

Koolbridge Solar SMART LOAD CENTER™ v1.0 Spec Sheet

***The Gateway to the Intelligent Home* begins with the Koolbridge Solar SMART LOAD CENTER v1.0.**

The SMART LOAD CENTER (SLC) was created to maximize the use of renewable energy from the sun, battery, generator or wind (if available). It optimizes the use of solar energy when the sun is shining and only pulls power from the grid when solar energy, either direct or stored in the battery, is low. It measures, displays and records the homeowner's energy usage down to the individual circuit breaker level and provides homeowners with the information as to where and when energy is being utilized throughout the home. The SMART LOAD CENTER began UL testing in February 2017. It has met UL requirements as an "Automatic Electrical Control For Household And Similar Use" in the US and Canada (UL 60730-1, CAN/CSA-E60730-1). and UL67 "STANDARD FOR PANEL BOARDS."

SMART LOAD CENTER features:

- Preset User Priorities - prioritizing loads to match available solar power to home power demand
- Minimize reliance on the electrical grid
- Maximizes use of your own free solar power
- Communicates with PCs or laptops
- Displays current and historical power usage by time, per circuit and per energy source
- Time-of-day dependent operations may be programmed
- Peak Demand Control
- Real-time appliance power usage
- Battery technology agnostic
- Inverter agnostic (inverter must be a load-supporting inverter, and inverter and battery must be compatible)
- Integrated tracking of energy utilization independently for each branch circuit
- Coordination of total load on inverter and grid to avoid falling foul of time-of-use tariffs

- Dynamically adjusts loads to match the power available from each source
- Fits flush between 16" spaced wall studs in standard US wood frame construction

SMART LOAD CENTER Product Description

The Koolbridge Solar SMART LOAD CENTER v1.0 can be fitted instead of a regular sub-panel in homes that are either intending to use solar energy immediately or whose owners wish to facilitate that option for the future.

Even when solar and grid power are both available, the intelligence built into the SLC gives preference for using its own, free solar power by switching as many breaker circuits to solar as it can at that time.

The SMART LOAD CENTER v1.0 provides Data Collection, Reporting, Monitoring, and Engagement by integrating today's state of the art technology into a traditional breaker box format resulting in a solution that seamlessly provides a Residential Distributed Energy Software Management Solution for both solar and grid-based electricity throughout the home on a branch circuit-by-circuit basis.

Built-In Energy Management Features

Upon installation and at any time thereafter, the 8-switched branch circuits are listed in priority order. They are also utilized for daily load shedding to load shed and load match to available power. The SLC *dynamically* selects the circuits that are powered based on measured demand, so none are permanently excluded, even when power is short.

The instantaneous demand is continuously monitored by the built in per-branch-circuit current sensors, and may be displayed on a PC or laptop.

The measured branch-circuit current is combined with measured voltage to show the power used by each circuit and power usage is accumulated over time using the built-in real-time calendar-clock to show energy usage per circuit in kilowatt-hours in various time periods. Also displayed is how much of each circuit's usage was from grid and solar respectively.



SMART LOAD CENTER v1.0

Figure 1 shows how an SLC may be wired into a house and to the main service-entrance panel. It is preferably located such that the length of the cable runs to the branch circuits it serves are a minimum in total. Up to 16-branch circuits of 20-amps or less are selected to be served by an SLC.

The SLC is fed with grid power via a two-pole feeder breaker in the service entrance panel. 60- amp breakers are shown to the right but may be up to 100 amps. The feeder cable comprises L1, L2, neutral and ground and may be individual wires in a conduit.

Monitoring Your Solar Output

Built-in SMART LOAD CENTER software provides several advantages to the homeowner. It shows that solar panels are working efficiently by tracking power output, you can see as often as you want how much money your solar system is saving in energy production, and real-time visibility of the number of kilowatt hours of electricity you are saving. Access to this information is available any time through applications.

Why the SMART LOAD CENTER v1.0 is “The Hub of The Internet of Things in The Smart Home”

The present configuration of the SMART LOAD CENTER has four-optically isolated digital communication links for outside devices, not including power-line communications. Optical isolation is important to avoid ground-loops which otherwise could result in damaging currents flowing to communications devices during power fault conditions.

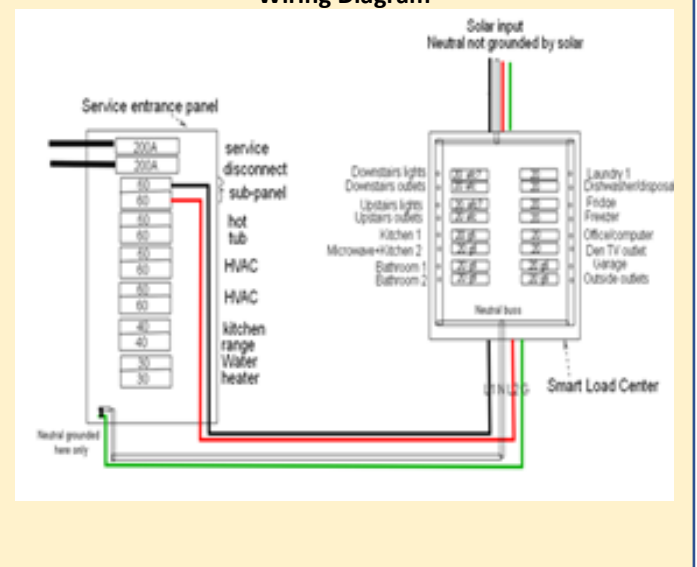
Two of the optically isolated interfaces emanate from the SLC’s main processor and are envisaged for connection to the user’s computer on the one-hand and possibly a Wi-Fi adaptor or an ethernet adaptor on the other hand. The latter could be hard wired to the user’s router so that the SLC had access to the Internet even when the user’s computer is turned off.

The second interface with the SLC main processor would also be hardwired preferably to the user’s internet router by means of an ethernet interface with its own processor to handle protocols with- out burdening the SLC. The other two optical interfaces are for internal system use by Koolbridge Solar devices only such as connecting to inverters, and solar combiners. These go through other companies’ inverters. The protocol in the SLC is always the same: It asks for some information, the unit, if a Koolbridge unit, recognizes the request and responds. If it is a request to some other company’s equipment, the adapters translate the request into something the other company’s product understands and then translates the response into the form the SMART LOAD CENTER v1.0 wants.

SMART LOAD CENTER V1.0 Specifications

Voltage	Designed to work in U.S. and Canada. Type 120 Vims, 60Hz AC split-phase electric systems. Will also work in Mexico and many Caribbean systems that use 2-legs of a 127,220 V, 3-phase system .
Amperage	100A on each phase of the single split phase input.
Breakers	8-slots for breakers up to 20 amps trip level. Breakers may be Overcurrent protection only, GFCI, AFCI or pole. The SLC can switch any of the 20-amp breakers to do so at this time. 8-breaker slots for breakers up to 20-amps trip level. Breakers may be double pole occupying 2-adjacent slots. Each breaker slot has an associated two-color LED that shows which electrical power source is currently supplying power to that breaker circuit.
Indicators	An LCD display is provided to access all data locally if a PC, Laptop or Smart Phone interface is not used.
Controls	Four-push-buttons are provided for selecting data to be displayed locally or for changing set-up data if the PC or Laptop interface is not used.
Interfaces	Four, optically-isolated communications interfaces are provided. Two are used for communication with other elements of the solar installation and the other two may be used to provide connections to any of a PC or Laptop, a Wi-Fi adaptor, a Wi-Fi router or a cable or DSL or another internet modem or wireless adaptor. Adaptors to all standard interfaces (ethernet, USB, etc.) are available and may be located anywhere, with connection via standard 4-wire indoor telephone cabling. NOTE: The two inter-systems interfaces have not been programmed active to date and are intended for communication with Koolbridge Solar Inverters via suitable adaptors, slave SLC’s or HVAC system interface adaptors.
Dimensions	14” W X 34” L X 4” D (Fits flush between 16”

Figure 1. Typical SMART LOAD CENTER Wiring Diagram



The importance of obtaining UL approval for the SMART LOAD CENTER v1.0

Koolbridge Solar has obtained from UL the following certifications:

1. **UL 60730-1** - AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE.
2. **UL 67 - Standards for Safety:** STANDARD FOR PANELBOARDS
3. **UL 486A-486B** - Standards for Safety: Wire Connectors / COMPONENT - WIRE CONNECTORS AND SOLDERING LUGS (Terminal connectors Cat. Nos. *Hot Lug and Neutral Lug*)
4. **UL 486A-486B** - Standards for Safety: Wire Connectors / COMPONENT - WIRE CONNECTORS AND SOLDERING LUGS (*Terminal connectors Cat. Nos. Ground Bus*)
5. **UL 486A-486B** - Standards for Safety: Wire Connectors, CSA C22.2 No. 65-13 - WIRE CONNECTORS AND SOLDERING LUGS - (*Ground Bus*)

Certification by UL of the SLC v1.0 opens many new doors for Koolbridge Solar towards taking a leadership position in the further development of *Disruptive Innovative Energy Technology*. The SLC will fill a serious void that has existed in the home energy management market segment and allow homeowners to be less reliant on the electrical grid. Having the UL logo on our products further substantiates the serious investment and exceptional team work by Koolbridge Solar management and employees have made towards engineering and manufacturing the SMART LOAD CENTER.



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Figure 2. Solar system block diagram

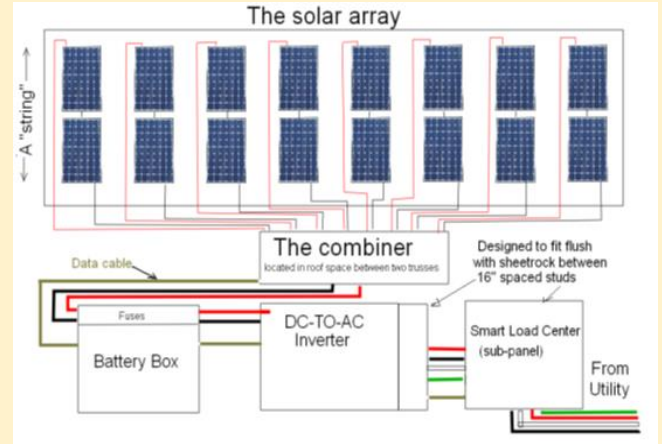


Figure 3. Wiring Diagram shown with a Sonnen Battery System

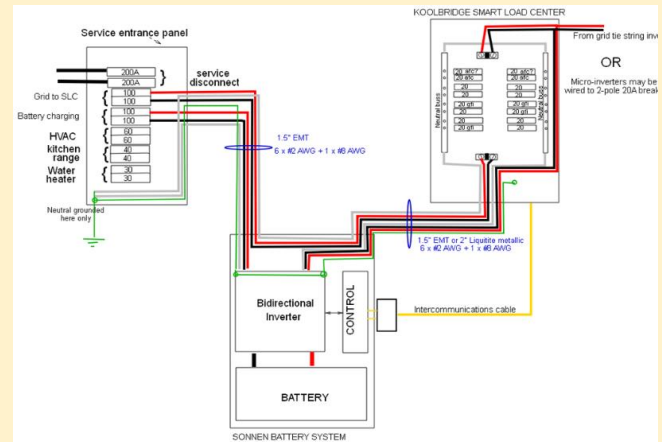
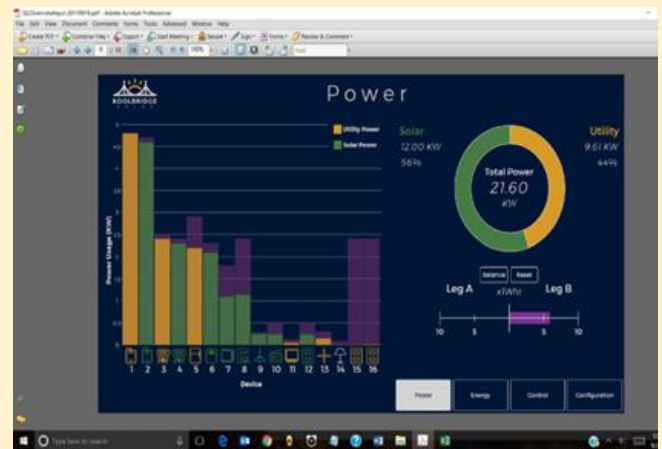


Figure 4. Laptop screen display showing power consumption monitored by the SMART LOAD CENTER



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 V03.01.19