

# User Guide F5521gw

## USER GUIDE



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## Abstract

This document describes the Ericsson Mobile Broadband Module F5521gw from a user perspective. End-user value, functionality, features and basic building blocks are described.

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## Statements

### NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**Radiofrequency radiation exposure information:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

**NOTICE:**

This device complies with Part 15 of the FCC Rules [and with RSS-210 of Industry Canada].

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

**NOTICE:**

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.

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# 1 About this Document

## 1.1 Purpose

This user guide for F5521gw gives the reader a deeper technical understanding of the features, applications and configuration of F5521gw. A simplified technical explanation of GSM/GPRS/EDGE and UMTS/HSPA/HSPA Evolution data services is also included in this document.

# 2 Product Overview

F5521gw is a PCI Express Full-Mini Card Mobile Broadband Module for UMTS and GSM, which enables host device users to have flexible and high speed mobile access to the Internet or corporate network, including “always online” capability. It supports data services through HSPA Evolution, UMTS, EDGE, GPRS, and Data message service. The module has a GPS receiver which is working with most common positioning applications. Updated versions of the PC application software, drivers and module firmware can be installed by the end user.



## 2.1 Product Features

F5521gw is flexible and automatically chooses the best data service available in a particular location, whether it is HSPA Evolution, UMTS, EDGE or GPRS. This is particularly useful for users roaming on several different networks.

As a quad-band device, F5521gw can operate globally. It automatically chooses between UMTS band I, II, V, VI, or VIII. It is also a quad-band GSM device, and can operate on GSM systems all over the world. Therefore, users can use wireless communication from their host devices on all five continents, in over 205 countries.

With the F5521gw Mobile Broadband Module installed in a host device, it is always available for data transfer. Connection settings are automatically configured based on the SIM card. The user simply clicks the “Connect” button to make an Internet connection. Parameter settings suitable for many networks are included and can be configured if needed to facilitate manual configuration where required. A status screen and an icon in the notification area enable users to check status information such as signal strength, to perform common functions and to access help.

F5521gw has wide host device compatibility. It is designed to use the integrated antennas in host devices. F5521gw supports the Microsoft Windows XP, Vista, Windows 7, Linux, and Android operating systems. Since the module is designed for host devices, it is better integrated and provides a superior end-user experience compared to generically produced USB dongles that need to work across multiple computing platforms.

Application developers may utilize F5521gw via the high level API.

The built-in GPS receiver provides positioning data compatible with most commonly used positioning applications, to show the position on maps, trace the route, or provide driving directions.

## 3 Communication

The F5521gw Mobile Broadband Module keeps end-users up-to-date by providing them the best available mobile service wherever they are.

F5521gw is a dual mode device, able to connect via UMTS/HSPA and GSM/GPRS/EDGE. The user will remain connected without having to think about what system is being used – the handover between two systems and network technologies is automatically managed by F5521gw. F5521gw comes in one hardware version supporting both quad-band UMTS (Band I, II, V, VI and VIII) and quad-band GSM/GPRS/EDGE (850/900/1800/1900 MHz).

### 3.1 Network Technologies

#### 3.1.1 3G

3G (third-generation) services combine high-speed radio access with IP-based (Internet Protocol) services. This not only means fast mobile connection to the Internet, but also a totally new way to communicate, access information, conduct business, learn and be entertained.

Compared to 2G mobile networks, 3G significantly boosts network capacity, a much needed feature in densely populated areas. This means that operators are able to support more users and offer them more sophisticated services.

##### 3.1.1.1 HSPA Evolution

HSPA (High Speed Packet Access) Evolution enables downlink speeds up to 21 Mbps (HSDPA cat 14) and uplink speeds up to 5.76 Mbps (HSUPA cat 6). Higher order modulation results in higher possible speeds in the network.

##### 3.1.1.2 HSPA

HSPA is available in all developed 3G markets. With its HSDPA solution, F5521gw is capable of downlink speeds of up to 14.4 Mbps and uplink speeds of up to 5.76 Mbps. This, together with its antenna diversity technology, gives F5521gw a fast and reliable connection.

##### 3.1.1.3 WCDMA

The initial implementation of 3G networks enables Internet or corporate network access at bidirectional data rates of up to 384 kbps.



### 3.1.2 2G

GSM/GPRS coverage is available in almost all populated areas of the world and provides a secure fall back so that network connection is maintained.

#### 3.1.2.1 GPRS

GPRS is an enhancement to GSM networks and provides packet data transmission. The connection setup is fast and, once connected, applications may send and receive data whenever required.

F5521gw is using GPRS with Multislot class 12, this enables communication speed up to 85.6 kbps both uplink and downlink.

#### 3.1.2.2 EDGE

EDGE (Enhanced Data rates for Global Evolution) is an integral part of the GSM family of open mobile standards. EDGE improves GPRS by increasing data throughput by a factor of three. GPRS networks enhanced with EDGE are often referred to as E-GPRS (Enhanced GPRS) networks.

F5521gw using E-GPRS with Multislot class 12, this enables communication speeds up to 247.4 kbps both uplink and downlink.

## 3.2 Core features

### 3.2.1 Browsing and Internet access

F5521gw provides a standard Internet connection using an NDIS “Wireless WAN” adaptor. It is possible to use the Internet or intranet with a generic browser.

A common e-mail solution is to use an Internet connection and TLS security to browse corporate e-mail via a web interface.

### 3.2.2 SMS

F5521gw can send and receive text messages with the convenience of a full keyboard. Facilities such as copy and paste make it fast and easy to send information via text messages from a computer. The standard maximum length of a text message is 160 characters, (dependent on character coding), but since concatenation is supported, messages longer than 160 characters can be sent and received.

### 3.2.3

## GPS

The Global Positioning System (GPS) gives the positioning information around the globe and can be used together with the most commonly used positioning applications. The positioning data from the F5521gw module can be used together with all major positioning applications to, for example, show locations on maps, trace routes, give information on how to get to a destination, etc.

F5521gw has a built-in standalone GPS receiver with good sensitivity performance. For increased performance, F5521gw supports both network and Internet assisted GPS, which helps the GPS receiver increase its sensitivity and perform a faster Time To First Fix (TTFF).

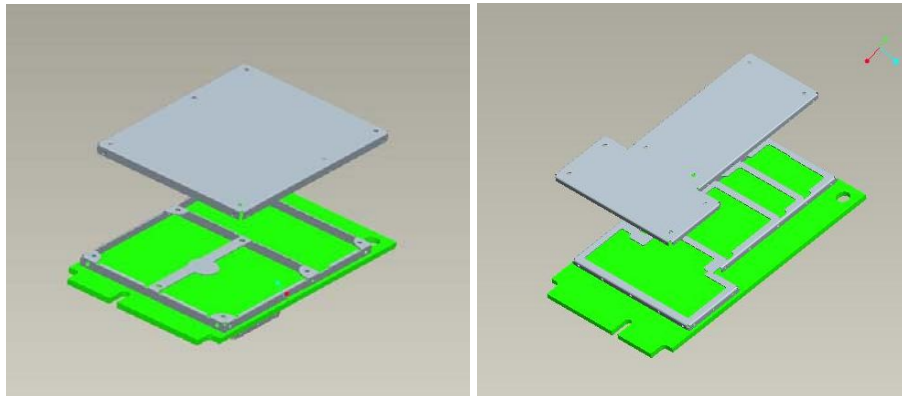
## 4 Hardware Overview

### 4.1 General

F5521gw is a full-size, type F2 mini card, built according to the PCI express mini card specifications, see chapter 6. F5521gw is an integrated solution using the host device's antenna system and UICC reader. It is designed as an add-in option for integrators of host devices and comprises the following component parts:

- HSPA wireless network adapter with GPS, which is the wireless enabler and GPS circuitry integrated onto the Mini Card PCB together with its mechanical RF shielding.
- RF connectors, which provide physical connectivity to the antennas integrated into the host device's mechanical housing.
- System connector, which provides the data, control, power, status and UICC interface between the host computer and the wireless network adapter.

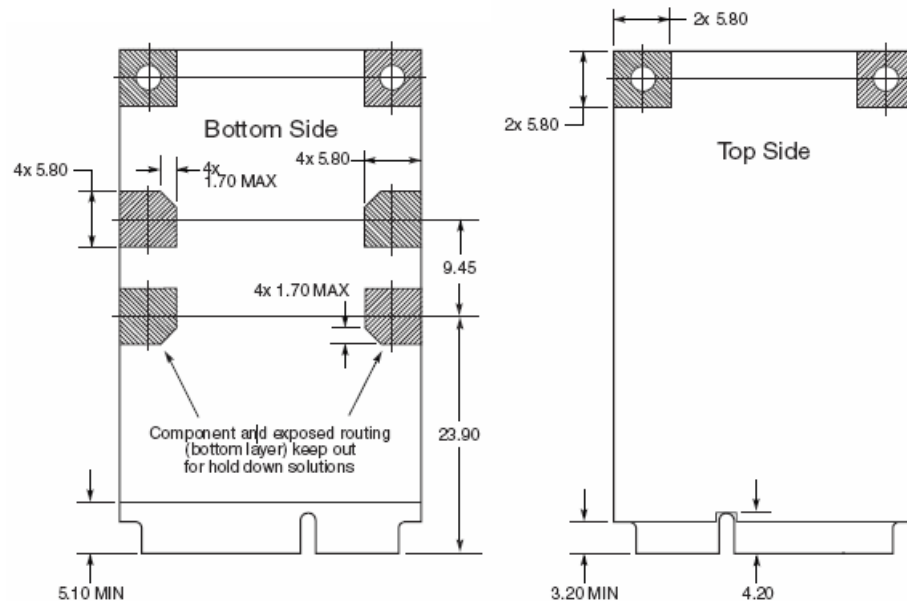
Below, the primary and secondary sides of the module are depicted.



All components except the two antenna connectors are covered by EMC shields. All power and baseband communication is routed through the edge connector of the card. The fastening holes in the upper corners are connected to ground.

## 4.2 Dimensions

The dimensions of the card are given in the figure below. The figure shows top and bottom views of the card with all measurements in millimeters. The mini card is a type F2 and is designed to fit into a full-size Mini card slot or into two half-size Mini card slots. Note that the figures are given without tolerance values; see the PCI Express Mini Card Electro Mechanical specification for more details.



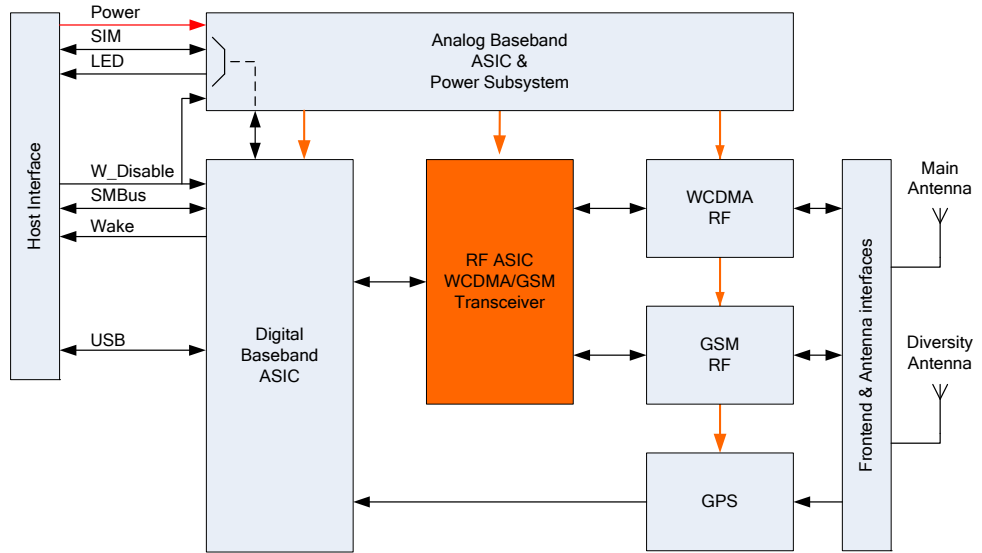
There are three connectors located on the card: two RF connectors located in the top corners and one system connector located on the lower edge.

The RF connectors are of type U.FL. The Main connector is used for UMTS/GSM transmission and reception. The AUX connector is used for UMTS diversity and GPS.

The System connector is a straight single 52-pin connector, 26 pins on each side of the card. The connector is specified in the PCI Express Mini Card specification.

### 4.3 Functional Block Diagram

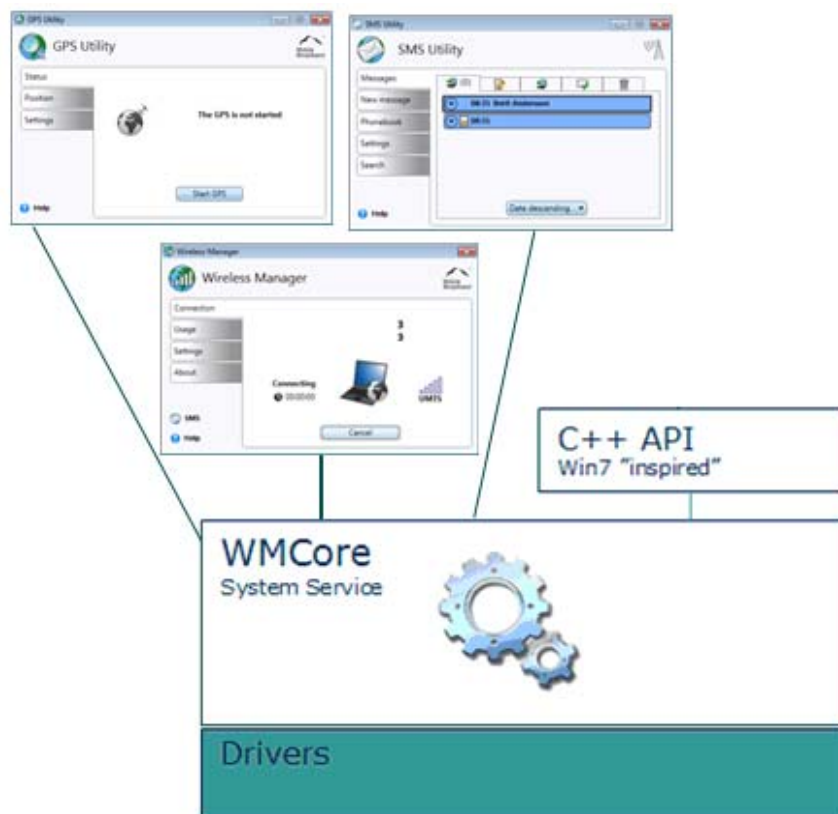
A function representation of F5521gw Mini Card is included in the figure below.



## 5 Software Overview

The PC software consists of drivers, a Windows service, APIs and three applications:

- Wireless Manager to control the Mobile Broadband connection
- SMS application, used to send and receive text messages
- GPS Utility used to configure and control the GPS.



## 5.1 Installation Procedure

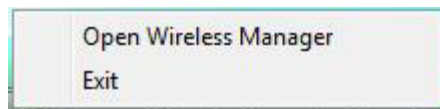
Installation follows normal Windows procedures. Microsoft .NET™ 3.5 or later needs to be installed on the machine. If missing, a prompt will inform the user during the installation process to install the .NET Framework.

The installation can be done both in interactive and silent mode to enable installation without user interaction.

## 5.2 Wireless Manager

The Wireless Manager is accessed from the Windows Desktop or via **Start | Programs | Wireless Manager**. Preferences can be set to automatically switch the radio transmitter on and to make a connection.

A Wireless Manager icon is placed in the Windows notification area at the bottom right of the screen. Set the “Minimize to notification area” option in Wireless Manager to only show an icon in the Windows notification area if the Wireless Manager Status window is minimized

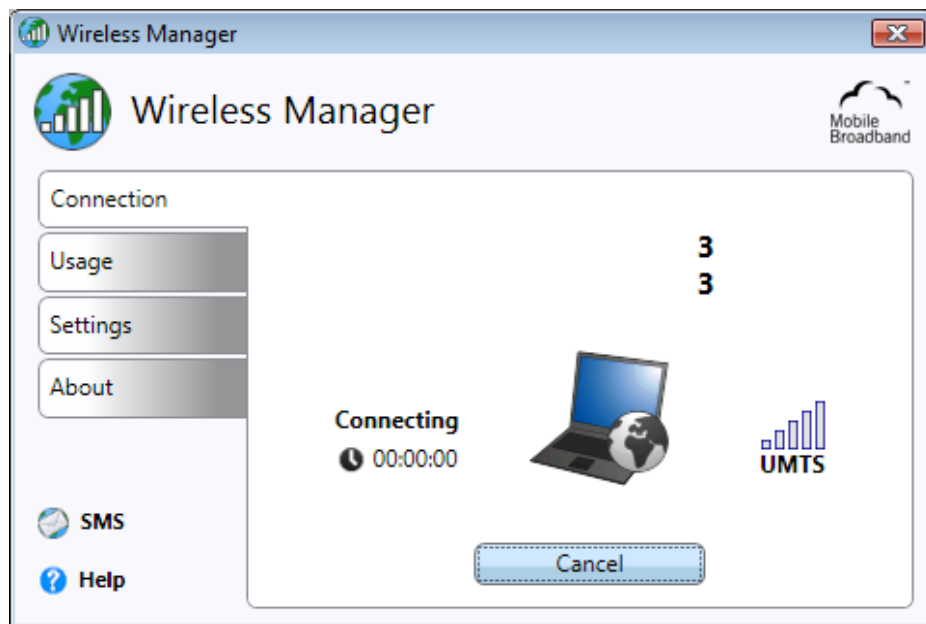


To open the Wireless Manager, right-click the Wireless Manager icon to access a menu and select “Open Wireless Manager”. Select “Exit” to quit the Wireless Manager.

The Windows NDIS icon indicates an active connection and data flow. The total connection time and transmit and receive byte count is also shown in the Wireless Manager.

### 5.2.1 Status Display

Wireless Manager opens to a status window which provides network and connection information.



The network operator's and the host device manufacturer's logos can be customized in the application. Connection duration, connection mode, volume of data and an indication of the signal strength are provided in the Wireless Manager window while connection is active. The figures provide an approximate checkpoint of the data volumes. Please note that the information shown here is not guaranteed to match the mobile operator's bill.

## 5.2.2 Settings

Settings are presented in logical groups. Connection settings are automatically set up each time a new SIM card is inserted into the host device. The Wireless Manager contains a list of many operator settings. The home operator on the SIM is matched with this list and a default connection profile is automatically created.

The settings may be viewed and edited. Alternative settings can be manually entered or selected from a database covering many mobile operators.

### 5.2.2.1 Connection Configuration

When a new SIM card is detected by F5521gw, the Wireless Manager identifies the home network and automatically creates a connection profile from a pre-loaded list of operator settings. This becomes the default profile and is available immediately. Therefore, in most cases, the user does not need to do anything except click the Connect button to establish a connection.



If the operator settings are not available or a personalized (company-specific) APN is used, the information may be entered manually. Any number of profiles may be defined (including Access Point Name, Username and Password). Quality of Service parameters are set to “network default”.

### **5.2.2.2 Connection Operation**

No user interaction is required to set the speed of the connection. It will be automatically set by the network depending on available network resources, the user's subscription and the need amount of buffered data.

F5521gw will automatically use the UMTS network by preference and automatically switch over to GPRS/EDGE where the operator has an integrated UMTS/GSM network if UMTS coverage is not available. When UMTS coverage returns, the connection will return to the UMTS network. In some networks, data flow must be paused. F5521gw therefore needs to return to an idle state before a return to UMTS can take place. This is network-specific.

Similarly, if HSPA is available in the UMTS network, the higher download speeds will be automatically available. In some networks, it is not possible to detect that HSPA is available until a connection is made.

### **5.2.2.3 IP Number Allocation**

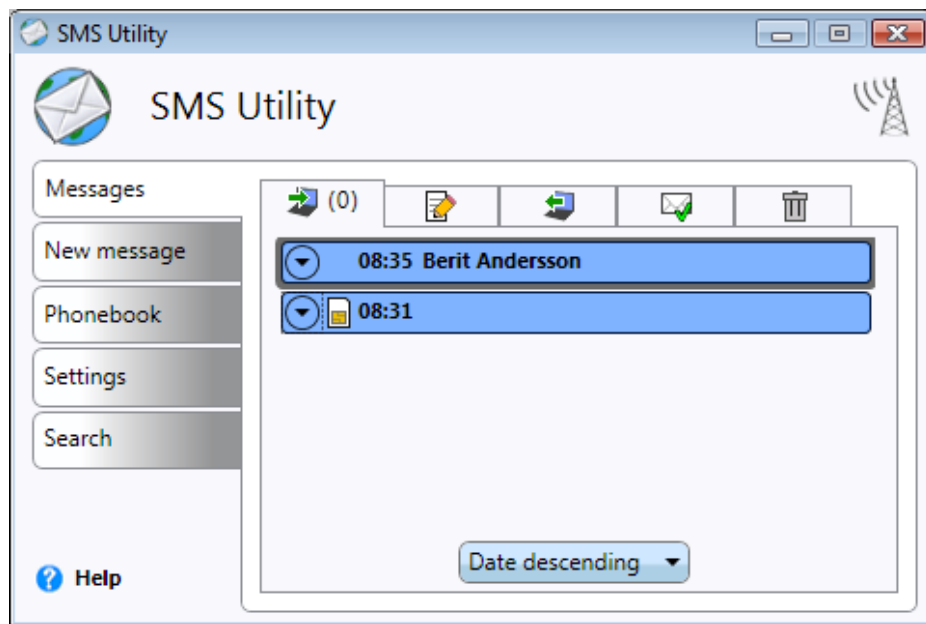
F5521gw enables you to work within your corporate and/or ISP-assigned IP numbering scheme. Dynamic IP allocation is supported, which is normally used by both ISPs and corporate networks.

### **5.2.3 Help**

The Wireless Manager has a built in help function. The help window is started by clicking on the help in the main window, or by pressing function key F1.

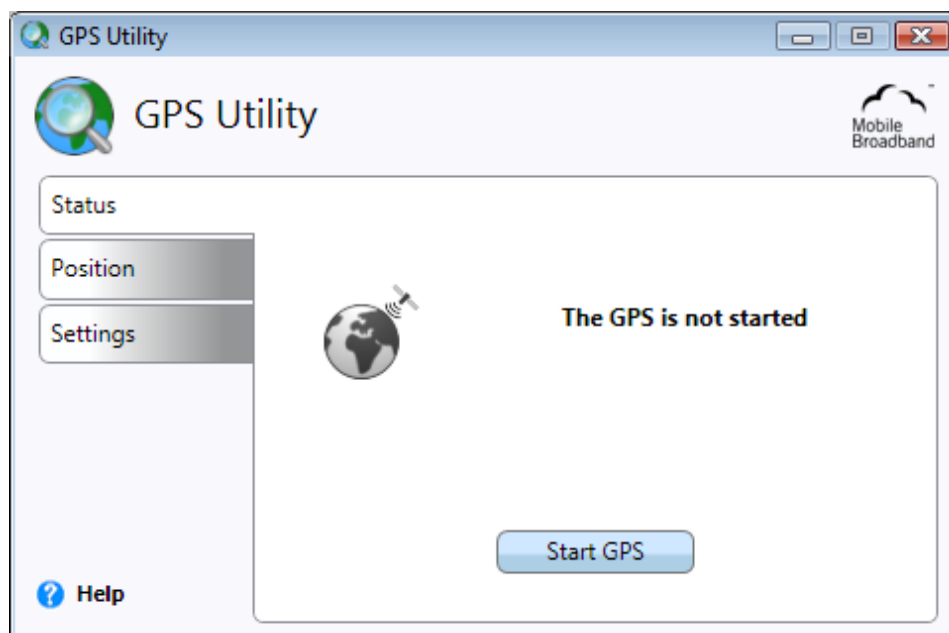
## **5.3 SMS Utility**

Text messages can be sent and received with the SMS Utility. Concatenation is supported, so messages longer than 160 characters (dependent on character coding) can be sent and received. The phonebook is an integrated part of the application and messages can be sent from a phonebook contact.



## 5.4 Global Position System

The Mobile Broadband Module provides Global Positioning System (GPS) functionality. The GPS Utility is a separate application and can be used without the wireless manager.



### 5.4.1 Standalone

Standalone mode uses the satellites to acquire the information needed for the GPS function like almanac and ephemeris data. The performance in this mode depends on the number of satellites that are visible to the GPS receiver and the line of sight the GPS receiver is in with the satellites.

### 5.4.2 Assisted GPS

An Assisted GPS mode is supported with network assisted. In the Assisted mode the external ephemeris data is received through an aiding server. As the ephemeris data is received through an aiding server instead of reading from the received satellite signal the performance is increased and the power consumption decreased.

Data is transmitted over the mobile broadband connection when using assisted GPS which may imply a cost, check your mobile subscription plan for details.

#### 5.4.2.1 Network assisted

The network assisted GPS is using Secure User Plane Location (SUPL). This is a standard promoted by Open Mobile Alliance specifying the interactions between the SUPL Enabled Terminal and the SUPL server. The SUPL server is hosted by the operators. The user may need a separate subscription towards the operators to enable network assisted GPS, check your mobile subscription plan for details.

## 5.5 SDK

In addition to the AT-command interface, an API interface for F5521gw is provided as part of the SDK package. The API library is written in C++ and will provide third-party developers with a simplified interface to access device functionality.

The API is delivered as a Dynamic Link-Library (DLL), which exposes all necessary functionality to third party applications.

## 6 Related Information

<b>Web Site</b>	<b>Information</b>
<a href="http://www.ericsson.com/mobilebroadbandmodules">http://www.ericsson.com/mobilebroadbandmodules</a>	Product information and information about mobile network infrastructure
<a href="http://www.gsmworld.com/">http://www.gsmworld.com/</a>	General information on GSM, GPRS and EDGE
<a href="http://www.umts-forum.org">http://www.umts-forum.org</a>	General information on UMTS
<a href="http://www.pcisig.com/home">http://www.pcisig.com/home</a>	The PCI Express Mini Card Standard
<a href="http://mbm.sourceforge.net">http://mbm.sourceforge.net</a>	Linux Support for MBM Modules

## 7 Terminology and Abbreviations

<b>2G</b>	Generic term for the second generation of cellular networks, when digital technology was used. GSM is a 2G network.
<b>3G</b>	Generic term for the third generation of cellular networks such as UMTS.
<b>API</b>	Application Programming Interface.
<b>APN</b>	Access Point Name. Used in GPRS to define services to which the terminal can connect, for example, Internet, MyCompany.
<b>bps</b>	Bits per second – rate of data flow.
<b>DLL</b>	Dynamic-link library, a shared library.
<b>E-GPRS</b>	Enhanced GPRS. A GPRS network enhanced with EDGE technology to provide greater speed and capacity.
<b>EDGE</b>	Enhanced Data Rates for Global Evolution. Technology which improves the throughput of a GPRS network by a factor of 3.
<b>GPRS</b>	General Packet Radio Services.
<b>GPS</b>	Global Positioning System.
<b>GSM</b>	Global System for Mobile Communications. GSM is the world's most widely-used digital mobile phone system. At the end of Jan 2004 there were over one billion GSM subscribers across more than 205 countries.
<b>HSPA</b>	High Speed Packet Access, term for HSDPA and HSUPA.
<b>HSPA Evolution</b>	High Speed Packet Access Evolution with DL speeds up to 21 Mbps (HSDPA cat 14) and UL speeds up to 5.76 Mbps (HSUPA cat 6).
<b>HSDPA</b>	High Speed Downlink Packet Access.
<b>HSUPA</b>	High Speed Uplink Packet Access.

<b>ISP</b>	Internet Service Provider.
<b>kbps</b>	Kilobits per second – rate of data flow.
<b>NDIS</b>	Network Driver Interface Specification. A Windows Device Driver specification, used for Ethernet cards, ISDN Adaptors and GPRS WAN adaptors.
<b>PC</b>	Personal Computer.
<b>SDK</b>	Software Developer's Kit.
<b>Service Provider</b>	A company that provides services and subscriptions to mobile services (phones, mobile broadband, etc.).
<b>SIM card</b>	Subscriber Identity Module card – a card that must be inserted in any GSM-based mobile terminal. It contains subscriber details, security information and memory for a personal directory of numbers. The card can be a small plug-in type or credit card-sized, but both types have the same functions.
<b>SMS</b>	Short Message Service. Allows messages of up to 160 characters to be sent and received via the network operator's message center to a mobile phone.
<b>UICC</b>	UMTS Integrated Circuit Card.
<b>UMTS</b>	Universal Mobile Telecommunications System. 3G network technology using WCDMA methods.
<b>WCDMA</b>	Wideband Code Division Multiple Access. A modulation technique using a wide bandwidth (5MHz in the case of UMTS). All terminals transmit in the entire bandwidth and the signals from each are differentiated via the use of unique codes assigned to each transmission.