



A Division of Grid Connect Inc.

Smart Power Cord Users Guide



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Disclaimer and Revisions

The information in this guide may change without notice. The manufacturer assumes no responsibility for any errors that may appear in this guide.

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3/05/2020	A	MBJ	Preliminary Release
3/11/2020	B	GPM	Basic Edits to improve content and readability
4/7/2020	C	GPM	Added details for switch operation and other edits
6/22/2020	D	GPM	Added TOC and Figure 2. Added clarification of LED operation. Edits to improve content and readability

Table of Contents

1. Quick Start	2
1.1 Overview of the ConnectSense Smart Power Cord	2
1.2 Provisioning Requirements	4
1.3 Summary of the Provisioning Steps	4
1.4 How to Create an Account	6
1.5 Connecting the Smart Power Cord to the Network	10
1.5.1 Add a Smart Power Cord	11
1.5.2 Reboot and reset the Smart Power Cord	11
1.5.3 Connect to the Smart Power Cord's SoftAP	11
1.5.4 Select a Wi-Fi network	13
1.5.5 Verify the Smart Power Cord is Connected	14
2. Graphical Interface	14
2.1 Display Modes	14
2.1.1 Pump Mode	15
2.1.2 Appliance Mode	15
2.1.3 Advanced Mode	16
2.2 Available Graphs	17
2.3 Power Signature	18
2.4 Rules	19
2.5 Sample Text message	20
2.6 Miscellaneous Settings	21
2.7 Power Signature example	22
2.8 Displaying the variables about your cord	23
2.9 Sample Label on the Smart Power Cord	24
2.10 Sample device to plug-in	25
2.11 Smart Power Cord Specifications	26
2.12 Smart Power Cord Warranty	26
3. Compliance	26
3.1 FCC/IC Information	26

1. Quick Start

This section provides an overview of the Smart Power Cord and how to quickly provision it to the ConnectSense Cloud application.

1.1 Overview of the ConnectSense Smart Power Cord

LEDS

There are 2 LEDs on the Smart Power Cord.

Status LED:

Blue, in normal operation LED used to indicate relay on/off status.

Relay is on	Blue LED is on
-------------	----------------

Wi-Fi LED:

On factory reset	Solid red for 1 second, then off
------------------	----------------------------------

On reboot	Solid green for 1 second, then off
-----------	------------------------------------

In provisioning state	Yellow slow (2x) flash
-----------------------	------------------------

Connecting to Wi-Fi	Yellow fast (20x) flash
---------------------	-------------------------

Failed connect Wi-Fi	Yellow solid
----------------------	--------------

Connecting to AWS	Green slow (2x) flash
-------------------	-----------------------

Connection to AWS	Green on for 5 seconds, then off
-------------------	----------------------------------

Failure to connect AWS	Red slow (2x) flash
------------------------	---------------------

When holding the cord with the Push button below the LEDs, the Wi-Fi LED is on the upper left and the Status LED is on the upper right as shown below.



Figure 1

Push Button

The push button on the Smart Power Cord can be used to manually turn on and off any device that is plugged into the Smart Power Cord. If desired, the button can be disabled through the configuration screen. Here is the behavior of the push button

<i>Push button</i>	<i>Wi-Fi LED</i>
Holding button for 5 seconds does a reboot	flash green for 1 second
Holding button for 10 seconds does a soft (Wi-Fi credentials) reset	flash yellow
Holding button for 15 seconds does a full factory reset	flash red
Press the push button down for 1 second to toggle the relay and turn on / off a device plugged into the Smart Power Cord.	N/A

The push button is used to provision the Smart Power cord on the ConnectSense Cloud application. If you hold down the push button for roughly 15 seconds it will reset the Smart Power Cord to default configuration and put the Wi-Fi interface into SoftAP mode so that it can be provisioned onto the customer's network and the ConnectSense cloud application.

SoftAP

The ConnectSense Smart Power Cord has an internal Wi-Fi radio. The Wi-Fi can be used in 2 different modes:

1. Client Station mode – to connect to network Access Points (APs)
2. SoftAP mode – allows host computers to connect to it for configuration

For provisioning the Smart Power Cord to the cloud, we use the “SoftAP” or soft access point. The use of the SoftAP is temporary and is only enabled during the provisioning process. To Provision the Smart Power Cord to the ConnectSense Cloud, you need to make a Wi-Fi connection from a host computer to the SoftAP wireless connection in the Smart Power Cord. Once the Smart Power Cord is connected to the cloud, the SoftAP is disabled for security.

1.2 Provisioning Requirements

To follow this Quick Start guide, you will need the following items to get your unit up and running quickly.

- To follow along with this document, you will need a ConnectSense Smart Power Cord (SC) and a test device like a fan or light bulb. (See section 2.10)
- You will also need to have an account on the ConnectSense cloud application. (See section 1.4)
- This process requires that your local network support 2 features to provision the Smart Cord to the ConnectSense cloud:
 - The Wi-Fi Access Point AP must broadcast its SSID
 - The DHCP server is active and can assign an IP address to the Smart Cord. If Static IP addresses are preferred, then the DHCP server must be configured to assign the static IP address to the MAC address of the Smart Cord.

1.3 Summary of the Provisioning Steps

Here is a summary of the provisioning procedure. Please refer to figure 2 when reviewing the steps:

1. Connect the Smart Power Cord to the wall outlet to power the unit. In this example you are connecting to the 120VAC power, the cord will handle up to 240VAC.
2. Plug a test or customer device that you want to monitor/control into the other end of the Smart Power Cord.
3. Using a host computer, sign into the ConnectSense Cloud application using a Web Browser.

<https://cord.connectsense.com>

4. Hold down the push button for roughly 15 seconds (until the Wi-Fi LED flashes Red) to reset the Smart Power Cord to default configuration and put the Wi-Fi interface into SoftAP mode so that it can be provisioned onto the customer's ConnectSense cloud application.
5. Connect a Host computer's Wi-Fi interface to the SoftAP interface of the cord that you want to provision. The Smart Power Cord presents an SSID of "CS-CORD-XXXXX" (where XXXXX is the unique serial number for each Smart Power Cord)
6. The Smart Power cord will sense the SoftAP connection and will then discover a list of local Wi-Fi networks and passes this to the ConnectSense application.
7. From the list of available Wi-fi networks, select the desired Wi-Fi network and provide the passphrase key. The Smart Power Cord will associate with the AP and make a secure network connection to AWS.
8. The Smart Power Cord is now connected.

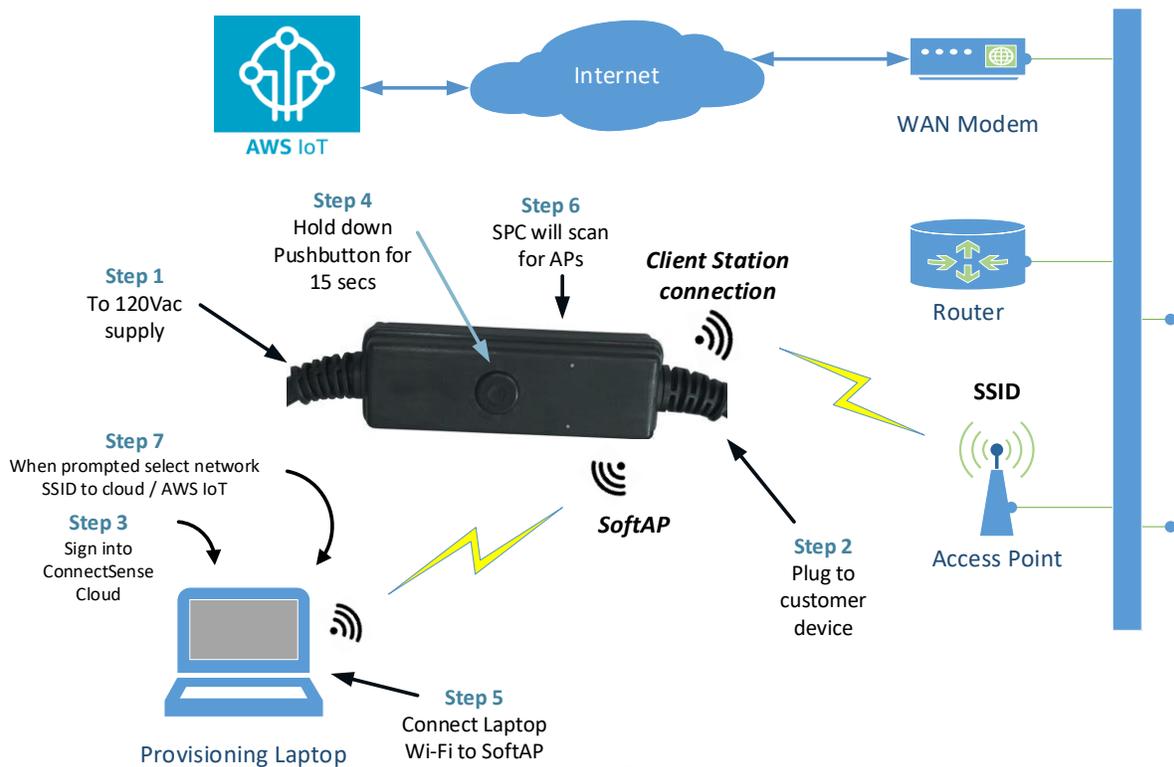


Figure 2

1.4 How to Create an Account

This section covers how to create a user account on the ConnectSense Cloud application.

Before you can provision a Smart Power Cord, we must create a user account On the ConnectSense Cloud application. If you already have an account, jump to the next section. To start, go to the following web address.

<https://cord.connectsense.com>

Sign in

Email *

Password *

Sign In Sign up

Forgot password?

A red arrow points from the text 'Click on the "Sign up" button' to the 'Sign up' button in the form.

Click on the "Sign up" button

That will show the following dialog box. Fill it out and click on the "Sign Up" button.

< Sign in

Sign up

First name *
Mike

Last name *
Justice

Email *
mikej@gridconnect.com

Phone Number
6302451445

Password *
.....

Password confirmation *
.....|

Sign Up

Now go back to:

<https://cord.connectsense.com>

and **Sign in** and sign into your account

Sign in

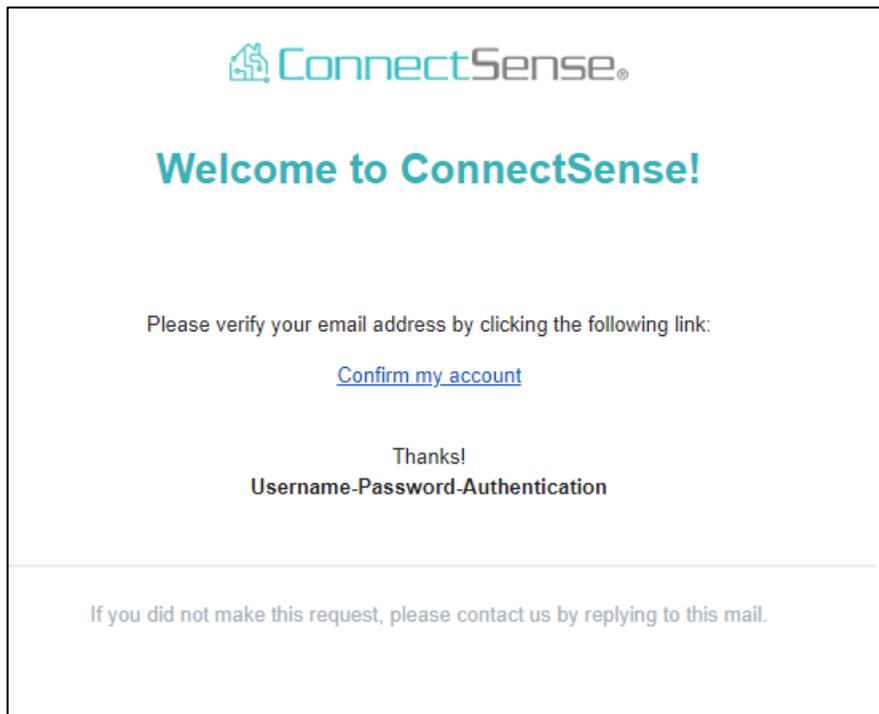
Email *
mikej@gridconnect.com

Password *
.....

Sign In Sign up

[Forgot password?](#)

Your email will be verified. Click on “Confirm your account” to complete the account setup.



If it is successful, you will see the following screen.



Email Verification

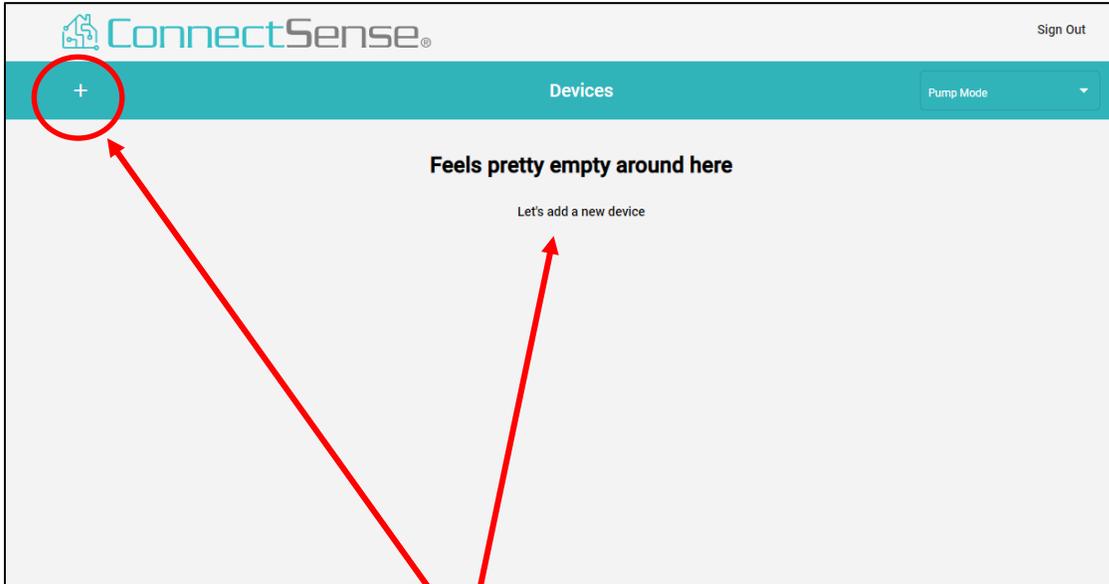
Your email was verified. You can
continue using the application.

Need more help? Please contact the systems administrator.

1.5 Connecting the Smart Power Cord to the Network

This section will show you how to Add the Smart Power Cords to ConnectSense Cloud and get them connected. This section assumes that you already have an account on the ConnectSense Cloud.

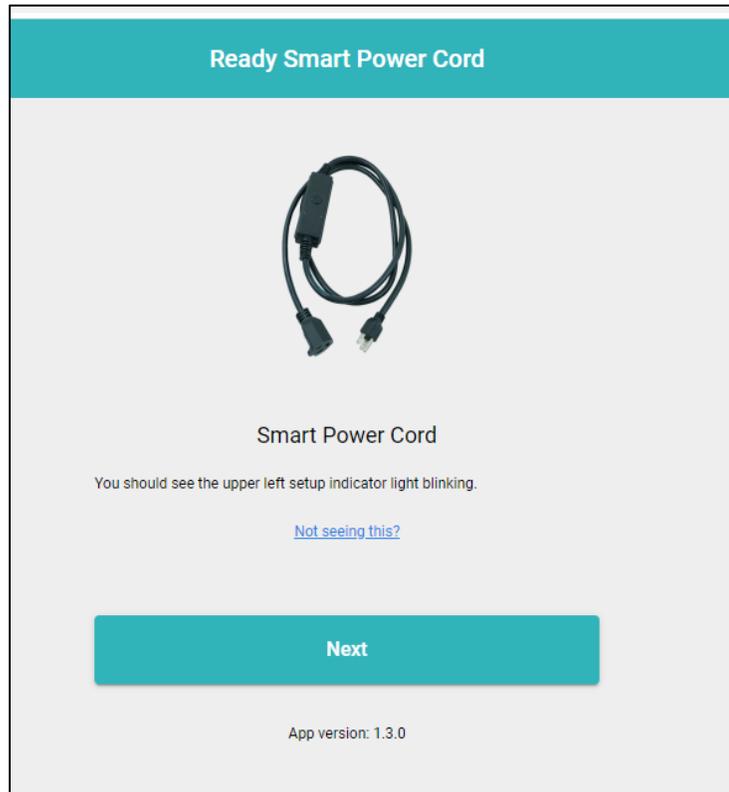
The following is the Main screen for the ConnectSense Cloud application. You can add multiple Smart Power Cords to the ConnectSense Cloud. As you add them, they will display on this screen.



Click on the "+" OR "let's add a new device" link to add Smart Power Cords (first device only)

1.5.1 Add a Smart Power Cord

To ADD a Smart Power Cord to the account, select the “+” in the top left-hand pane. For the first device you can click on “let’s add a new device” link to add a new device. This will bring up the following window.



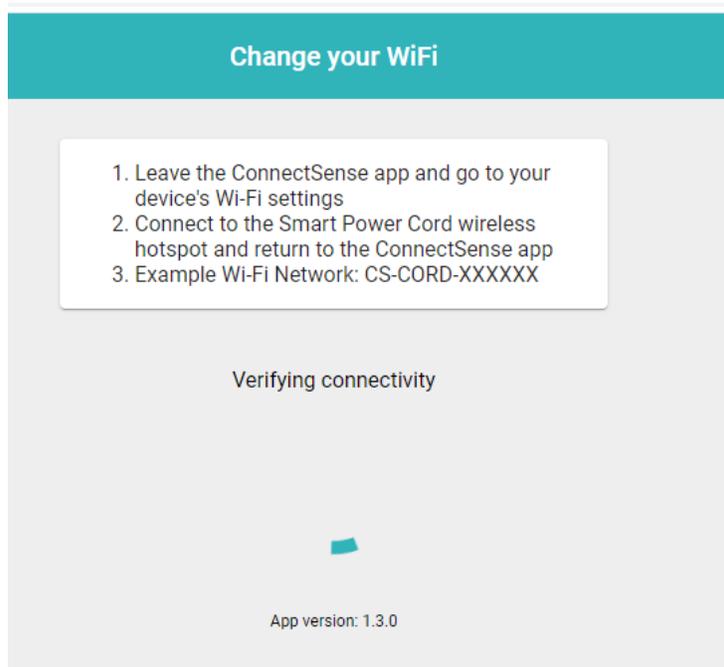
1.5.2 Reboot and reset the Smart Power Cord

To reset and activate the Smart Power Cord’s SoftAP network, **press and hold the push button (about 15 seconds) until you see the Wi-Fi LED flash Red.** Once the Wi-Fi LED flashes Red, the LED Light will switch to look yellow and start flashing.

1.5.3 Connect to the Smart Power Cord’s SoftAP

Click on the “Next” button on the screen.

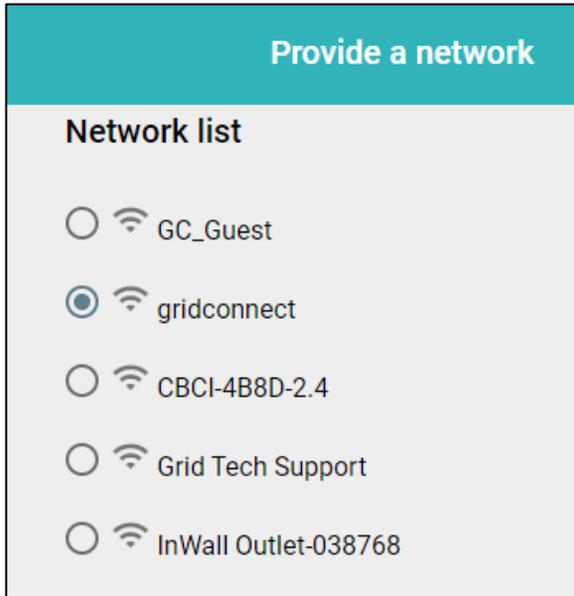
You should see the Wi-Fi LED (upper left) light blinking. The status LED should be solid Blue. The screen will change and look like this:



Note: To do this step you need to use your host computer's Wi-Fi interface to scan and connect to the Smart Power Cord's SoftAP Wi-Fi interface.

Using your host computer's network utility scan the Wi-Fi network for the SoftAP on the Smart Power Cord. The Smart Power Cord will be named "CS-CORD-XXXXX" (where XXXXX is the unique serial number for each Smart Power Cord). Click on the desired Smart Power Cord to connect to the device.

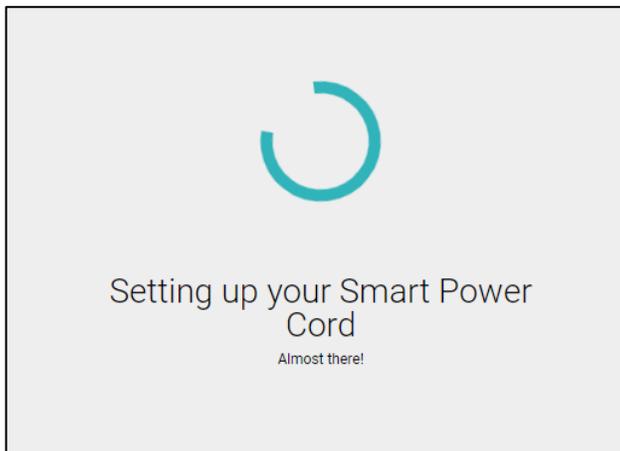
When the Smart Power Cord gets a connection from your host computer to its SoftAP, it will use its client station radio to perform a Wi-Fi scan of the environment and the screen will change to show all of the Access Points that it can see. The screen will change as shown:



1.5.4 Select a Wi-Fi network

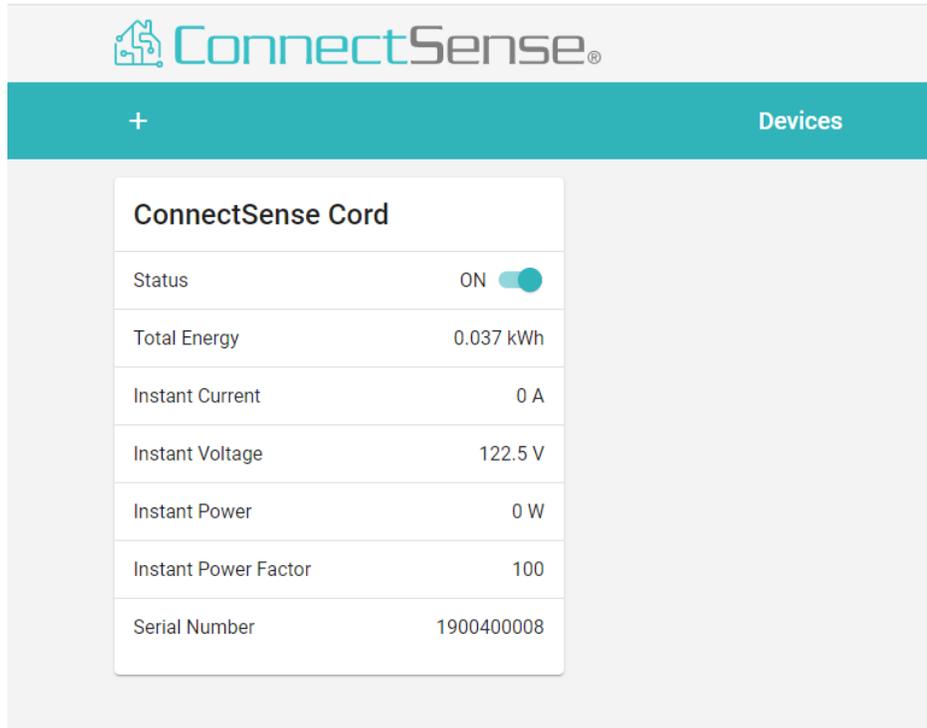
Next, select the Wi-Fi network that you want the Smart Power Cord to pair with that will allow a connection to the Internet and AWS. Once you select a network, you will likely need to add the security passphrase to connect to the Wi-Fi network.

The screen will change to this:



1.5.5 Verify the Smart Power Cord is Connected

Now the Wi-Fi LED should go off and you should see the screen below. This screen shows the status as “ON” which means that the cord is now connected to the local Wi-Fi network and the Cloud application.



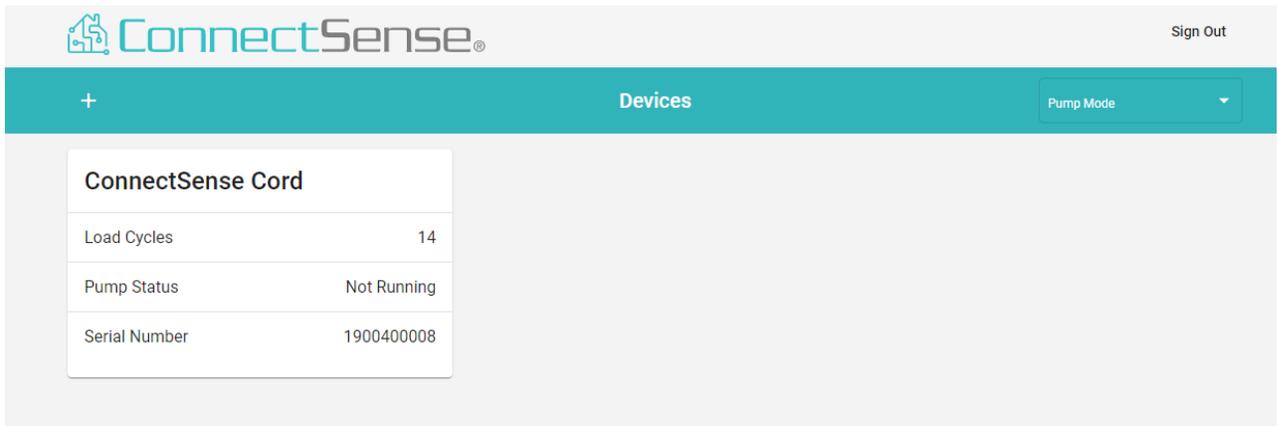
The Smart Power Cord is now connected. The default name of this cord is “ConnectSense Cord”. You can edit the name if you are using multiple Smart Power Cords or to make it more meaningful for the application.

2. Graphical Interface

2.1 Display Modes

There are currently 3 different display Modes – Pump, Appliance and Advanced. Each of these modes will display different information about the device attached to the cord. You can select more information about each device by selecting the cord. Below are the different display modes and more information screens.

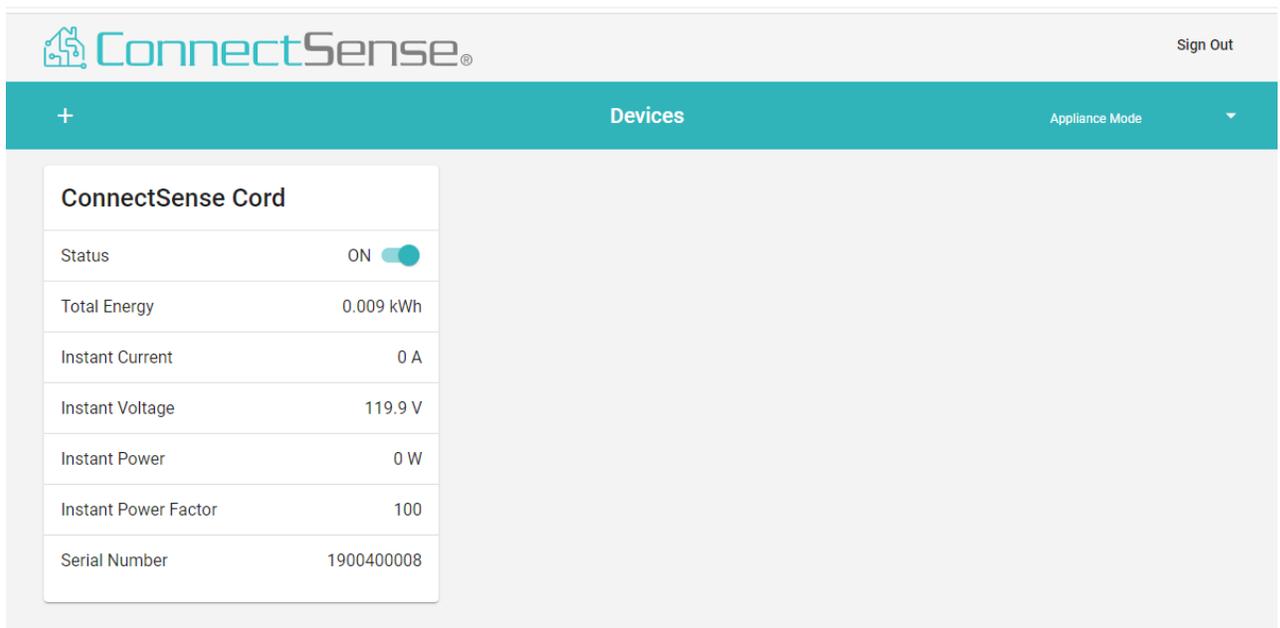
2.1.1 Pump Mode



The screenshot shows the ConnectSense web interface in Pump Mode. The top header includes the ConnectSense logo and a 'Sign Out' link. Below the header is a teal navigation bar with a '+' icon, the word 'Devices', and a dropdown menu currently set to 'Pump Mode'. The main content area displays a table for a device named 'ConnectSense Cord'.

ConnectSense Cord	
Load Cycles	14
Pump Status	Not Running
Serial Number	1900400008

2.1.2 Appliance Mode



The screenshot shows the ConnectSense web interface in Appliance Mode. The top header includes the ConnectSense logo and a 'Sign Out' link. Below the header is a teal navigation bar with a '+' icon, the word 'Devices', and a dropdown menu currently set to 'Appliance Mode'. The main content area displays a table for a device named 'ConnectSense Cord'.

ConnectSense Cord	
Status	ON <input checked="" type="checkbox"/>
Total Energy	0.009 kWh
Instant Current	0 A
Instant Voltage	119.9 V
Instant Power	0 W
Instant Power Factor	100
Serial Number	1900400008

2.1.3 Advanced Mode

ConnectSense® Sign Out

ConnectSense Cord Advanced Mode ▾

DASHBOARD RULES SETTINGS

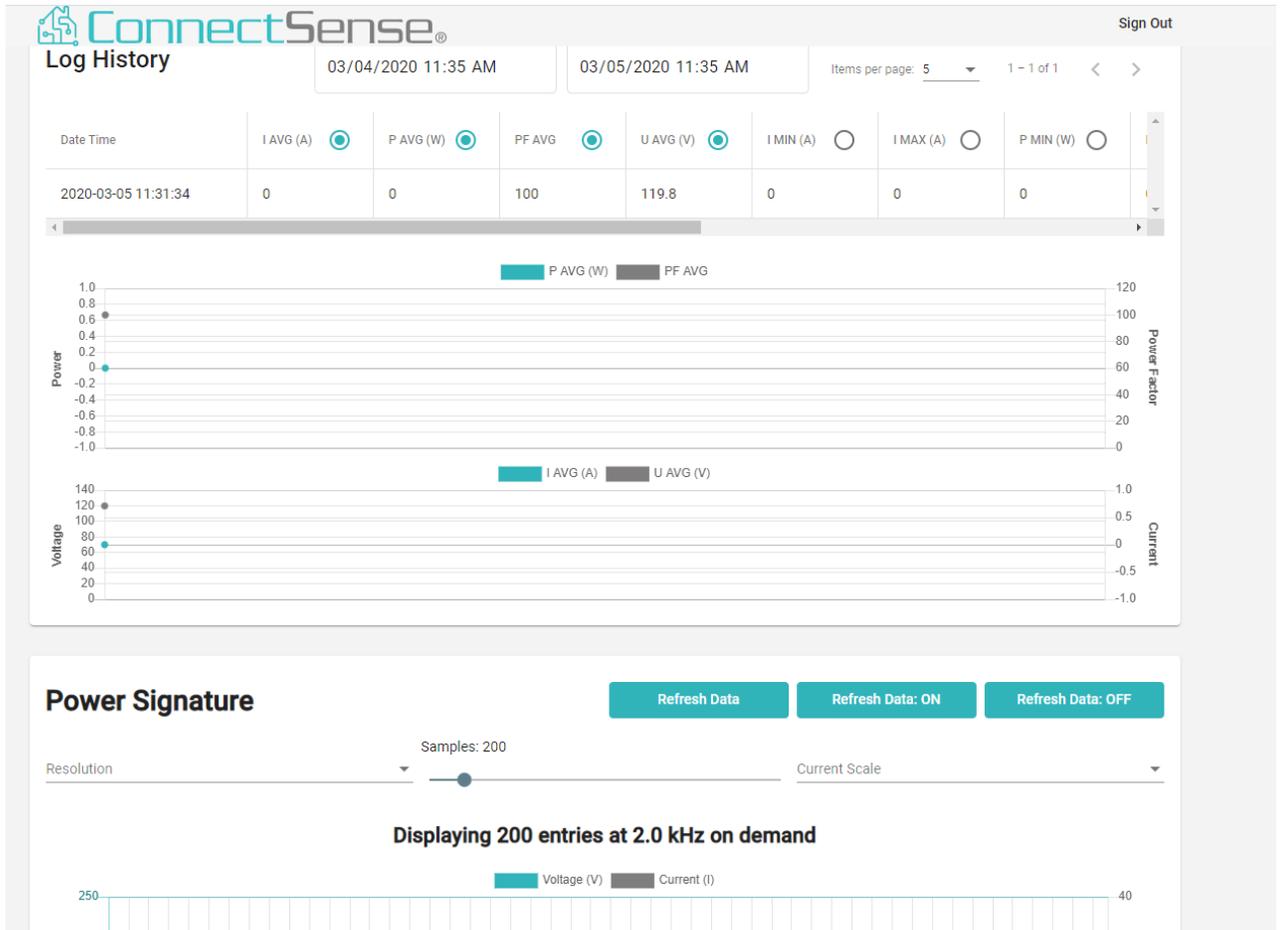
Cumulative Values		Instant Values	
Total Cord Runtime	sec	Status	ON <input checked="" type="checkbox"/>
Total Energy	0.009 kWh	Relay ON Time	313 sec
Relay Cycles	10	Load Status	OFF
Total Relay ON Time	1914 sec	Load OFF Time	313 sec
Load Cycles	14	Instant Current	0 A
Total Load ON Time	625 sec	Instant Voltage	119.8 V
		Instant Power	0 W
		Instant Power Factor	100
		Temperature	C

Log History From: To: Items per page: 1 - 1 of 1 < >

Date Time	I AVG (A) <input checked="" type="checkbox"/>	P AVG (W) <input checked="" type="checkbox"/>	PF AVG <input checked="" type="checkbox"/>	U AVG (V) <input checked="" type="checkbox"/>	I MIN (A) <input type="checkbox"/>	I MAX (A) <input type="checkbox"/>	P MIN (W) <input type="checkbox"/>
2020-03-05 11:31:34	0	0	100	119.8	0	0	0

2.2 Available Graphs

You can select which parameters you wish to display



2.3 Power Signature

The Power Signature shows the precision real-time data of the voltage and the current



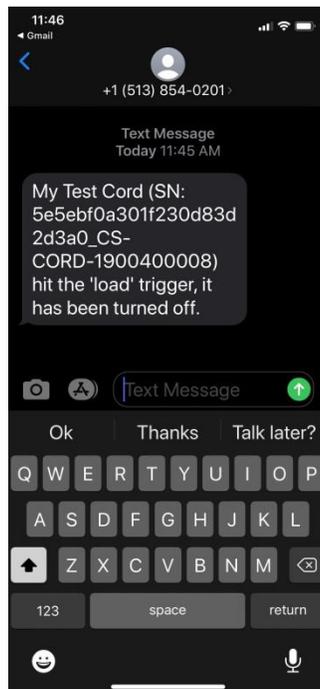
2.4 Rules

The following shows the rules for shut down of the device (power on/off) and notification via text and/or email

The screenshot displays the 'ConnectSense Cord' web interface. At the top left is the 'ConnectSense' logo, and at the top right is a 'Sign Out' link. Below the logo is a teal navigation bar with 'ConnectSense Cord' in the center and 'Advanced Mode' in a dropdown menu on the right. The navigation bar also contains three tabs: 'DASHBOARD', 'RULES', and 'SETTINGS', with 'RULES' being the active tab. The main content area is divided into two columns. The left column is titled 'Rules' and contains the text 'Any enabled rule will turn the relay OFF when triggered'. It lists six rules, each with a toggle switch and an edit icon: 'Current is less than 0 mA for 30 seconds', 'Current is greater than 20000 mA for 30 seconds', 'Voltage is less than 1090 V for 30 seconds', 'Power factor is less than 0 for 60 seconds', 'Temperature is greater than 40 C for 60 seconds', and 'Load is active for 3600 seconds'. The right column is titled 'Contacts' and contains the text 'Any enabled rule will notify the following contacts when triggered'. It lists one contact, 'Mike Justice', with an edit icon, and an 'ADD CONTACT' link below it.

2.5 Sample Text message

Shows the name of the cord and parameter that triggered the event, note the relay and be turned off as part of the notification.



2.6 Miscellaneous Settings

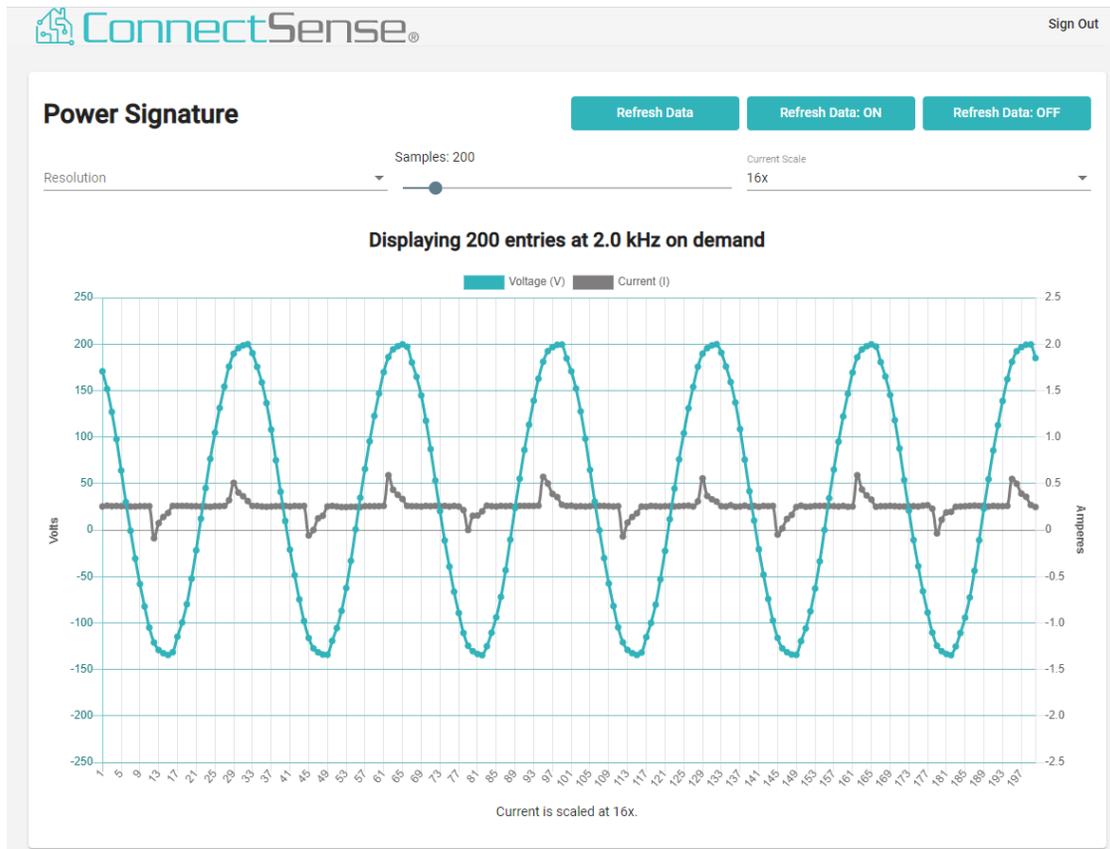
These settings allow you to change the name of the Cord, the reporting frequency, or removing a device

The screenshot displays the 'My Test Cord' settings page in the ConnectSense web application. The interface features a teal header with the 'ConnectSense' logo and a 'Sign Out' link. Below the header is a teal navigation bar containing the title 'My Test Cord' and a dropdown menu for 'Advanced Mode'. The main content area is divided into three tabs: 'DASHBOARD', 'RULES', and 'SETTINGS', with 'SETTINGS' being the active tab. The settings form includes the following elements:

- Device Name:** A text input field containing 'My Test Cord'.
- Log Reporting Interval (seconds):** A text input field containing '300'.
- High Current Circuit Interruption:** A toggle switch currently turned off.
- Firmware Version:** A text input field that is currently empty.
- SAVE:** A teal button to save the changes.
- REMOVE DEVICE:** A red button to remove the device.

2.7 Power Signature example

The following page will show the high-resolution capture of the Voltage and Current waveforms. These can be exported to a CSV file.



2.8 Displaying the variables about your cord

ConnectSense® Sign Out

My Test Cord Advanced Mode ▾

DASHBOARD RULES SETTINGS

Cumulative Values

Total Cord Runtime	sec
Total Energy	0.009 kWh
Relay Cycles	10
Total Relay ON Time	2208 sec
Load Cycles	16
Total Load ON Time	657 sec

Instant Values

Status	ON <input checked="" type="checkbox"/>
Relay ON Time	607 sec
Load Status	ON
Load ON Time	11 sec
Instant Current	0.051 A
Instant Voltage	119.6 V
Instant Power	6.1 W
Instant Power Factor	54
Temperature	C

Log History

From: To: Items per page: 1 - 1 of 1 < >

Date Time	I AVG (A) <input checked="" type="checkbox"/>	P AVG (W) <input checked="" type="checkbox"/>	PF AVG <input checked="" type="checkbox"/>	U AVG (V) <input checked="" type="checkbox"/>	I MIN (A) <input type="checkbox"/>	I MAX (A) <input type="checkbox"/>	P MIN (W) <input type="checkbox"/>
2020-03-05 11:31:34	0	0	100	119.8	0	0	0

2.9 Sample Label on the Smart Power Cord



2.10 Sample device to plug-in

The following diagram shows a variable speed computer fan plugged into the Smart Power Cord



2.11 Smart Power Cord Specifications

See the Smart Power Cord data sheet

2.12 Smart Power Cord Warranty

See the website

3. Compliance

3.1 FCC/IC Information

This device complies with Part 15 of the FCC Rules and with Industry Canada license exempt RSS standard(s). 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.

This radio transmitter 2AFC3-CSSC01 and 22503-CSSC01 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

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

FCC / IC RF Radiation Exposure Caution Statement: To maintain compliance with FCC / IC's RF exposure guidelines, place the product at least 20cm from near persons.

Changes or modifications not expressly approved by Grid Connect could void the user's authority to operate the equipment.