

# AURA SMART SWITCH



## User Guide

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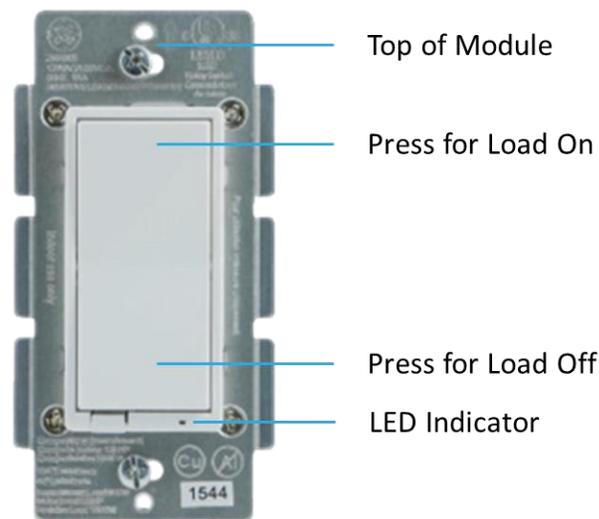
# 1 Product Description

## 1.1 Overview

AURA is a 120V Smart Switch has the form factor of a standard AC Decorator style rocker switch (see Figure 1-1) but incorporates a LoRa radio with power control and monitoring circuitry which allows for the following remote user features:

- Power on-off control and status
- Precise measurement of:
  - consumed energy (kWh)
  - line voltage (Vrms)
  - load current (Arms)
  - load power (real, reactive, and apparent, W)
  - load power factor

AURA is a Class C device that enables real-time control and telemetry inquiry.



**Figure 1-1 AURA form factor**

AURA is connected via LoRaWAN, enabling seamless transmission and reception in US915 frequency band.

This document provides comprehensive descriptions of AURA Smart Switch, along with detailed guidance on its hardware capabilities. For insights into the functional operation and software behavior, please consult the [Technical Reference Manual \(TRM\) document](#).

## 1.2 Specifications

AURA specifications are listed in **Error! Reference source not found.** The main sensing functions are described in the following subsections.

**Table 1-1: AURA Specifications**

Parameter	Specification
Dimensions	43 mm (1.7") W x 47 mm (1.85") D x 104 mm (4.1") H
Weight	0.14 kg (0.30 lb)
Air Interface	LoRa US915 (902 - 928 MHz) Class C
Operating Control	Type 1.C Action
Environment	Indoor residential & commercial 0 to 40 °C (32 to 104°F) 5 - 95% non-condensing RH Pollution Degree 2
Line	120 VAC, 60 Hz, 15 A circuit
Load	1800 W (15 A) Resistive 1000 W Incandescent 5A Electronic ballast 1200 VA Standard ballast ½ HP Motor
Wire Termination	Max. 2 wires per terminal except 1 wire for Ground #14 - #12 AWG copper or copper clad solid conductor 16 mm (5/8") strip length Torque terminal screw to 2.3 N.m (20 lbf-in)
Surge Prot.	IEEE C62.41 Category A
Impulse Voltage	2500 V
Approvals	cUL (E515077) FCC Pt. 15, RSS-247, FCC Pt. 27

## 2 Operating Instructions

### 2.1 Included Product and Accessories

The following items are shipped with each sensor:

- 1x AURA Smart Switch device.
- 1x corresponding device Quick Start Guide.

**NOTE:** to ensure safe installation and maintenance of the device please read [Safety Precautions](#).

### 2.2 Unpacking and Inspection

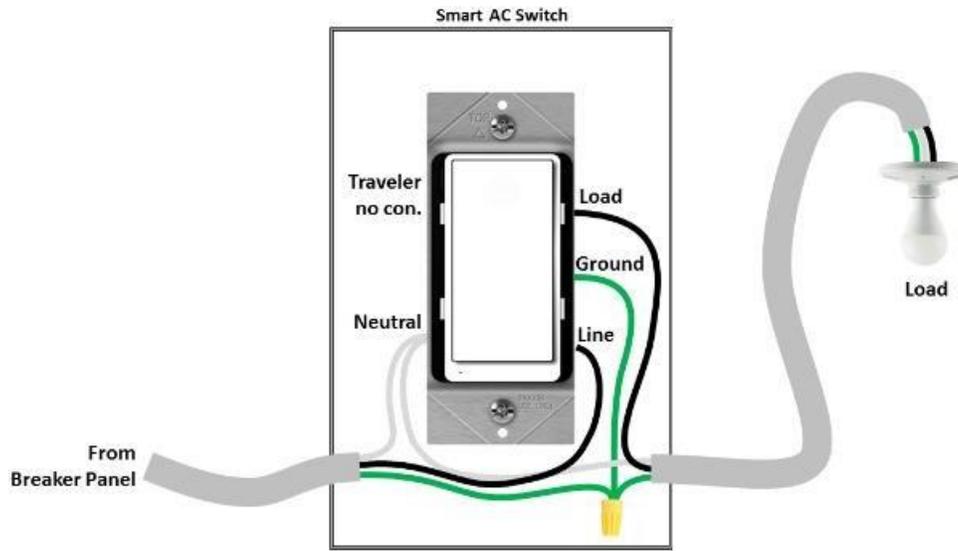
The following should be considered during the unpacking of a new sensor.

1. Inspect the shipping carton and report any significant damage to TEKTELIC.
2. Unpacking should be conducted in a clean and dry location.
3. Do not discard the shipping box or inserts as they will be required if a unit is returned for repair or re-configuration.

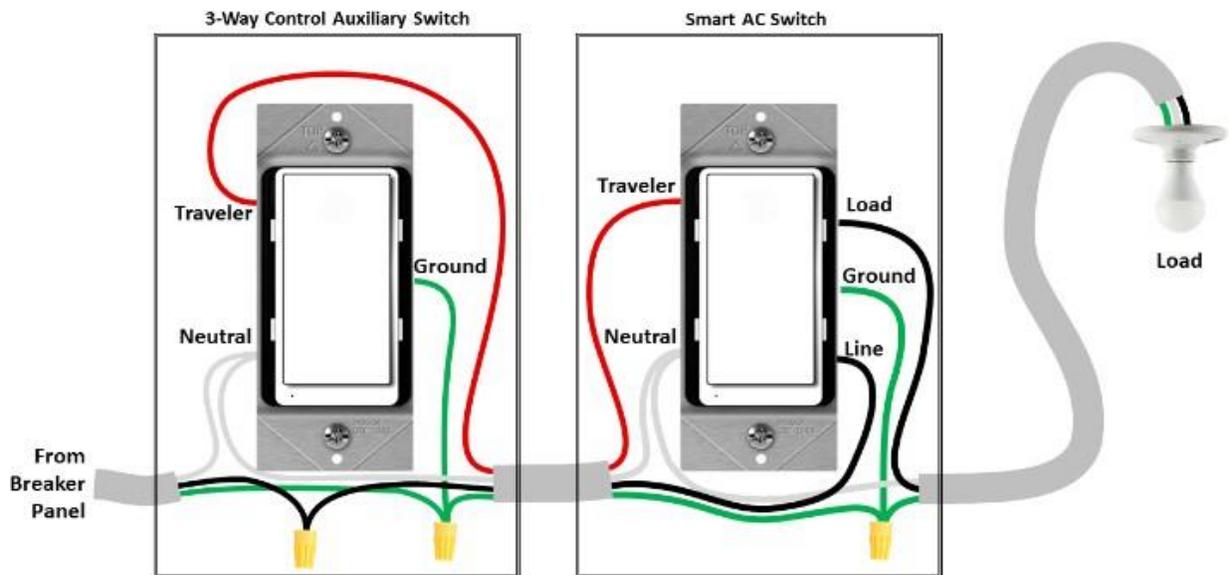
### 2.3 Installation Procedure

The following steps are required to install AURA:

1. Locate the electrical box into which AURA will be installed.
2. Remove power to the wiring by turning off circuit power at the circuit breaker or fuse panel.
3. Test the existing wiring to ensure that power has been removed.
4. Inspect the electrical box, a box depth of at least 2" is required. The electrical box may be metal or plastic but a plastic box will result in the best all-around RF performance. Note that the AURA requires a Neutral connection.
5. Identify the appropriate wiring diagram for your installation situation. Common installation diagrams are described in Figure 2-1, other options are possible. Always follow appropriate electrical codes and regulations.



Option A: Single Switch End of Run



Option B: Multiple Switch Run

Figure 2-1 Wiring Diagrams

6. Strip wire insulation back 5/8" (16 mm) and maintain a straight conductor for each of the wires to be terminated to the switch module.
7. Connect the wires to the module in accordance with the wiring diagram by inserting the bare wire fully into the wire hole for each of the Line (Hot), Load, Neutral Wire and Ground terminals on the switch module.

8. Once the module is fully wired, push the wiring and the module into the electrical box, secure the module with the two mounting ear screws, and install the trim plate with the two trim plate screws. Always use a plastic faceplate for best RF reception.
9. Reapply power to the circuit. The module faceplate LED will now begin to flash indicating connection to a LoRa network is underway.
10. Observe the load and test using the local on-off faceplate rocker switch.
11. Commission as LoRaWAN Class C device on the appropriate LoRa network.

## 2.4 Commissioning

AURA is a Class C device that has a set of commissioning information that must be entered into the network server for the sensor to be able to join the network and begin normal operation once activated. For instructions on how to do this please refer to the Network Server Quick Start Guide you get in the box with the device (also available online in the [Knowledge Base](#)).

## 3 Operation

### 3.1 Switch Control Modes

AURA rocker switch is a momentary contact style and will always return to its central neutral position when released and is used for local user on-off load control like standard AC switch.

AURA can also be used in 3-way installations with the addition of a 3-Way Control Auxiliary Switch. The Auxiliary Switch does not contain a load switch or a LoRa radio and simply controls the main Smart AC Switch by sending a signal through the traveller wire.

### 3.2 Remote Operation

By default, the switch load will be off after AC power is applied to the module. This is a LoRaWAN Class C device which means one can send a downlink to AURA and get a reply in close-to-real time without the wait of an uplink to transmit the downlink.

The switch load can be turned on/off through the LoRa remote interface.

Information available through the interface:

- measurement of energy supplied to the connected load
- line voltage
- load current
- load power (real, reactive, and apparent)
- load power factor

Please refer to the TEKTELIC Communications [Technical Reference Manual \(TRM\)](#) for details regarding the LoRa network interface.

### 3.3 Local Operation

The switch load can be turned on by pressing momentarily the top of the faceplate rocker switch and turned off by pressing momentarily the bottom of the rocker switch. This load status change will be reported over the LoRa network which will be indicated by LED status change.

### 3.4 LED Behaviour

The module faceplate has an LED indicator:

**Table 1-1: AURA LEDs**

LED	Description
Solid Blue	Load power is OFF; Module is connected to LoRaWAN
Off	Load power is ON; Module is connected to LoRaWAN
90% On - 10% Off; 1s cadence	Load power is OFF; Module is connecting to LoRaWAN
10% On - 90% Off; 1s cadence	Load power is ON; Module is connecting to LoRaWAN

## 4 Basic Downlinks

AURA uses a "tick" system for reporting data. Generally, telemetry reporting time interval in seconds = core tick time interval \* number of ticks per reporting.

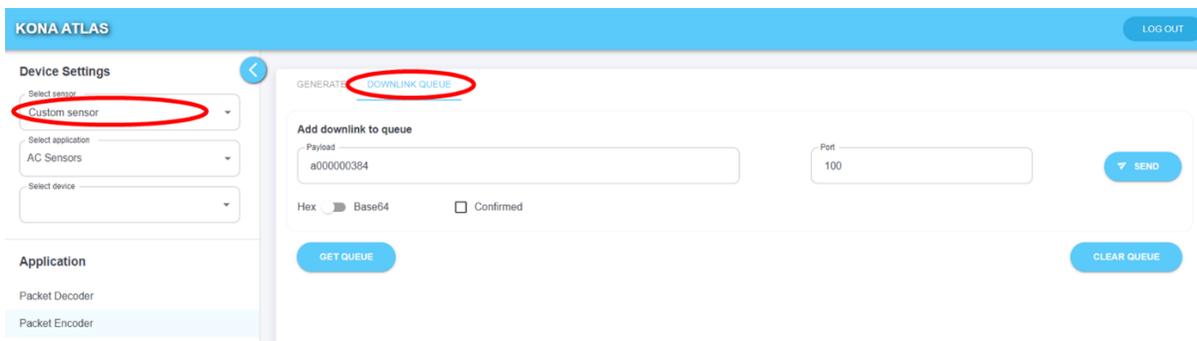
There are two sets of settings that must be configured in conjunction - "Core reporting tick in seconds" and "Ticks per [data/report]".

"Core reporting tick in seconds" will determine the interval between ticks. For example, you may set it to 30 seconds or 180 seconds (3 minutes) for each tick.

"Ticks per [data/report]" determines how many ticks it will take before the sensor reports any data. For example, if you set "Ticks per Battery report" to 2, it will take 2 ticks before the sensor reports battery data.

### To Change the Core Report To Every 15 Minute

Send the Downlink: a0 00 00 03 84 **port** 100. Aura doesn't have a decoder included in Atlas. However, it is possible to send the downlink in online mode as shown in the picture.

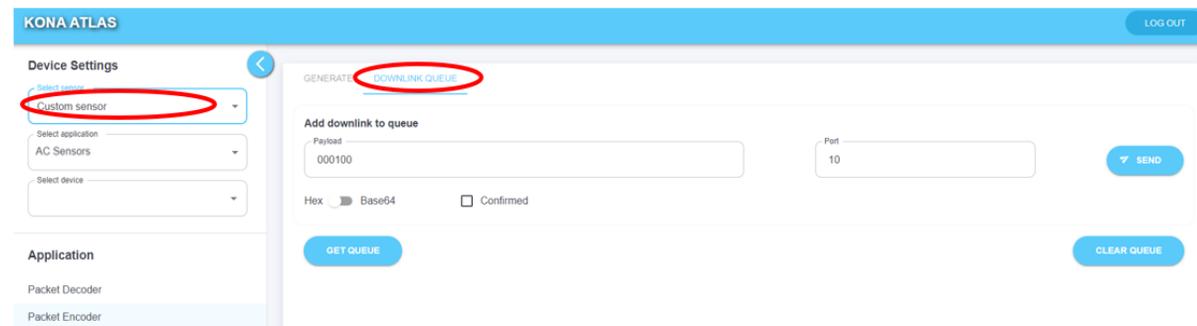


The screenshot shows the KONA ATLAS web interface. On the left, the 'Device Settings' section has 'Custom sensor' selected in a dropdown menu. The main area is titled 'GENERATE DOWNLINK QUEUE'. Below this, there is a form to 'Add downlink to queue'. The 'Payload' field contains 'a000000384' and the 'Port' field contains '100'. There are 'GET QUEUE' and 'CLEAR QUEUE' buttons. The 'Hex' radio button is selected, and the 'Confirmed' checkbox is unchecked. A 'SEND' button is also present.

Figure 4-1 Downlink to change core report.

### To close the relay

Send the Downlink: 000100 **port** 100.



The screenshot shows the KONA ATLAS web interface. On the left, the 'Device Settings' section has 'Custom sensor' selected in a dropdown menu. The main area is titled 'GENERATE DOWNLINK QUEUE'. Below this, there is a form to 'Add downlink to queue'. The 'Payload' field contains '000100' and the 'Port' field contains '10'. There are 'GET QUEUE' and 'CLEAR QUEUE' buttons. The 'Hex' radio button is selected, and the 'Confirmed' checkbox is unchecked. A 'SEND' button is also present.

Figure 4-2 Downlink to close the relay

## To open the relay

Send the Downlink: 0001ff **port** 100.

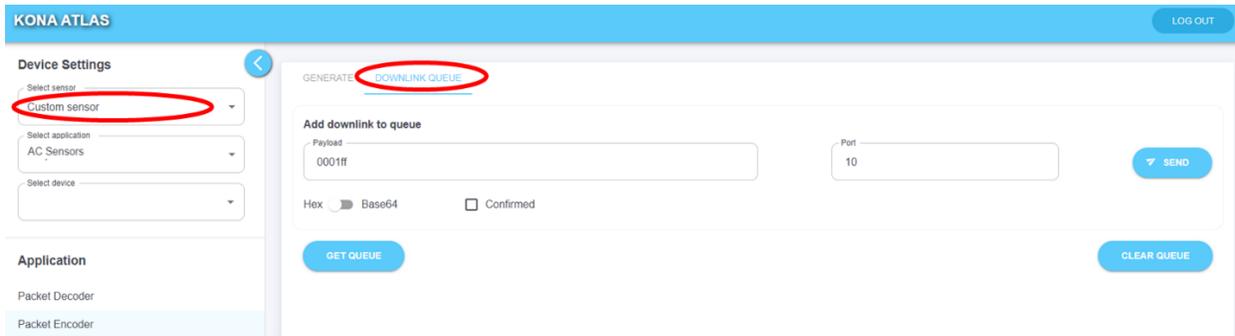


Figure 4-3 Downlink to open the relay

## Examples Of Uplinks

0x00 0xFE 0x00 0x01 0x51 0x80 0x00 0x00 0x6A 0x50 0x00 0x00 0x00:

- Energy Consumption Meter:
  - Total elapsed time: 86400 seconds (= 24 hours)
  - Total energy consumed: 27216 W-h (= 27.216 kW-h)
- Energy Consumption Meter Status Indicator:
  - Status: Idle (stopped)

## Example of data on LeapX

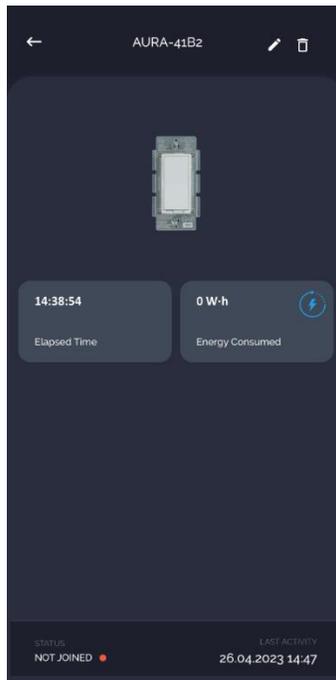


Figure 4-4 LeapX application

## 5 Data converters

Please follow this link: <https://github.com/TektelicCommunications/data-converters/tree/master> for the data converters used with TEKTELIC NS & other Network Server for TEKTELIC Sensors. These data converters can be used as a reference for other platforms.

TEKTELIC's data converters conform to the LoRa Alliance Payload Codec Specification and can be used with any 3<sup>rd</sup> party Network Server / Application Server that supports this specification.

<https://resources.lora-alliance.org/technical-specifications/ts013-1-0-0-payload-codec-api>

## 6 Safety Precautions

The following safety precautions should be observed for AURA installation:

- TO AVOID FIRE, SHOCK, OR DEATH, ALWAYS TURN OFF POWER at the circuit breaker or fuse panel before wiring the module!
- If you are unsure or uncomfortable with installation of this module, consult an electrician.
- To be installed in a standard electrical box and used in accordance with appropriate electrical codes and regulations.
- To be installed with copper or copper clad wires only.
- Exercise caution when powering loads from the LoRa radio- controlled switch. Loads connected to this switch may be automatically powered on by a timer or by a remote user. Such unexpected operation may present a hazardous condition for local personnel.
- This product shall not be used with medical and/or life support equipment.

## 7 Compliance Statements

### **Federal Communications Commission:**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

To comply with FCC exposure limits for general population / uncontrolled exposure, this device should be installed at a distance of 20 cm from all persons and must not be co-located or operating in conjunction with any other transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in an industrial 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 to correct the interference by one of the following measures:

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

### **Innovation, Science and Economic Development Canada (Industry Canada):**

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- i. This device may not cause interference, and

- ii. This device must accept any interference, including interference that may cause undesired operation of the device.

This device should be installed and operated with minimum distance 0.2 m from human body.

***California Proposition 65:***

 **WARNING:** This product can expose you to chemicals including lead, nickel, and carbon black, which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).