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Savant Power Storage 20 Power Control System Brief

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General Operation

A Power Control System (PCS) is defined as a system which electronically limits or controls the steady state AC or DC currents to a programmable limit or level. The Savant Power Inverter used in the Savant Power Storage 20 (“ESS”) can operate as a PCS to control import and export of power between utility and ESS with no additional equipment required. All PCS controlled busbars or conductors shall be protected with suitably rated overcurrent devices appropriately sized for the busbar rating or conductor ampacity.

This technical guide describes the PCS Functions Supported by the Savant Power Storage 20 and their applications –

- Limited Exchange Mode: The ESS can be configured to limit both import and export from the system to enable installation for various onsite conditions or AHJ requirements.
- Solar Only Charging (Export Only Mode): The ESS will only charge from solar and will never import grid power to charge the batteries.
- No Export Mode (Import Only Mode): The ESS may import power to charge from utility, but will never export power to the grid.

The following product models fall under the scope of this document:

Savant Power Inverter Models: PS-INV-12.5KW-100A-XX

where XX is a numeric wildcard to represent different hardware configurations of the inverter for internal tracking

Savant Power Storage Models: PS20-12.KW-20KWH-100A-XX

where XX is a numeric wildcard to represent different hardware configurations of the inverter for internal tracking

Applications

There are numerous applications in which PCS functionality is utilized to enable site-specific deployment and interconnection. Two of the most common are discussed below:

Equipment Upgrade Avoidance: Utilities often have system size constraints for interconnection, limiting customer's ability to offset consumption or back up the on-site load, without addition of electrical system upgrades. By utilizing PCS functionality, the SP20 can work within required power constraints eliminating the need for costly upgrades while still providing the on-site production and back up the customer requires.

The most common scenario where customers are required to add onsite equipment to enable interconnection is the requirement of a Net Generation Output Meter (NGOM) for ESS systems with an output >10 kW by utilities in California. By utilizing the PS20's Export Only or Solar Only Charging modes, the end user can avoid the additional cost of adding a NGOM.

Panel Upgrade Avoidance: The rating of main panel busbars often acts as a bottleneck for interconnection of onsite generation within residences. Traditionally, this bottleneck has been removed by either derating the main breaker of the panel or upgrading the panel to equipment with a higher current rating, at significant cost to the customer. By utilizing the SP20's Limited Power Mode, the relevant bussing and conductors can be protected from overloads via programming per 2023 NEC 705.13, eliminating the need to perform costly electrical work.

PCS Installation

The Savant Power Storage 20 requires no additional equipment in order to enable the PCS functions supported by the system. Figure 1 below shows a typical installation using a Savant Power Storage 20.

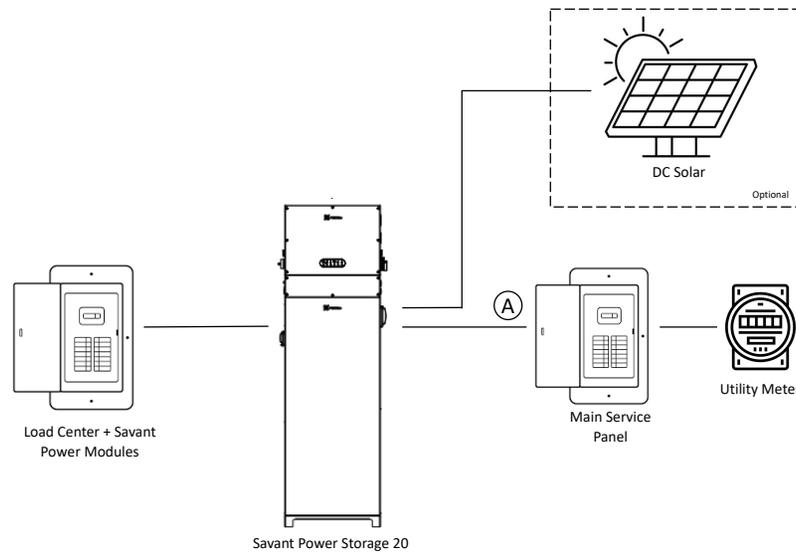


Figure 1

Current flowing through circuit A is controlled via PCS functionality. The maximum operating currents in controlled conductors are limited by the settings of the PCS and may be lower than the sum of the currents of the connected controlled power sources. Guidance on setting up the system to control current flow through circuit A is given in the following section.

While Figure 1 shows a single unit deployment, the Savant Power Storage 20 can be deployed in multi-unit configurations. In those instances, each system should be individually programmed such that the sum of all system outputs does not exceed the current rating of controlled busbars or conductors

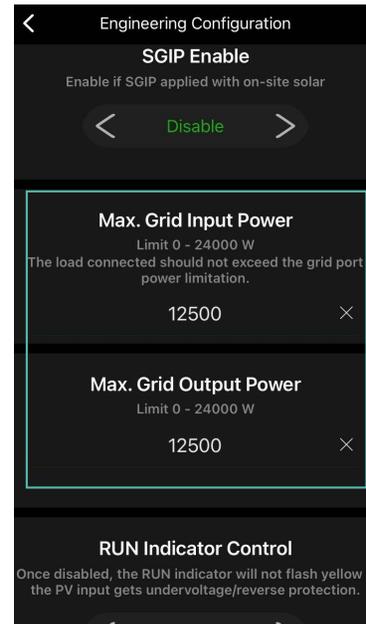
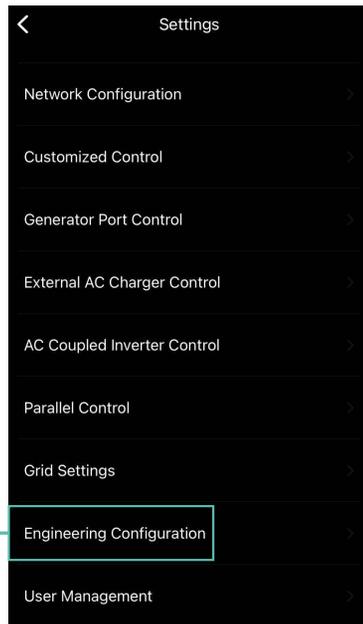
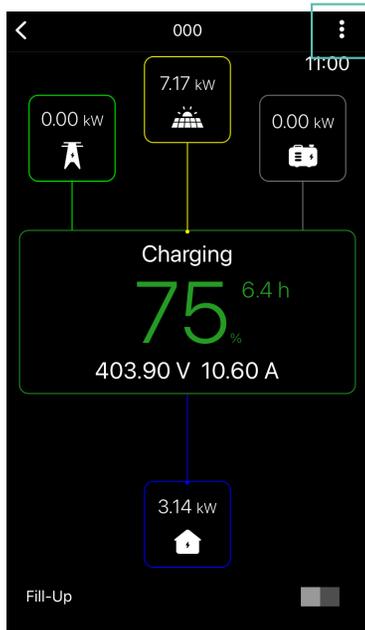
Using the Savant Power Storage 20 as a PCS



Only qualified personnel shall be permitted to set or change the setting of the maximum operating current of the PCS. The maximum PCS operating current setting shall not exceed the busbar rating or conductor ampacity of any PCS controlled busbar or conductor.

PCS functionality is achieved within the Savant Power 20 via programming from the Savant Power Storage commissioning app. The supported PCS functions are configured by adjusting the relevant grid import and export parameters under the engineering configuration of the app. Only qualified personnel (installers, OEM personnel) will be given access to these settings.

All PCS Modes are programmed via the Engineering Configuration settings.



1 Limited Exchange Mode

Set Max Grid Input Power and Max Grid Output Power to the appropriate power ratings to operate within the ratings of onsite OCPD and conductors.

2 Solar Only Charging

Set Max Grid Input Power to 0W to disable charging ESS from grid with Max Grid Output Power to the appropriate power ratings for onsite OCPD and interconnection.

3 No Export Mode

Set Max Grid Input Power to appropriate power rating for onsite OCPD and interconnection while Max Grid Output Power is set to 0W to disable any export.

Example Configurations

Panel Upgrade Avoidance

Installers often achieve interconnection of power production sources in accordance with 705.12(B)(2), often referred to as the '120% rule' which states, "...the sum of 125 percent of the power source(s) output circuit current and the rating of the overcurrent device protecting the busbar shall not exceed 120 percent of the busbar ampere rating." Applied as a formula—

$$125\% \times \text{inverter current} + \text{Main Breaker} \leq \text{Busbar Rating} \times 120\%$$

For a 200A bus, with a 200A main breaker, this means -

$$125\% \times \text{inverter current} + 200A \leq 200A \times 120\%$$

$$\text{inverter current} \leq \frac{(200A \times 120\%) - 200A}{125\%}$$

$$\text{inverter current} \leq 32A$$

Because the PS20 features a continuous output of 52A, the above would require an alternate source connection strategy than 705.12(B)(2) if no PCS functionality were available. By using the Limited Exchange Mode and setting *both* the Max Grid Input Power and Max Grid Output power to 7,600W (32A), 705.12(B)(2) becomes an approved source connection method.



PCS shall be programmed such that the system does not exceed the limitations of the overcurrent devices in the panelboard and connected circuit. The PCS shall be coordinated with the limits defined by NEC 210.20, 705.12 or NFPA 70 2020 edition section 705.13.

Equipment Upgrade Avoidance

One of the most costly upgrade a homeowner can face when installing a solar + storage system is a utility transformer upgrade to allow the additional generation capacity on that unit. Without a PCS, the only options for such an occurrence would be to pay to have the transformer upgraded or install a smaller solar + storage system, reducing the customer's ability to back up the desired loads.

By using the No Export or Limited Exchange modes, a customer is able to limit the Max Grid Output Power of the system to the appropriate level in order to ensure the transformer feeding the residence is never overloaded by the power production source installed at a customer's homes.



Please refer to utility documentation to ensure the selected PCS functionality is adequate for the utility interconnection requirements.