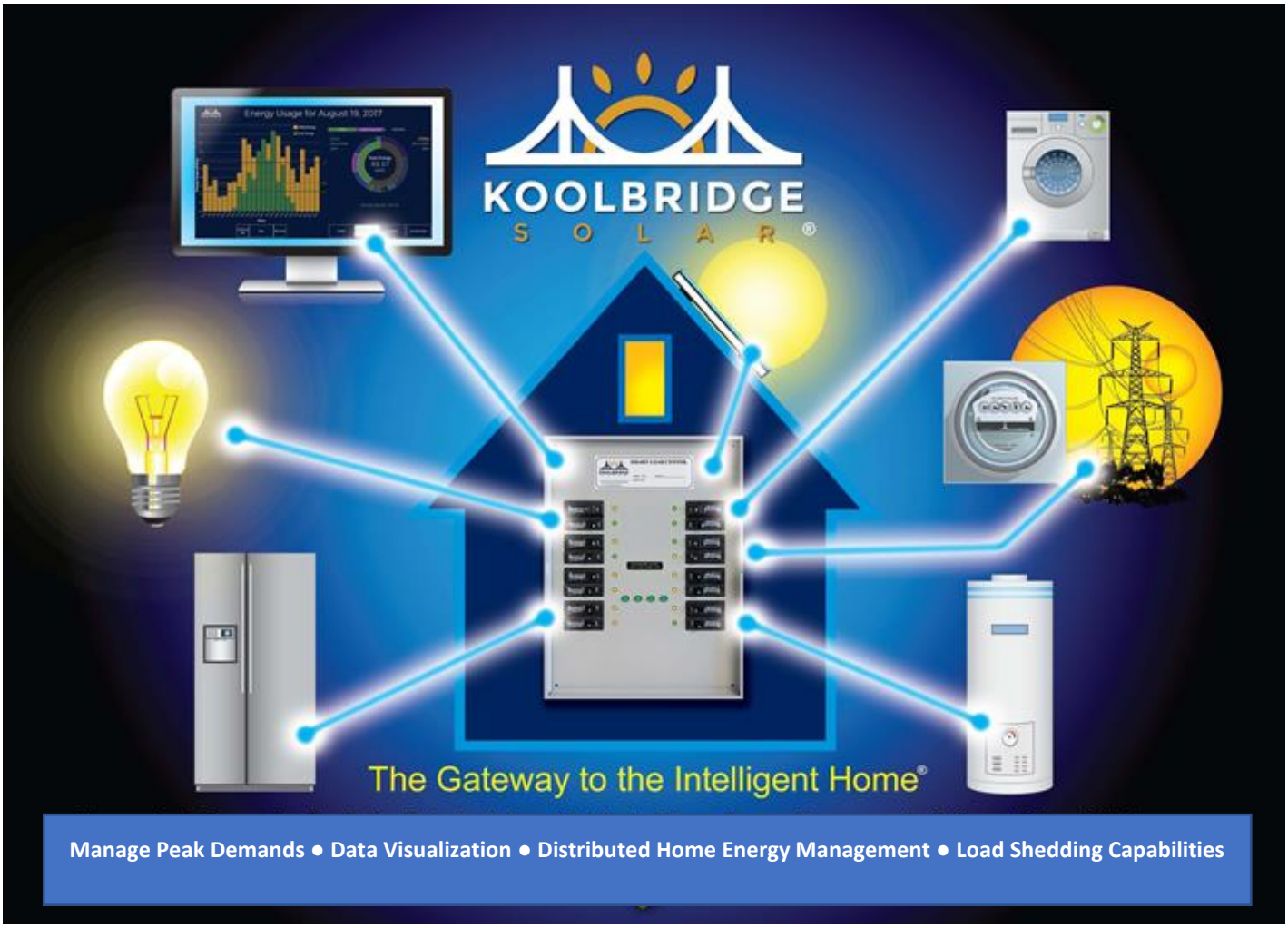


Koolbridge Solar™ SMART LOAD CENTER™ Spec Sheet

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

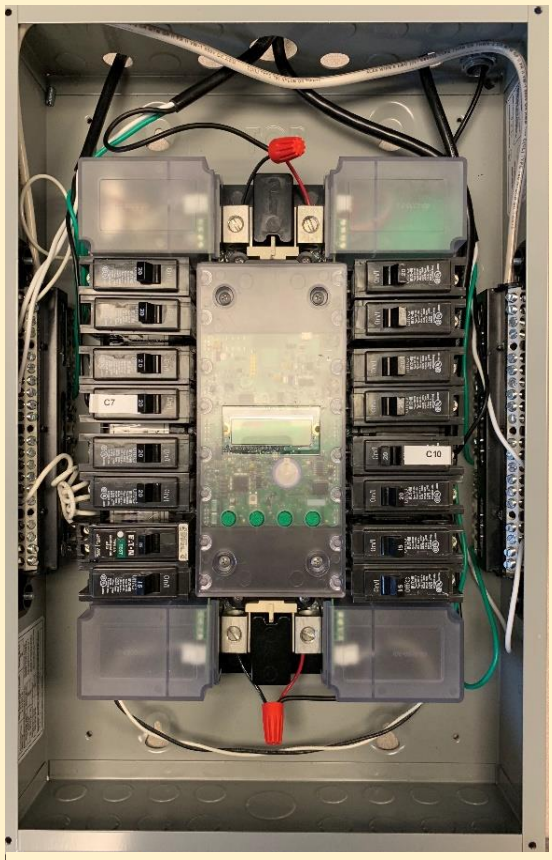
The SMART LOAD CENTER (SLC) was created to maximize the use of renewable energy from the sun, battery, generator or wind (if available). It optimizes the use of solar energy when the sun is shining and only pulls power from the grid when solar energy, either direct or stored in the battery, is low. It 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).

The SLC is at an advanced stage of being qualified as a sub-panel to UL 67 and this will be followed by testing as a transfer switch (UL 1008). The SMART LOAD CENTER may also be used in businesses such as small retail chains, restaurant chains, gas stations or to provide back up for essential point-of-sale terminal operations and back-office computers in large stores, big box retailers or supermarkets or to provide energy cost savings and back-up power for military and other Federal, State, City or local government establishments.

SMART LOAD CENTER features:

- Preset User Priorities - prioritizing loads to keep alive longest in a prolonged power outage on a circuit-by-circuit basis
- Keeps power on when the electrical grid goes down
- Minimize reliance on the electrical grid
- Maximizes use of your own free solar power
- Communicates with smart phones, 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
- Selectively connects circuits based on power priorities during extended power outages
- Fits flush between 16” spaced wall studs in standard US wood frame construction



SMART LOAD CENTER Product Description

The Koolbridge Solar SMART LOAD CENTER 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.

As been recently experienced by victims of hurricanes, most of today's residential solar installations do not keep the power on when the grid goes down, as grid-tied systems must switch off during a grid outage.

With the SLC however, Koolbridge Solar provides a new type of solar installation that keeps solar and grid power isolated from each other and therefore solar power and stored solar power are available for use in the home when the grid goes down. Even when solar and grid power are both available, the intelligence built into the SLC gives preference for using own, free solar power by switching as many breaker circuits to solar as it can at that time.

The SMART LOAD CENTER 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 16-branch circuits are listed in priority order for keeping alive in the event of a grid outage. The priority order is only needed if, during a prolonged grid outage, the received solar power plus stored power is not enough to keep all 16-circuits powered up.

The SLC d*ynamically* 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, laptop or Smart Phone. Because Smart Phone access is by wireless Internet, security considerations dictate that it only be available when the SLC is provided with an Internet access and the Internet is functioning to authenticate a Smart Phone via Koolbridge Solar's server. Access via the PC interface or the SLC's front panel is always available.

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. The diagram at the right 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 a SLC. If desired, in a large house, two-SLCs may be installed to serve 32, 20-amps branch circuits and one may be designated to be a slave of the other. NOTE: Special considerations for neutral routing must be observed in the latter case to avoid creating neutral loops.

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 any cable rated for the feeder breakers used or may be individual wires in a conduit. A conduit is always recommended for new construction.

The other power input of the SLC is connected to an alternative energy source such as a solar inverter of "standalone" type (not the grid-tie output of a grid-tie inverter). The solar inverter must not ground its neutral and must be a "non-independently derived system" as defined by the National Electrical Code, in which its neutral is grounded via the grid neutral. The SLC makes this neutral-to-neutral bonding internally.

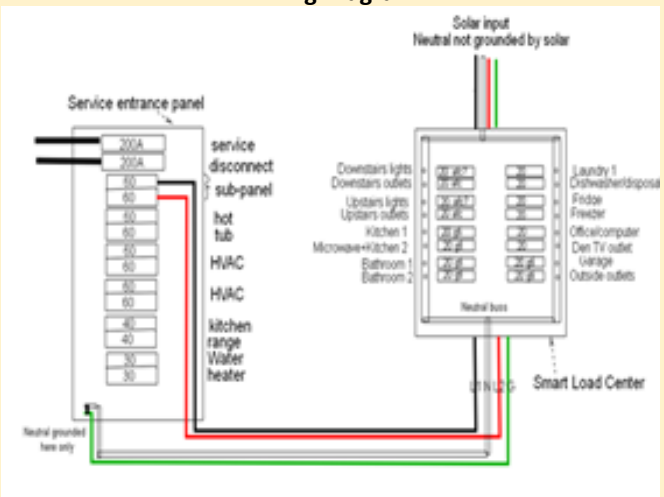
Monitoring Your Solar Output

Built-in SMART LOAD CENTER software provides

SMART LOAD CENTER 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	100 amps on each of the two grid line inputs and 100 amps on each of the two alternative energy inputs
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 30-amps trip level. Breakers may be double pole occupying 2-adjacent slots.
Indicators	Each breaker slot has an associated two-color LED that shows which electrical power source is currently supplying power to that breaker circuit. 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	24" W X 34" L

Figure 1. Typical SMART LOAD CENTER Wiring Diagram



several advantages to the home owners, it shows that your 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 online or mobile applications.

Why the SMART LOAD CENTER 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 communications 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 elements of a User Interface are shown to the right.

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 if necessary, to handle protocols without burdening the SLC. The other two optical isolated interfaces are for internal system use by Koolbridge Solar devices only, such as connecting to inverters, other SLCs and solar combiners etc. 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, recognized the request and responds. If it is a request to some other company's equipment, the adaptors translate the request into something the other company's product understands and then translates the response into the form the SMART LOAD CENTER wants.

For additional information, please contact:
Bill Griffin, CEO & President at 703-395-1379 or
bgriffin@koolbridgesolar.com
www.koolbridgesolar.com

Figure 2. Solar system block diagram

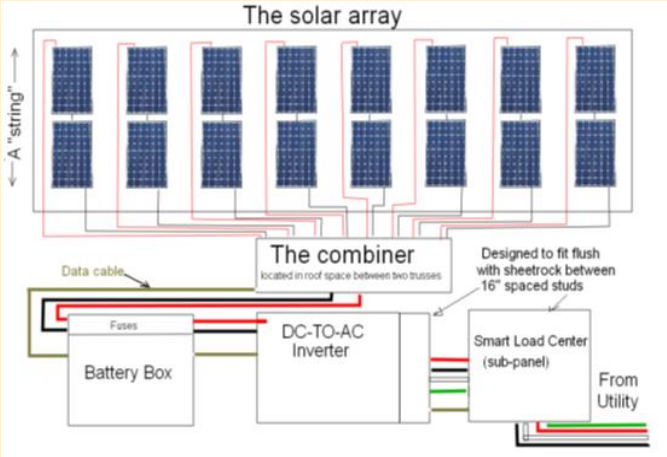


Figure 3. Wiring Diagram shown with a Sonnen Battery System

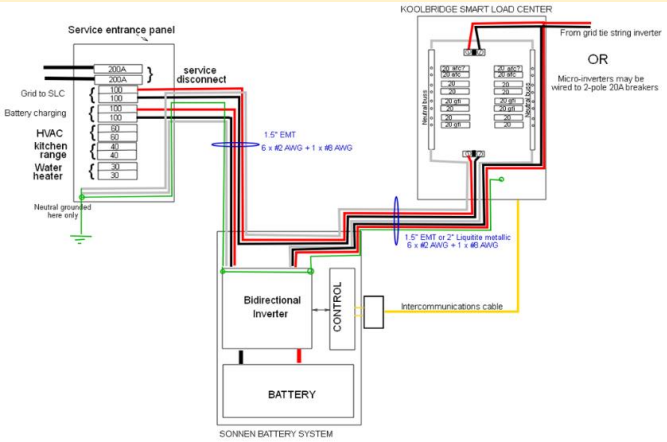


Figure 4. Laptop screen display showing power consumption monitored by the SMART LOAD CENTER