Skywire® LTE Global CAT M1
NL-SW-LTE-QBG96
GPS Application Note

NimbeLink Corp

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Table of Contents

1. Introduction

This document covers setting up GPS on the Skywire® Global LTE CAT-M1 modem. The reader should be comfortable interfacing with a modem over a serial connection. This guide uses the Skywire Development Kit (NL-SWDK) as the platform for communicating with the modem.

1.1. Notation

Throughout this document, commands for the modem will be in **bold** on their own line, as shown below:

AT

OK

The first line is the command to be issued (**AT**), and the remaining lines are the response sent back by the modem (**OK**). The response from the modem may be longer than one line.

1.2. Orderable Parts

Part Number	Description	Manufacturer
NL-SWDK	Skywire Development Kit	NimbeLink
NL-SW-LTE-QBG96	LTE CAT M1 Skywire Modem	NimbeLink
MA.301.A.AB.001	Cellular and GPS Antenna	Taoglas

1.3. Additional Resources

- Nimbelink's 4G LTE Cat M1 Global Skywire® Product Page
- Nimbelink's Skywire® Development Kit Product Page
- NMEA Message Format

2. Hardware Setup

Before sending commands to the modem, make sure the following hardware connections are setup properly. This guide uses the Skywire Development Kit, but this is not required to receive GPS data. Steps 2-5 are specific to the Skywire Development Kit and will be different depending on your hardware setup:

2.1. Connect a cellular antenna to U.FL connector X1, and connect a GPS antenna to U.FL connector X3 on the Skywire.

Left: Primary Cellular U.FL connector (X1); Right: GPS U.FL connector (X3)

2.2. Connect power to the Skywire Development Kit

2.3. Connect USB connector J14 to your PC. J14 is used to send AT commands to the modem.

2.4. Power on the modem by pressing the "ON BTN" for 3+ seconds, Then wait at least 15 seconds before trying to communicate with the modem.

2.5. Optional: Connect USB connector J5 to your PC to receive GPS data on a separate communication line (see Section 3, "Option 2").

3. GPS Setup

The following sequence of commands is used to set up the GPS receiver to receive location fix data without assistance from a network connection using the NL-SW-LTE-QBG96 modem based on the Quectel BG96 module.

Before receiving GPS location data, the GPS antenna must be powered on. To do this, a GPIO pin on the Skywire must be turned on.

3.1. Power on the GPS antenna:

AT+QCFG="gpio",1,64,1,0,0 // Enables GPIO 64 as an output

OK

AT+QCFG="gpio",3,64,1 // Sets GPIO 64 to logic level HIGH

OK

AT+QCFG="gpio",2,64 // Returns the current state of GPIO 64

+GPIO: 1

OK

Note: GPIO states will persist after reset, and the above AT commands will not need to be reissued each time the modem is powered on. Firmware updates may overwrite saved GPIO states, however.

3.2. Turn on GNSS:

AT+QGPS=1

OK

The modem should begin attempting to get a GPS fix. Note that it may take up to a few minutes to receive the first GPS fix. If you are getting +CME ERROR: 516, this means that the modem has not received a GPS fix yet. Either continue to wait for a few minutes, or move the GPS antenna near a window or outside.

3.3. Obtain positioning information:

AT+QGPSLOC?

+QGPSLOC: 061951.0,3150.7223N,11711.9293E,0.7,62.2,2,0.0,0.0,0.0,110513,09

OK

The modem will respond with the current acquired GPS location in the following format:

<UTC>,<latitude>,<longitude>,<hdop>,<altitude>,<fix>,<cog>,<spkm>,<spkn>,<date>,<nsat>

Where <latitude>,<longitude> is formatted as: ddmm.mmmm N/S,dddmm.mmmm E/W

3.4. There is also an unsolicited option for receiving data from the modem. You can specify which type of NMEA sentence you would like to receive using the table below and entering the following AT command:

NMEA Type	<value>
Disable	0
GGA	1
RMC	2
GSV	4
GSA	8
VTG	16
All	31

AT+QGPSCFG="gpsnmeatype",<value>

3.5. It is also possible to receive unsolicited GPS data returned by the modem in NMEA format.

Unsolicited NMEA GPS data in the format of <NMEA SENTENCE><CR> can be sent over the dedicated USB NMEA port. This option can be enabled by issuing the following AT command:

AT+QGPSCFG="outport","usbnmea"

The output on either the USB port will look similar to the following example. This example is set to display only GGA NMEA sentences:

$GPGGA,220703.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*6E
$GPGGA,220705.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*68
$GPGGA,220707.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*6A
$GPGGA,220709.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*64
$GPGGA,220711.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*6D
$GPGGA,220713.0,4701.387238,N,09327.689237,W,1,00,0.1,300.0,M,-33.0,M,,*6F

To view NMEA sentences directly, input the following AT command to enable NMEA acquisition:

AT+QGPSCFG="nmeasrc",1

Then, to obtain an NMEA sentence, enter the following command and replace <type> with which type of NMEA sentence you would like to receive from the following: GGA, RMC, GSV, GSA, VTG, GNS.

AT+QGPSGNMEA="<type>"