Application Note:
Sol-Ark PCS 200A Pass-Through and CT Placement

Using the 200A Pass-Through and Power Control System (PCS) for Code-Compliant, High-Performance ESS

This application note applies to these Sol-Ark inverters:
Limitless 18K-2P-LV; **Limitless 15K-LV**; **30K-3P-208V**; and **60K-3P-480V**

Before engaging in any design or installation of a Distributed Energy Resource (DER) using Sol-Ark products, please familiarize yourself with the installation manual for the specific inverter.

Scope

Practical guidance to design and commission Sol-Ark 15K and Sol-Ark 18K (and larger) inverters with 200 A pass-through, focusing on maximizing Power Control System (PCS) compatibility for whole-home/large-load applications, ESS self-consumption, and code-compliant interconnections—including breaker-fed (load-side) and supply-side (line-side tap) options. Includes current transformer (CT) placement patterns and commissioning checklists.

Note on codes: References align to NEC 2020/2023 Articles 705 (Interconnected Power Production Sources) and 706 (Energy Storage Systems). Requirements vary by AHJ/utility; verify the inverter's listings and local interpretations, especially for NEC 705.13 Power Control Systems (PCS) acceptance.

1. Key Concepts and Capabilities

200 A Pass-Through (Whole-Home)

- Allows the inverter to be placed in-line with a standard 200 A residential service feeder (or ahead of a main load center feeding a house).
- Under grid-present conditions, grid power can pass through to loads; under outage, the inverter/battery supplies loads within its rating.

PCS (Power Control System)

- Uses grid-sense CTs (and internal measurements) to limit export and cap back feed currents dynamically, satisfying utility non-export rules, and enabling NEC 705.13 control schemes where permitted.
- PCS also enables peak-shaving, TOU discharge/charge windows, and self-consumption maximization.

Self-Consumption Optimization

With proper CT placement and settings, the inverter prioritizes serving local loads from PV/battery, importing only deficit power from the grid, and—when export is restricted—trimming PV output/battery discharge to avoid export.

2. Where PCS Unlocks Design Flexibility

Breaker-Fed (Load-Side) Interconnections

- Traditional 120% busbar rule math can severely limit the PV/ESS breaker size (e.g., a 200 A busbar with a 200 A main only allows ~40 A of generation breaker).
- When accepted by the AHJ/utility, NEC 705.13 PCS lets you interconnect with a larger breaker because the system actively controls the net source current, so the panel never exceeds its rating.

Supply-Side (Line-Side Tap) Interconnections

- Useful when the main load center cannot accept additional back-feed or is center-fed.
- A properly sized tap and OCPD feed the inverter upstream of the busbar.
- PCS still controls export at the service point.

Whole-Home 200 A Pass-Through

- Place the inverter between the service disconnect and the main panel to back up the entire building.
- PCS ensures non-export (if required) and keeps service conductors within permitted currents.
- **Design intent**: Use PCS to maximize interconnection size and self-consumption while keeping busbar/service currents within ratings.

3. Quick Math Refresher — 120% Rule vesus PCS

3.1 Traditional NEC 705.12(B)(2) 120% Busbar Rule - Load-Side

For a panel with Busbar Rating (B) and Main OCPD (M), the maximum generation breaker (G) without load calculation or PCS is roughly:

$$G_{max} = 1.2 \times B - M$$

Example: 200 A busbar with 200 A main → G_max = 240 − 200 = 40 A. A single 40 A back-feed breaker would be the limit.

3.2 With NEC 705.13 PCS - When Accepted by an AHJ

- The listed PCS monitors and controls total source current so that at the busbar (or service) rating, the sum never exceeds limits (e.g., 200 A).
- Practically, you can land a larger breaker (e.g., 80–125 A, per equipment limits) while configuring PCS to cap export/back-feed so the busbar limit is respected and therefore protected from overloads at all times.
- AHJ/utility acceptance and equipment listing as a PCS are critical—plan reviewers may request a control narrative, settings sheet, and a commissioning test showing the cap works.

4. Typical One-Lines and CT Placement

The golden rule: Grid CTs must "see" the entire service net flow to/from the utility—not just the inverter feeder. Place CTs so the controller acts on the true import/export at the service point.

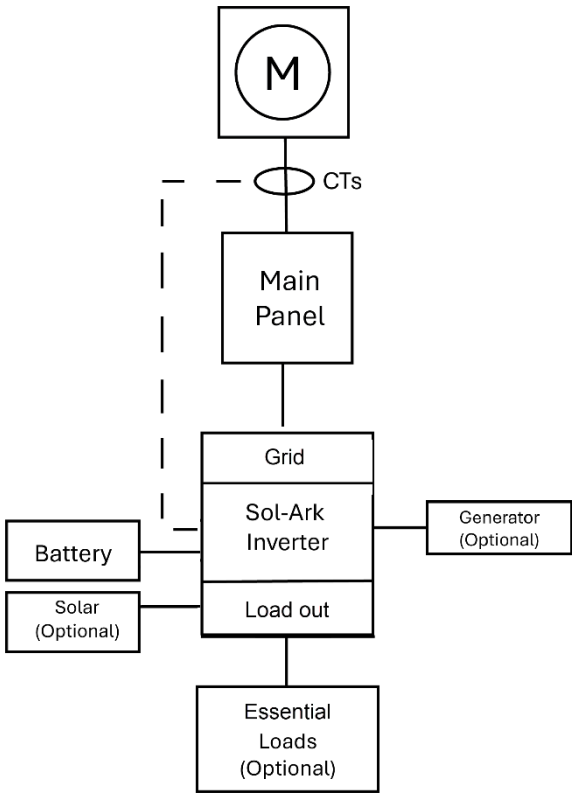
4.1 Breaker-Fed or Load-Side Interconnection — CTs at Service Conductors

Why CTs here?

They measure whole-home net import/export. PCS then trims inverter power to respect the busbar and export limits.

Panel tips

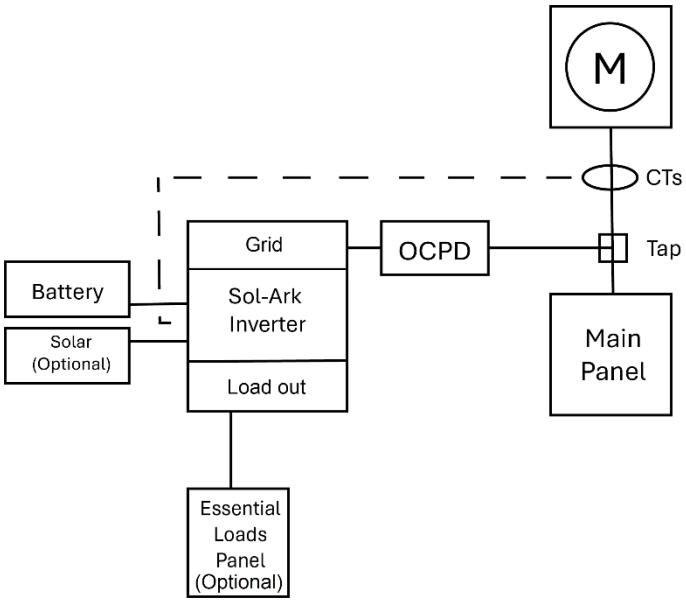
- Land the inverter breaker at the opposite end of the busbar from the main where required.
- Avoid center-fed busbars for 120% unless the AHJ explicitly allows that method; otherwise, consider supply-side or PCS narrative.



4.2 Supply-Side or Line-Side Tap — CTs on Utility Side of the Tap

Why CTs here?

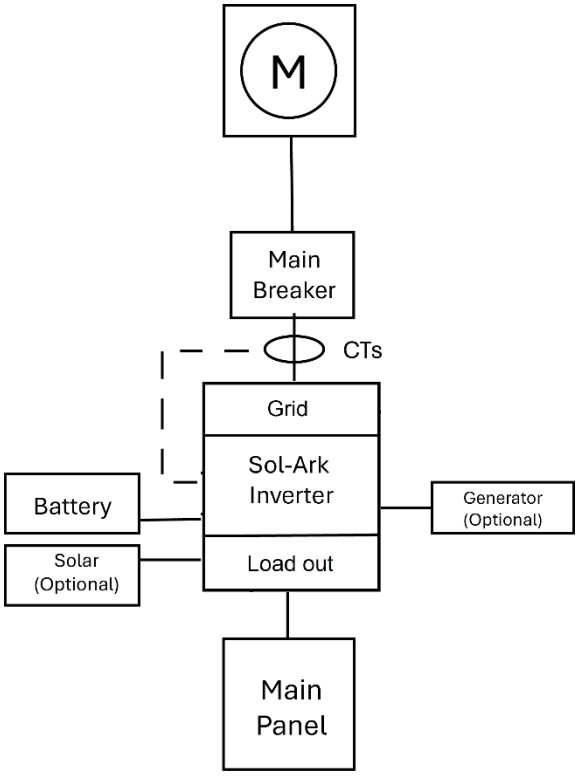
They must capture net service exchange with the utility. If CTs are installed only on the inverter feeder, PCS will not “see” other sources/loads correctly and export in the diagram above, power imported from the grid for the loads after the Service Disconnect would not be “seen” control can fail.



Tap tips

- Size per 230/240 and utility rules.
- Provide a visible open, service-rated disconnect if required.
- Maintain conductor length limits for CT leads.

4.3 Whole-Home with 200A Pass-Through



Why CTs here?

In this topology, the inverter becomes the “gatekeeper” between utility and house.

CTs on the incoming service let PCS limit grid export/import as configured.

5. CT Hardware and Installation Details

Which conductors?

- Only on the ungrounded (hot) service conductors—never on neutrals/grounds.
- One CT per phase/leg; for split-phase, two CTs; for 3Φ, three CTs.

Orientation

- Follow the arrow/labeling. A common convention is arrow → toward the load, i.e., the grid, for service conductors.
- The inverter UI should indicate positive import versus export; flip a CT if signs are inverted during commissioning.

Location priority

- On service conductors upstream of all load panels (best for global control).
- If impossible, on feeders where all grid exchange is observable (avoid missing sub-feeds like EVSEs or outbuildings that bypass the CTs).

Lead routing

- Keep CT leads away from high-noise cables
- Use twisted pairs where provided
- Respect maximum lead length
- Avoid sharp bends
- Avoid running parallel with inverter AC output for long distances

Verification

- With a known resistive load (such as a 1–2 kW space heater), confirm that the load displays an import of about 1–2 kW.
- With PV/battery discharging, verify a near-zero or capped export per setpoint

6. Maximizing PCS for ESS Self-Consumption and Export Control

6.1 Primary Inverter Settings

- **Mode**: Self-Consumption / Priority Load (serves local loads first).
- **Export Limit**: Zero (non-export) or a specific kW/kVA cap (utility-allowed export).
- **Grid Charge Windows (TOU)**: Allow off-peak charge to raise SoC for on-peak discharge/peak shaving.
- **SoC Reserves**: Maintain UPS reserve for outages (e.g., 20–40%) while still enabling peak shaving above that.

6.2 "Exceed 120%" on a Breaker-Fed Tie Using PCS

1. Choose a larger inverter breaker appropriate to conductor/equipment limits (e.g., 80–125 A for a 15K-class AC output—use manufacturer tables).
2. Set the PCS export cap so that Main OCPD + Effective Back-feed ≤ Busbar Rating at all times.
3. Document the control narrative in the plan set: where CTs are, the exact limit value, and the witness test you will perform.
4. During commissioning, you can confirm the cap with a clamp meter and UI screenshots.

Example

Consider this scenario:

- 200 A busbar, 200 A main, inverter landed on a 100 A breaker.
- Traditional 120% would limit you to 40 A; with PCS, set an export cap so the net back-feed never raises busbar current >200 A.

6.3 TOU and Demand-Charge Playbook

- **Off-peak**: Allow limited grid charge to target an SoC that covers expected on-peak demand.
- **On-peak**: Enforce zero-export (if required) but allow full discharge to shave grid import to a target (e.g., 2–3 kW net).
- **Shoulder**: Float at self-consumption; backstop with small import cap for comfort loads (HVAC/EVSE coordination helps).

7. Breaker-Fed versus Line-Side Tap

Consideration	Break-Fed (Load Side	Supply Side (Line-Side Tap
Panel Constraints	Limited by 120% unless PCS accepted	Bypasses busbar calc; tap rules apply
AHJ Comfort	High (familiar), but center-fed busbars tricky	Varies; needs service-rated gear, labeling
Metering/Utility	Standard net meter/non-export meter	Utility may require separate service disconnect
PCS Value	Enables larger breaker under 705.13	Controls export at service point

8. Parallel Inverters and 3-Phase Notes

Stacked/Parallel Sol-Ark

- Use the designated CT input architecture per manual (one shared grid-CT)

Three-Phase (30K/60K)

- One CT per phase (A/B/C).
- Confirm phase mapping in software so CT-phase matches voltage phase.
- Run loads one phase at a time to validate proper that CTs are on the correct phase and are oriented properly.
- On three-phase services, the arrows on the CT should point to the inverter.

9. Common Problems and Quick Fixes

- **PCS blind to house loads** → CTs on the wrong conductors (e.g., only on inverter feeder) → Move CTs to service conductors.
- **Export shows as import** → Reversed CT polarity → Flip CT orientation.
- **Generator back feed risk** → Never allow export toward a generator; use approved transfer/ATS → Place CTs on the load conductors, not generator or utility conductors.

10. Boilerplate Plan-Set Editable

Below is an editable form you can fill out and include with the plan-set that you submit to an AHJ to illustrate the interconnection means of the DER project.

Interconnection Methd

[ ] Load-Side (Breaker-Fed) [ ] Supply-Side (Line-Side Tap)

Busbar/Main Ratings

Bus ____ A, Main ____ A; Inverter AC OCPD ____ A; Conductors ____ AWG Cu/Al (____ °C)

PCS Declaration (NEC 705.13)

This system employs a listed power control function in the Sol-Ark inverter to maintain total source current at or below ____ A at the [panel/service] at all times.

Control is based on service-conductor CTs located at _____.

Export limit set to ____ kW.

Commissioning Test

Zero-export and export-cap witness tests will be performed; screenshots and clamp-meter photos provided to AHJ.

Document Revision History

Rev.	Date	Author	Description of Changes
01	Oct. 30, 2025	Pooya Afifian	First release