Savant Power Storage Generator Installation and ATS Integration Guide

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This document serves as a supplemental guide and guides the installer through the process of installing a generator and(or) automatic transfer switch with an existing Savant Power Storage system (PS20 or PS50) configured using the Savant Power Storage App and either RacePoint™ Blueprint or the Savant Power & Light App. Visit the Getting Started - Installer page, or the Savant Power Documentation Portal for Savant Community users to review the relevant documentation listed below before continuing with the steps outlined in this guide:

- Savant Power Storage 20 Installation Guide or Savant Power Storage 50 Installation Guide
- Savant Power Storage App Setup Guide
- Savant Power System Deployment Guide - RacePoint Blueprint
- Savant Power System Deployment Guide - Power & Light App

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1. Before You Begin

- Savant Power Storage (SPS) systems are only compatible with permanently installed, non-separately derived generators as per NEC 250.35(B).
- The generator shall be an AC home standby generator that is hardwired. Portable and/or manual start generators are not supported.
- Savant recommends the generator has provisions for 2-wire start/stop capability. The SPS system uses these control wires to START/STOP the generator based off SPS battery state of charge (SOC).
- Savant supports (2) ways of connecting the generator AC output cables to the SPS unit:
  1. **Generator to GEN**: Connecting directly onto the SPS GEN terminal.
     A. GEN terminal is rated up to 24kW (100A @240V).
  2. **Generator to GRID**: Connecting the load side of an upstream Generator Automatic Transfer Switch (ATS) to the SPS GRID terminal.
     A. Utility / Grid cables are connected to the **Normal** side of the Generator ATS.
     B. Generator cables are connected to the **Emergency** side of the Generator ATS.
     C. Load side cables of the Generator ATS are connected to the GRID terminal of the SPS.
     D. Generator ATS (NC/NO) auxiliary contact monitoring is required for generator to GRID terminal designs only.
        - Via the Savant Director, the SPS system can determine the position of the ATS (Utility vs Generator).
     E. GRID terminal is rated up to 24kW (100A @ 240V).
- SPS system supports DC and AC coupled solar with generator installations. The SPS system is designed to ensure that neither DC nor AC coupled solar is back-fed to a connected generator system while the generator is running.
  1. **DC Coupled Solar:** Connected to the SPS unit via two (2) MPPT's rated 8.5kW / 26A DC, located on each SPS inverter. DC coupled solar is supported for both the Generator to GEN terminal and Generator to GRID terminal designs.
     A. Sell back / export to the grid of any DC coupled solar will be disabled when a SPS system is passing through generator power to charge the batteries and feed the downstream loads.
  2. **AC Coupled Solar:** Connected directly to the SPS system via the GEN terminal. AC Coupled solar is supported **only** with generator to GRID terminal designs when using alongside a generator.
     A. Limit AC coupled solar to 12.5kW / 52A at 240V at the GEN terminal.
     B. The GEN terminal relay on the SPS unit will be physically opened to prevent any back feed. Any AC coupled solar will be shut off while the SPS system is passing generator power through to charge the batteries and feed the downstream loads.
     C. The GEN terminal relay will close to re-introduce AC coupled solar once the generator ATS switches back to the normal position.

NOTE: It is the design engineer and installer's responsibility to ensure that appropriate provisions are in place at the customer's site to allow the SPS system to connect, control, and communicate with the generator. This also includes any additional generator controller programming coordination required by the generator manufacturer. Always check the generator manual or contact the generator manufacturer for the engine start requirements and generator exercising procedures.

It is the design engineer's responsibility to ensure the generator, and any associated Over Current Protection (OCP) devices are appropriately sized to handle charging each battery stack while ensuring the downstream critical loads are also powered.

A 120V/240V line is required from utility to the generator for the battery charger transformer inside the generator.

2. Generator to GEN Terminal Installation

Installation steps for a Generator to GEN Terminal design include physical wiring, configuration with the Savant Power Storage app, and configuration using the Savant Power & Light app or RacePoint Blueprint software.

When off grid, a Generator to GEN Terminal installation allows the batteries of the SPS system to be charged via a generator in the following manner:

1. When an individual battery stack discharges and reaches its generator starting state of charge (determined by the Savant Power Storage app. See section 2.2), the inverter calls on the generator to start during a power outage.

2. Once the generator has warmed up and the SPS unit has qualified the generator signal at the SPS GEN terminal, the generator then starts charging the battery stack while also supplying the downstream house loads.

3. The inverter stops the generator once the battery reaches its generator stopping state of charge parameter (determined by the Savant Power Storage app. See section 2.2).

NOTE: In a Generator to GEN Terminal parallel system design, only one battery stack can be charged at a time. All other battery stacks go into “standby mode” and pass through generator power through the inverter to feed the loads.

⚠ **IMPORTANT! The generator must be sized accordingly to feed all critical loads and charge the batteries at the same time.**

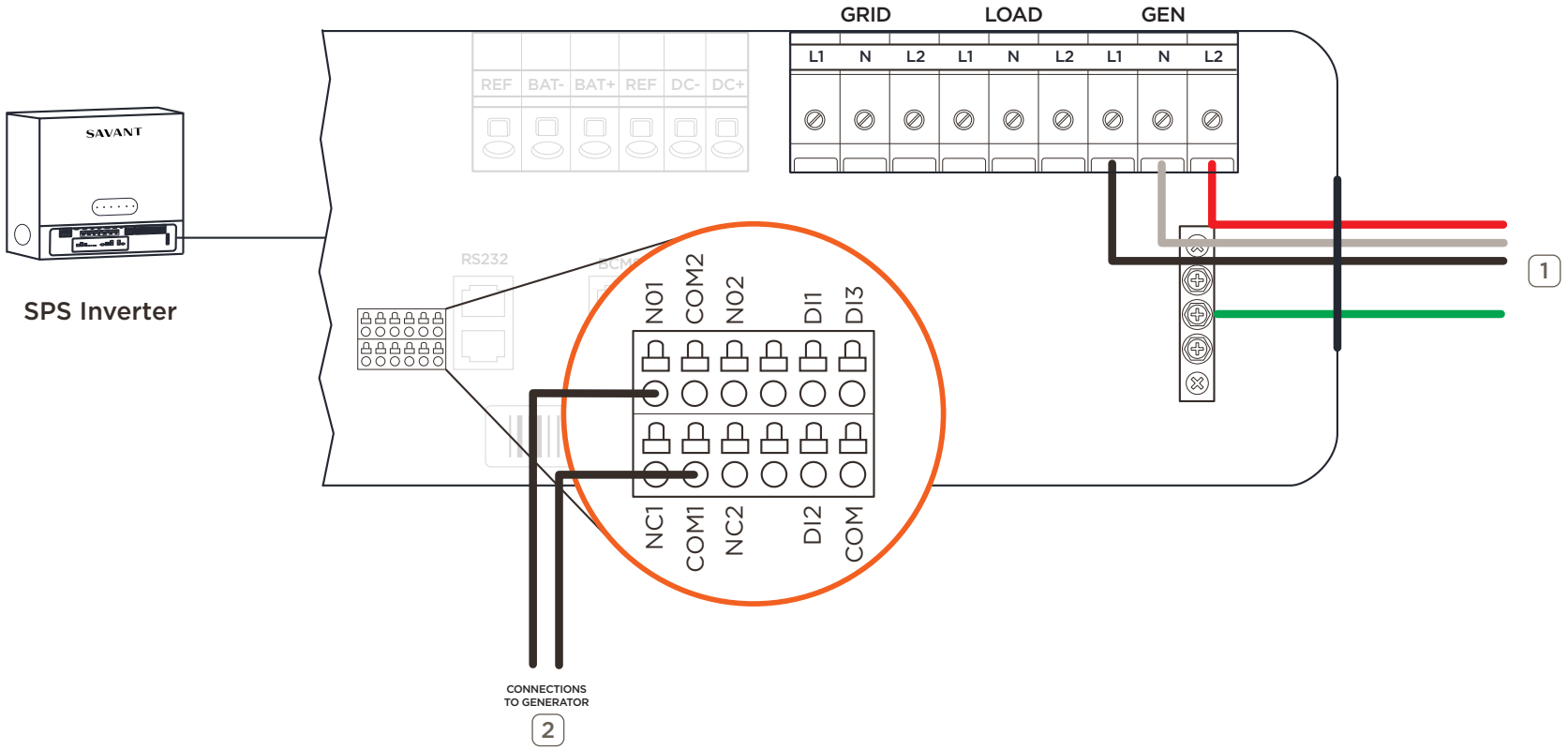
2.1. Physical Installation

Follow the instructions below to install a generator with an existing Savant Power Storage system. See Appendix: Generator to GEN Terminal Wiring Diagram for wiring example.

1. Connect the AC output and ground terminal of the generator into all SPS GEN terminals (L1/L2/N/G). This can be done either directly onto the SPS GEN terminals or through a Generator Combiner Breaker Panel for a parallel SPS configuration. Ensure an OCPD is present upstream of the each SPS GEN terminal, properly sized for the generator with a maximum rating of 100A/2P.

2. Connect generator 2-wire START/STOP control wiring to every parallel SPS unit (see figure below). The SPS generator START/STOP functionality is controlled via a normally open (NO) dry contact.

   NOTE: The inverter for both the PS20 and PS50 are identical.



2.2. Generator to GEN Terminal Savant Power Storage App Setup

Use the Savant Power Storage (SPS) App to program the AUTO-START/STOP parameters of the connected generator for each SPS system.

From the Settings menu in the SPS App, navigate to **Connected Power Sources** and access the **Generator Port** page to configure the following fields:

1. Select **Generator** mode.

2. Input **Maximum Power** output value of the generator. This is the maximum usable continuous power budget that each SPS unit draws from the generator to supply the downstream load and charge its own battery stack (up to 24kW/100A). Priority is given to supplying the downstream loads first. Remaining power (within the constraints of this budget) goes to charging its own battery stack.
   - **Single unit installation** – This value equals the maximum usable size (kW) of the generator connected to the system.
   - **Parallel unit installation** – This value equals the maximum usable size (kW) of the generator divided by the number of SPS units connected in the system.

   NOTE: The maximum usable size of the generator shall be determined by the EOR "Engineer on Record" and/or per the generator manufacturer's instructions. Most generator manufacturers prefer their gensets run at 80% duty and therefore this value shall be taken into consideration when sizing the generator for handling downstream critical loads and charging each battery stack.

3. Input **Starting SOC** value. This is the state of charge percentage the battery must reach before the SPS unit automatically starts the generator in an off-grid scenario.

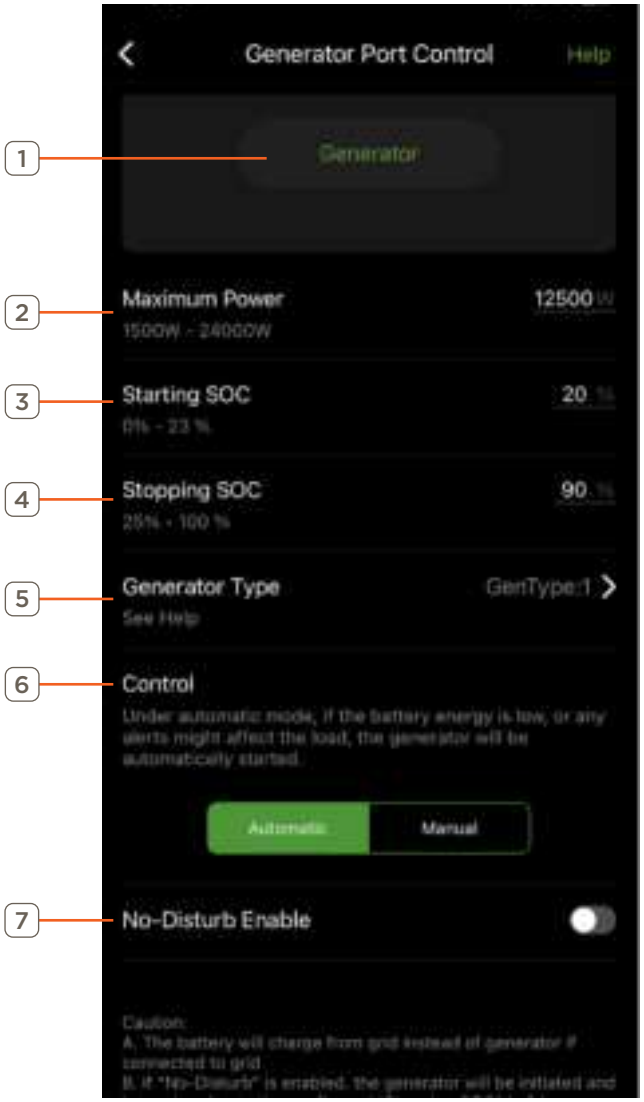
4. Input **Stopping SOC** value. This is the state of charge percentage the battery must reach before the SPS unit automatically stops the generator in an off-grid scenario.

5. Select "GenType:1" for the **Generator Type** field.

6. Set **Control** to "Automatic". This enables the SPS unit to automatically start or stop the generator as per the pre-programmed settings above.

   NOTE: "Manual" may also be selected to expose start/stop commands in the SPS app for generator testing and troubleshooting of the 2-wire start functionality.

7. Toggle **No-Disturb Enable** to ensure that the generator will not be activated during a specified time.



3. Generator to GRID Terminal (Upstream ATS)

Installation steps for a Generator to GRID Terminal design include physical wiring, configuration with the Savant Power Storage app, and configuration using either Blueprint or the Savant Power & Light app. Once configuration has been completed in the Savant Power Storage app, additional configuration is required to properly automate generator functionality. Complete configuration using the Savant Power & Light app described in section 4 OR RacePoint Blueprint described in section 5.

A Generator to GRID Terminal installation allows the batteries of the SPS system to be charged via a generator in the following manner:

1. When an individual battery stack discharges and reaches its generator starting state of charge the inverter calls on the generator to start during a power outage.

2. The upstream generator ATS qualifies the generator signal and switches from “Normal/Utility” position to “Emergency/Generator” position.

3. Once the generator has a stable output signal and the ATS has switched positions, the SPS unit starts qualifying the generator signal at the grid terminal.

4. Once qualified, the generator then starts charging the battery stack while also supplying the downstream house loads.

5. The inverter stops the generator once the battery reaches its Storm Watch SOC parameter as set in Blueprint or SP&L app.

NOTE: In a parallel Generator to GRID terminal system design, once one battery stack reaches the "Generator Charges Battery Threshold” parameter, all battery stacks in the system are charged at the same time. Meanwhile, all downstream loads are also being fed by the generator.

IMPORTANT! The generator must be sized accordingly to feed all critical loads and charge the batteries at the same time.

3.1. Physical Installation

Follow the instructions below to install a generator with an existing Savant Power Storage system. See Appendix: Generator to GRID Terminal Wiring Diagram for wiring example.

1. Connect the Utility Power Source onto the Normal terminal of the generator ATS (L1/L2/N/G).

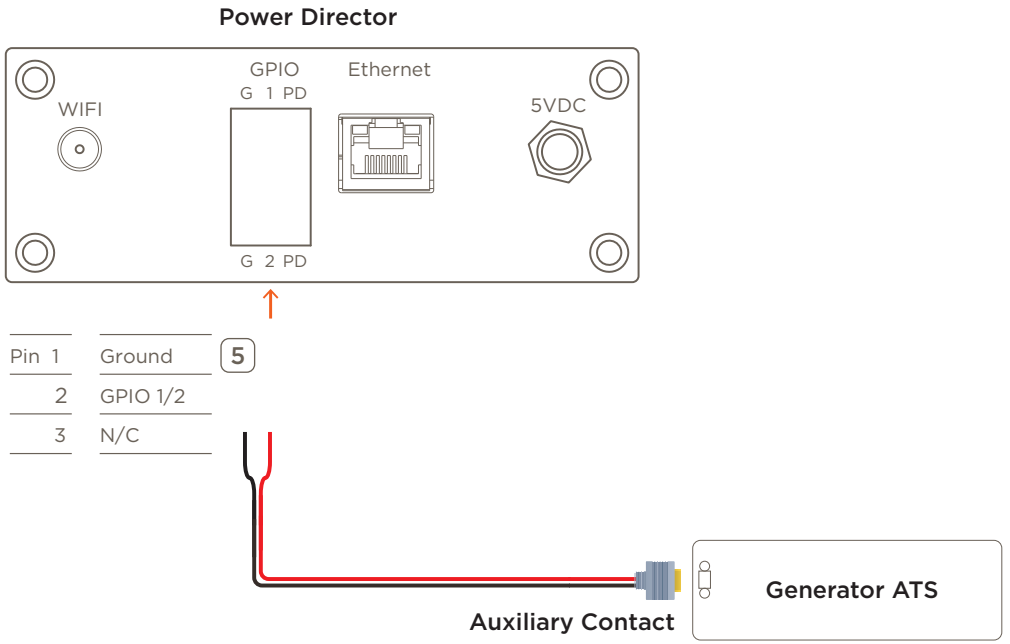
2. Connect the Generator Power Source onto the Emergency terminal of the generator ATS (L1/L2/N/G).

3. Connect the AC generator ATS load wires onto the GRID terminals of all SPS systems (L1/L2/N/G). This can be done either directly onto the SPS GRID terminals or through a Grid Combiner Breaker Panel for parallel SPS configurations. Install a properly sized OCP device upstream of each SPS GRID terminal.

4. Refer to the ATS and generator wiring diagram/manual for auxiliary connection (NC/NO) locations.
   - Connect the generator 2-wire START to the SPS unit. See Appendix: Generator to GRID Terminal Wiring Diagram.
   - Connect a NC/NO auxiliary contact in the generator ATS to the GPIO port on the Savant Power Director. This NC/NO auxiliary contact gives the positional status of the generator ATS (Normal position vs Emergency).
   - The Director can support ATS position sensing from either a NC or NO contact. During system set-up, the director will be programmed to indicate the normal position of the auxiliary contact

   NOTE: A dedicated Savant Controller (e.g. SSC-0012, SSC-0014) is required for systems using a different Savant Host than the Savant Power Director.

5. Connect generator 2-wire START/STOP control wiring to the Leader SPS unit (see Appendix: Generator to GRID Terminal Wiring Diagram). The SPS generator START/STOP functionality is controlled via a normally open (NO) dry contact.



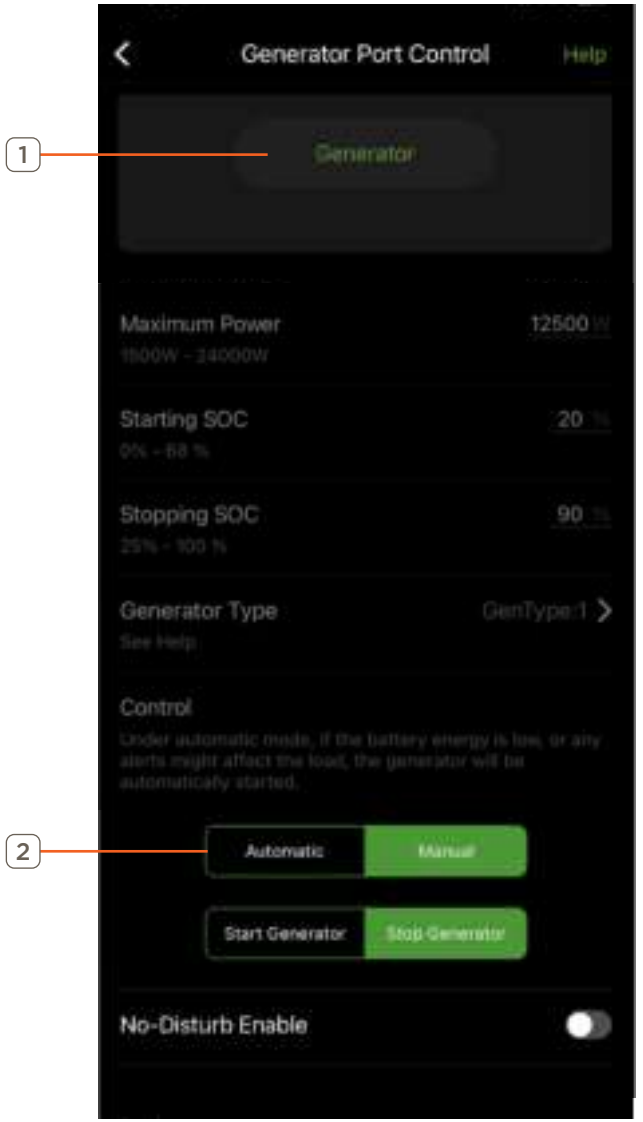
3.2. Generator to GRID Terminal Savant Power Storage App Setup

When using the Generator to GRID Terminal option, the Generator Port is unused and must be deactivated.

From the Settings menu in the SPS App, navigate to **Connected Power Sources** and access the **Generator Port** screen to configure the following fields:

1. Select **Generator Mode**.

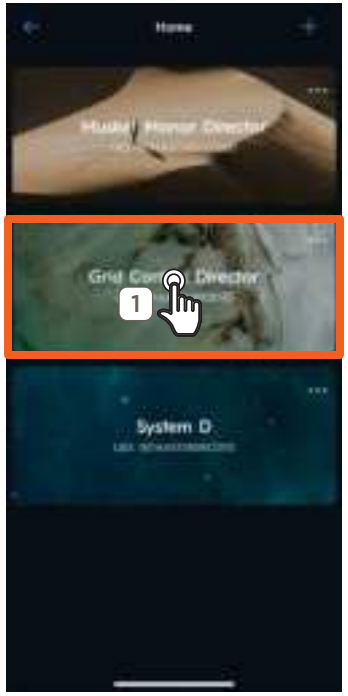
2. Select **Manual** for the control field.

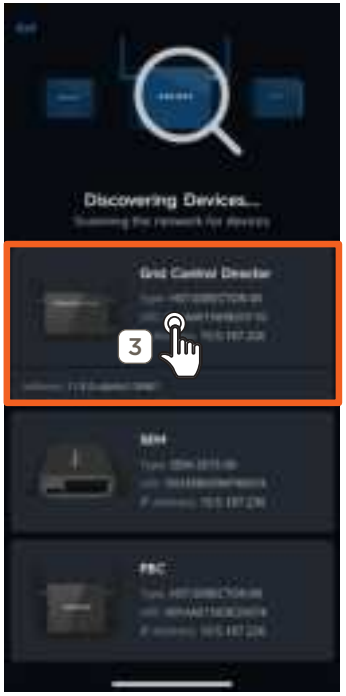


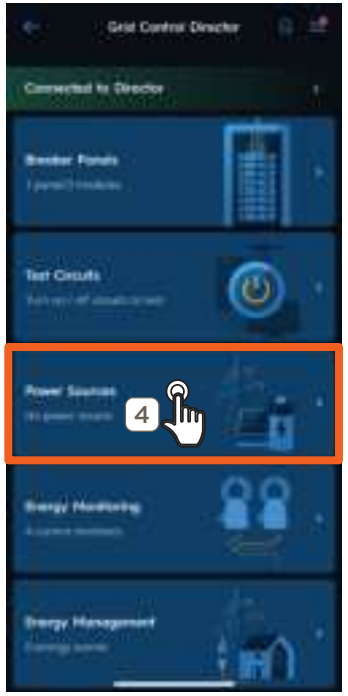
4. Savant Power & Light App Configuration

Additional configuration is required to properly automate generator functionality once configuration in the Savant Power Storage app is completed. Only one configuration tool is needed. (RacePoint Blueprint OR Savant Power & Light app.) If the Savant Power & Light app is the configuration tool of choice, follow the instructions below. Alternatively, see the Blueprint Configuration section for configuration steps in RacePoint Blueprint. These steps assume the installer has an already configured Savant Power Storage system and is adding a generator to the SP&L configuration. For information configuring a Savant Power Storage system in the SP&L App, see the Savant Power System Deployment Guide - Savant Power & Light App on the Savant Customer Community.

1. In the SP&L App, select **Home**.
2. Select **System Configuration**.
3. Once the SP&L App is finishing discovering, Select the Director for this installation. Get configuration from host if necessary.
4. Select **Power Sources**.







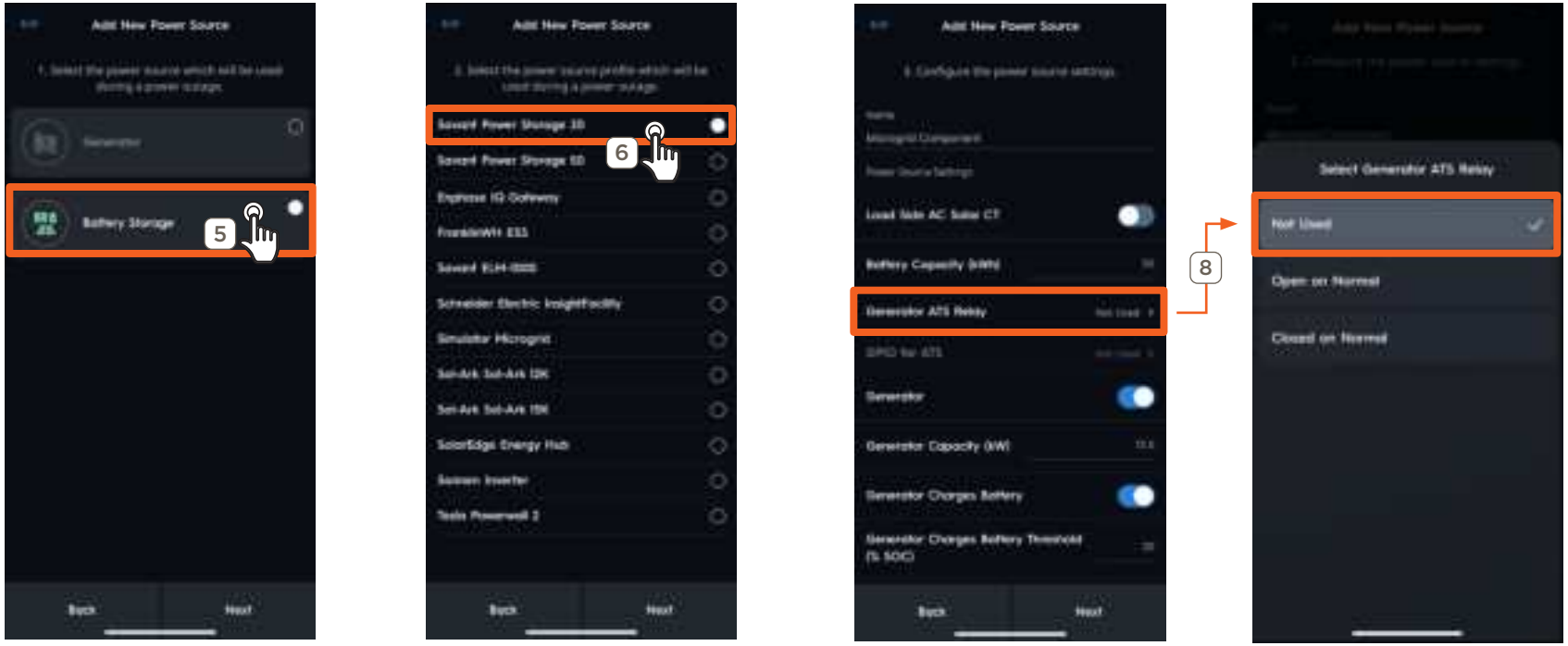
5. Select **Battery Storage** then tap **Next**.

6. Select **Savant Power Storage 20** or **Savant Power Storage 50** as the power source profile then tap **Next**.

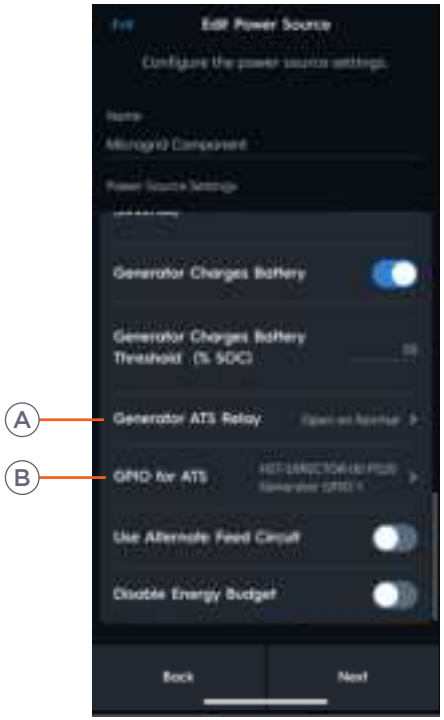
7. Determine the configuration from the options below and continue onto steps:
   - No external generator configured. (There is no generator sitting on an upstream ATS). Continue to step 8.
   - External generator configured with a Normally Open ATS (Not ASCO). Continue to step 9.
   - External generator configured with a Normally Closed ATS. Continue to step 10.

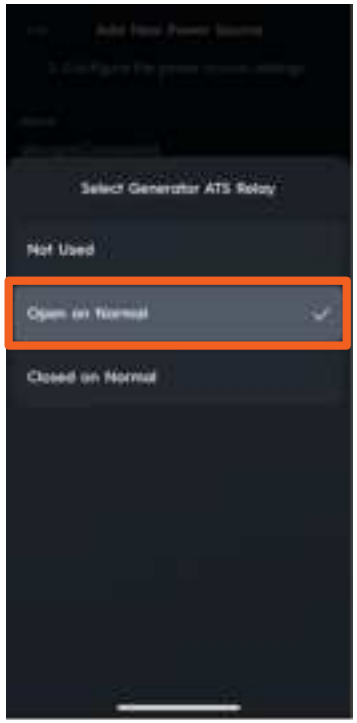
8. If no external generator configured, (there is no generator sitting on an upstream ATS) set **Generator ATS Relay** to **Not Used**. (The GPIO for ATS option will be unavailable).

9. If there is an external generator configured with a Normally Open ATS, (Not ASCO) follow the steps below:



10. If there is an external generator configured with a Normally Closed ATS, (ASCO typically) follow the steps below:



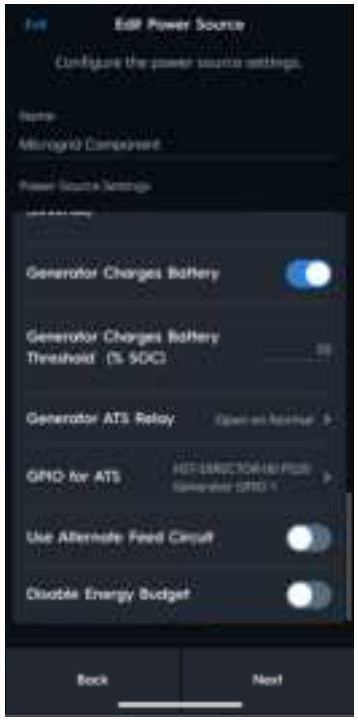


Ⓐ Set **Generator ATS Relay** to **Open on Normal** if the ATS auxiliary connection is Open on Normal.

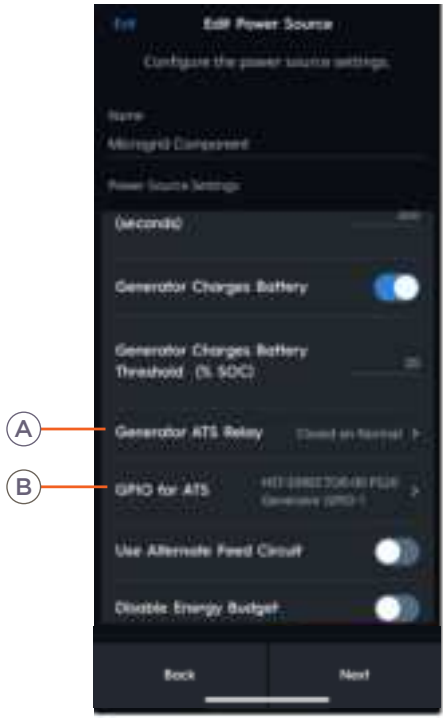
Ⓑ Set **GPIO for ATS** to the GPIO port on the network which the ATS auxiliary is connected to.

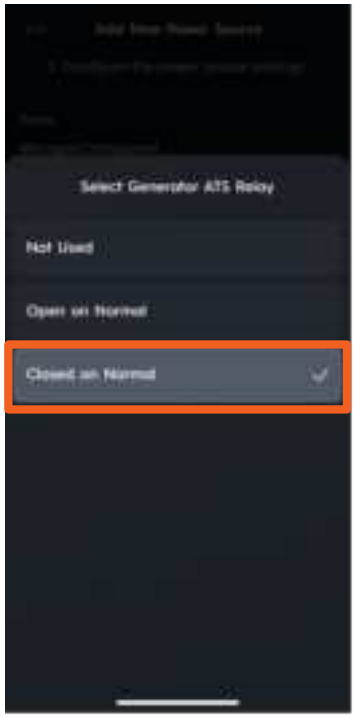
In this example a standard director is displayed.

The name is typically HST-DIRECTOR-00 Unconfigured #UUID Number#.



Ⓒ Both ports have been selected and are shown in the SP&L app. Select **Next** and **Sync** the configuration.





Ⓐ Set **Generator ATS Relay** to **Closed on Normal** if the ATS auxiliary connection is Closed on Normal.

Ⓑ Set **GPIO for ATS** to the GPIO port on the network which the ATS auxiliary is connected to.

In this example a standard director is displayed.

The name is typically HST-DIRECTOR-00 Unconfigured #UUID Number#.

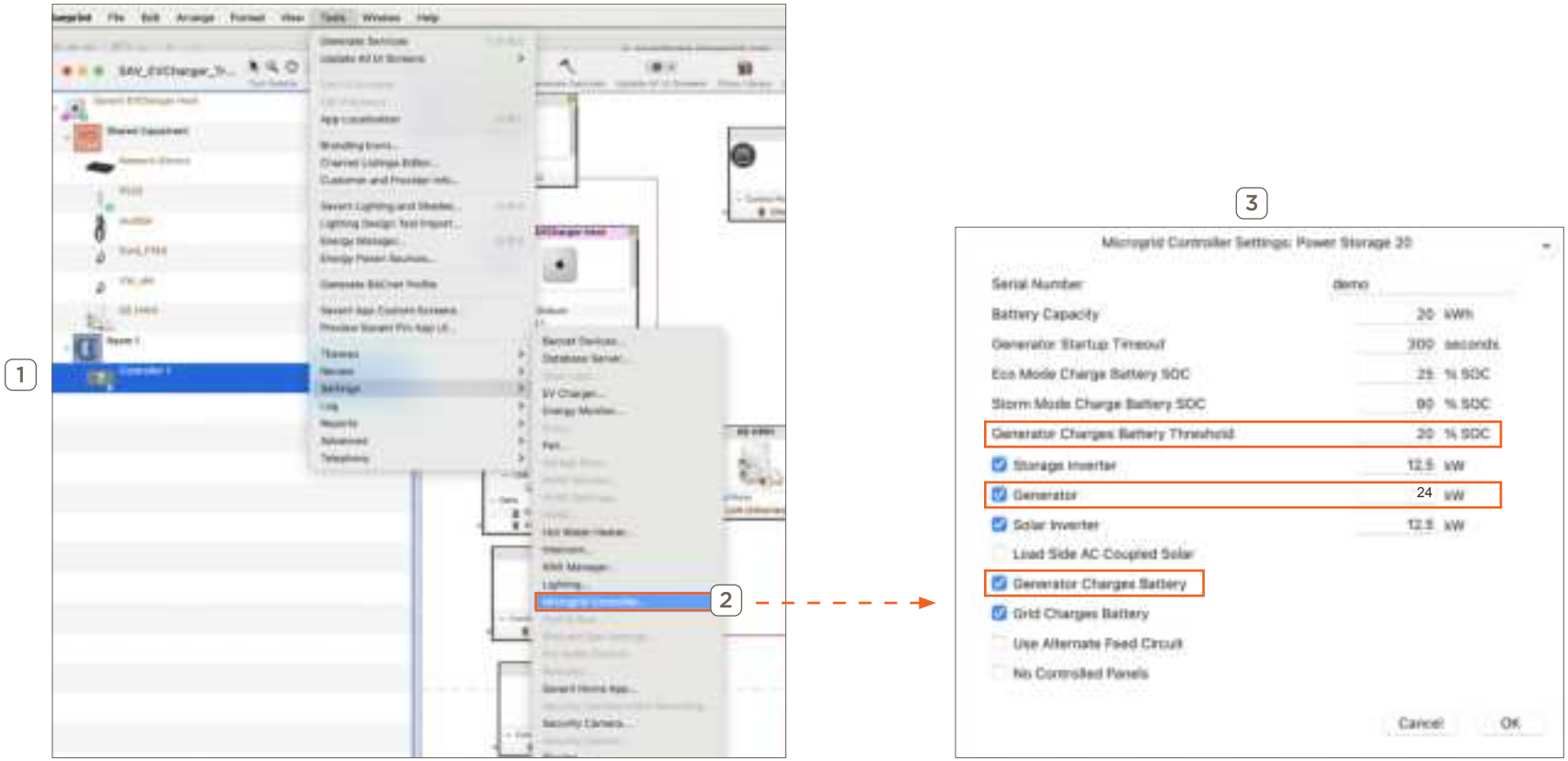
Ⓒ Both ports have been selected and are shown in the SP&L app. Select **Next** and **Sync** the configuration.

5. Blueprint Configuration (Generator to GRID Terminal ONLY)

Additional configuration is required to properly automate generator functionality once configuration in the Savant Power Storage app is completed. Follow the instructions below. Alternatively, see the Savant Power & Light app section for configuration steps with the SP&L app.

1. In Blueprint, select the controller that will be used for installation.
2. Navigate to **Tools** > **Settings** > **Microgrid Controller**.
3. Set the following parameters under Microgrid Controller Settings:
   - Set **Generator Charges Battery Threshold** to an SOC percentage that will turn on the generator when in an off-grid scenario.
   - Select **Generator Charges Battery**.
   - Select **Generator** and set generator size.

     NOTE: Maximum generator size is 24kWh.



4. Select the ATS profile for the Generator Connection. The ATS will have a relay to represent its Normal State. If the Normal State is open, select the Normally Open profile. If it is closed, select the Normally Closed profile.

5. Connect the ATS auxiliary contact to GPIO ports used in installation.

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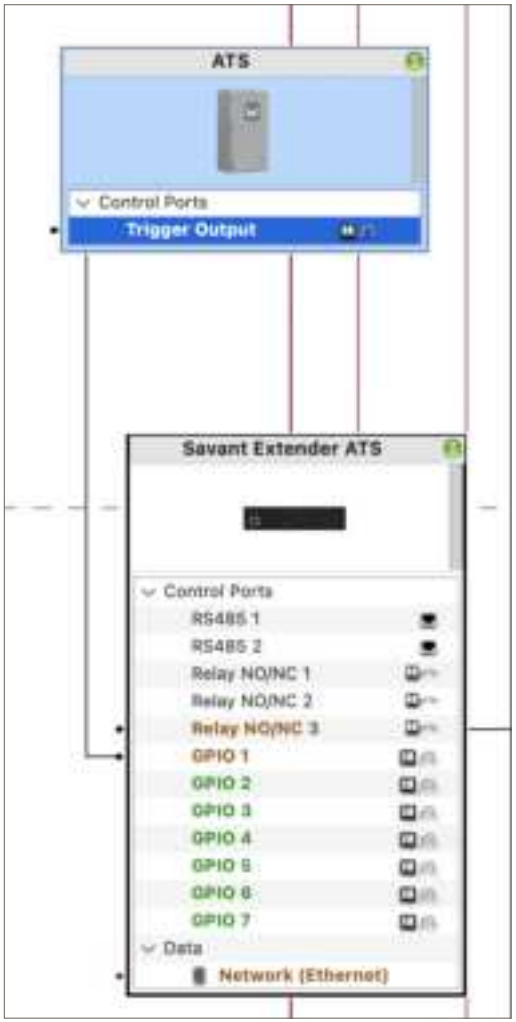
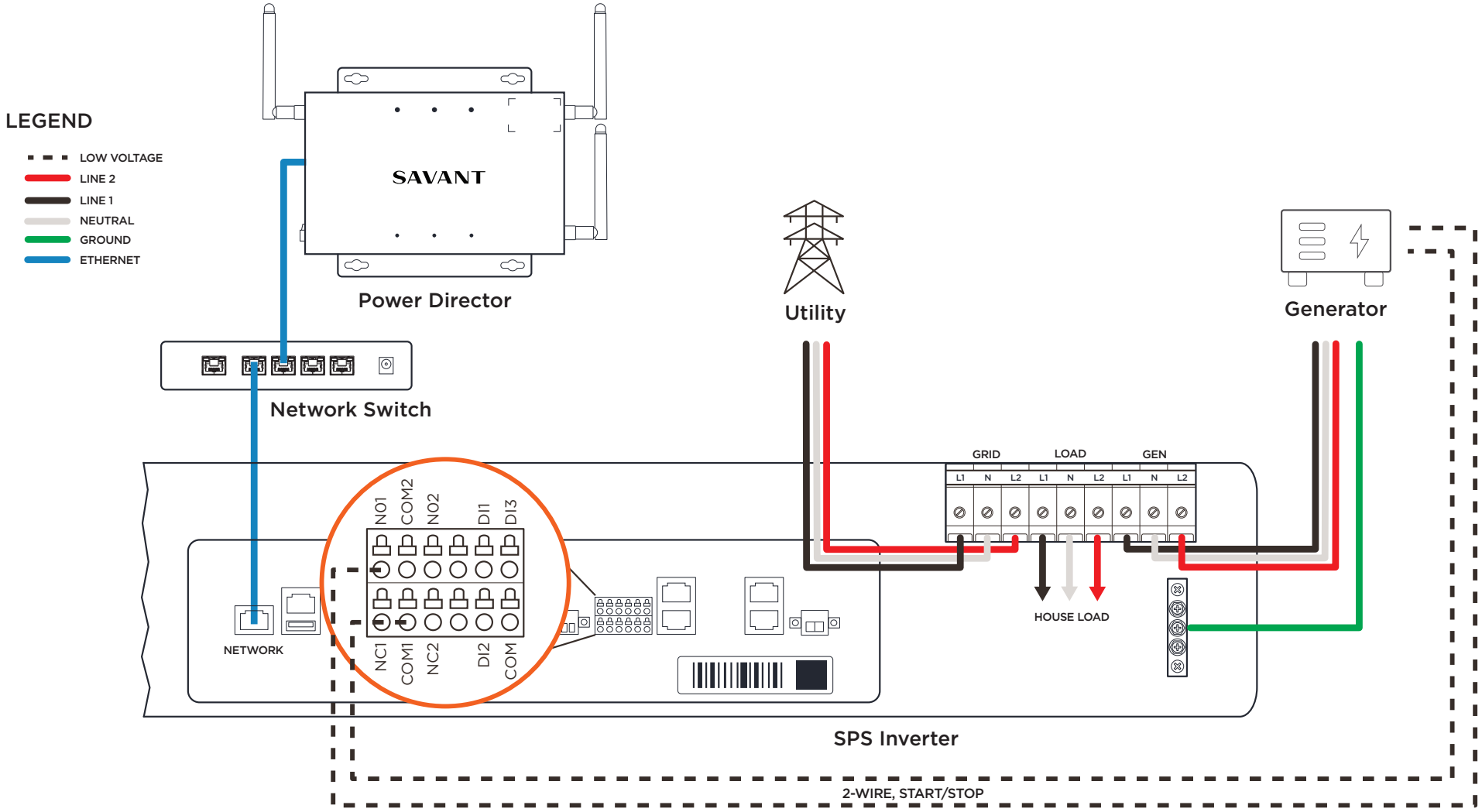
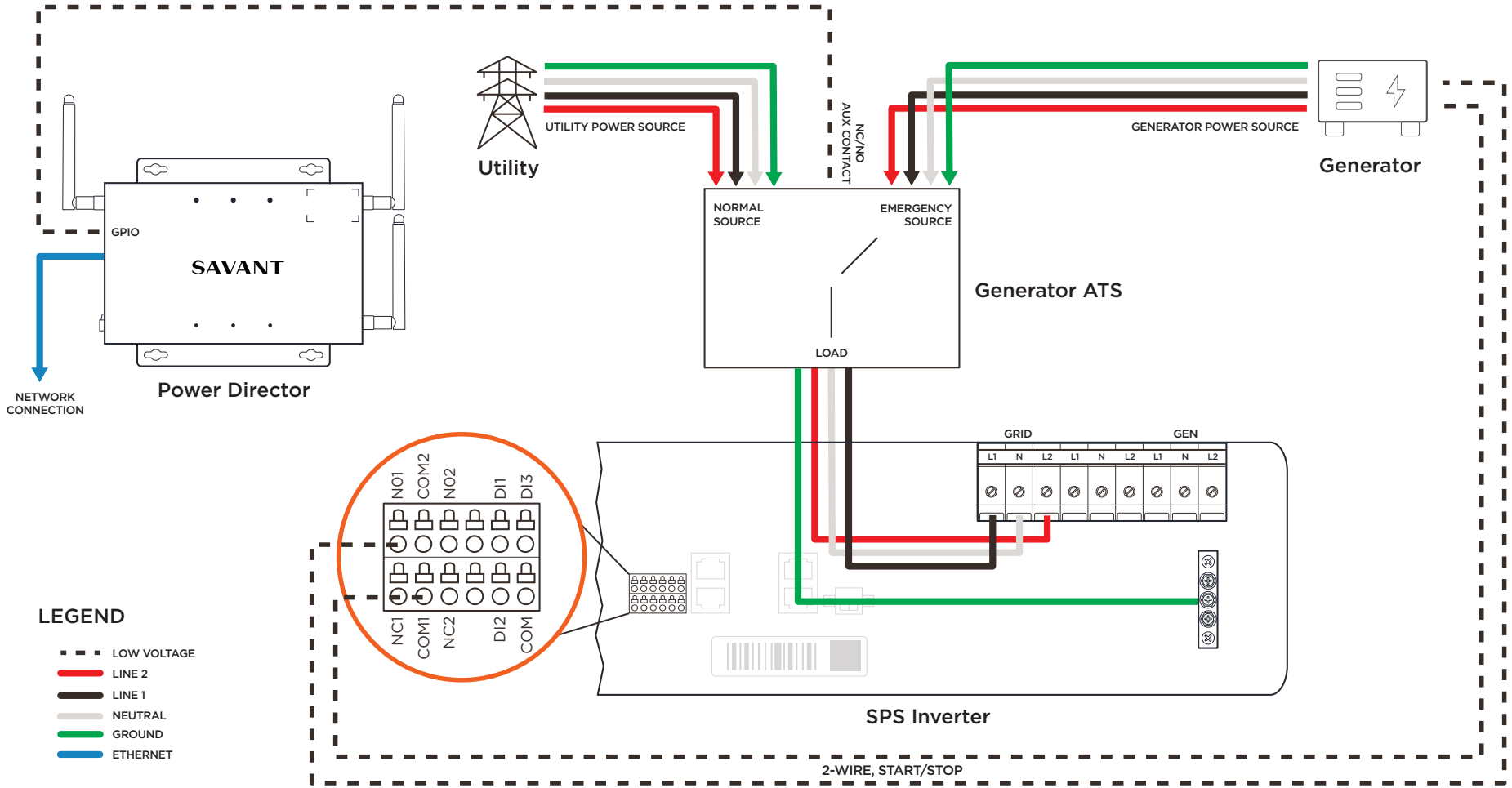


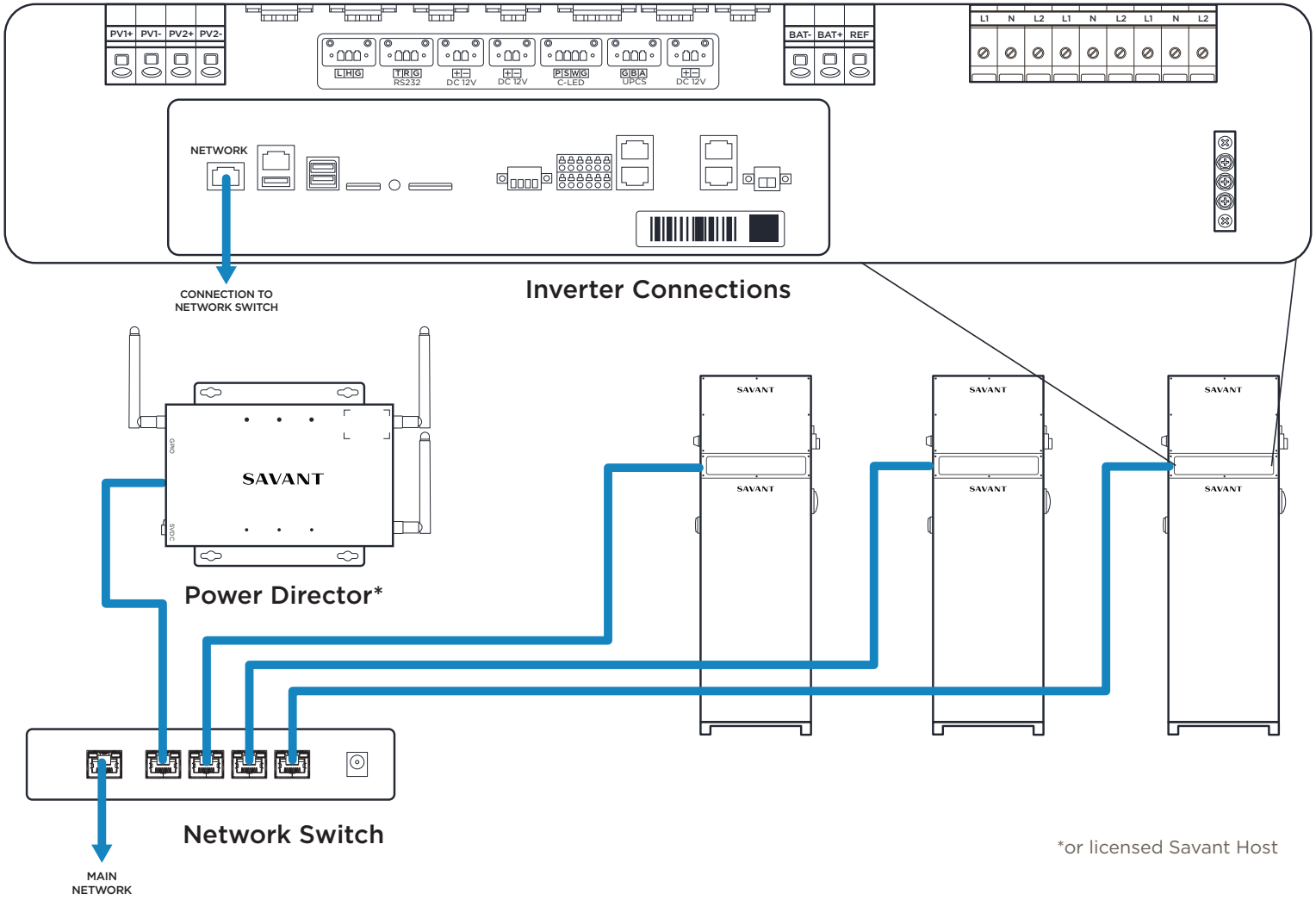
Appendix: Generator to GEN Terminal Wiring Diagram



Appendix: Generator to GRID Terminal Wiring Diagram



Appendix: Parallel SPS System Network Wiring Diagram



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