the battery to the voltage of the percentage specified in the "Batt" column.

**Sell**: The sell check box allows us to discharge the battery for grid sell-back for that time slot.

**GEN connect to Grid Input**: Enable if Generator connects to the AC Grid terminals

**Zero Export Power** : Power that is always drawn from the grid

**Batt First vs. Load First**: Internal Use, Select "Batt First"

| Grid Param                          |                       |       |         |          |      |                          |                          |
|-------------------------------------|-----------------------|-------|---------|----------|------|--------------------------|--------------------------|
| Limiter                             | Other                 |       | Time    | Power(W) | Batt | Charge                   | Sell                     |
| <input type="checkbox"/>            | Grid Sell             | 30000 | 01:00AM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | Limited Power to Home |       | 05:00AM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | Limited Power to Load |       | 09:00AM | 2000     | 100% | <input type="checkbox"/> | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | Time of Use           | Setup | 01:00PM | 2000     | 100% | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            |                       |       | 05:00PM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            |                       |       | 09:00PM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| CANCEL                              |                       | OK    |         |          |      |                          |                          |

| Grid Param                          |                           |
|-------------------------------------|---------------------------|
| Limiter                             | Other                     |
| <input checked="" type="checkbox"/> | GEN connect to Grid Input |
| Zero Export Power                   | 10W                       |
| <input checked="" type="checkbox"/> | Batt First                |
| <input type="checkbox"/>            | Load First                |
| CANCEL                              |                           |
| OK                                  |                           |



Note: If you need the batteries to never charge from the grid, **uncheck** the "Grid Charge" box under the charge tab of the battery menu. See Charge Tab under Batt Setup



## Selecting Power Mode (Limiter Tab Details)

Sol-Ark 60K-3P-480V will simultaneously use various power sources available to meet the load demand. The following power modes allow the user to determine the power sources available to the Sol-Ark 60K-3P-480V.

### Limited Power to Load / Self Consumption

- A. Sol-Ark will only power loads connected to the load output
- B. It will not produce more power than what the connected loads require
- C. This mode will **NOT** sell back to the Home nor Grid (Grid Terminal)

### Limited Power to Home (Zero -Metering)

Main Menu → System Settings → Grid Setup → Limiter → Limited Power to Home

- A. Pushes power to the whole Home **WITHOUT** selling back any excess to the grid (no net metering agreement required)
- B. This mode requires the use of limiter sensors (see pg. 41)
- C. Power source priority is the same as Grid Sell Back

### Grid Sell

Main Menu → System Settings → Grid Setup → Limiter → Grid Sell

- A. This mode allows Sol-Ark 60K-3P-480V to **SELL BACK** any excess power produced by the solar panels to the grid.

#### Power source priority:

1. Solar Panels | 2. Grid | 3. Generator (Manual) | 4. Batteries (until reaching programmable % discharge)

### Time Of Use (using batteries during peak power times)

Main Menu → System Settings → Grid Setup → Limiter → Time of Use

- A. Use the batteries to reduce power consumption from the grid during a user-programable peak pricing time

#### Power source priority:

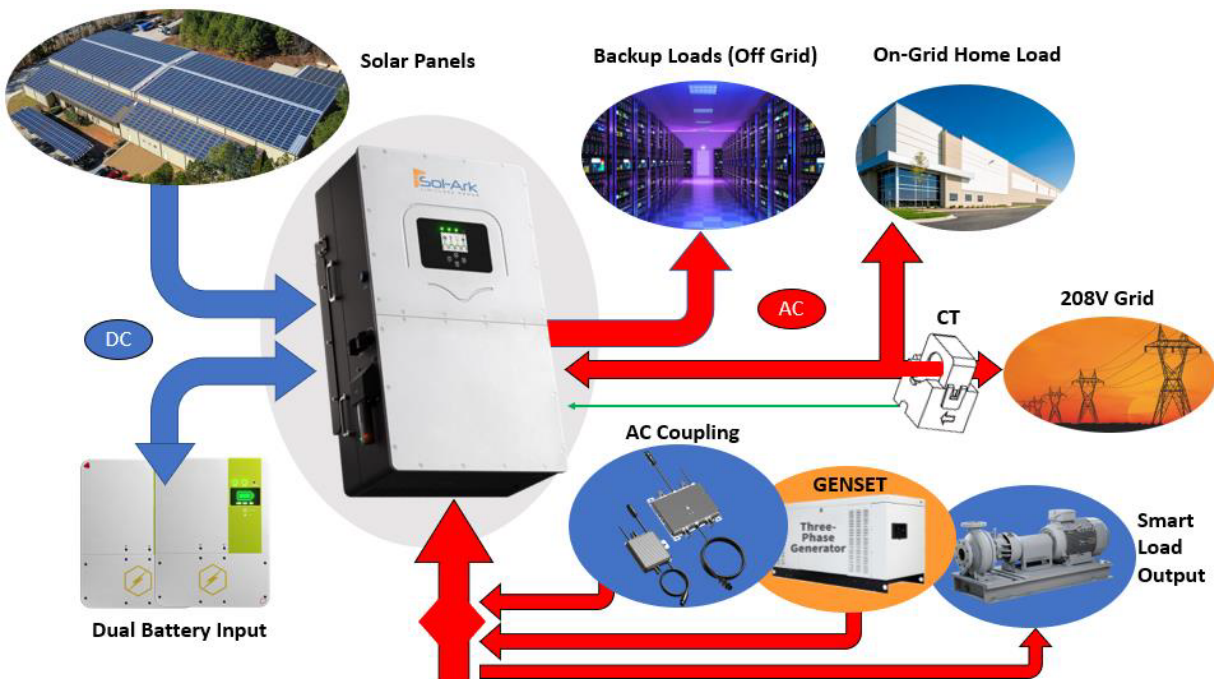
1. Solar Panels | 2. Batteries (programmable % discharge) | 3. Grid (control when Grid charges) | 4. Generator

| Grid Param                          |                       |         |          |      |                          |                          |
|-------------------------------------|-----------------------|---------|----------|------|--------------------------|--------------------------|
| Limiter                             |                       | Other   |          |      |                          |                          |
|                                     |                       | Time    | Power(W) | Batt | Charge                   | Sell                     |
| <input type="checkbox"/>            | Grid Sell             | 30000   | 01:00AM  | 2000 | 50%                      | <input type="checkbox"/> |
| <input type="checkbox"/>            | Limited Power to Home | 05:00AM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | Limited Power to Load | 09:00AM | 2000     | 100% | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | Time of Use           | 01:00PM | 2000     | 100% | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | Time of Use           | 05:00PM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | Time of Use           | 09:00PM | 2000     | 50%  | <input type="checkbox"/> | <input type="checkbox"/> |

CANCEL OK

**Simultaneously select Grid Sell and Limited Power to Home**

Load (light bulb) icon on the home screen now includes both the load output power and the home's consumption.



## Grid Selection Tab

**General Standard** : uses Protect Parameters in table

**UL 1741 & IEEE1547** : Enables sell compliant functionality

**UL1741SA** : Enables wider Freq, Voltage, and Power Factor

**Grid Frequency** : Select the Grid Frequency connection

**Grid Reconnect Time** : Time to reconnect to the grid after grid loss

**Grid Level** : Several voltage levels for the inverter output voltage when in off-grid mode. LN:277VAC LL:480VAC



Each time the input/output voltage changes, the inverter(s) require a power cycle

## Connect Tab

**Reconnect** : The voltage and frequency range the Inverter uses to reconnect to the grid after a grid loss

**Reconnect Ramp Rate** : The reconnection power ramp

**Normal Connect** : The voltage and frequency range the Inverter uses when connecting to the grid for the FIRST time

**Normal Ramp Rate** : The startup power ramp



We recommend widening the frequency range when connecting a generator to the grid terminal (55-65Hz)

## IP Tab

**HV1/HV2/HV3** : Overvoltage protection point  
• 4.8s trip time

**LV1/ LV2/ LV3** : Undervoltage protection point  
• 2.5s trip time

**HF1/HF2/HF3** : Over frequency protection point  
• 4.8s trip time

**LF1/LF2/LF3** : Under frequency protection point  
• 2.5s trip time

## F(W) Tab

The Sol-Ark 60K-3P-480V can adjust inverter output power according to the grid frequency

**Droop F** : The percentage of nominal power per Hertz (Hz)

**Example:**

**Start freq F** > 50.2Hz | **Stop freq F** < 51.5Hz

**Droop F** = 40%P/HZ

If the grid frequency reaches 50.2Hz, the Inverter will decrease its active power at Droop F of 40%. When the grid frequency is less than 51.5Hz, the Inverter will stop decreasing output power

Please follow the local grid code

## V(W) / V(Q) Tab

These functions are used to adjust the Inverter's output power (both active power and reactive power) when there are changes in grid voltage

**V(W)** : Will be used to adjust the Inverter's active power according to the set grid voltage

**V(Q)** : Will be used to adjust the Inverter's reactive power according to the set grid voltage

**Example:**

**V2 = 110.0% | P2 = 20%** When the grid voltage reaches 110% of the rated grid voltage, the Inverter will reduce its output power (active output power) to 20% rated power

**Example:**

**V1 = 93% | Q1 = 43%** When the grid voltage reaches 93% of the rated grid voltage, the Inverter will output 43% reactive output power

## P(Q) / P(F) Tab

**P(Q)** : Will be used to adjust the Inverter's reactive power according to the set active power

**P(F)** : Will be used to adjust the Inverter's PF (power factor) according to the set active power

Please follow the local grid code

**Grid Param**

| Grid selection | Connect | IP | F(W)            | V(W)/V(Q) | P(Q)/P(F)     |
|----------------|---------|----|-----------------|-----------|---------------|
|                |         |    | Over frequency  | Droop F   | 40%P/HZ       |
|                |         |    | Start freq F    | 50.20Hz   | Stop freq F   |
|                |         |    | Start delay     | 0.00s     | Stop delay    |
|                |         |    | Under frequency | Droop F>  | 40%PE/HZ      |
|                |         |    | Start freq F>   | 49.80Hz   | Stop freq F>  |
|                |         |    | Start delay F>  | 0.00s     | Stop delay F> |
|                |         |    | CANCEL OK       |           |               |

**Grid Param**

| Grid selection | Connect | IP | F(W)      | V(W)/V(Q) | P(Q)/P(F)  |
|----------------|---------|----|-----------|-----------|------------|
|                |         |    | V(W) V(Q) |           |            |
|                |         |    | V1:109.0% | P1:100%   | L.in:20.0% |
|                |         |    | V2:110.0% | P2: 20%   | L.out:5.0% |
|                |         |    | V3:111.0% | P3: 20%   | V1:94.0%   |
|                |         |    | V4:112.0% | P4: 20%   | Q1:43%     |
|                |         |    |           |           | V2:97.0%   |
|                |         |    |           |           | Q2: 0%     |
|                |         |    |           |           | V3:105.0%  |
|                |         |    |           |           | Q3: 0%     |
|                |         |    |           |           | V4:108.0%  |
|                |         |    |           |           | Q4: -43%   |
|                |         |    | CANCEL OK |           |            |

**Grid Param**

| Grid selection | Connect | IP | F(W)      | V(W)/V(Q) | P(Q)/P(F)    |
|----------------|---------|----|-----------|-----------|--------------|
|                |         |    | P(Q) P(F) |           |              |
|                |         |    | P1:655%   | Q1: 0%    | L.in:655.3%  |
|                |         |    | P2:655%   | Q2: 0%    | L.out:655.3% |
|                |         |    | P3:655%   | Q3: 0%    | V1:655%      |
|                |         |    | P4:655%   | Q4: 0%    | F1:0.000     |
|                |         |    |           |           | V2:655%      |
|                |         |    |           |           | F2:0.000     |
|                |         |    |           |           | V3:655%      |
|                |         |    |           |           | F3:0.000     |
|                |         |    |           |           | V4:655%      |
|                |         |    |           |           | F4:0.000     |
|                |         |    | CANCEL OK |           |              |

# Limiter Sensors (CT Sensors)

CT Sensors enable Limited Power to Home mode (meter zero) and Peak Shaving mode. CT sensors also allow the system to calculate loads powered upstream of the Grid Input in the "home." We **recommend** CT installation if using multiple inverters or a critical loads panel.

## CT Sensor Install Location

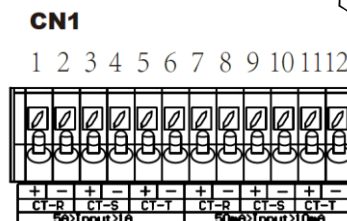
- ☒ Install the CT sensors on L1 and L2, and L3 upstream of everything in the home except for a Generator Transfer Switch, Knife Blade Disconnect, or Bypass Transfer Switch (upstream of Main Service Panel and Line-Side Tap) – see Diagrams Section Pgs. 8-17

## CT Sensor Size

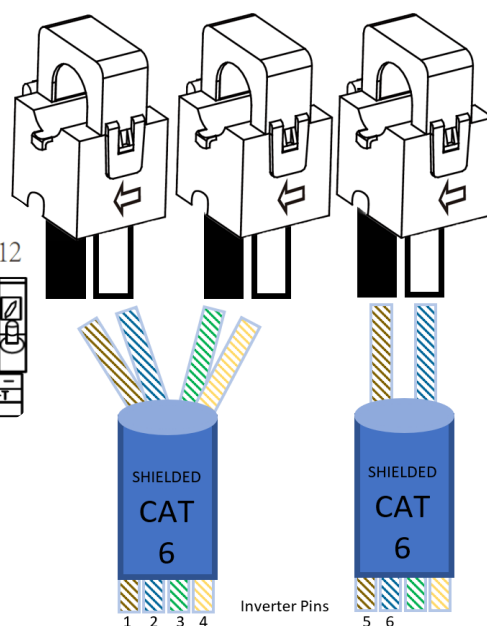
- ☒ Each Inverter includes three (3) x 1 3/8" CT sensors (fits up to 4/0 AWG service wires and busbars)
- ☒ We have 2" (> 4/0 AWG or Metal Busbars) sensors available for purchase if needed.
- ☒ Dimensions refer only to CT sensor hole size; contact Sales at (972) 575-8875 Ext 1 to purchase larger sensors

## CT Sensor Wiring

- ☒ Wire CT sensor on L1 to pins 1 (white +) and 2 (black -)
- ☒ Wire CT sensor on L2 to pins 3 (white +) and 4 (black -)
- ☒ Wire CT sensor on L3 to pins 5 (white +) and 6 (black -)
- ☒ Twist the black and white wires for each sensor along the length of the run
- ☒ If needed, you may extend the range using Shielded Cat 6 (use two twisted pair wires per sensor)
- ☒ Use two shielded Cat 6 cables for sensor extensions



CT Sensor Extension Example



## CT Sensor Direction

- ☒ The arrow embossed on the CT sensor housing helps determine the direction
- ☒ Install CT sensors with the arrow pointing towards the Inverter

## Peak Shaving Mode

- ☒ Grid Peak Shaving is available with the CT sensors in the location described above and the correct arrow direction

## CT Ratio

Set the CT ratio; the default value is 2000/1. **DO NOT** change this value unless you speak with technical support; 3<sup>rd</sup> Party CT sensors require our permission not to void the warranty.

## Parallel 1277V<sub>AC</sub> / 480 V<sub>AC</sub> Three -Phase Note \*

**Contact Sol-Ark , BEFORE designing / installing parallel systems, for operation details.**

## Limiter Sensor Automatic Setup

**Requires Batteries and AC coupled panels must be off while detecting.**

**If you do not have batteries: verify CT sensor placement manually.**

- Install limiter sensors as previously described (shown in all diagrams). We require a battery and grid connection before starting auto-setup.
- Navigate to the "Advanced" Tab of the Basic Setup screen (follow the directions below to get there)

- Fig. C**



Sensor Polarity is wrong (White = + | BLK = -)



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## Off-Grid Install Tips

Sol-Ark 60K-3P-480V will automatically operate in Off-Grid Mode without the grid (under the same power priority as TOU)

- Limiter Sensors are not required for completely Off-Grid installs unless you use Grid Peak Shaving with a Gen connected to the Grid input terminal
- The Grid input Terminal Block on the Sol-Ark should be used as the Generator input (up to 54kW generators) so that you may maintain Smart Load output capability when off-grid. Therefore, you will use Grid Charge (default) in the Battery Setup/Charge menu to enable the generator's ability to charge the batteries. Enable "GEN connect to Grid Input," as shown on the right
- When off-grid, there is no need for a transfer switch: connect the load output of the Sol-Ark to the whole home/building
- Do not use Grid Sell or Limited Power to Home Modes Off-Grid. Only Limited power to load (default)
- The Auto Generator start functions as a 2-wire switch (closes the circuit when needing charging)
  - Auto Gen-start will be triggered when the battery voltage or percent reaches the level programmed in the battery setup menu. Then, the generator will continue to charge the batteries until they are about 95% full (this percentage is not programmable) before turning the generator off
- We recommend changing the "Grid Reconnect Time" under the Grid Selection tab of the grid setup menu to 30 seconds; otherwise, the Sol-Ark will not charge from the generator until it has been on for at least 5 minutes per the default value of 300 seconds
- Under setup for Limiter: Other, select "GEN connect to Grid Input." And General Standard in the Grid Selection tab. Then, ensure to widen the input frequency range to 55-65Hz to work with any frequency generator
- If you want to use a wind turbine with the Sol-Ark 30K-3P-208V, the turbine must have a 400V charge controller with a dump load to prevent overcharging the batteries. Connect the charge controller on the turbine to the battery bank the Sol-Ark uses, and the turbine will help charge the batteries
- Don't forget to set the Battery capacity and reasonable charge/discharge rates

## Grid-Tie / No Battery Install Tips

- Under Battery setup, select no Battery & disable Activate Battery (or the system will beep)
- Note: a whole system power cycle is required when changing the battery to no battery settings
- Under the Limiter Setup, select Grid Sell
- Touch the Battery Icon to see the Detailed Volts View to verify your inputs & outputs.

| 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%  |        |      |



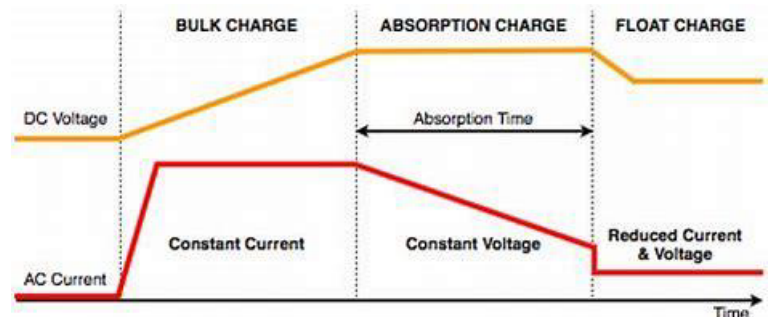
## Battery Charging Information

### 3-Stage Charging

The MPPT has a 3-stage battery charging algorithm for rapid, efficient, and safe battery charging. The figure below shows the stage sequence.

#### Bulk Charge Stage

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



#### Absorption Stage

When the battery has reached the absorption voltage setpoint, we use constant-voltage regulation to maintain battery voltage at the absorption setpoint, preventing heating and excessive battery gassing. The battery is allowed to come to a full state of charge at the absorption voltage setpoint. Absorption lasts until batteries charge at 2% of the programmed Ah size.

#### Float Stage

After the Absorption stage charges the battery fully, the MPPT reduces the battery voltage to the float voltage setpoint. If batts have 100% charge, there can be no more chemical reactions, and all the charging current turns into heat and gassing. The float stage provides a meager rate of maintenance charging while reducing the heating and gassing of a fully charged battery. The purpose of float is to protect the battery from long-term overcharge.

Find our full list of currently supported battery communications

[www.sol-ark.com/battery-partners](http://www.sol-ark.com/battery-partners)



# Troubleshooting Guide

## 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 Light is not on

- ☒ PV voltage must be 200V-850V | It's night

## Panels are not producing

- ☒ Check for proper wiring on all solar panel connections
- ☒ Turn PV disconnect "ON"
- ☒ Check that the PV input voltage is not greater than 850V
- ☒ If the system says PV = 0V, check the PV polarity

## Panels are not producing much power

- ☒ PV Wire Strip Length: 5/8". Your batteries are charged; you can test Grid Sell to verify

## The system does not keep batteries charged

- ☒ Check the charge setting in the Charge Menu

## Auto Gen-Start is not working

- ☒ Check to make sure your generator is compatible with Auto Start
- ☒ Make sure that the Auto Gen Start wire is adequately connected to the Sol-Ark and the generator
- ☒ Ensure the generator connected is a three-phase gen and that its phasing is correct

## Normal LED isn't on

- ☒ Sol-Ark is in pass-through-only mode, with only a Grid connection
- ☒ Sol-Ark is not working correctly (Call us)

## The alarm light 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 home mode)

- ☒ Limiter Sensors are backward, or L1/L2/L3 sensors are swapped or incorrectly wired. Try Auto Learn

## 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 the grid and quickly disconnects

- ☒ With a digital multimeter, verify your Neutral wire connection (should be 0 Vac referenced to GND)
- ☒ Check your Freq is set to 60Hz, and that the 60K-3P measures 277V on L1 / L2 / L3 vs. N
- ☒ If overloading: verify 277/480V grid input and load output wires are not swapped
- ☒ The L1, L2, and L3 are phase-specific. So, you may have to swap Grid L1 / L2 / L3 for 208V applications

## DC Overload Fault

- ☒ Check PV voltage
- ☒ Make sure you have not wired more than two (2) solar strings in parallel

## System is beeping

- ☒ Check the system alarms menu to see which alarm has been triggered. Most alarms will self-reset
- ☒ There is no battery connected. If not using a battery, select "no battery" and disable "activate batt" in Batt menu
  - Turn off the center button, remove AC Grid and PV Power for the 30s (the screen is dead), and then power up to fully reset the system

### Battery cable sparks when connected

- ☒ Put the external battery disconnect in the off position before connecting or disconnecting the batteries

### The battery symbol on the home screen is red

- ☒ The battery is under-Voltage or over-Voltage

### The battery symbol on the home screen is yellow

The battery is low, or the charge/discharge current is close to the programmed limit (which is ok)

### The grid symbol on the home screen is yellow

- ☒ Grid parameters are out of specified range, or the grid is down

### System has restarted

- ☒ It happens if the system is overloaded, the battery voltage is greater than 500V, or the Software update

### Batteries were connected backward

- ☒ It can cause **SEVERE** damage! Check the voltage before turning the system on

### Why is the LCD screen still on when the power button is off?

- ☒ If PV or Grid power, LCD stays on, but the Inverter and loads are off

### The Batt% meter is not reaching 100%

- ☒ The system needs to go through a small discharge/charge cycle first to calibrate the battery

### The generator setup is reading 0Hz

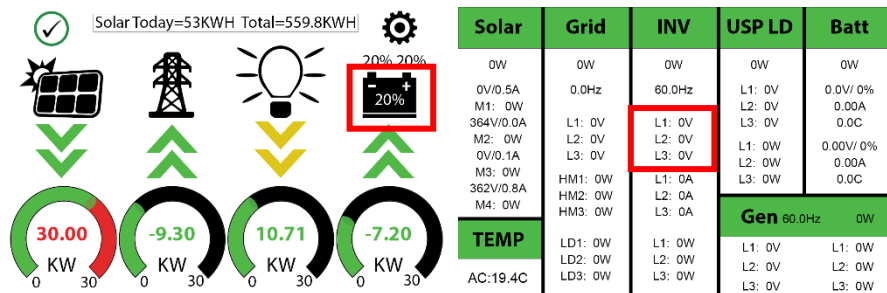
- ☒ Select "General Standard" instead of UL1741. Then widen the frequency range to 55Hz-65Hz

### Color Touchscreen is Frozen

- ☒ Press and hold the escape button [←] for 7-10 seconds

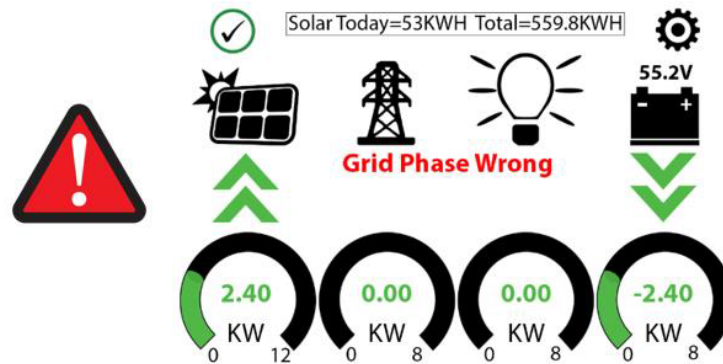
### Constant F18 Faults while powering loads within specification

- ☒ Click the battery icon on the front of the Inverter and look to see what the AC Output voltage is:



- ☒ If the AC Output Voltage is ~120V per leg (this is Wye configuration) and you have more than one Inverter in parallel, contact engineering support for further assistance.

## Troubleshooting Phasing Issues



If the Sol-Ark screen shows **Grid Phase Wrong**, there is a phasing issue with your wiring, and it may cause overload faults (F18, F26, F34) and **WILL CAUSE DAMAGE if left unchecked**.

Single Sol-Ark: To locate the improperly wired phases, measure **L1 to L1 (Top Screws)** between the **Grid** and **Load** terminals; you should see 0V AC. Repeat for **L2 to L2** and **L3 to L3** between the **Grid** and **Load** terminals. Attempt to correct the wiring until you only read 0V AC between **L1 to L1 | L2 to L2 | L3 to L3**

Parallel inverters: measure L1 of the **Grid** Terminal to L1 of another unit's **Grid** terminal L1; you should see 0V AC. If in 480V parallel, measure the lines of the same wire color between sol-arks to see if you read 0V AC.

Make sure to correct both the Grid and Load wiring; they both need to be correct.

If the error persists, you will need to check your AC wiring beyond the Inverter and may also need to verify that the phases are properly labeled coming from your meter.

## Sol-Ark 60K -3P -480V Error Codes

| Fault | Instruction             | Common Cause/Remedy   |
|-------|-------------------------|---|
| F1    | DC Inversed Failure     | If you have parallel systems and turn one system off, you will get this notification. <b>NOT</b> a fault  |
| F8    | GFDI_Relay_Failure      | 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, <b>NOT</b> 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   | Tz_Ac_OverCurr_Fault    | Overloaded the Load Output (reduce loads) or overloaded a generator (reduce Gen Start A see pg. 33). 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; see sensor pinout table   |
| F23   | Tz_GFCI_OC_Fault        | PV Ground fault. Check PV+ or PV- wiring (which must be ungrounded, or damage can occur). Typically caused by pinched PV wire grounding the PV+ or PV-. Grounded PV wire can cause F20, F23, or F26               |
| F24   | DC_Insulation_Fault     | An exposed PV conductor combined with moisture is faulting (can cause F16, F24, F26)  |
| F25   | AC_Active_Batt_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  |
| F30   | AC_MainContactor_Fault  | Contact Sol-Ark.com   |
| F31   | Soft_Start_Failed       | The soft start of a 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    | If one system faults in parallel, this normal fault will register on the other units as they disconnect from grid   |
| F45   | AC_UV_OverVolt_Fault    | Grid under-voltage causes a disconnect. This will self-reset when the grid stabilizes.  |
| F46   | Parallel_Aux_Fault      | Cannot communicate with other parallel systems. Check Master = 1, Slaves are 2-9, ethernet cables are connected   |
| F47   | AC_OverFreq_Fault       | Grid over Frequency (common in power outages) causes a 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.   |
| F55   | DC_VoltHigh_Fault       | PV may be higher than 500V. Battery voltage should not be above 500V (depending on the model).  |
| F56   | DC_VoltLow_Fault        | Batteries are overly-discharged, the Inverter is off-grid and exceeds programmed batt discharge current by 20%, or Lithium BMS has shut down. If battery settings are incorrect, this can also happen.            |
| F58   | BMS communication fault | Sol-Ark is programmed to BMS Lithium Battery Mode but cannot communicate with a BMS   |
| 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 Master   |
| F63   | ARC_Fault               | It can be a poor PV connector/connection. And sometimes a false alarm due to powerful lightning storms.   |
| F64   | Heatsink_HighTemp_Fault | Check the built-in fans are running; ambient temp may be too high. Ensure proper clearance (pg. 6).   |

# Install Verification Checklist

**For the installer to complete AFTER the system is operational. The purpose is to protect the installer, homeowner, and Inverter.**

1. Was a diagram of your installation submitted to Sol-Ark for review? Y/N
  - A. If not, Sol-Ark is not liable for any issues with system performance as a result of the installation, nor is Sol-Ark liable for any changes to installation that are needed to ensure proper system operation.
2. Is the 60K-3P installed where the **LCD is protected from direct sunlight** and has 2" clearance left and right for cooling? Y/N
3. Are all the battery lugs tightened? Y/N
4. 60K-3P should connect to the grid, 60K-3P load ON, Grid disconnect ON, batteries connected, PV input ON and ON button ON.  
With the Inverter running the Backup load's panel and Grid-connected:
  - A. Did any breakers trip? Y/N
  - B. Did the inverter overload? Y/N
5. If you have problems, please take pictures of these and email them to: support@sol-ark.com
  - A. **Battery icon screen, showing detailed voltages (the screen shown below)**
  - B. **Sol-Ark 60K-3P-480V with batteries and a picture of the user wiring area**
6. Load and solar test
  - A. Press the battery icon for the detailed voltages screen.
  - B. Turn on many loads for the Backup circuits. Are solar panels producing enough power to match the load (provided there is enough sun)? Y/N
  - C. Program Full Grid Sell Mode. If there are enough panels and sun or light loads in the entire house, the Grid HM measurements will be negative on L1/L2/L3. Are they negative (solar selling back to the grid)? Y/N
  - D. Program Limited Power to Home mode. The Grid HM sensors will be near zero or slightly positive. Are they both near zero and canceling out the whole home power? Y/N
  - E. You have verified the limit sensors are correctly installed. An auto-learn function corrects any mistakes in CT limiter wiring (provided you have batteries). Program in the correct Grid mode the customer will use.
7. Did you program the correct Ah for the battery bank and max Amps charge/discharge? Y/N
8. Did you program the correct battery charge voltages for your battery type? Y/N
9. **Turn off the AC breaker so 60K-3P operates in an off-grid mode for several minutes.** Are appliances still powered? Y/N
10. **Turn off the PV inputs, running only on batteries for several minutes.** Are appliances still powered? Y/N
11. Turn on the PV inputs and AC Grid inputs.
12. Did you set up the Wi-Fi plug to the customer's internet? Y/N
13. Absolutely important for software updates. Did you help the customer register system on Monitoring App? Y/N
14. Does the customer have a standby generator or a small portable Generator? Y/N
  - A. Did you turn off UL1741/IEEE1547 (use General Standard) and reprogram grid freq. range to 55-65Hz? Y/N
  - B. Did you enable Gen charging and adequately set the charge current if using a small gas generator on Gen inputs? Y/N



This checklist must be filled out and submitted to register your warranty. Please visit:

<https://www.sol-ark.com/register-your-sol-ark/>

\_\_\_\_\_  
Installer Name

\_\_\_\_\_  
Installer Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Customer Name

\_\_\_\_\_  
Customer Signature

\_\_\_\_\_  
Date

# 60K -3P -480 V Limited Warranty

10-Year Limited Warranty for SOL-ARK (Portable Solar LLC) Products. Sol-Ark provides a Ten-year (10) limited Warranty ("Warranty") against defects in materials and workmanship for its Sol-Ark 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 Product purchaser and is transferable only if the Product remains installed in the original use location. Please call Sol-Ark to let us know if you are selling your home and give us the name and contact of the new owner.

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 Portable Solar 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 Portable Solar, LLC

**Contact Us: 1-972-575-8875**

**For Info/Purchasing:**

[sales@sol-ark.com](mailto:sales@sol-ark.com) | ext.1

**For Tech Support/Warranty Claim:**

[support@sol-ark.com](mailto:support@sol-ark.com) | ext.2

**For Administrative Help:**

ext.3

Sol-Ark (Portable Solar LLC) liability for any defective Product, or any Product part, shall be limited to the repair or replacement of the Product, at Portable Solar LLC discretion. Sol-Ark 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 the date of purchase.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO SOL-ARK (PORTABLE SOLAR LLC) PRODUCTS. SOL-ARK EXPRESSLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES OF ITS PRODUCTS. SOL-ARK 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 of 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 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 Portable Solar 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 (e.g. 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](mailto:sales@sol-ark.com) or call us at the number above during regular (M-F) business hours.

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