S-60 Wireless Energy Meter User Manual

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Throughout this document this symbol indicates an electric shock hazard exists

OmniSense LLC confidential information
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1. Revision History

Date	Revision	Description
7/20/2018	1.0	Originated

2. Warnings

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA or applicable local codes
- This equipment must only be serviced and installed by qualified electricians
- Read and understand the instructions prior to installation
- Turn off all power before working on or inside the equipment
- Use a properly rated voltage sensing device to confirm power is off.
- DO NOT DEPEND ON THIS DEVICE FOR VOLTAGE INDICATION!

Failure to follow these instructions will result in death or serious injury!

NOTICE

- This product is not intended for life or safety applications
- Do not install this product in hazardous or classified locations
- The installer is responsible for conformance to all applicable codes
- Mount this product inside a suitable fire and electrical enclosure

CAUTION

RISK OF EQUIPMENT DAMAGE

- **This product is designed for use with 0-0.333 VAC current transducers ONLY.**
- **DO NOT USE CURRENT OUTPUT CTs ON THIS PRODUCT**

3. Terminology

CT - Current Transformer
L - Line
N - Neutral
PT - Potential Transformer
W - Active (or Real) Power, Watts
Wh - Active Energy, Watt Hours
VA - Apparent Power in units of VA
VAh - Apparent Energy, VA Hours

4. Wireless Energy Meter Overview

The S-60 Wireless Energy Meter is a single phase energy meter. It monitors 4 different parameters:

- Vrms = AC Volts in units of Root Mean Squared Volts (Vrms) - the RMS voltage at the instant the meter generated the current reading.
- Irms = Amperes in units of Root Mean Squared Amperes (Irms) - The RMS current at the instant the meter generated the current reading.
- Pacc(Wh) = Active Energy in units of Watt Hours (Wh) - the total accumulated Active (a.k.a. Real) energy consumed
- VA(W) = Apparent Power in units of Volt Amps (VA) - the instantaneous apparent power derived by computing VRMS * IRMS where the VRMS and IRMS values are sampled at the instant the meter generated the current reading

The sensor is "plug and play" with any OmniSense or GE HygroTrac gateway and can be used concurrently with all of our other sensor types. When using an OmniSense monitoring system users will be able to do powerful data analysis such as plot heat pump energy vs. ambient air temperature, heat pump energy vs. geothermal source temperature, HVAC energy vs. Solar Radiation etc. The S-60 sensor can use any 0.333 VAC output current transformer. A typical application is monitoring energy on sub circuits in a breaker panel.

5. Supported Configurations

Any configuration with 1 phase with or without a neutral is supported.

6. General Specifications

1. Connections
   1.1. Current Transformer (CT) 0-0.333 VAC input
   1.2. High voltage AC - 1 neutral and 1 phase1, screw terminal connections accept 10-22 AWG wire
      1.2.1. UL Compliance Maximums: 260 VAC L-N
      1.2.2. CE Maximums: 260 VAC L-N
      1.2.3. NOTE : For higher voltages a Potential Transformer (PT) can be used to scale the voltage down to a level compliant with our maximum inputs. Channels whose voltage input use that scaled voltage can apply a scale factor using the web site user interface.
2. Metering Category
   2.1. North America - CAT III; for distribution systems up to 260 VAC L-N
   2.2. CE - CAT III; for distribution systems up to 260 VAC L-N
3. For use in a Pollution Degree 2 or better environment only.
4. Measurement Accuracy @25˚C - Accuracy is
   4.1. Real Power and Energy - +/-1% at >10% full load
   4.2. Current - +/- 1% >10% full load
   4.3. Voltage - +/- 1% >10% full load
5. Meter Accumulator Range - (rolls over to 0 after maximum)

Accumulator	CT (Amps)	Frequency (Hz)	max Wh
Active Energy	80	60	16777215

6. Update Rate - The default is 1 minute and is "over the air" programmable from 30 seconds to 1 hour
7. Current Transformer
   7.1. CT Scaling - no limit, any 0.333 VAC full scale output CT can be supported

7. North American Electrical Specifications

Parameter	Min	Typ	Max	Units
Operating Temperature	-40	25	85	°C
Storage Temperature	-40		85	°C
Operating Humidity	0		95	%RH[1]
CT Input Voltage	0		0.333	VAC
Operating Current load on L1-N		0.022	0.1	A
L-N	90	260		VAC
Wireless Frequency Band	902		928	MHz
Wireless Transmit Power		10		dBm
Wireless Range		100[2]		m
Wireless Channels		64		Channels
Wireless Channel Separation		400		KHz

8. CE Electrical Specifications

Parameter	Min	Typ	Max	Units
Operating Temperature	-40	25	85	°C
Storage Temperature	-40		85	°C
Operating Humidity	0		95	%RH[1]
CT Input Voltage	0		0.333	VAC
Operating Current load on L1-N		0.022	0.1	A
L-N	90	2**60**		VAC
Wireless Frequency Band	868.2		869	MHz
Wireless Transmit Power		10		dBm
Wireless Range		100[2]		m
Wireless Channels		3		Channels
Wireless Channel Separation		600		KHz

[1] Non-condensing
[2] Varies based on many factors including the presence of obstacles such as concrete walls and interference from other electronic equipment

9. Mechanical Specifications

Parameter	Min	Typ	Max	Units
Length		**4.625**		Inches
Width		**2.375**		Inches
Height		**1.0**		Inches
Weight		4		Ounces

10. Antenna Considerations

The S-60 has an internal antenna. There should be minimal metal obstructions around the antenna for maximum RF range performance.

11. LEDs and indicators

There S-60 meter has 4 numeric LED displays. The meter is NOT internally calibrated so the power and energy display data are NOT accurate. The Voltage IS accurate.

12. Viewing Meter Data On OmniSense Web Site

Please see our web site user manual for instructions on accessing and viewing meter data.

13. Energy Accumulation, Positive and Negative

The S-60 always accumulates positive energy. Put another way, the CT direction is does not matter.

14. Meter Installation Guidelines

The energy meter should only be installed by a professional electrician. The meter can either be installed directly in the existing breaker panel, space permitting, or adjacent to the breaker panel inside a plastic or fiberglass NEMA enclosure. For best wireless performance avoid the use of a metal enclosure.

14.1. Connecting AC Power

The meter has connections for Neutral (N) and a single phase (L). The terminal block can accept 10-22 AWG wire. The meter voltage sense leads and power leads should be supplied by a spare 15 or 20 amp circuit breaker using 14 AWG or 12 AWG wire. The meter itself draws its operating energy from the N-L terminals so at a minimum they must be connected to Neutral and a breaker protected hot Leg. The LED displays will be on if the unit has a valid AC power input on N-L. DO NOT DEPEND ON THESE LED DISPLAYS FOR VOLTAGE INDICATION! Depending on the meter configuration and the configuration of the breakers you wish to monitor. For a typical residential breaker panel the breakers alternate "legs" (in the US

technically residential power has two "legs" not two "phases") as you move down the panel. Its important that you maintain the correct relationship between the CT and the phase the current it is monitoring belongs to. Failure to observe the correct relationship will result in incorrect data.

14.2. Current Transducer Interface

Any voltage output current transducer with a full scale output of 0.333VAC can be used.

- Transducer must have maximum 0.333 VAC output at maximum rated current
- Any maximum current CT can be supported. contact us to adjust the meter calibration for non-stock CTs.
- Current transducers will always have a phase error and it varies from one model to the next as well as from unit to unit for identical models. This phase error contributes to kWh error. When the power factor is close to 1.0 the contribution of phase error to overall error is minimal. When the power factor is at 0.5 the contribution of phase error to overall error is maximal. If accuracy (i.e. the closeness of the meter reading to the correct value) is critical choose a CT with a small phase error. If precision (i.e. the repeatability of a measurement, or the relative comparison between two measurements) is all that is required use of a common CT may be sufficient and phase error is not critical.

14.3. Current Transformer Installation Guidelines

Any voltage output current transformer with 0-0.333 VAC full scale output can be used. Either a solid core or split core transformer can be used. An example of split core CTs in a residential breaker panel can be seen in Figure 1. Note that polarity does not matter. Split core CT's should be clamped around the hot wire coming from the protected side of the breaker.

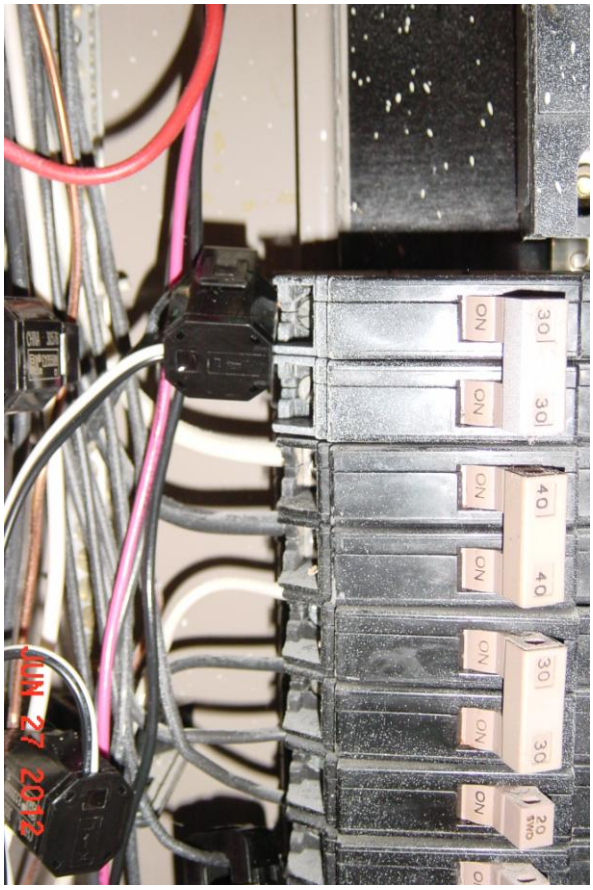

Figure 1 - CTs in a Residential Breaker Panel

15. Wiring Diagrams

Warning

RISK OF ELECTRIC SHOCK OR PERMANENT EQUIPMENT DAMAGE

- **CT input negative terminals may be referenced to the meters Neutral connections and may be at elevated voltages**
- **Do not contact CT input terminals while the unit is connected**
- **Do not connect or short other circuits to the CT input terminals**

The meter's internal circuitry is powered directly from the L-N power connection so regardless of configuration the L-N must have power applied for the meter to function. When power is present the units LED displays will be lit.

A typical US residential service configuration is shown in Figure 2 . Note that US residential service is interchangebly called single phase or two phase because the two phases (properly called "legs") are created using a transformer center tap to create the neutral connection. Thus technically US residential service is 240 VAC single phase with two legs and a neutral.

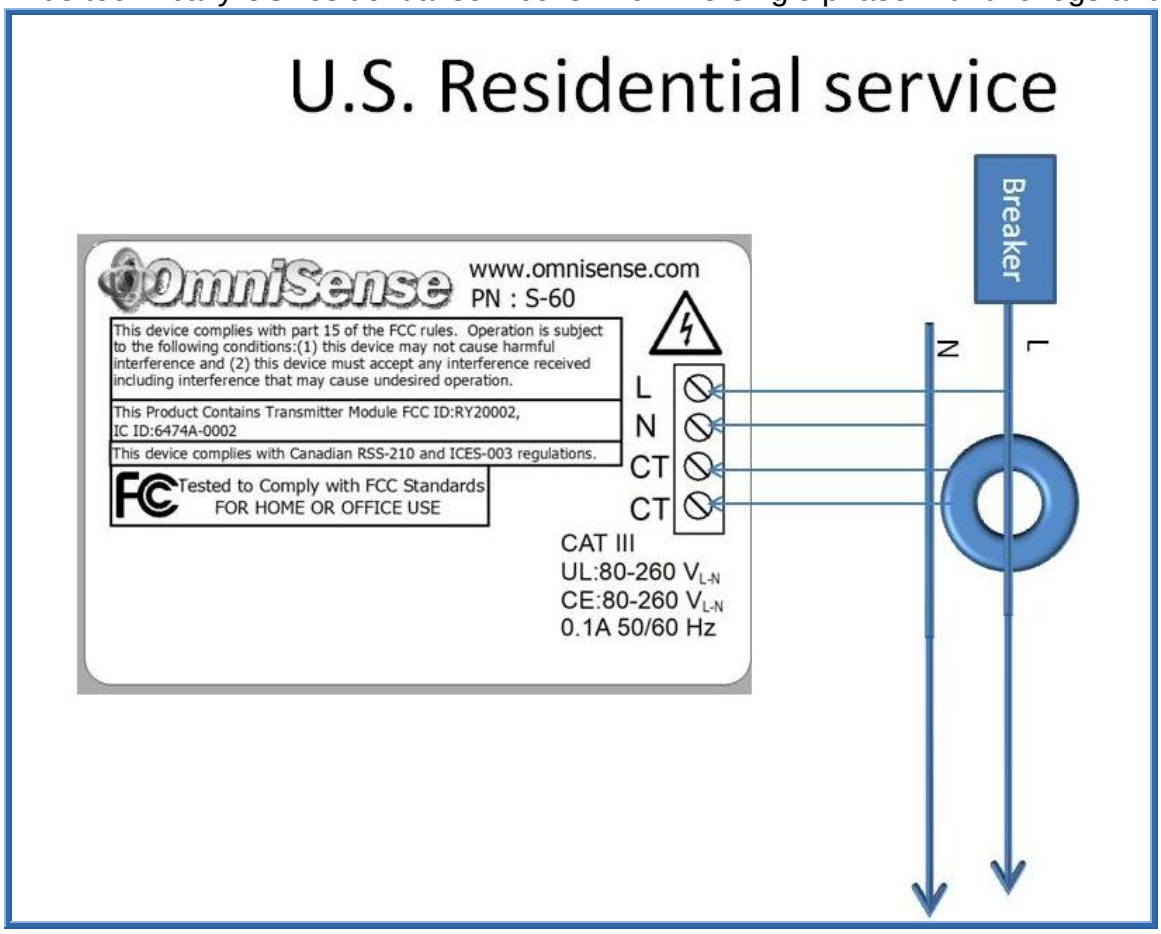

Figure 2 - 1 Phase US Residential Service Wiring Diagram

16. Data Scaling

The meters do not scale data locally so the data displayed on the LED display that is derived from the CT is not accurate. All scaling of data is done on the web server.

17. Labeling for Regulatory Compliance

17.1. US/Canada

For US and Canadian use equipment is marked as shown below.

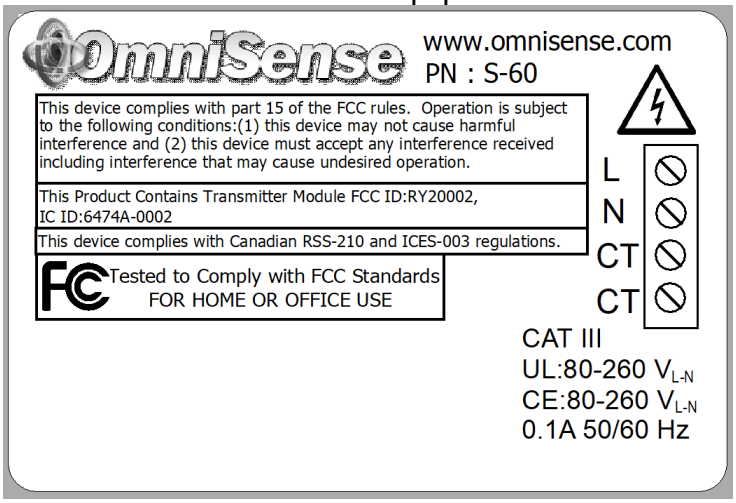

Figure 3 - US and Canadian compliance labeling

18. Manufacturer's Declaration of Conformity

We,

OmniSense LLC
72 Sams Point Road
Lady's Island SC 29907
U.S.A.

declare under our sole responsibility that the

S-60 Wireless Energy Meter

to which this declaration relates is in conformity with the following standards:

For US and Canada Models Only

FCC Part 15

This Product Contains Transmitter Module FCC ID: RY20002.

This equipment complies with Parts 15 of the Federal Communications Commission (FCC) rules for the United States. Operation is subject to the following two conditions:

(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

The equipment has been tested and found to comply with part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet or on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Part 15 Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada (IC)

This Product Contains Transmitter Module IC ID:6474A-0002. This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference causing equipment standard entitled Digital Apparatus, ICES-003 of Industry Canada. This device complies with Canadian RSS-210 regulations. NOTICE: The Industry Canada (IC) label identifies certified equipment. The Department does not guarantee the equipment will operate to the user's satisfaction.

Beaufort - July 2018
issued

Chris Hoogenboom
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