

# Configuring Skywire® [SR1] CAT 4 LTE and CAT 1 LTE Modems for MBIM Mode on Windows 10 and 11

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# 1. Introduction

## 1.1 Overview

The Mobile Broadband Interface Model (MBIM) is a networking protocol created by the USB Implementers Forum, and is designed for USB-based networking solutions, such as cellular modems. This protocol facilitates the connection of USB-enabled embedded modems with other USB-enabled electronics such as personal computers.

This application note will describe how to configure a 4G LTE CAT4 or 4G LTE CAT1 Skywire modem to use MBIM protocol and establish a connection to a cellular LTE network. Please note that MBIM protocol only works for Windows 10 and Windows 11.

## 1.2 Orderable Part Numbers

This application note has been tested on and is intended for use with the following Skywire modems:

Orderable Device	Description	Carrier	Network Type
NL-SWDK2	Skywire Development Kit	Any	Any
NL-SW-LTE-QBG95-B	LTE CAT M1	Verizon/AT&T	LTE-M, NB-IoT
NL-SW-LTE-QBG96-B	LTE CAT M1	Verizon/AT&T	LTE-M, NB-IoT
NL-SW-LTE-SRC7611-4	LTE CAT4	Verizon/AT&T	LTE
NL-SW-LTE-SRC7611-4NG-B	LTE CAT4	Verizon/AT&T	LTE
NL-SW-LTE-TC4NAG-B	LTE CAT4	Verizon/AT&T	LTE
NL-SW-LTE-TC4EU	LTE CAT 4 <del>EU</del>	European Carriers	LTE
NL-SW-LTE-TC1WWG	LTE CAT 1	Verizon/AT&T, European Carriers	LTE
NL-SW-LTE-TC4WWG	LTE CAT 4	Verizon/AT&T, European Carriers	LTE
NL-SW-LTE-TG1WWG	LTE CAT M1	Verizon/AT&T	LTE

# 2. Skywire Configuration Procedure

## 2.1 Introduction

Section 2 describes the part of the setup procedure that is common for each of the different cellular carriers. This includes the installing of Windows drivers, enabling of MBIM mode, and the verification of cellular signal strength and cellular functionality.

## 2.2 Install Drivers

First, install the most recent Windows 10/11 drivers for the Skywire. These drivers are located at the link below:

<https://source.sierrawireless.com/resources/airprime/software/hl854x-usb-drivers/>

Note: A Sierra Wireless account must be created to download the above file.

Inside of the zip file is a guide for the driver installation process, as well as the drivers themselves. Follow the instructions in the guide to ensure that the drivers are installed correctly. Once the drivers have been installed, proceed to Section 2.3.

## 2.3 Preliminary Skywire Setup

Before beginning, ensure that the target Skywire has a functioning SIM card inserted, and that the Skywire is properly installed into a Skywire development kit or a similar development interface. Additionally, ensure that the modem's firmware is up to date, and that the correct carrier-specific firmware is installed on the modem.

## 2.4 Enable MBIM Mode

First, establish a connection to the target modem using the Skywire's USB interface and a preferred serial console. Verify that the modem is responsive by issuing:

**AT**

The modem will respond with:

**OK**

After the modem is responsive, issue the following command to switch the modem into MBIM mode:

Modem	Command	Response
NL-SW-LTE-QBG95-B NL-SW-LTE-QBG96-B NL-SW-LTE-SRC7611-4 NL-SW-LTE-SRC7611-4NG-B	<b>No configuration required</b>	<b>N/A</b>
NL-SW-LTE-TC4NAG-B NL-SW-LTE-TC4EU	<b>AT#USBCFG=2</b>	<b>OK</b>
NL-SW-LTE-TC1WWG NL-SW-LTE-TC4WWG	<b>AT#USBCFG=0</b>	<b>OK</b>
NL-SW-LTE-TG1WWG	<b>No longer supported</b>	<b>N/A</b>

The modem will reboot. Once it is back up and running, the terminal should respond with:

**OK**

Once the modem has rebooted, verify that the correct setting has been applied. Issue this command:

**AT#USBCFG?**

The modem will respond with:

**#USBCFG: 2**

If the modem returns the proper response, proceed to [Section 2.5](#). Otherwise, attempt [Section 2.4](#) again.

## 2.5 Enable Cellular Functionality

Next, ensure that cellular functionality is enabled by issuing the following command:

**AT+CFUN?**

If cellular functionality is indeed enabled, the modem will respond with:

**+CFUN: 1,0**

If the modem does not respond with the above text, issue the following command:

**AT+CFUN=1,1**

The '1,1' argument tells the modem to restart and boot up with cellular functionality enabled. After the modem reboots, check for functionality by issuing the first command listed in this section.

Once cellular function has been enabled, it is important to verify that the primary antenna is receiving an adequate signal. To check signal strength, issue the following command:

**AT+CESQ?**

The modem should respond with:

**+CESQ: <n>, <rxlev>, <ber>, <rscp>, <ecno>, <rsrq>, <rsrp>, <rssnr>**

Where each item in "< >" is replaced with an integer value. See the bullet points below for an explanation of some of these parameters:

- 'rxlev' indicates the received signal strength (RSSI).
  - The returned value should be between 0 and 63.
  - A value of 99 indicates that the signal strength is not detectable or is unknown. This is usually indicative of an improperly connected antenna.
- 'rsrq' indicates the reference signal received quality.
  - The returned value should be between 0 and 34.

- A value of 255 indicates that the received signal quality is not detectable or is unknown. This is usually indicative of an improperly connected antenna.
- 'rsrp' indicates the reference signal received power.
  - The returned value should be between 0 and 97.
  - A value of 255 indicates that the received signal quality is not detectable or is unknown. This is usually indicative of an improperly connected antenna.

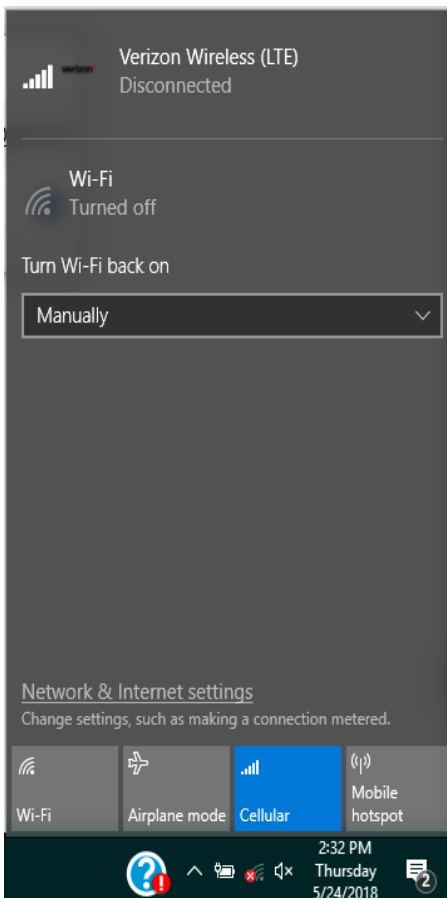
For an explanation of the other parameters in the '+CESQ:' response, please refer to the AT command manual for the applicable modem. Links to AT command manuals for each respective modem can be found on their respective product pages.

Once cellular functionality and signal strength have been verified, proceed to [Section 3](#).

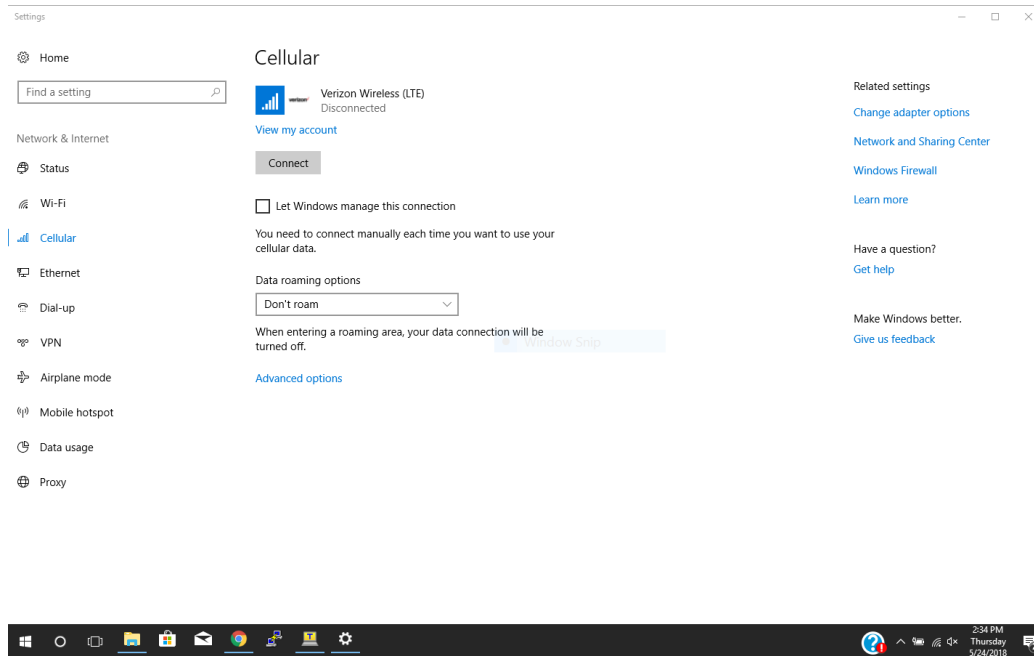
## 3. Configure Windows Cellular Settings

### 3.1 Open the "Wireless Internet Settings" Menu

Open the "Wireless Internet Settings" menu in the Windows toolbar. It should look something like the image below where 'Verizon Wireless (LTE)' is replaced by the carrier that corresponds to the SIM card:



Next, open up the "Cellular" settings menu by typing "change cellular settings" into the search bar. The menu should look like this:



If an option for a cellular connection appears in this menu, proceed to the next section. Otherwise, make sure that the latest drivers are installed for the modem, and retry the connection.

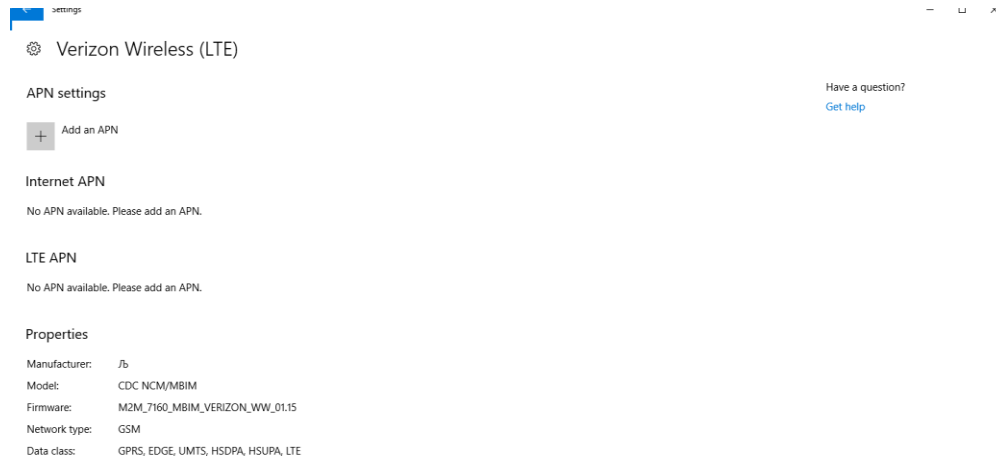
## 3.2 Configure the Connection Settings

Section 3.2 contains instructions for configuring the connection settings for each carrier. Click on a link below or navigate to the section that contains the proper instructions for the relevant carrier:

- Verizon: [Section 3.2.1](#)
- AT&T: [Section 3.2.2](#)
- T-Mobile: [Section 3.2.3](#)

### 3.2.1 Verizon Connection Settings

Within the "Cellular" settings menu, click on the link that says "Advanced options." A new page will open with information about the modem. It should look similar to the image below:



Select "Add an APN". In the new window, enter the following information:

A screenshot of the "Add APN" form. The form fields are: Profile name (NL Verizon), APN (nimblink.gw12.vzwentp), User name (empty), Password (Password), Type of sign-in info (None), IP type (IPv4), and APN type (Internet). There is a checkbox for "Apply this profile" which is checked, and a "Save" button at the bottom. Three callout boxes with red arrows point to specific fields: "Enter custom name here, if desired." points to the Profile name field; "If using NimbeLink Cellular Service, enter: nimblink.gw12.vzwentp" points to the APN field; "Important! Set IP type to IPv4." points to the IP type dropdown menu.

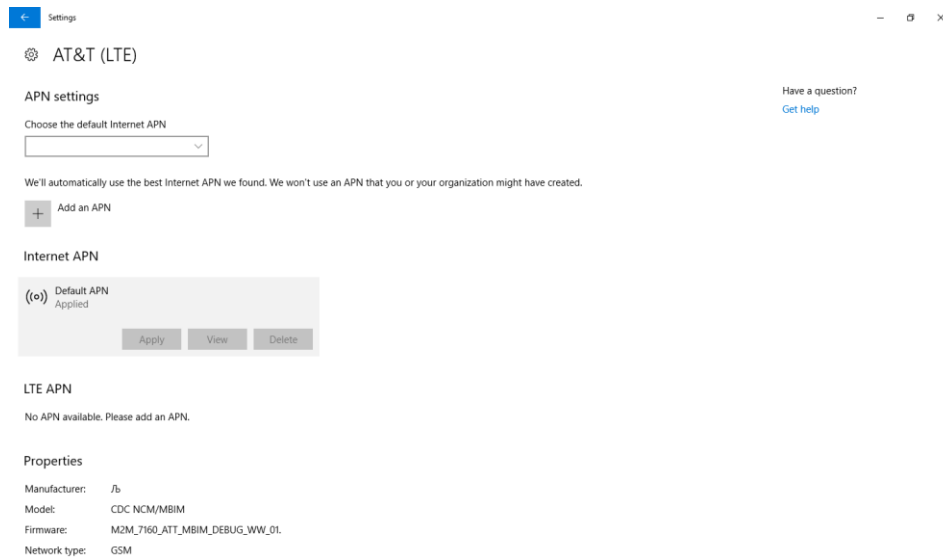


**Note:** The value of the APN field may vary. Please make sure that the APN entered into the Windows settings is the correct APN associated with the data plan being used.

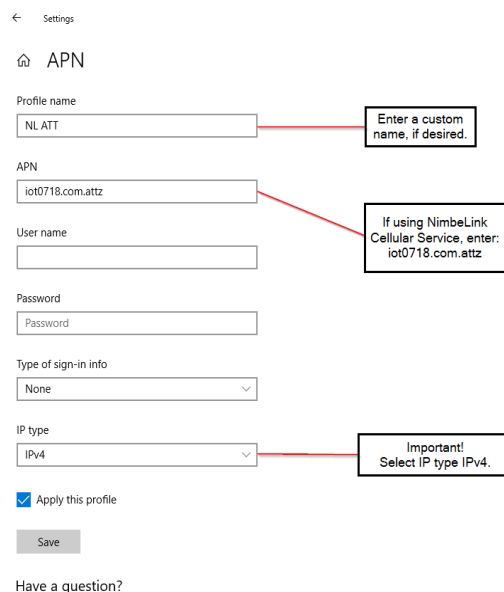
After filling out the info in the image above, press "Save" and proceed to [Section 3.3](#).

### 3.2.2 AT&T Connection Settings

Within the Windows Cellular Settings menu, click on the link that says "Advanced options." A new page will open with information about the modem. It should look similar to the image below:



Select "Add an APN". In the new window, enter the following information:



**Note:** The value of the APN field may vary. Please make sure that the APN entered into the Windows settings is the correct APN associated with the data plan being used.

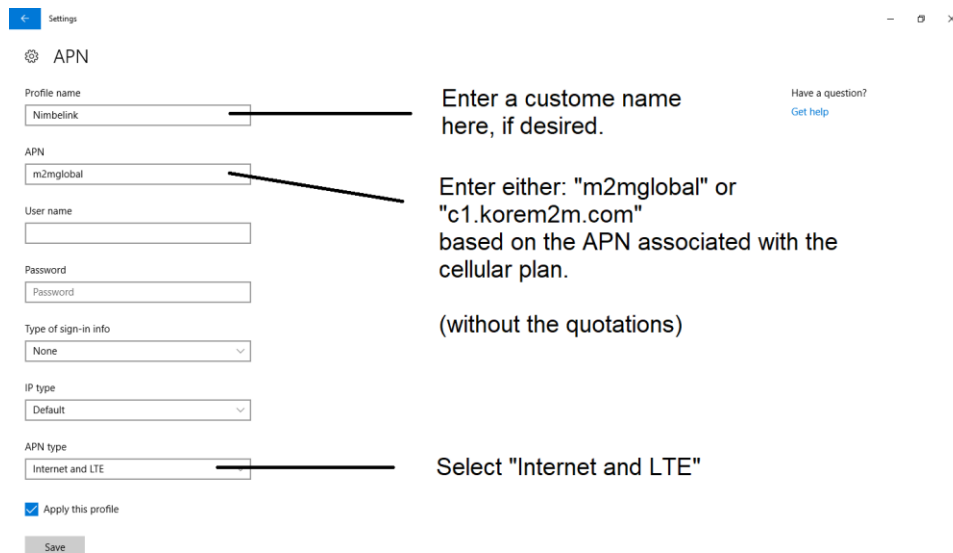
After filling out the info in the image above, press "Save" and proceed to [Section 3.3](#).

### 3.2.3 T-Mobile Connection Settings

Within the Windows Cellular Settings menu, click on the link that says "Advanced options." A new page will open with information about the modem. It should look similar to the image below:



Select "Add an APN". In the new window, enter the following information:

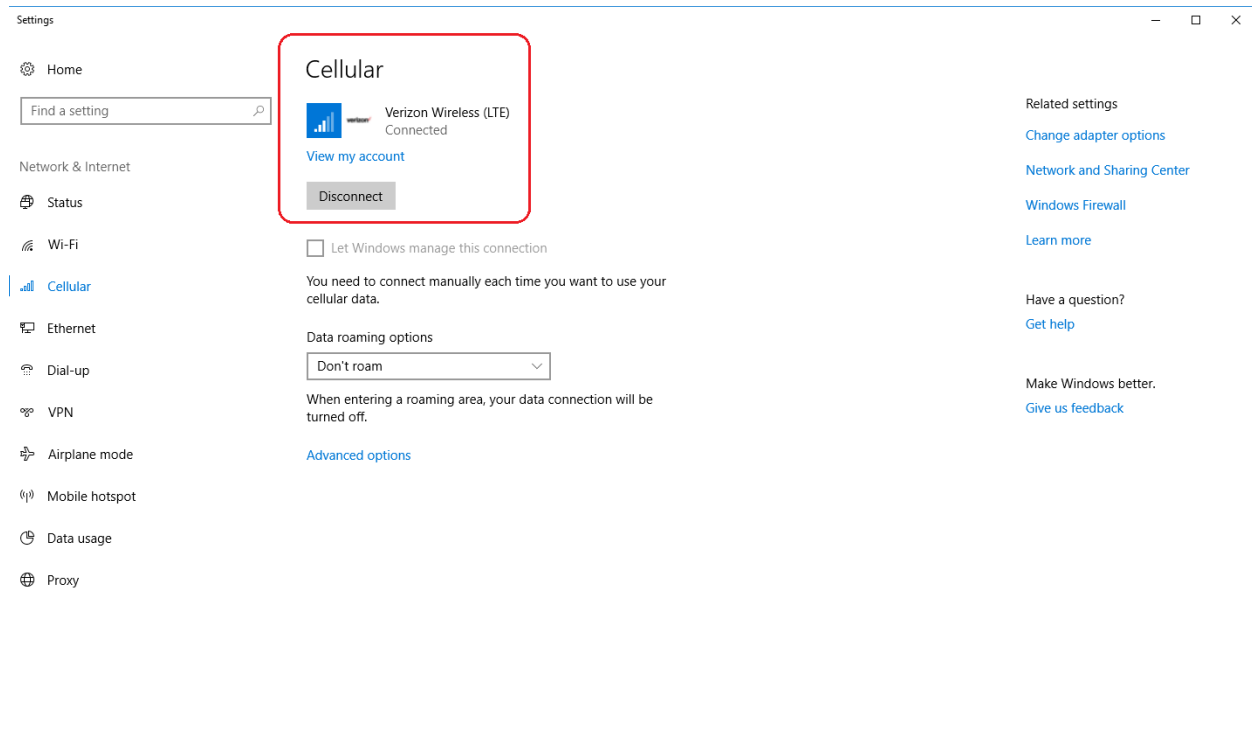


**Note:** The value of the APN field may vary. Please make sure that the APN entered into the Windows settings is the correct APN associated with the data plan being used.

After filling out the info in the image above, press "Save" and proceed to [Section 3.3](#).

## 3.3 Verify Cellular Connectivity

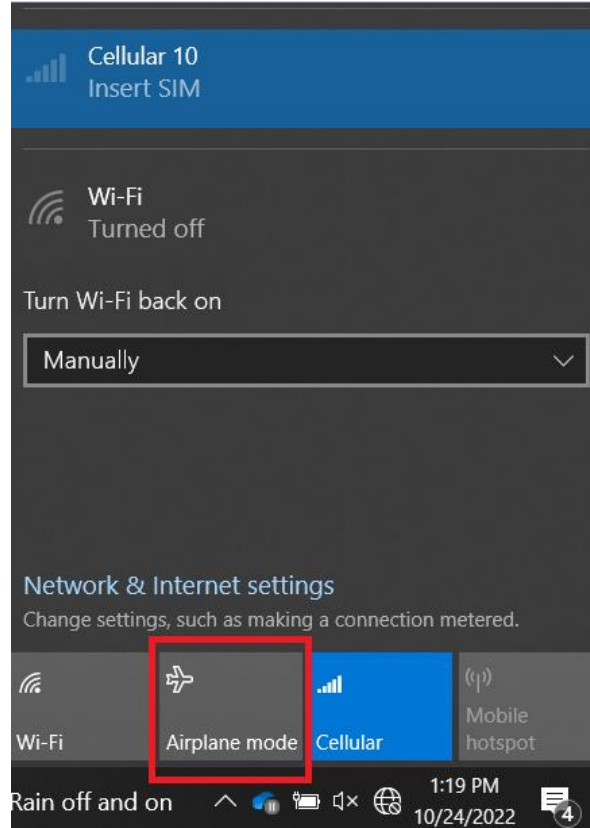
In the "Cellular" menu, hit the 'Connect' button, and the modem should establish a cellular connection. If connected, the window should look something like this:



If the cellular connection has been established, then the internet connection is ready to use. The connection will function just like any other ethernet or WiFi connection.

# 4.Troubleshooting

The modem may fail to connect and/or display 'Insert SIM' in the cellular settings as show below.



Attempt to reconnect by clicking 'Airplane mode' on and off. This should allow the modem to make a connection with Windows. Remember to turn WiFi off when testing connectivity.

## 5. Document Version Information

Revision	Description	Date
3	<ul style="list-style-type: none"><li>- Revision Control Updated</li><li>- Updated Formatting</li><li>- Removed Unsupported Modems</li><li>- Updated Supported Modems</li><li>- Updated to support Windows 11</li></ul>	10/21/22
4	Added NL-SW-LTE-SRC7611-4NG-B PN	03/08/24

[SR2]