Getting Started Guide For AWS IoT Core

Sentrius™ MG100

Version 1.0

Revision History

Version	Date	Notes	Contributors	Approver
1.0	18 Nov 2021	Initial Release	Mark Calhoun	Andy Ross

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1 Overview

Powered by Laird Connectivity's Pinnacle™ 100 Modem, the Sentrius™ MG100 Gateway captures data from Bluetooth 5 long range sensors and sends it to the cloud via a global low power cellular (LTE-M/NB-IoT) connection. This makes it the perfect fit for the following applications.

- Cold chain transportation monitoring
- Predictive Maintenance
- Industrial IoT

2 Hardware Description

2.1 Datasheet

The MG100 datasheet can be found on the MG100 product page:

https://www.lairdconnect.com/documentation/mg100-gateway-hardware-guide

2.2 Standard Kit Contents

The most common product kit is the Sentrius MG100 – Wireless IoT Starer Kit. This kit provides the following pieces of hardware.

- 1x Sentrius MG100 Micro Gateway, LTE-M & NB1 modem, Bluetooth LE, external antenna, battery backup
- 1x MVNO SIM card
- 3x Sentrius™ BT510 – Bluetooth 5 multi sensor, IP67 – temperature, shock/movement, and open/close contact
- 3x Regional power supplies (US/EU/UK)

Product Page: *https://www.lairdconnect.com/iot-devices/iot-gateways/sentrius-mg100-gateway-lte-mnb-iot-and-bluetooth-5*

2.3 User Provided items

The user may need to supply the following items:

- Micro USB Cable(s)
- Micro SD card for logging
- MNO or MVNO SIM card for LTE-M or NB-IoT

2.4 3rd Party purchasable items

You may purchase the Micro USB cable and SD card here or elsewhere.

- Micro USB Cable : *https://www.amazon.com/dp/B074VM7J68/ref=twister_B07BWMNQTY?_encoding=UTF8&psc=1*
- SD card: *https://www.amazon.com/dp/B07R8GVGN9/ref=twister_B09CG3FLV1?_encoding=UTF8&psc=1*

2.5 Additional Hardware References

You may find additional information on the hardware and starter kit on our MG100 product page.

- https://www.lairdconnect.com/iot-devices/iot-gateways/sentrius-mg100-gateway-lte-mnb-iot-and-bluetooth-5

3 SET UP YOUR DEVELOPMENT ENVIRONMENT

3.1 Tools Installation (IDEs, Toolchains, SDKs)

The Sentrius™ MG100 uses the Zephyr RTOS as its operating system. You can use various IDEs, but the widely recommend setup is with Microsoft's VS Code and the PlatformIO plugin. These are available on Windows, MacOS, and Linux. Follow the link below for a guide on how to set up an IDE.

- https://www.zephyrproject.org/developing-zephyr-rtos-embedded-applications-on-platformio-and-simulating-on-antmicro-renode/

To get the remaining necessary tools to develop, build, and flash a Zephyr application you'll want to follow the latest Getting Started Guide on the official Zephyr project.

- https://docs.zephyrproject.org/latest/getting_started/index.html#

Other prerequisites for software are as follows.

- mcumgr CLI (cross platform)
- Sentrius MG100 device running AWS OOB demo firmware v3.x or greater
- Terminal program: PuTTY (Windows, Linux, macOS), Teraterm (Windows), Serial (macOS)

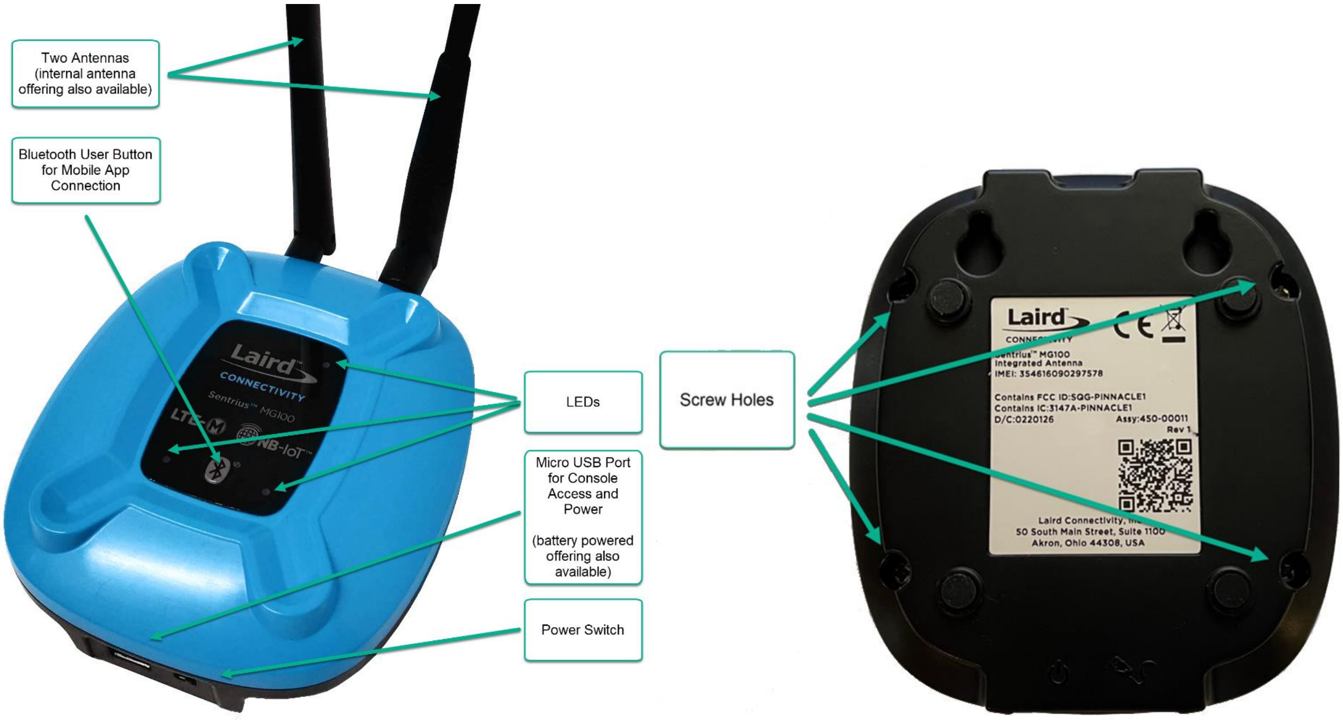
3.2 Additional Software References

You can find additional software information for the firmware and the out of box demo at the following locations on GitHub.

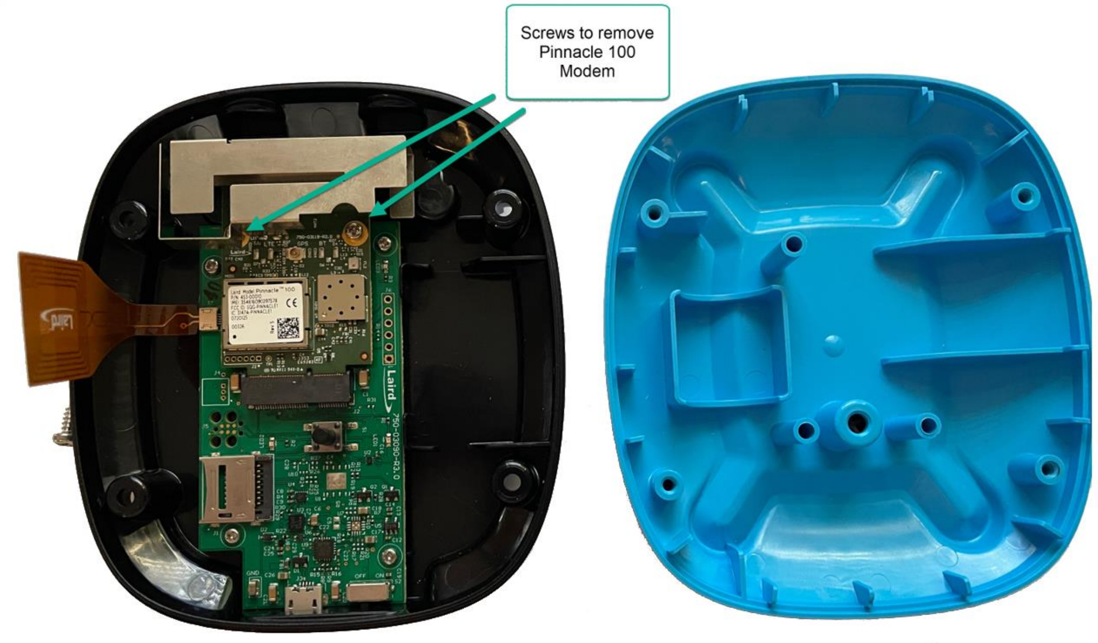
- https://github.com/LairdCP/Pinnacle-100-Firmware
- https://github.com/LairdCP/Pinnacle_100_oob_demo

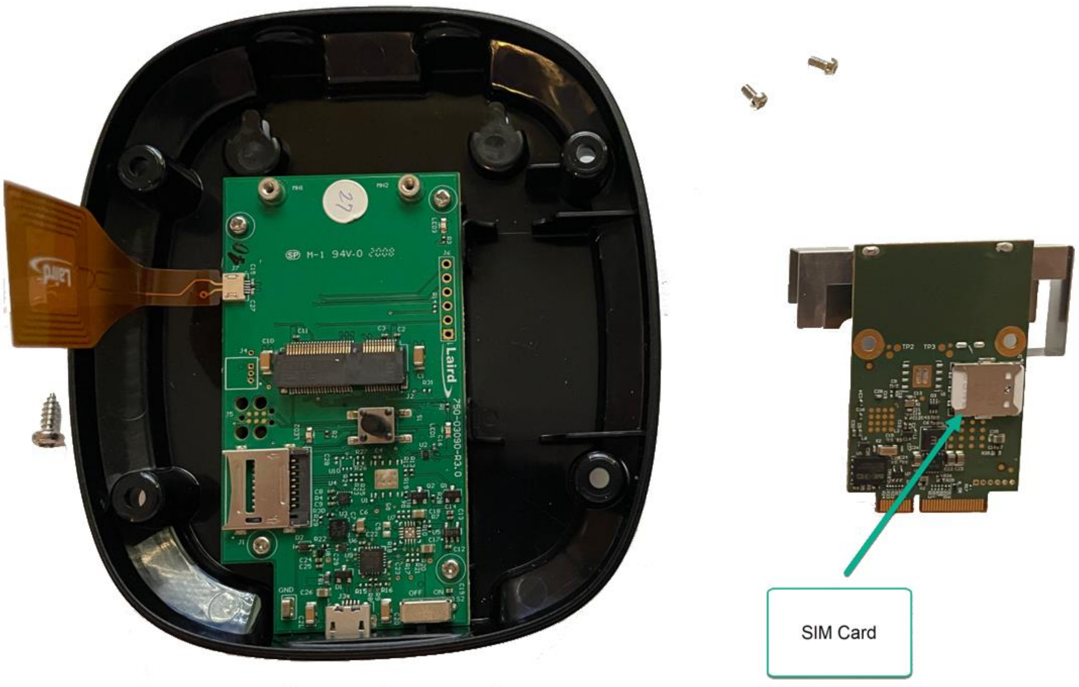
4 SET UP YOUR HARDWARE

The Sentrius MG100 has the hardware features depicted below.


Two Antennas (internal antenna offering also available)
Bluetooth User Button for Mobile App Connection
LEDs
Micro USB Port for Console Access and Power
(battery powered offering also available)
Power Switch
Screw Holes

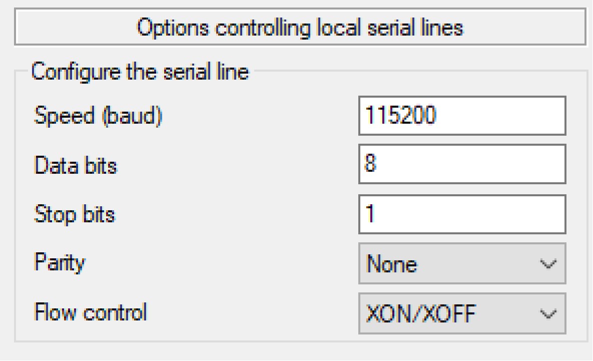
Please note that the Sentrius MG100 typically comes with a pre-installed MVNO-based SIM card for LTE-M or NB-IoT connectivity. You may need to activate this SIM card via the MVNO's website with your personal or business account. You may also choose to use your own MNO or MVNO SIM card. In this case, unscrew the 4 screws on the back of the device and separate the back from the front of the enclosure. Then remove the 2 screws holding the Pinnacle 100 modem in place. Remove the modem and flip it over. Here you will find the SIM card slot.





The device is plug-and-play compatible on any Windows, Linux, or Mac system via a USB to Micro USB cable and your favorite terminal program such as minicom, PuTTY, or Teraterm.

To connect to the device, identify the correct COM port on your host machine and then use the following serial settings.



Options controlling local serial lines

Configure the serial line

Speed (baud)	115200
Data bits	8
Stop bits	1
Parity	None
Flow control	XON/XOFF

Figure 1: MG100 terminal settings

Finally, turn on the device by flipping the power switch to the right side. In this case the device is “off” when the power switch is set to the left position and it is “on” when the power switch is set to the right position. If the terminal is connected, you’ll see the MG100 booting up and displaying debug information in the terminal.

5 Setup your AWS account and Permissions

Refer to the instructions at Set up your AWS Account. Follow the steps outlined in these sections to create your account and a user and get started:

- Sign up for an AWS account and
- Create a user and grant permissions.
- Open the AWS IoT console

Pay special attention to the notes in the AWS documentation.

6 Create Resources in AWS IoT

Refer to the instructions at Create AWS IoT Resources. Follow the steps outlined in these sections to provision resources for your device:

- Create an AWS IoT Policy
- Create a thing object

Pay special attention to the notes in the AWS documentation.

7 Provision the Device with credentials

To provision your device with the proper credentials, follow the instructions in our BLE gateway firmware documentation.

- https://lairdcp.github.io/guides/ble-gateway-firmware/1.0/docs/aws_iot#configure-device-for-aws-connection

8 Build the demo

The MG100 arrives pre-flashed with the demo app, but you may need to update to the latest version. This will require you to flash the device. The latest software releases can be found here, along with instructions on how to flash the device.

- https://github.com/LairdCP/Pinnacle-100-Firmware/releases

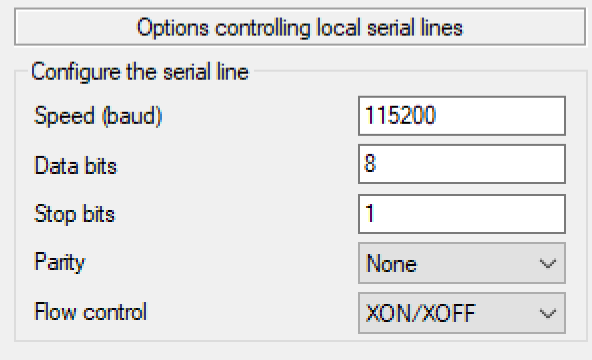
9 Run the Demo

To verify this demo works and MQTT messages are being received by AWS IoT Core, follow the instructions on our documentation site.

- https://lairdcp.github.io/guides/ble-gateway-firmware/1.0/docs/aws_iot#monitor-aws-messages

10 Debugging

To access the console or serial port of the device, plug in a USB to Micro USB cable between your PC and the MG100. Next use your favorite serial or terminal program with the following settings to initiate a proper connection as explained in Set up your hardware.



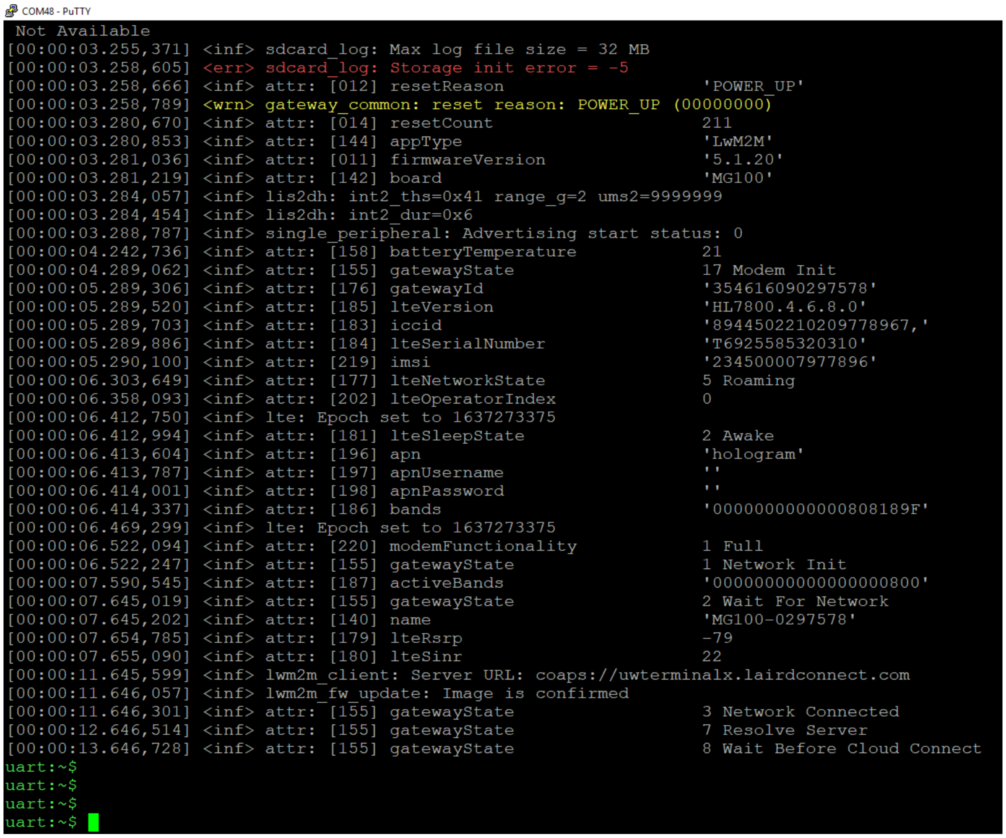
Options controlling local serial lines

Configure the serial line

Speed (baud)	115200
Data bits	8
Stop bits	1
Parity	None
Flow control	XON/XOFF

Figure 2: MG100 terminal settings

At initial boot up you will be presented with a command line interface as well as debug output. The command line interface has an interactive help menu to guide you through the various commands and parameters you can use.



```
 Not Available
[00:00:03.255,371] <inf> sdcard_log: Max log file size = 32 MB
[00:00:03.258,605] <err> sdcard_log: Storage init error = -5
[00:00:03.258,666] <inf> attr: [012] resetReason                   'POWER_UP'
[00:00:03.258,789] <wrn> gateway_common: reset reason: POWER_UP (00000000)
[00:00:03.280,670] <inf> attr: [014] resetCount                    211
[00:00:03.280,853] <inf> attr: [144] appType                       'LwM2M'
[00:00:03.281,036] <inf> attr: [011] firmwareVersion               '5.1.20'
[00:00:03.281,219] <inf> attr: [142] board                         'MG100'
[00:00:03.284,057] <inf> lis2dh: int2_ths=0x41 range_g=2 ums2=9999999
[00:00:03.284,454] <inf> lis2dh: int2_dur=0x6
[00:00:03.288,787] <inf> single_peripheral: Advertising start status: 0
[00:00:04.242,736] <inf> attr: [158] batteryTemperature            21
[00:00:04.289,062] <inf> attr: [155] gatewayState                  17 Modem Init
[00:00:05.289,306] <inf> attr: [176] gatewayId                     '354616090297578'
[00:00:05.289,520] <inf> attr: [185] lteVersion                    'HL7800.4.6.8.0'
[00:00:05.289,703] <inf> attr: [183] iccid                         '8944502210209778967,'
[00:00:05.289,886] <inf> attr: [184] lteSerialNumber               'T6925585320310'
[00:00:05.290,100] <inf> attr: [219] imsi                          '234500007977896'
[00:00:06.303,649] <inf> attr: [177] lteNetworkState               5 Roaming
[00:00:06.358,093] <inf> attr: [202] lteOperatorIndex              0
[00:00:06.412,750] <inf> lte: Epoch set to 1637273375
[00:00:06.412,994] <inf> attr: [181] lteSleepState                 2 Awake
[00:00:06.413,604] <inf> attr: [196] apn                           'hologram'
[00:00:06.413,787] <inf> attr: [197] apnUsername                   ''
[00:00:06.414,001] <inf> attr: [198] apnPassword                   ''
[00:00:06.414,337] <inf> attr: [186] bands                         '0000000000000808189F'
[00:00:06.469,299] <inf> lte: Epoch set to 1637273375
[00:00:06.522,094] <inf> attr: [220] modemFunctionality            1 Full
[00:00:06.522,247] <inf> attr: [155] gatewayState                  1 Network Init
[00:00:07.590,545] <inf> attr: [187] activeBands                   '00000000000000000800'
[00:00:07.645,019] <inf> attr: [155] gatewayState                  2 Wait For Network
[00:00:07.645,202] <inf> attr: [140] name                          'MG100-0297578'
[00:00:07.654,785] <inf> attr: [179] lteRsrp                       -79
[00:00:07.655,090] <inf> attr: [180] lteSinr                       22
[00:00:11.645,599] <inf> lwm2m_client: Server URL: coaps://uwterminalx.lairdconnect.com
[00:00:11.646,057] <inf> lwm2m_fw_update: Image is confirmed
[00:00:11.646,301] <inf> attr: [155] gatewayState                  3 Network Connected
[00:00:12.646,514] <inf> attr: [155] gatewayState                  7 Resolve Server
[00:00:13.646,728] <inf> attr: [155] gatewayState                  8 Wait Before Cloud Connect
uart:~$
uart:~$
uart:~$
uart:~$
```

Figure 3: MG100 terminal output

To enable logging use the command:

```
# log go
```

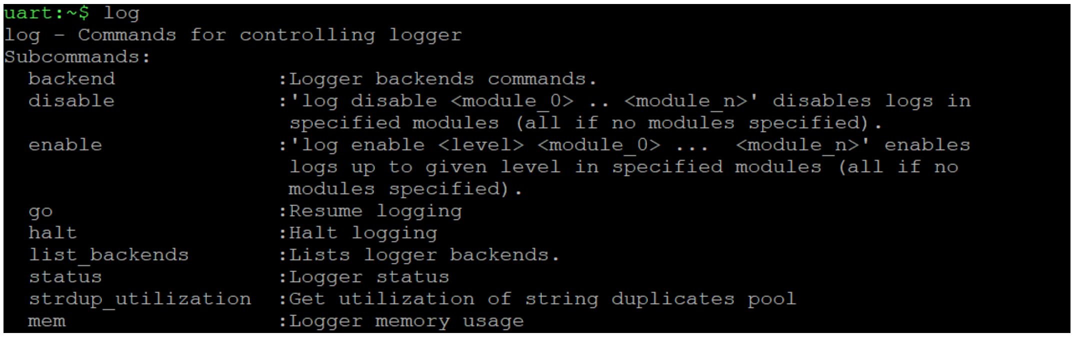
To disable logging use the command:

```
# log halt
```

To leverage the interactive help menu use the command:

```
# help
```

Note: There is only one level of logging on the device. However, you can enable or disable logging for specific software modules of the device as seen below.



```
uart:~$ log
log - Commands for controlling logger
Subcommands:
  backend             :Logger backends commands.
  disable             :'log disable <module_0> .. <module_n>' disables logs in
                       specified modules (all if no modules specified).
  enable              :'log enable <level> <module_0> ...  <module_n>' enables
                       logs up to given level in specified modules (all if no
                       modules specified).
  go                  :Resume logging
  halt                :Halt logging
  list_backends       :Lists logger backends.
  status              :Logger status
  strdup_utilization  :Get utilization of string duplicates pool
  mem                 :Logger memory usage
```

Figure 4: log command help on the MG100

11 TROUBLESHOOTING

Problems may arise as you go through development and testing. Below are some commons issues and their solutions.

- Device will not connect to a network.
  - Ensure that your SIM card is inserted properly.
  - Validate that the SIM card is active with your MNO/MVNO provider and has data allotted to it.
  - Verify that the APN is set correctly.
- Device will not connect to AWS.
  - Check to see if you have the correct AWS endpoint set.
  - Verify that you have the proper certificates and keys loaded to the device.
  - Validate that you have the correct IoT Core thing and policies in place on AWS.