

TECHNICAL DOCUMENT

ABB Ability™ Smart Sensor Bluetooth® Gateway

Installation manual



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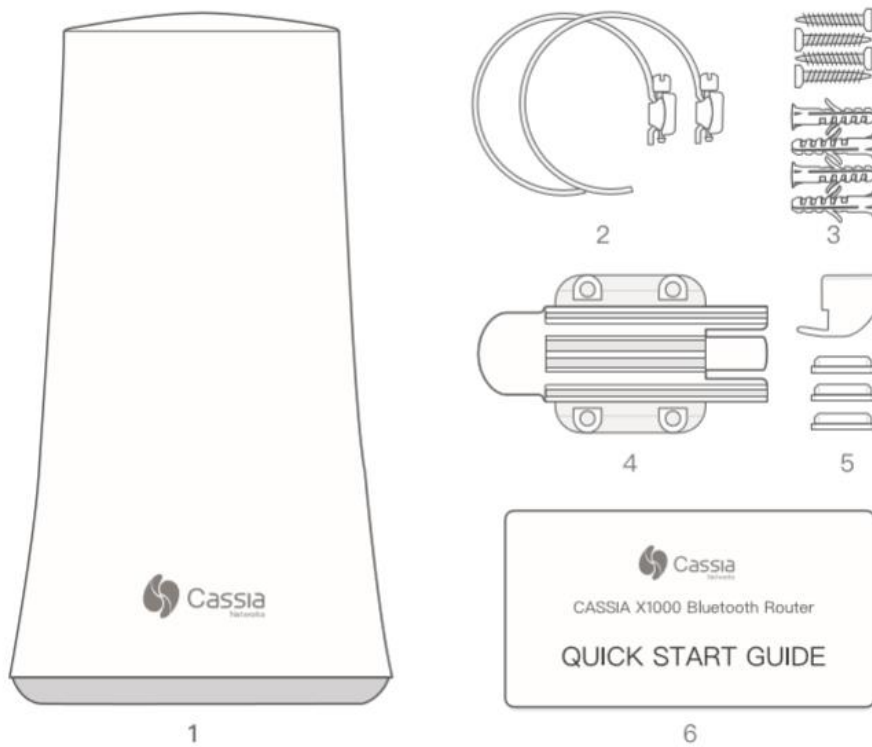
1 General

The ABB Ability™ Smart Sensor gateway is used to upload the Smart Sensor data automatically to the Smart Sensor portal. The gateway needs to be configured for Internet access before it can start reading the Smart Sensors. Following Internet connections are supported:

- LAN/Ethernet network together with PoE injector.
- 2.4GHz WIFI network.
- 3G/4G Mobile network with specific USB dongle.

The sales package includes:

- X1000 Bluetooth router, wall and pole mounting kits and a quick guide.



- | | | | | | |
|-------------------------|-----|------------------------------|------------------|----------------------|-----|
| 1. X1000 Router | (1) | 3. Anchors with Screws (2*4) | 5. Silicon Plugs | (4) | |
| 2. Pole Mounting Straps | (2) | 4. Mounting Bracket | (1) | 6. Quick Start Guide | (1) |

Figure 1 Content of the sales package

For general information about the Cassia gateway, please refer to the Cassia User Manual on https://www.cassianetworks.com/download/docs/Cassia_User_Manual.pdf

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2 Installation

2.1 Prerequisites for installation

Internet connection:

- Gateway does not operate in networks with a VPN (Virtual Private Network).
- The default DNS server address is the Google DNS server for Global customers (8.8.8.8) and the Baidu DNS server for China customers (114.114.114.114).
- In case there is a firewall used, the following ports need to be opened:

Type	Port	M/O	Communication Partner for Gateway	Description
UDP	5246, 5247	Mandatory	Access Controller (AC)	Default CAPWAP communication between AC and router
UDP	6246, 6247	Optional	Access Controller (AC)	Backup CAPWAP communication between AC and router
TCP	8883	Mandatory	Access Controller (AC)	MQTT communication between AC and router
TCP	1883	Optional	Local MQTT broker	MQTT bypass function
TCP/HTTP	80	Optional	Access Controller (AC)	Container/APP download from AC
TCP/HTTPS	443	Mandatory	Access Controller (AC) Smart Sensor Platform	Container/APP download from AC Communication with Smart Sensor Platform
TCP	9999	Mandatory	Access Controller (AC)	Remote SSH to container
UDP	53	Mandatory	DNS server	DNS lookup for AC address

AC – Access Controller

Global: **gw.smartsensor.abb.com**

China: **gw.smartsensor.abb.com.cn**

Smart Sensor Platform

Global: **smartsensor.abb.com**

China: **smartsensor.abb.com.cn**

- Only one AC address must be whitelisted in the network. For the gateways working outside China, the Global AC address must be whitelisted. For gateways working inside China, only the China AC address must be whitelisted.
- Smart Sensor Platform and all the existing subdomains must be whitelisted in the network for a successful communication and measurement report to the Portal.

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- Mobile network needs to have adequate signal strength. In the most demanding locations, an extension USB cable or external antenna might be needed for the USB modem/dongle.

Power supply:

- In case PoE network is not available, a PoE injector (power supply) is needed.
- PoE is 802.3af/at compliant.

Ethernet cable:

- 1 Ethernet cable is needed when PoE, WIFI or mobile network is used.
- 2 Ethernet cables are needed when LAN/Ethernet network is used.

Computer:

- A computer with WIFI adapter is needed for gateway configuration. A tablet computer or mobile phone can also be used.
- Google Chrome web browser is recommended to be used.

USB Cellular Modem / Dongle

- The gateway has built in drivers for several USB dongles. For the list of supported dongles please check the section 2.7 USB mobile dongle connection.
- A SIM card with Internet data plan.
- The gateway also supports the use of any USB powered WIFI modems.

Mounting:

- Flat head screwdriver for pole mounting.
- Phillips head screwdriver and a drill (if needed) for wall mounting.
- Mounting is not mandatory, but it is recommended to secure the gateway somehow to its intended place.

2.2 Recommended location

Height:

- The recommended height for the gateway is 3-30 meters from ground level. Lower levels are also acceptable, but the gateway Bluetooth range might be shorter due to obstacles.

Orientation:

- The gateway has the best reception in the direction where the Cassia logo is shown on its side. If the gateway has trouble connecting to a specific Smart Sensor, it is recommended to rotate the gateway to point in that direction.

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2.3 Gateway configuration

When the gateway is powered on, the blue LED at the bottom of the gateway turns ON. After bootup, the gateway will turn on the configuration WIFI hotspot. The bootup takes about 30-60 seconds.

Configuration WIFI hotspot has SSID “cassia-XXXXXX”, where XXXXXX are the last 6 characters of the gateway’s MAC address. MAC address can be found on the bottom of the gateway. Password for this WIFI hotspot is the same as the SSID.

Connect to this WIFI hotspot with the device used for configuration (computer, phone or tablet) and open the web browser. Type **192.168.40.1** to the web browser’s address field and press enter. Cassia configuration page will open. During the first login the default password needs to be changed. Default credentials are:

- Login: **admin**
- Password: **admin**

Figure 2 Cassia (Firmware 1.4.3) Login

Figure 3 Cassia (Firmware 2.1.0) Login

It is recommended to replace the default credentials.

Once logged in, the **Status Page** is shown. This page shows current operation mode and connection status of the gateway. AC Online Time shows how long the gateway has been connected to the AC (Access Controller) server. If no time is shown, it means that the gateway does not have a connection to the AC server.



Access Controller server connection is needed for a successful Smart Sensor data transfer.

As the gateway now supports two firmware versions, the UI is different between the old firmware (1.4.3) and the new firmware (2.1.0), the latter having more information about the current state of the gateway.

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Status Basic Container Logs Other	
Model	X1000
MAC	CC:1B:E0:E0:95:4C
Working Mode	AC Managed
ETH IP	192.168.8.178
WLAN IP	
Cellular IP	
Country/Region	Romania
Firmware Version	1.4.3.1908161524
Up Time	41hrs 55min 33sec
AC Online Time	3hrs 4min 39sec
CPU Usage	2.99%
Memory Usage	46.42%

Figure 4 Cassia (Firmware 1.4.3) Status

Status Basic Container Events Other	
Model	X1000
MAC	CC:1B:E0:E0:8D:9C
Working Mode	AC Managed
AC-Router Protocol	MQTT
Uplink	Wi-Fi
Uplink Signal Strength	GOOD
ETH IP	
WLAN IP	192.168.1.147
Cellular IP	
Country/Region	United States
Firmware Version	2.1.0.2105191325
Up Time	1hrs 9min 50sec
AC Online Time	55min 51sec
Chip0	Active Scan,Adv
Chip1	Idle
CPU Usage	4.39%
Memory Usage	81.50%
Storage Usage	2.46MB / 111.20MB

Figure 5 Cassia (Firmware 2.1.0) Status

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2.3.1 Network configuration – Firmware 1.4.3

The **Basic Page** is where the configuration is done.

Following values are common for all network configurations (PoE, LAN, WIFI, Mobile):



- Router Mode: **AC Managed Router**
- Tx Power: **20**
- Statistics Report Interval: **5 minutes**
- AC Server Address: **gw.smartsensor.abb.com**
- AC Server Address for China: **gw.smartsensor.abb.com.cn**
- AC Router Comm. Ports: **5246, 5247**
- Remote Assistance: **ON**

Connection Priority is where a priority connection method is selected in case there are several in use. Select the priority according to connection in use:

- **Wired** for PoE and LAN connections.
- **Wireless** for WIFI connection.
- **3G/4G** for mobile USB dongle connection.

If all the information has been filled as shown above and the **Wired**, **Wireless** or **3G/4G** sections are configured according to your **network specifications**, please refer to **2.9 Verifying the configuration** to check if the connection has been successfully set-up.

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2.3.2 Network configuration – Firmware 2.1.0

The values in the first section of the **Basic page** are similar to firmware 1.4.3, but with some extra options that the newer firmware brings:



- Router Mode: **AC Managed Router**
- Tx Power: **20**
- Statistics Report Interval: **5 minutes**
- AC Server Address: **gw.smartsensor.abb.com**
- AC Server Address for China: **gw.smartsensor.abb.com.cn**
- AC-Router Protocol Priority: **MQTT**
- Enable OAuth2 Token For Local API: **OFF**
- Remote Assistance: **ON**

Connection Priority in 2.1.0 firmware is similar to firmware 1.4.3, only the naming of the three connection types have changed:

- **Wired** for PoE and LAN connections.
- **Wi-Fi** for WIFI connection.
- **Cellular** for mobile USB dongle connection.






If **Cellular** connection is used, the option **Recovery Action** must be set to **ON**.



This option enables the gateway to attempt a **reboot** of the 3G dongle when it is not being able to provide a network connection anymore.

If all the information has been filled as shown above and the **Wired**, **Wi-Fi** or **Cellular** sections are configured according to your **network specifications**, please refer to **2.9 Verifying the configuration** to check if the connection has been successfully set-up.

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 Status
 **Basic**
 Container
 Logs
 Other

Router Mode

Tx Power


Statistics Report Interval

AC Server Address

AC-Router Comm. Ports

Remote Assistance


Connection Priority

 **Wired**

IP Allocation

DNS1

DNS2

 **Wireless (5Ghz WiFi is not supported)**


Operating Mode

SSID

Password

IP

Netmask

 **Cellular Modem**

USB Modem Type









Figure 6 (Firmware 1.4.3) Basic page

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 Status
 Basic
 Container
 Events
 Other

Router Mode

Tx Power

Statistics Report Interval

AC Server Address

AC-Router Protocol Priority

Connection Priority

Enable OAuth2 Token For Local API

Remote Assistance

Wired

IP Allocation

DNS1

DNS2

Wi-Fi (5Ghz Wi-Fi is not supported)

Operating Mode

SSID

Password

IP

Netmask

Cellular Modem

USB Modem Type

Recovery Action

Apply




Figure 7 (Firmware 2.1.0) Basic page

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2.4 PoE connection

If a PoE (Power Over Ethernet) network is available, the gateway can be configured to use it without any additional power supply.

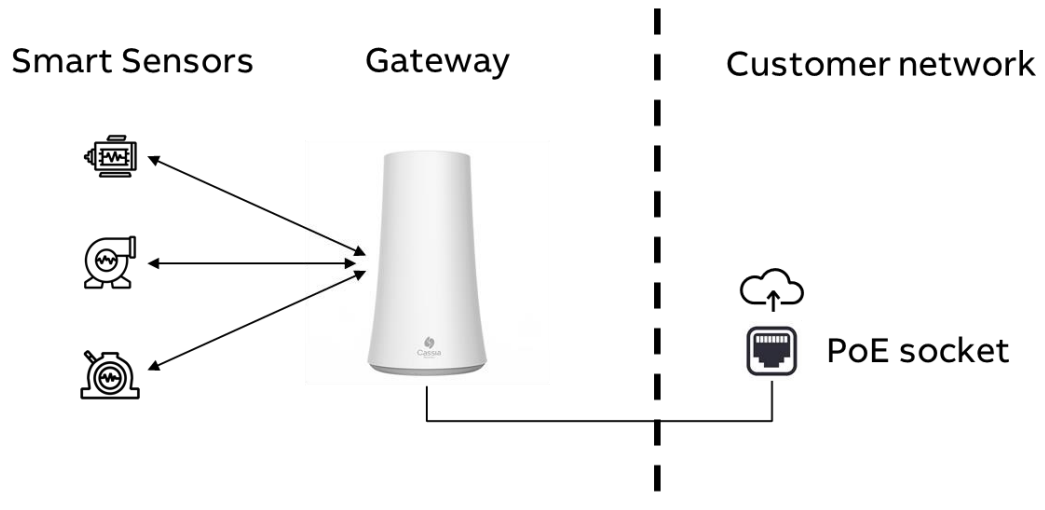


Figure 8 PoE network configuration

From the Gateway Basic Page select:

- Connection Priority: **Wired**
- IP Allocation: **DHCP** or **Static** (in case the IP address is given)

Press **Apply** at the bottom of the screen.

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2.5 LAN/Ethernet cable connection

If a LAN/Ethernet network is available, the gateway can be configured to use it. Additional PoE injector with an Output of 55V and 0.55A is needed for power supply.

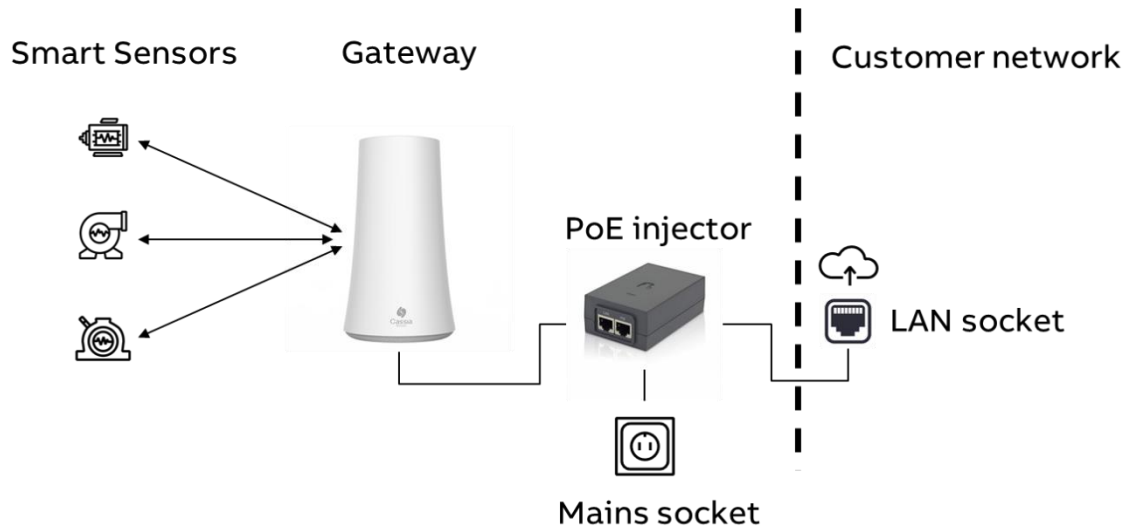


Figure 9 LAN network configuration

From the Gateway Basic Page select:

- Connection Priority: **Wired**
- IP Allocation: **DHCP** or **Static** (in case the IP address is given)

Press **Apply** at the bottom of the screen.

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2.6 WIFI connection

The gateway can be configured to use an existing WIFI network. An additional PoE injector with an Output of 55V and 0.55A is needed for power supply.



Only 2.4GHz WIFI is supported!

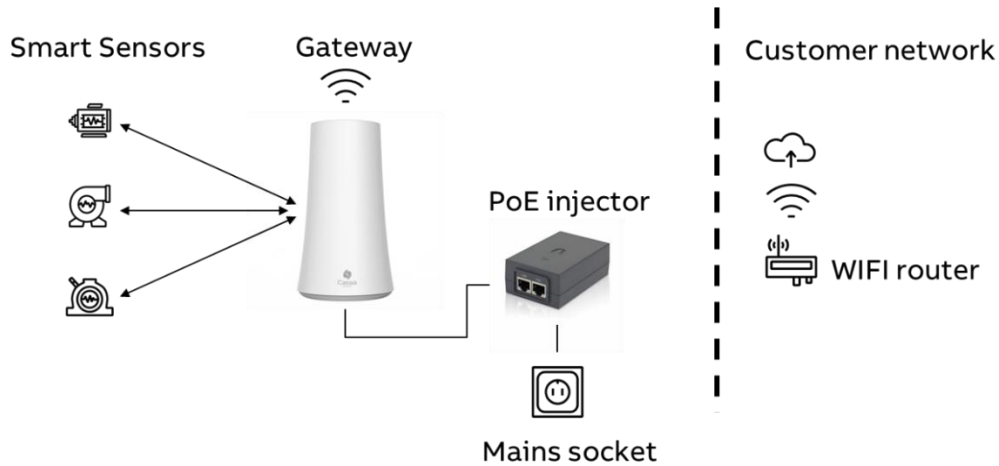


Figure 10 WIFI network configuration

From the Gateway Basic Page select:

- Connection Priority: **Wireless** (fw 1.4.3) / **Wi-Fi** (fw 2.1.0)
- Enter the **SSID** (name) of the WIFI network
- Enter the WIFI network **password**
- Change the Wireless operation mode from Hotspot to **Client**
- IP Allocation: **DHCP** or **Static** (in case the IP allocation is given)

Press **Apply** at the bottom of the screen.



NOTE! Once the Apply button is pressed, the gateway WIFI adapter stops sharing the WIFI hotspot and changes the connection to configured WIFI network. In case the DHCP is used, the gateway has now a new IP address. This IP address is needed to reconnect to the gateway e.g. to check the Status Page or scan the devices within the gateway's range. Local IT department can find out the gateway's IP address by accessing the WIFI router device list or by performing the network scan for IP addresses. In case a static IP is used, the address is known.

Connect your computer, tablet or mobile phone to the same WIFI network as the gateway is connected. Open a web browser and type the new IP address to the address field and press enter. Access to gateway configuration pages is established again.



NOTE! If there was an error in SSID, password or IP address configurations, you cannot access the gateway anymore. In this case the gateway isn't shown in WIFI router device list or in network scans. Press the reset button at the bottom of the gateway for 10 seconds to reset the gateway to factory default values.

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2.7 USB mobile dongle connection

Mobile network can be used with a specific USB dongle. Additional PoE injector (power supply) with an Output of 55V and 0.55A, supported USB dongle and a SIM card are needed.

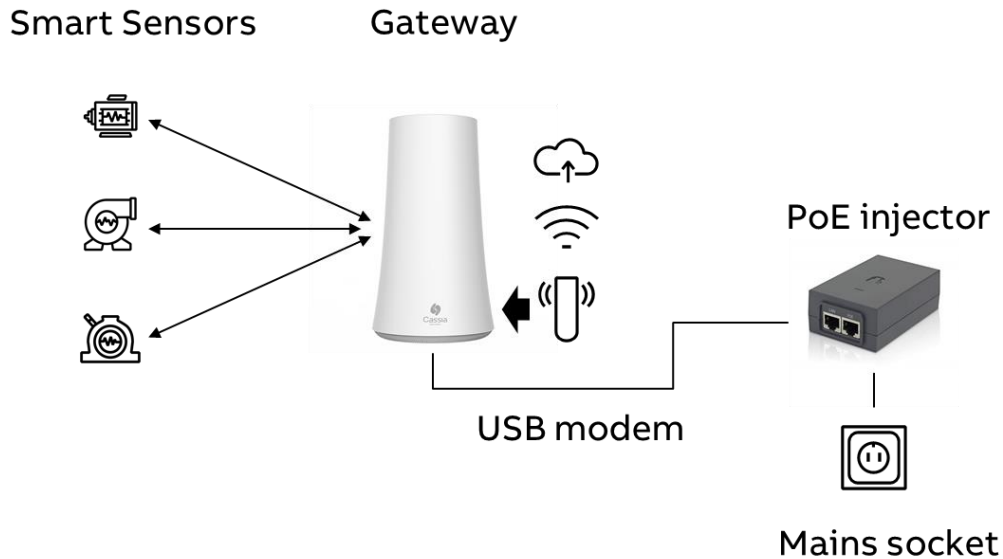


Figure 11 Mobile network configuration

Insert the USB dongle with SIM card to USB port at the bottom of the gateway. PIN query needs to be disabled from the SIM card.

From the Gateway Basic Page select:

- Connection Priority: **3G/4G** (fw 1.4.3) / **Cellular** (fw 2.1.0)
- USB Dongle Type: select correct **dongle type** used
- Type the **Access Point Name** (APN) which the SIM carrier is using
- Type the username and password for the APN if needed

Press **Apply** at the bottom of the screen.

Reboot the gateway by removing the power supply for a few seconds and then reconnecting it.



NOTE! With a USB dongle the gateway needs to be in place where there is a good network coverage. In case of weak signal strength, an extension USB cable or additional external antenna for USB dongle might be needed.

If a WIFI modem is used, insert the modem to USB port at the bottom of the gateway and follow the 2.6 WIFI connection section instructions.

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For supported USB dongle modems, please consult the Cassia User Manual. Please note that some countries may have regulations which may forbid the usage of certain types of hardware providers (e.g. Check if Huawei can be used in the US)

2.8 Firewall configuration

In case there is a firewall in the network which the gateway is using, specific ports need to be opened.

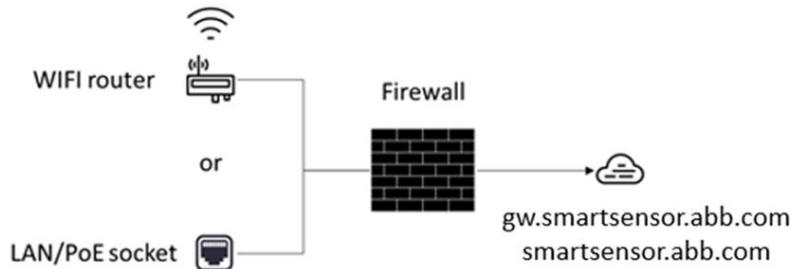


Figure 12 Firewall Configuration for Global

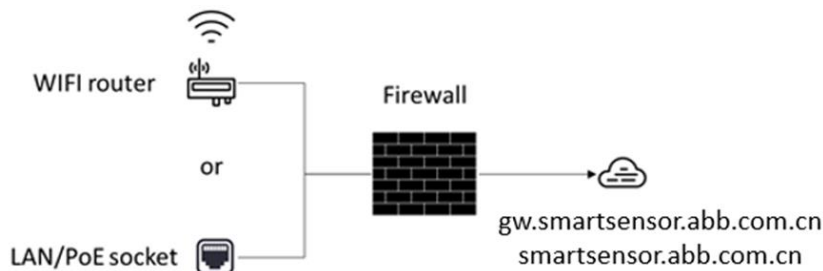


Figure 13 Firewall configuration for China



- Firewall should allow communication between the gateway and Access Controller, and gateway and Smart Sensor platform respectively (see required ports in section **2.1 Prerequisites for Installation**).

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2.9 Verifying the configuration

Once the configuration is done, it can be verified from the status page. When connection is established to Access Controller the AC Online Time is shown.

Parameter	Value
Model	X1000
MAC	CC:1B:E0:E0:8D:9C
Working Mode	AC Managed
AC-Router Protocol	MQTT
Uplink	Wi-Fi
Uplink Signal Strength	GOOD
ETH IP	
WLAN IP	192.168.1.147
Cellular IP	
Country/Region	United States
Firmware Version	2.1.0.2105191325
Up Time	1hrs 9min 50sec
AC Online Time	55min 51sec
Chip0	Active Scan,Adv
Chip1	Idle
CPU Usage	4.39%
Memory Usage	81.50%
Storage Usage	2.46MB / 111.20MB

Figure 14 Gateway with FW 2.1.0 connected to gw.smartsensor.abb.com

If the AC Online Time is not shown within few minutes:

- Double check the configuration and Internet connection
- Reboot the gateway (power off/on)

Connection to Access controller can be verified also with **Debug Tools** in **Other** tab (available in both firmware 1.4.3 and 2.1.0):

- To check the connection to the Access Controller, select **Ping**, add Address **gw.smartsensor.abb.com** (or **gw.smartsensor.abb.com.cn** in case of China) and Time 5 Seconds. Wait for the black screen with the result to appear below.
- To verify TCP port open/close status select **NetCat**, add Address **smartsensor.abb.com** (or **smartsensor.abb.com.cn** in case of China), Protocol **TCP**, Timeout **2**, Port **443** and press Start. Wait for the black screen with the result to appear below. If you receive a message containing the text "... **443 (https) open** ...", the connection for measurement upload should work.

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3 Troubleshooting

Forgetting the login credentials or making a mistake while configuring the WIFI network SSID or password:

- Press the reset button for 10 seconds while the gateway is powered on. This will reset all gateway settings to factory default values. Reset button is located at the bottom of the gateway.

Gateway does not generate the WIFI hotspot for setup:

- Check the power supply and that the blue LED is ON at the bottom of the gateway.
- If the gateway is configured to use a WIFI network, it does not generate a WIFI hotspot.
- Try to reset the gateway by pressing the reset button for 10 seconds while the gateway is powered on. Reset button is located at the bottom of the gateway.

Gateway does not connect to AC server:

- Check the Internet access.
- In case a USB dongle is used, check the model is supported by the gateway and that the dongle has established a connection to a mobile network.
- Check that the used network does not use VPN.
- Check the used network firewall settings. The necessary ports need to be open for outbound communication.
- Check if the Router Web Security under **Other** tab is toggled **OFF** (see below).

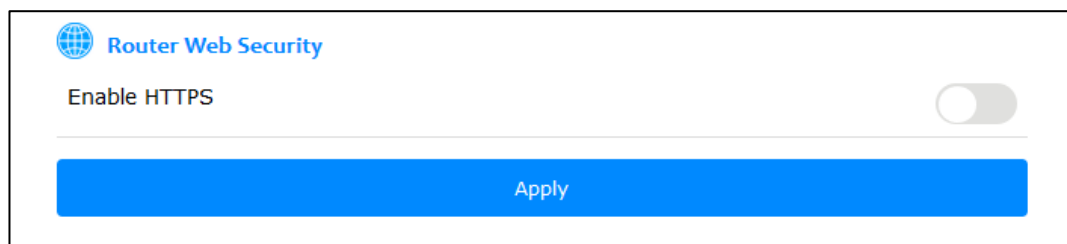


Figure 15 Router web security option

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Gateway is not reading the Smart Sensor data:

- Check that the Smart Sensors are within the gateway's range.
- Gateway is reading the data from Smart Sensors in timely manner. It can take couple of hours to see the first measurements in Smart Sensor portal.
- Check from the **Status** Page if it shows the Online Time. If not, please check the Internet connection.
- If the Online Time is shown, check in the **Container** page that under **Installed APPs** section (in fw 1.4.3 the section is called **List of installed apps**) there is an APP called **GwAppProd**. If not, contact the Smart Sensor Support (email address at the end of the manual) requesting the gateway application to be installed.

Testing the internet speed (fw 2.1.0):

The **SpeedTest** tool can be used to measure the throughput of the internet connection.

This tool can be found in the local configuration page, under the **Other** tab in the **Debug Tools** section of the page.

The fields must be completed as shown below, then click **Start**.

It will take ~10 seconds for the result to be shown.

Figure 16 SpeedTest tool

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Traceroute tool (fw 2.1.0):

This tool helps with pinpointing where on network are the biggest delays in communication. Each hop has three packets sent and three response delays, thus you could detect exactly which part of the packet journey is the slowest.

This tool can be found in the local configuration page, under the **Other** tab in the **Debug Tools** section of the page.

The fields must be completed as shown below, then click **Start**.

It will take ~10 seconds for the result to be shown.

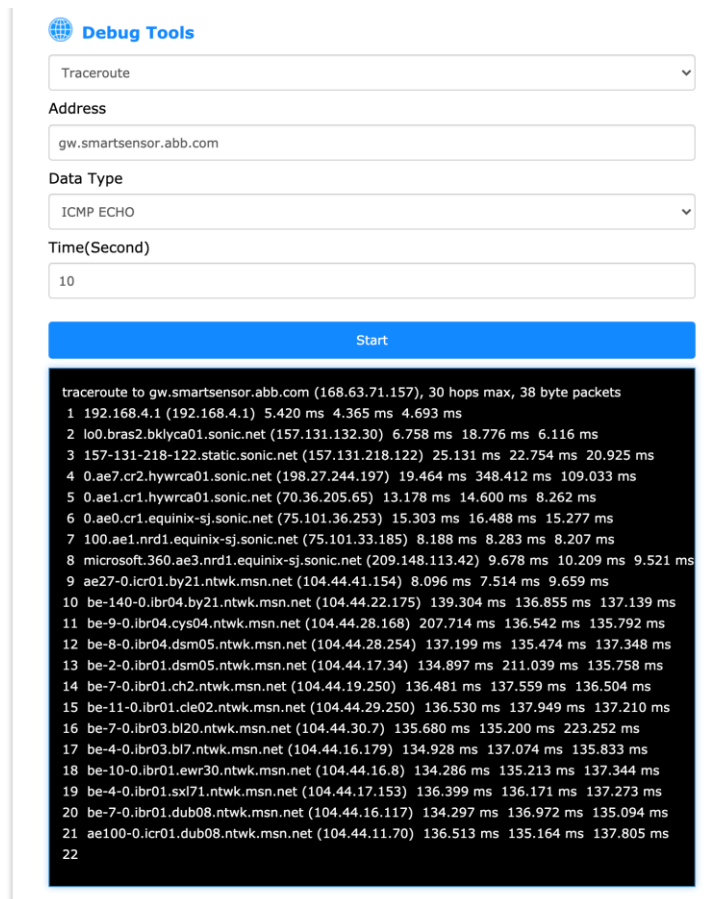


Figure 17 Traceroute tool

Scanning for Bluetooth devices:

A correct gateway placement can be checked by scanning the Bluetooth devices within the gateway’s range. The gateway location or orientation needs to be changed if all desired Smart Sensors are not visible for the gateway or if the Smart Sensor is showing weak signal level.

To enable the scanning, the router mode needs to be changed. This is done in the **Basic Page**. Change the mode from “AC Managed Router” to “Standalone Router”. Gateway will automatically reboot and is operational again within 30 to 60 seconds.

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On the computer, tablet or mobile phone, while having an Internet access, make sure that you're on the same network as the gateway and open the following web page:

<http://www.bluetooth.tech/debugger/>

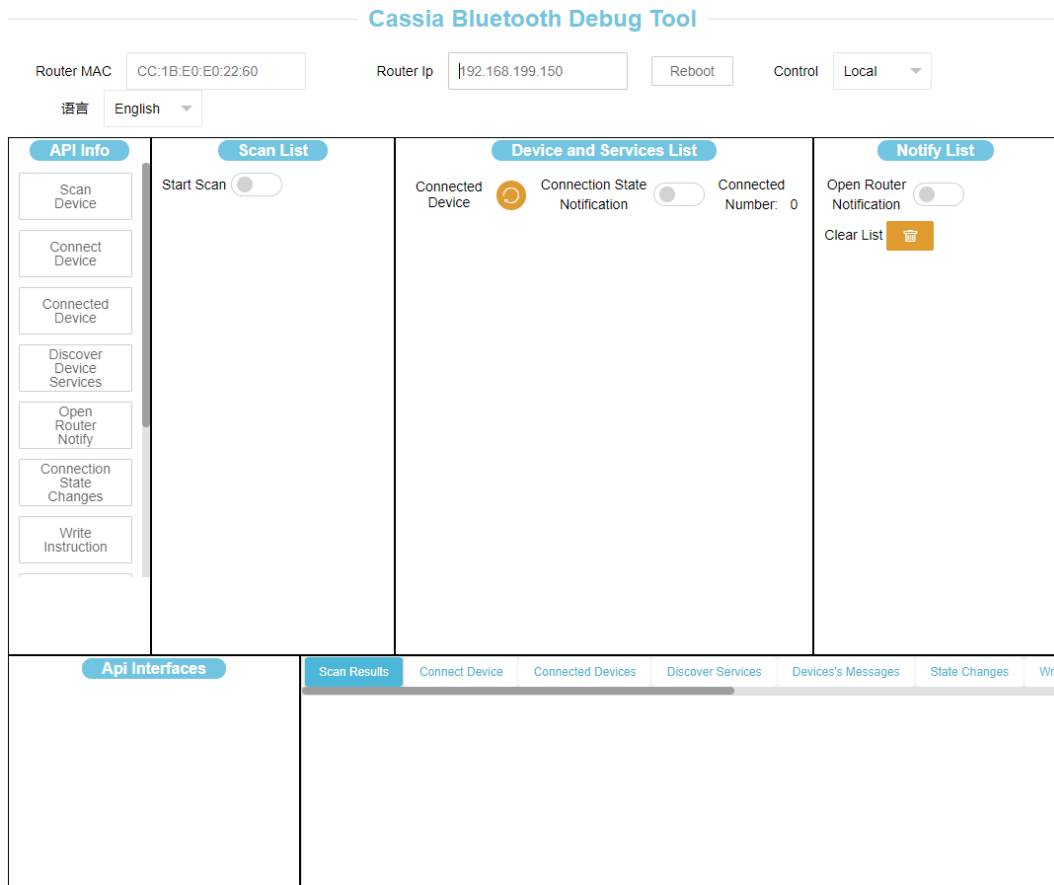


Figure 18 Cassia Bluetooth Debug Tool

Once the debug tool is loaded, connect the device used for configuration (computer, tablet or mobile phone) to the WIFI network generated by the gateway. If the gateway is connected to WIFI, then connect the configuration device to the same WIFI network as the gateway is connected.

Type in the gateway's MAC and IP addresses to the fields Router MAC and Router IP. Press Start Scan.

Debug Tool now starts to list all Bluetooth devices within its range. For all scanned devices the tool is showing the MAC address and RSSI value. Sometimes the name is not available, but it is listed if known. All ABB Smart Sensor MACs start with **50:31:AD**.

RSSI value can be roughly categorized to the following groups:

- RSSI value between 0 and -70 is OK
- RSSI value between -70 and -80 is weak, sensor might be read from time to time

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- RSSI value -80 or less is poor, most probably the sensor cannot be read

If the desired Smart Sensors are showing RSSI values of around -70, it is recommended to adjust the gateway's location or orientation.

! **NOTE!** Remember to change the router mode back to **AC Managed Router**. If the mode is not changed, the gateway is will not be able to establish a connection to the AC server and the data will not be read from the Smart Sensors.

! **NOTE!** If the gateway's container is displaying the **error** status, resetting the gateway will **NOT** solve this error. To check this please go into the gateway settings page under the **Container** tab. In case this happens, please contact Smart Sensor support.

For more support, please contact Smart Sensor support:

support.smartsensor@abb.com

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