

AT&T IOT STARTER KIT CELLULAR SHIELD FIRMWARE UPGRADE

Document revision 2.4 (Dec 5, 2017)

ABSTRACT

This guide documents the process for upgrading the firmware for the Cellular Shield based on the “M14A21-M1 Radio Module” included with several AT&T IoT Starter Kits.

This tutorial describes the steps needed to install firmware updates to the Cellular Shield, whether upgrading to a new version of the LTE or LTE-M firmware – or converting between the LTE and LTE-M firmware.

Host O/S: Currently, firmware updates are only supported on Windows 7/8/10 computers.

Time Required: This update required 20-30 minutes to complete.



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INTRODUCTION

OVERVIEW - UPDATING THE CELLULAR SHIELD FIRMWARE

This guide documents the process for upgrading the firmware (i.e. embedded software) for the Cellular based on the “M14A21-M1 Radio Module” included with several of the AT&T IoT Starter Kits:

- [AT&T IoT Starter Kit](#)
- [AT&T IoT Starter Kit Powered by AWS](#)
- [AT&T LTE IoT Add-on Kit](#)
- [AT&T IoT Starter Kit \(LTE-M\)](#)

This tutorial describes the steps needed to install firmware updates to the Cellular Shield. The procedure will require about 30 minutes; approximately 15 minutes of this time is spent waiting for the firmware to be written to the board. The firmware write process can run unattended, and it should not be interrupted once it has begun. Please make sure to read through all of the instructions first to ensure you don't skip or rush through a step.

NOTE: This does require a Windows PC for running the WNC Connection Manager (WNCCM) software. This software only runs on Windows 7, 8 or 10.

LTE VS LTE-M FIRMWARE

All the kits listed above, except the last one, *AT&T IoT Starter Kit (LTE-M)*, are shipped with the Cellular Shield pre-programmed using LTE communications mode. This wireless connection is similar to LTE cell phones, letting you communicate almost anywhere and everywhere.

The last kit listed above, *AT&T IoT Starter Kit (LTE-M)*, uses the same Cellular Shield hardware, but its firmware runs the cellular modem in LTE-M mode. This new protocol, first launched by AT&T in May 2017 is focused on lower data rate IoT communications. LTE-M provides extended range – deeper into buildings and basements – versus LTE while using less power. Unlike other IoT oriented LPWAN (low-power wide-area networks), LTE-M is already supported just about anywhere in North America where you can use your LTE cell phone. Please visit the following link to learn more about this exciting new technology:

<https://www.business.att.com/enterprise/Service/internet-of-things/networks/lte-m/>

CONVERTING BETWEEN LTE AND LTE-M

The Cellular Shield found in the AT&T IoT Starter Kits listed above can work using either mode. While the original starter kits ship with LTE support, they can be reconfigured to use LTE-M by changing the Cellular Shield firmware. Alternatively, they can also be changed back to LTE using the appropriate firmware.

With LTE-M's enhanced range, the modem only uses one antenna when in this mode; it should be attached to the "Primary" connector on the Cellular Shield. Note that both antennas are needed for LTE mode.

While the AT&T LTE-M IoT Starter Kit uses the same Cellular Shield hardware, it only ships with a single antenna. Therefore, while the hardware can run in LTE mode, you would need to supply a second antenna to make the system work correctly.

REQUIREMENTS / DOWNLOADS

The following hardware and software are required to complete the firmware upgrade process.

Computer

- Computer with Windows 7/8/10 operating system
(the firmware upgrade is not currently available for Mac OS or Linux computers)

Hardware (These items are found in the IoT Starter Kits)

- IoT Starter Kit Cellular Shield (pictured on the first page)
- IoT Starter Kit Cellular Shield Power Supply (A/C to 5V USB adaptor)
- Two Micro USB 2.0 Cables

Software / Firmware

- Download: [WNC Cellular Shield windows driver](#) (M14A2A_driver_x.x.x)
- Download: Firmware update application: [WNC Connection Manager \(WNCCM\)](#)
- Download: WNC Firmware update file: (choose one of the following)
 - LTE-M firmware: [NQ MPSS IMA3 v10.58.174043.zip](#) (recommended)
 - or the LTE firmware: [CM MPSS M14A2A v11.50.164451.zip](#)

As stated earlier, the IoT Starter Kits work with either firmware, but users will likely want the benefits found in the latest LTE-M firmware.

STEP-BY-STEP INSTRUCTIONS

BEFORE STARTING

Before starting the firmware update process, please take a moment to address the following:

- a) If the WNC Cellular Shield is mounted to the FRDM-K64F development board, separate the boards before starting this process. For this upgrade, you should work with the WNC Cellular Shield independently.
- b) Do not connect the WNC Cellular Shield to the PC until instructed to do so.
- c) Be prepared to spend 15-30 minutes upgrading the Cellular Shield firmware. The actual firmware update process may take about 15 minutes, although it can be left unattended once you have fully started the process.

FIRMWARE UPGRADE STEPS

OVERVIEW

This step-by-step tutorial consists of the following parts:

- Part I. Install Windows Drivers
- Part II. Connect Cellular Shield to PC
- Part III. Install the WNC Connection Manager tool
- Part IV. Update the WNC Cellular Shield

PART I. INSTALL WINDOWS DRIVERS

To upgrade the firmware on the WNC Cellular Shield, perform the following steps.

1. Verify the WNC Cellular Shield is disconnected.

If the Cellular Shield is mounted on the FRDM-K64F development board, disconnect (i.e. separate) the boards.

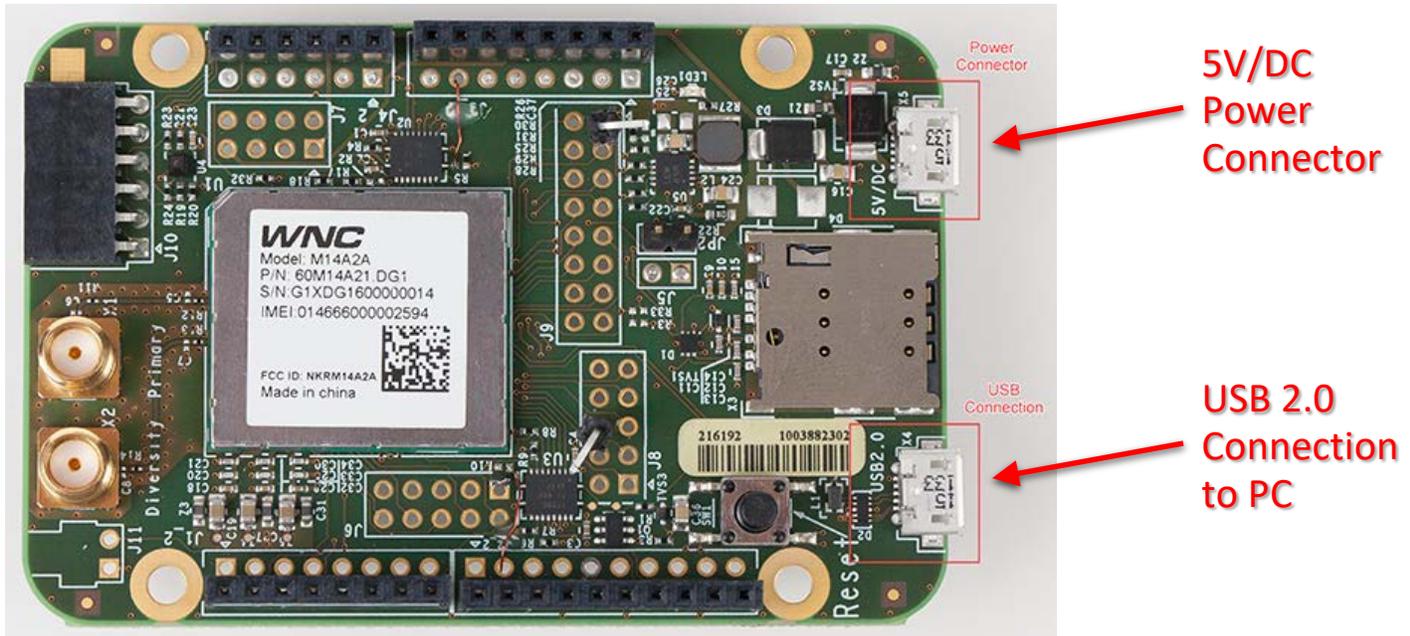
2. Download and install the WNC Cellular hardware driver for Windows.

If you have not already done so, download the WNC Cellular hardware driver (see "[Download](#)" link above). The file name will be a variation of M14A2A_driver_x.x.x; always use the highest available version number.

Double-click on the downloaded file to start the driver installation. During installation, we recommend that you accept all the default installation options.

Note that if you have previously updated your firmware and have already installed M14A2A driver, you do not have to repeat this step as long as the M14A2A_driver_x.x.x not been updated to a later revision.

PART II. CONNECT CELLULAR SHIELD TO PC

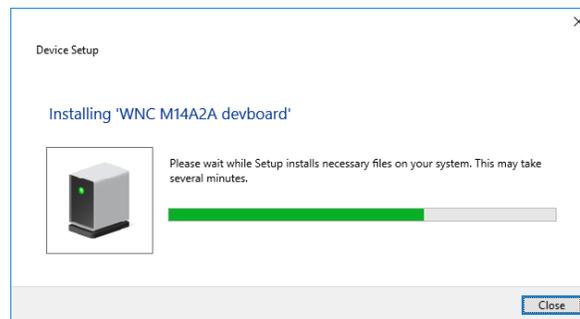


3. Connect the power supply to the WNC Cellular Shield board.

The IoT Starter Kit power supply consists of an A/C to USB power adaptor along with a micro USB cable. Connect the power supply using a micro USB cable to the WNC Cellular Shield board to the “5V/DC” connector shown in the upper-right corner of the preceding figure.

4. Connect the WNC Cellular Shield to the PC using a USB cable.

Connect the WNC Cellular Shield to the PC using the second USB cable. On the WNC Cellular Shield, the USB port is labeled “USB 2.0” and is in the lower-right corner of the previous figure.



The PC should automatically recognize the WNC Cellular Shield and install the appropriate drivers into the system's configuration. If the computer displays a warning indicating that it doesn't recognize the newly connected hardware, try uninstalling and re-installing the M14A2A_driver_x.x.x.exe device driver.

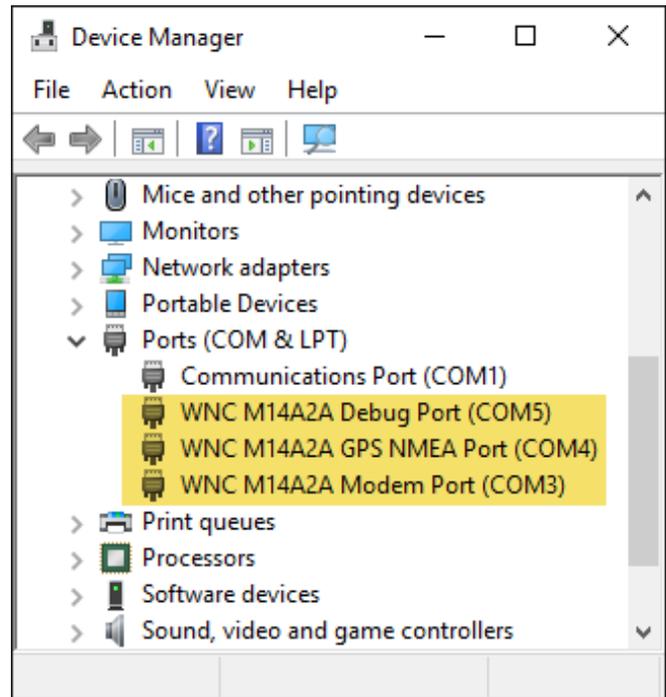
After the drivers are loaded and WNC Shield connected, leave it connected and powered up while attached to the PC.

5. Use Device Manager to verify that Windows recognizes the WNC Cellular Shield.

You can verify the Cellular Shield is correctly connected by (1) verifying the two cables are connected to the correct locations; and (2) checking if the Windows Device Manager displays the WNC M14A2A ports.

- a) Open the "Run" dialog box by pressing and holding the Windows key, then pressing the R key ("Run")
- b) Type: devmgmt.msc

Note: You will likely see different COM port numbers than those shown here. Windows randomly assigns COM port numbers when the board is first recognized.



PART III. INSTALL THE WNC CONNECTION MANAGER (WNCCM) TOOL

Installing the WNC Connection Manager (WNCCM) software to your Windows PC will allow you to program the Cellular Shield with its new firmware.

6. Download the WNC Connection Manager (WNCCM) software.

If you have not already done so, download the WNC Connection Manager (WNCCM) software (see "Download" link from the *Requirements / Downloads* section of this document). The file name will be a variation of WNCCM_x.x.x.msi. (At the time of writing, WNCCM version 1.09 was available.)

7. Double-click the downloaded WNCCM file to begin the installation.

When the connection manager install completes, the PC will create a network adapter for the WNC Shield Board.

Note: Do not perform this installation while the WNC Cellular Shield is connected to the FRDM-K64F development board, as the update might fail.

PART IV. UPDATE THE WNC CELLULAR SHIELD FIRMWARE

8. Download the WNC Cellular Shield firmware.

If you have not already done so, download the WNC Cellular Shield firmware (see “Download” link from the *Requirements / Downloads* section of this document).

The file name will be either:

NQ_MPSS_IMA3_v10.58.174043.zip (LTE-M)
or CM_MPSS_M14A2A_v11.50.164451.zip (LTE)

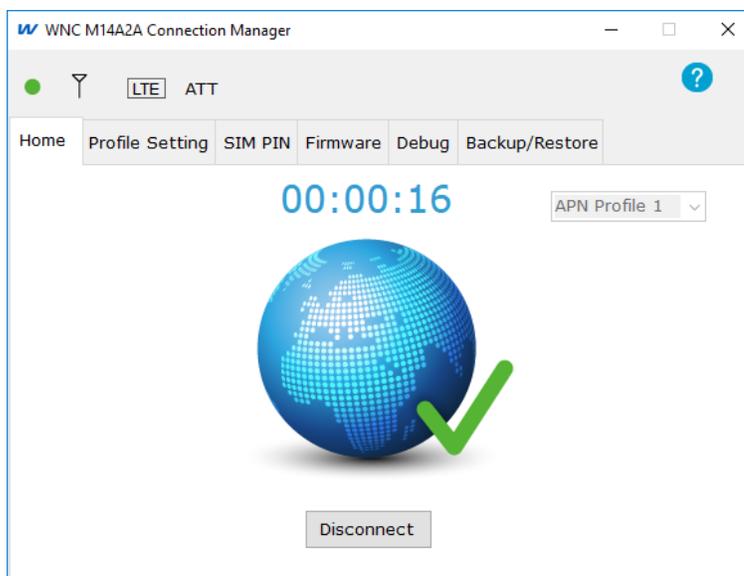
9. Unzip the new cellular shield firmware.

Once you've downloaded the file, extract the files from the zip file to a folder on the PC.

10. Open the WNC Connection Manager (WNCCM) application

Open the *WNC Connection Manager* (WNCCM) application that you installed in Part III of this document using the program icon on the desktop. Alternatively, you can also find on the Windows menu under the *WNC* subfolder.

After opening WNCCM, you will be greeted with the “Home” tab.



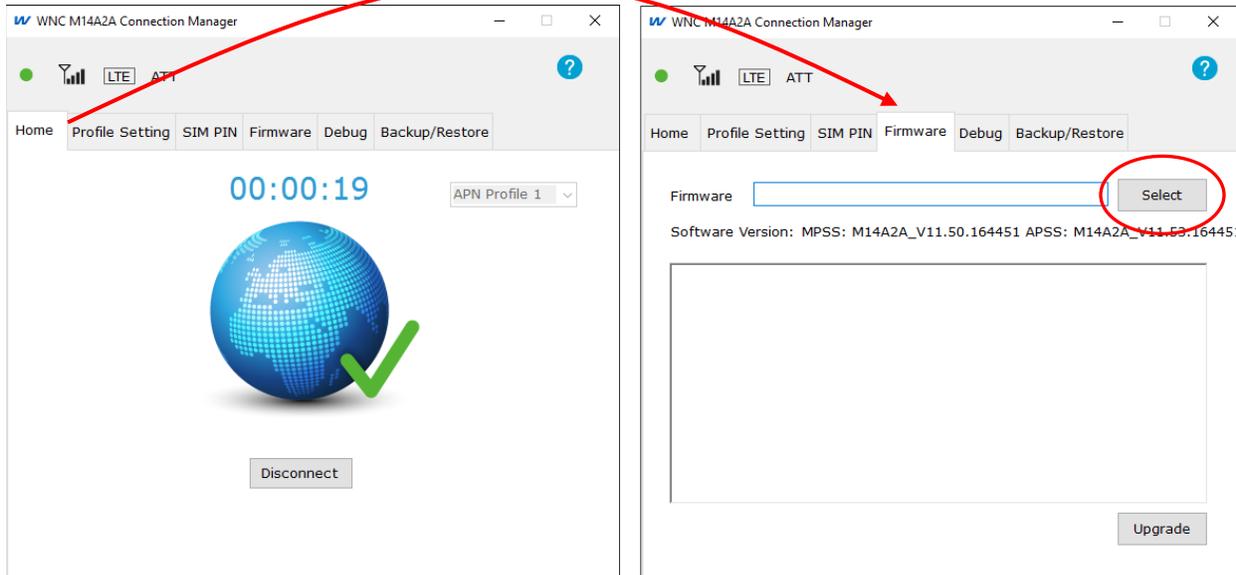
In most cases, if you have an active SIM IoT card installed in your Cellular Shield, the WNCCM application will make a connection to the AT&T network.

Don't worry if a connection does not occur. This is not required for you to upgrade the firmware in your Cellular Shield.

11. Select the *Firmware* tab

Once the application launches, select the **Firmware** tab.

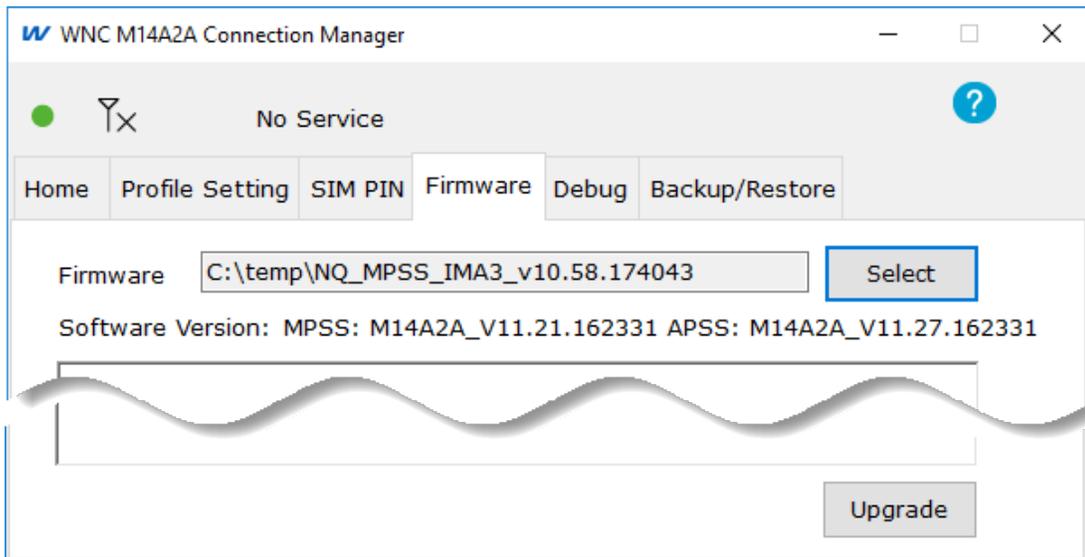
Click the **Select** button and choose the folder where the firmware was extracted. The zip file contains a folder matching the zip file name, so you'll want to select that folder. Be sure to select the folder and not any files within the folder.



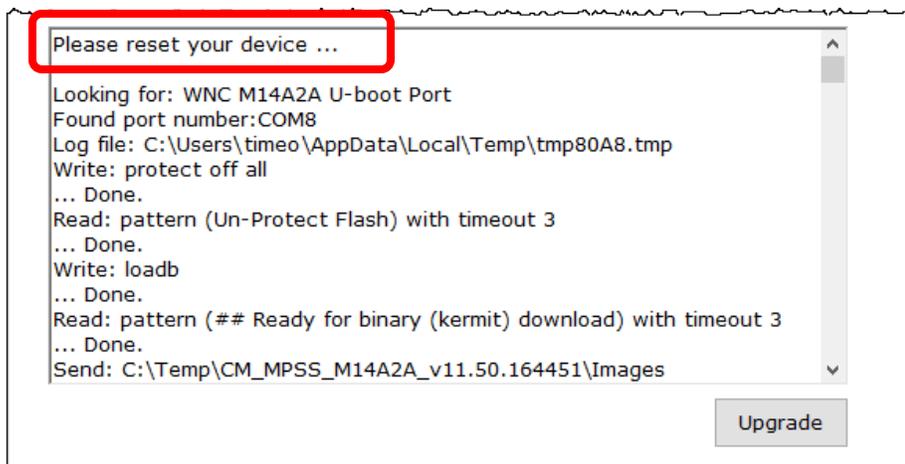
Note: *Firmware* Tab: The “Software Version” shown on this tab represents the firmware currently stored in the Cellular Shield’s non-volatile memory. This will be replaced by the new firmware you have selected. (Your software version may be different than that shown above.)

12. Click the “Upgrade” button... and then the “Reset” button.

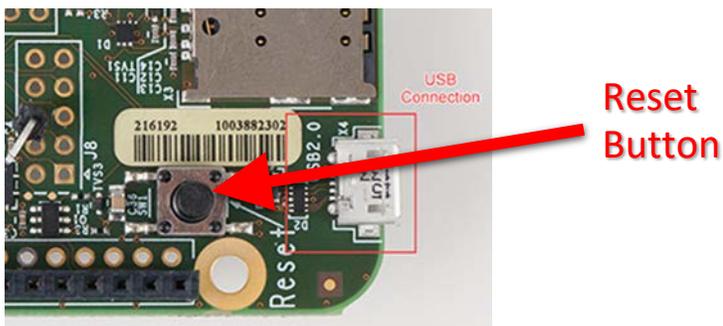
With the correct firmware file selected, click the **Upgrade** button in the WNCMM application to start the firmware update process. (Your version may be different than what’s shown here.)



13. If requested by the WNCMM application, “Press the Reset Button” on the modem board.



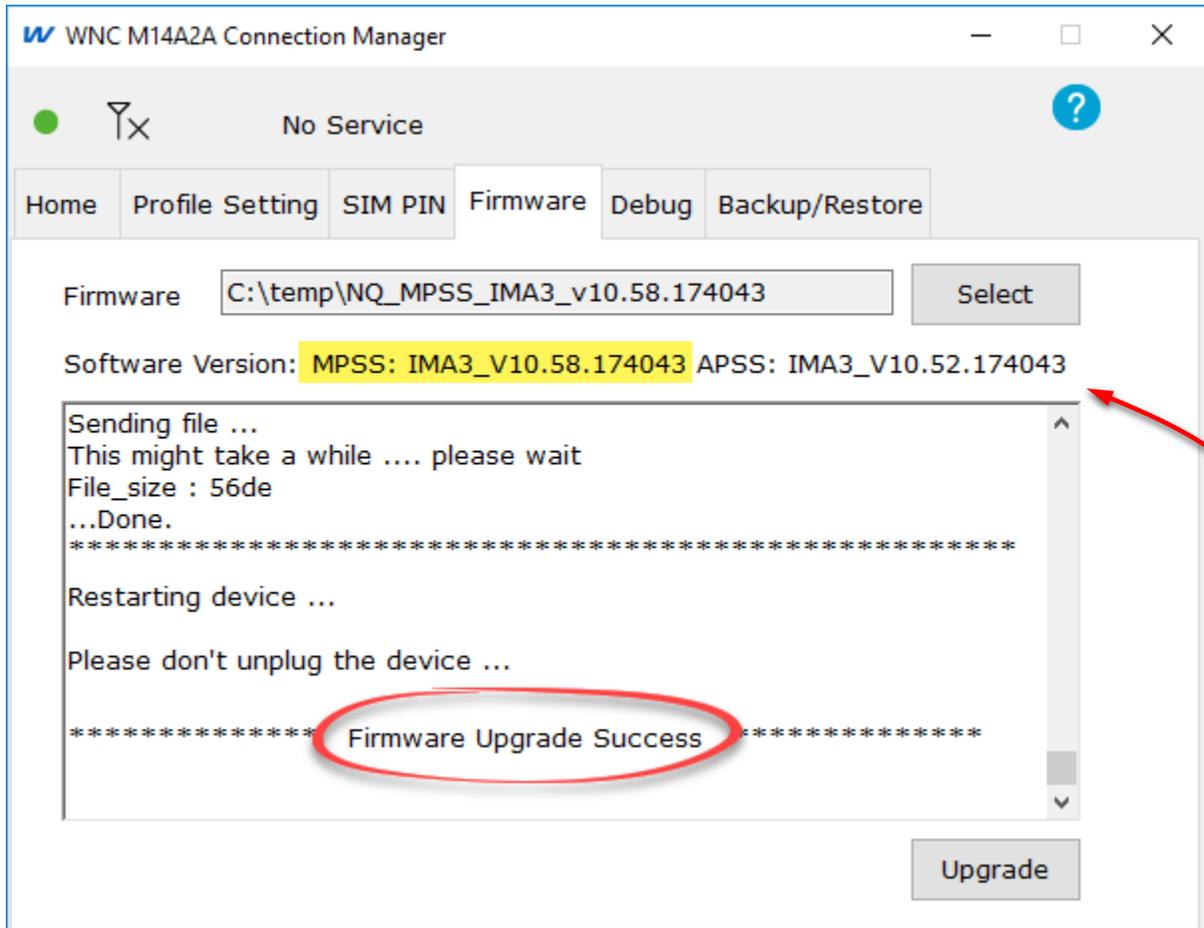
A manual reset is not required by all firmware updates, but if requested, press the reset button on the modem board for 5 seconds, as shown below.



After pressing reset, the status box will be updated as the firmware is being downloaded to the board. **Note that the firmware process may take up to 15 minutes to complete.**

14. Don't unplug your board until...

Do not unplug or remove power from the Cellular Shield as the firmware is being downloaded. You will know it is safe to disconnect the board when you see the message "Firmware Upgrade Success" message, as shown below. (Once again, the software versions shown here might not reflect the versions you are using.)



When the upgrade completes, the Cellular Shield board should automatically reboot and the WNC Connection Manager will display the new software version on the **Firmware** tab.

Optionally, you may want to switch over to the "Home" tab to see if WNCCM can make a connection to the AT&T network. Be aware that it can take up to a minute or two for a connection to be established.

Note: In some cases, we have seen WNCCM unable to connect to the network even after a successful firmware upgrade – and even in cases where the Cellular Shield works in an embedded system application.

15. Exit the Configuration Manager and power down the WNC-Shield.

You can now remove the USB cables once the firmware update is complete. At this point, you can go ahead and mate the Cellular Shield to the host microprocessor (NXP board or maybe your own Raspberry Pi) to continue experimenting with the AT&T IoT Starter Kit.

TROUBLESHOOTING IDEAS

Most users go through the entire update process without any problems, but here are a few ideas if you run into trouble:

- If the WNC Cellular Shield does not connect and doesn't appear under the "Ports" section of Windows Device Manager:
 - Try using a different USB cable and a different USB port on your computer.
 - Try uninstalling, and then reinstalling the WNC Windows device drivers.
- If the Firmware update process ends with "Failure" rather than "Success", try:
 - Using a different USB cable or port.
 - Uninstall, and then reinstall the WNC Connection Manager Windows application.
 - Try reinstalling the same firmware a second time.
- If your Cellular Shield cannot connect to the network (whether using the WNCCM software, the Cellular Shield is connected to the NXP FRDM-K64F, or it's connected to another host, such as a Raspberry Pi):
 - If using an embedded system host (e.g. NXP FRDM-K64F), try viewing the messages being written from it to the serial port on your computer. Not all applications provide status/error messages, but this can often be a very helpful debugging tool.
 - Make sure you have allowed sufficient time for a connection. It often takes a couple minutes for a connection to be established.
 - Reset or power-cycle the board and allow another couple of minutes for a connection to occur.
 - If using LTE-M mode, and you have a second antenna, try connecting a different antenna to the primary port. (Like USB cables, antennas can often stop working unexpectedly.)

LIST OF LINKS IN THIS DOCUMENT

Cellular Shield Windows Driver:

https://s3-us-west-2.amazonaws.com/starterkit-assets/M14A2A_driver_1.0.2.exe

WNC Connection Manager (WNCCM)

https://s3-us-west-2.amazonaws.com/starterkit-assets/WNCCM_1.0.9.zip

Firmware:

- LTE-M Firmware:

https://s3-us-west-2.amazonaws.com/starterkit-assets/NQ_MPSS_IMA3_v10.58.174043.zip

- LTE Firmware:

https://s3-us-west-2.amazonaws.com/starterkit-assets/CM_MPSS_M14A2A_v11.50.164451.zip

IoT Starter Kits

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- AT&T IoT Starter Kit Powered by AWS
<https://marketplace.att.com/products/att-iot-starter-kit-aws>
- AT&T LTE IoT Add-on Kit
<https://marketplace.att.com/products/att-lte-iot-add-on-kit>
- AT&T IoT Starter Kit (LTE-M)
<https://marketplace.att.com/products/att-iot-starter-kit-lte-m>

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