

# WIND3G

---

## User Guide

Version 1

05.15.2008

## Contents

Important Information .....	3
Warranty .....	3
Set Up and Configuration .....	6
Required Equipment .....	6
Installation.....	6
Software Installation.....	6
Hardware Installation .....	6
Making Measurements.....	8
Measurement Collection.....	8
Configure the Collection System.....	8
Select Channels.....	8
Starting and Stopping the Collection System.....	9
Real-Time Information.....	10
Status Display .....	10
GPS/Timing Display .....	10
Real-Time GSM Bar Graph.....	12
Real-Time UMTS Bar Graph.....	13

## Important Information

### Warranty

The WIND Measurement System is warranted against defects in materials and workmanship for a period of one year from the date of shipment, as evidenced by receipts or other documentation. Wider Networks will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The media on which you receive Wider Networks software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace software media that do not execute programming instructions if Wider Networks receives notice of such defects during the warranty period. Wider Networks does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. Wider Networks will pay the shipping costs of returning to the owner parts which are covered by warranty.

Wider Networks believes that the information in this document is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, Wider Networks reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult Wider Networks if errors are suspected. In no event shall Wider Networks be liable for any damages arising out of or related to this document or the information contained in it.

Except as specified herein, Wider Networks makes no warranties, express or implied, and specifically disclaims any warranty of merchantability or fitness for a particular purpose. Customer's right to recover damages caused by fault or negligence on the part of wider networks shall be limited to the amount theretofore paid by the customer. Wider networks will not be liable for damages resulting from loss of data, profits, use of products, or incidental or consequential damages, even if advised of the possibility thereof.

This limitation of the liability of Wider Networks will apply regardless of the form of action, whether in contract or tort, including negligence. Any action against Wider Networks must be brought within one year after the cause of action accrues. Wider Networks shall not be liable for any delay in performance due to causes beyond its reasonable control. The warranty provided herein does not cover damages, defects, malfunctions, or service failures caused by owner's failure to follow the Wider Networks installation, operation, or maintenance instructions; owner's modification of the product; owner's abuse, misuse, or negligent acts; and power failure or surges, fire, flood, accident, actions of third parties, or other events outside reasonable control.

### Copyright

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying, recording, storing in an information retrieval system, or translating, in whole or in part, without the prior written consent of Wider Networks.

**WARNING REGARDING USE OF WIDER NETWORKS PRODUCTS**

IN ANY APPLICATION, RELIABILITY OF OPERATION OF THE SOFTWARE PRODUCTS CAN BE IMPAIRED BY ADVERSE FACTORS, INCLUDING BUT NOT LIMITED TO FLUCTUATIONS IN ELECTRICAL POWER SUPPLY, COMPUTER HARDWARE MALFUNCTIONS, COMPUTER OPERATING SYSTEM SOFTWARE FITNESS, FITNESS OF COMPILERS AND DEVELOPMENT SOFTWARE USED TO DEVELOP AN APPLICATION, INSTALLATION ERRORS, SOFTWARE AND HARDWARE COMPATIBILITY PROBLEMS, MALFUNCTIONS OR FAILURES OF ELECTRONIC MONITORING OR CONTROL DEVICES, TRANSIENT FAILURES OF ELECTRONIC SYSTEMS (HARDWARE AND/OR SOFTWARE), UNANTICIPATED USES OR MISUSES, OR ERRORS ON THE PART OF THE USER OR APPLICATIONS DESIGNER (ADVERSE FACTORS SUCH AS THESE ARE HEREAFTER COLLECTIVELY TERMED “SYSTEM FAILURES”). ANY APPLICATION WHERE A SYSTEM FAILURE WOULD CREATE A RISK OF HARM TO PROPERTY OR PERSONS (INCLUDING THE RISK OF BODILY INJURY AND DEATH) SHOULD NOT BE RELIANT SOLELY UPON ONE FORM OF ELECTRONIC SYSTEM DUE TO THE RISK OF SYSTEM FAILURE. TO AVOID DAMAGE, INJURY, OR DEATH, THE USER OR APPLICATION DESIGNER MUST TAKE REASONABLY PRUDENT STEPS TO PROTECT AGAINST SYSTEM FAILURES, INCLUDING BUT NOT LIMITED TO BACK-UP OR SHUT DOWN MECHANISMS. BECAUSE EACH END-USER SYSTEM IS CUSTOMIZED AND DIFFERS FROM WIDER NETWORKS' TESTING PLATFORMS AND BECAUSE A USER OR APPLICATION DESIGNER MAY USE WIDER NETWORKS PRODUCTS IN COMBINATION WITH OTHER PRODUCTS IN A MANNER NOT EVALUATED OR CONTEMPLATED BY NATIONAL INSTRUMENTS, THE USER OR APPLICATION DESIGNER IS ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY OF WIDER NETWORKS PRODUCTS WHENEVER WIDER NETWORKS PRODUCTS ARE INCORPORATED IN A SYSTEM OR APPLICATION, INCLUDING, WITHOUT LIMITATION, THE APPROPRIATE DESIGN, PROCESS AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION.

# Conventions and Definitions

---

The following conventions and definitions are used in this guide:

- <>            Angle brackets contain numbers that represent a range of values. For example, BCCH<128-889>
- |                The | symbol leads you through nested menu items and dialog box options to a final action. The sequence **File|Page Setup|Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
- Bold**            Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options.
- Italic*            Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

## Set Up and Configuration

### Required Equipment

Set-up and use of the Wider Networks WIND3G Measurement Systems requires the following items:

- WIND3G hardware subsystem:
  - WIND3G wideband RF digital receiver
  - WIND automobile power adapter
  - USB cable (less than 36 inches in length)
  - RF antenna (PCS, cellular, or dual-band) with SMA connector
  - GPS antenna with BNC connector
- Notebook/laptop computer for measurement collection and control:
  - Windows Vista or Windows XP (Service Pack 2 or later)
  - One available USB (2.0) input
  - Minimum of 3GB memory
  - Core 2 Duo processor
  - 500 MB available disk space for application installation
  - Available disk space for data collection (approximately 20-30 MB per hour of collection)
- WIND Collection software installation CD
  - Installation application
  - WIND Collection USB drivers
  - Documentation

### Installation

#### Software Installation

The WIND3G Collection application should be installed on the control PC before connecting the hardware so that correct operation may be verified. Currently WIND3G collection software is supported on Windows Vista and Windows XP operating systems.

For Windows Vista and XP run the “WIND3GSetup.msi” program on the WIND Install CD, and installation will proceed automatically.

#### Hardware Installation

The WIND3G receiver hardware is designed to be used in an automobile and can be powered by 12VDC from a cigarette-lighter socket in the vehicle. An optional AC/DC transformer is available should it be necessary to obtain power from a 120V AC supply.

Before following the steps below to connect and power-up the WIND3G receiver, ensure that the:

- ✓ WIND3G receiver is not connected to the power supply
- ✓ WIND3G receiver power switch is in the OFF position
- ✓ vehicle engine is running

**NOTE: In order to avoid equipment damage  
DO NOT TURN THE ENGINE ON OR OFF WHILE THE  
WIND3G HARDWARE IS POWERED ON!**

- 1) Connect the RF antenna and GPS antennas.
- 2) Make sure the power switch on the WIND3G receiver is in the OFF position.
- 3) Plug the small, female connector of the car power adapter cable into the WIND3G hardware. **IT IS IMPORTANT THAT THIS END BE PLUGGED IN BEFORE THE POWER CABLE IS “LIVE” IN ORDER TO AVOID SHORTING THE CONNECTOR AND BLOWING THE POWER ADAPTER FUSE!**
- 4) Plug the large, male end of the car power adapter cable into the power (cigarette lighter) socket in the vehicle.
- 5) Turn on the power of the WIND3G receiver.
- 6) If the control PC is not already powered on, boot it up.
- 7) Connect the WIND3G receiver to the control PC using a standard USB 2.0 cable that is not more than 72 inches long.
- 8) You will see the “Found New Hardware” dialog box, and Windows will automatically install the correct driver for that particular WIND3G receiver.
- 9) Start the WIND3G application

## Making Measurements

Wider Networks' WIND3G System is specially designed to identify and quantify the sources of interference that reduce quality and capacity of a wireless telephone network. Armed with highly sensitive WIND3G data, which accurately details interference sources, an operator can effectively analyze and re-configure the network to unlock previously "hidden" capacity while simultaneously improving the overall quality the subscribers enjoy.

The WIND3G measurement system, configured as specified in Section 1, allows for the control of measurement collection and status display functions during a drive-test through the WIND3G Collection software application.

## Measurement Collection

### Configure the Collection System

Make a connection to the WIND3G hardware by starting a WIND3G application.

When the collection application is opened it will immediately look for a WIND3G receiver. When it finds the receiver the application will report its Hardware ID. The WIND Net Status should read "Warming Up" or "Ready" at this point. Start collection after the status reads "Ready."

### Select Channels

There are two methods of choosing channels to be measured by the WIND3G receiver. The first is to load in a pre-prepared channel list file and the second is to configure the receiver manually from the user interface.

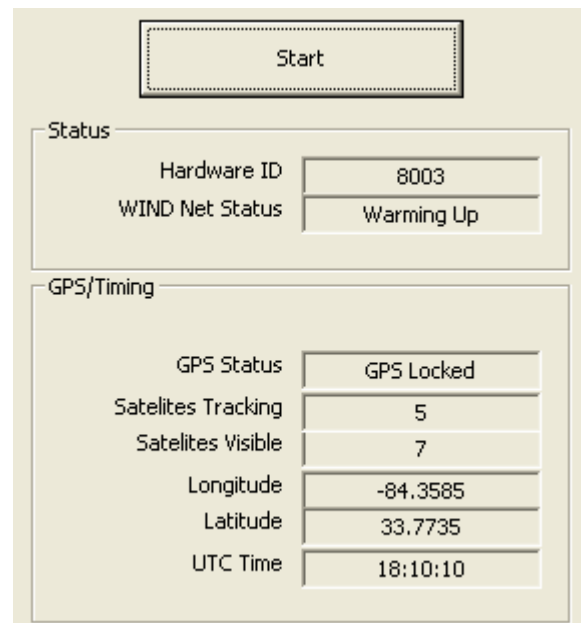
### Prepared channel list

On the menu bar select Carriers|Import Channel List.

This will bring up the standard Windows selection box that allows navigation to and selection of the channel list .txt file with the channel setup information with which to configure the WIND3G receiver.

The channel list is a tab delimited .txt file which contains a list of GSM and UMTS channels that the WIND3G receiver should measure. The format for this file is shown in the sample below.

Frequency List v1.0.0.1				
Technology	US/EU	GSM_Bottom_Range_ARFCN	GSM_Top_Range_ARFCN	UMTS_UARFCN
GSM	US	210	220	
UMTS	US			612



## Manual Configuration

### GSM

Click the Add button to transfer the input of the New ARFCN/Frequency Range to the ARFCN/Frequency Ranges box. Currently only frequency ranges can be input into the New ARFCN/Frequency Range boxes.

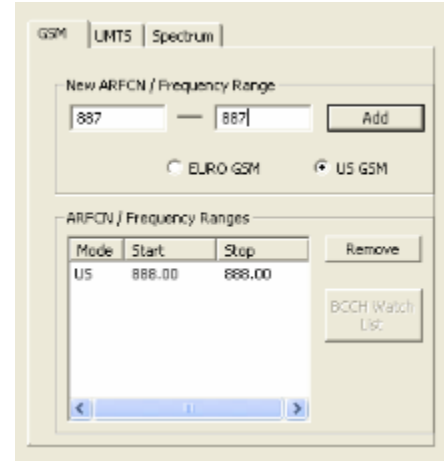
To remove a frequency range from being collected, select the range in the Base Channel Number(s) box and then click the Remove button.

Selection of the ranges has an effect on the rate of measurements that will be made on a per-channel basis. When the WIND3G Collection application is started, the frequency list will be filled in with the most recently used ranges selected.

Each range consists of a start frequency and end frequency. The WIND3G receiver will control any frequency retunes needed to capture the entire channel range. Each range is treated independently, and multiple, overlapping ranges are allowed. This overlap may be used to capture a particular channel (or range of channels) more often than other channels.

As each WIND3G “snapshot” scans 18 GSM channels, full capture of one range may require multiple snapshots, with a frequency re-tune occurring in between each snapshot. For example, if the selected frequency range is 880-885.2 (or 26 channels), WIND will capture all the data for these frequencies over two snapshots.

If there is one frequency range that should be collected more often than the others, you can input that range multiple times. The ranges are measured in the order that they are listed in the “ARFCN/Frequency Ranges” box.

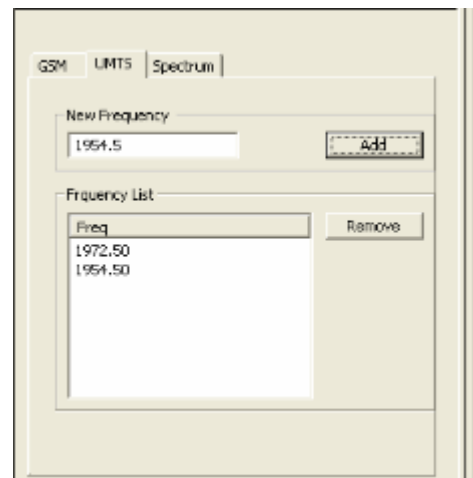


### UMTS

The same input process is used to load the UMTS channels or frequencies to be measured except no ranges are input only single channels or frequencies. The WIND3G receiver will handle all switching between GSM and UMTS measurements.

## Starting and Stopping the Collection System

Before starting to collect data ensure that the WIND Net Status is “Ready.” Click on the Start button. Enter the filename in which the measurements will be saved. For user convenience, a filename that represents the date, time, and HWID (hardware ID number of the WIND3G receiver) is presented as a default. However, any different filename may be entered manually.

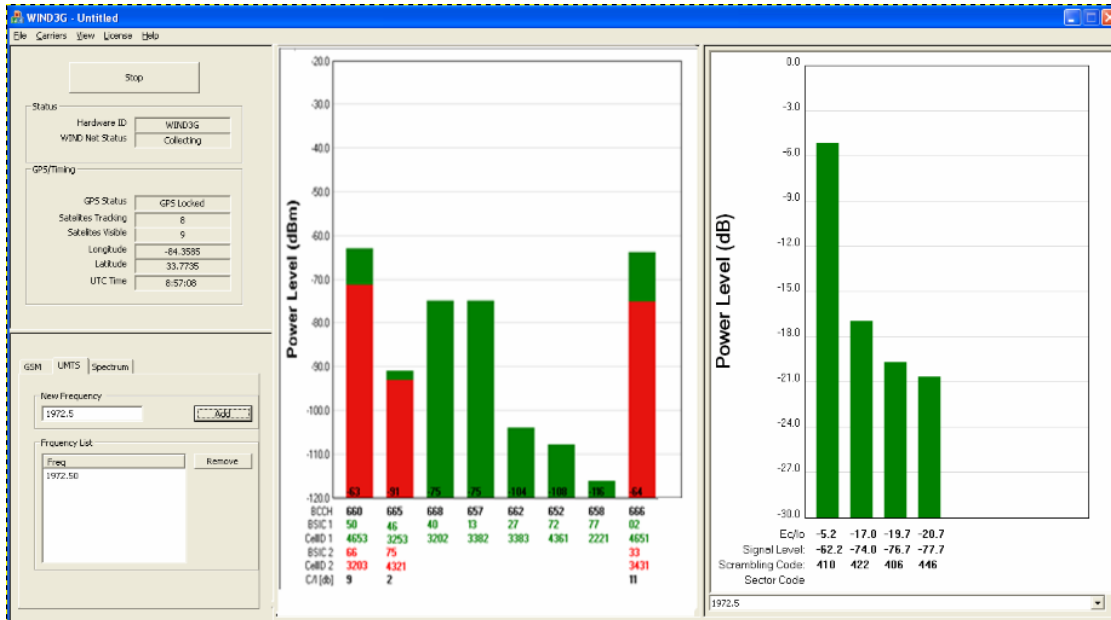


While the system is collecting data, the “Start” button becomes the “Stop” button. Press the Stop button and the system will stop collecting data.

There is no “Pause” feature. Once you press the Start button again you will begin collection in a new file.

## Real-Time Information

The WIND3G Collection software has a number of interface elements that provide real-time feedback during data collection on the performance of both the WIND3G hardware and the RF networks that are being measured.



## Status Display

The “Status” display provides 2 pieces of information about the state of the receiver.

Hardware ID: Reports the unique ID of the WIND3G receiver hardware being used.

WIND Net Status: Reports on the status of the WIND3G system. There are 6 different states.

“USB Opened”. This means that the collection software has established a communication channel with the receiver and the link is working.

“USB Closed”. This means that the collection software closed the communications link with the receiver.

“Warming Up”. This means that receiver is getting prepared to be able to collect data. This involves warming up the oscillators and getting GPS locked.

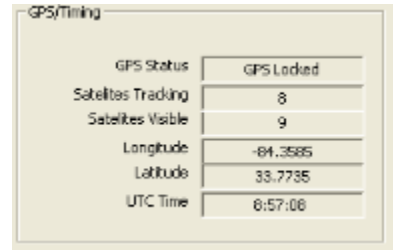
“Ready”. This means that the receiver is able to start collecting valid data. The status should be at “Ready” before the user begins data collection.

“Collecting”. This means that the receiver is currently collecting data.

“Error”. This means that there is an error in the system and it is not performing correctly.

## GPS/Timing Display

**GPS Status:** Reports the status of the GPS unit inside the WIND3G receiver. There are only two values that will be displayed here “Not Locked” and “Locked”. “Locked” means that the GPS has an accurate position because it has acquired a sufficient number of GPS satellites. When the status is “Not Locked” the GPS does not have an accurate position.



GPS/Timing	
GPS Status	GPS Locked
Satellites Tracking	8
Satellites Visible	9
Longitude	-84.3585
Latitude	33.7735
UTC Time	8:57:08

**Satellites Tracking:** The number of satellites the WIND3G internal GPS is actively tracking to determine its position.

**Satellites Visible:** The number of satellites from which the WIND3G internal GPS is reading a signal and stored in the GPS almanac.

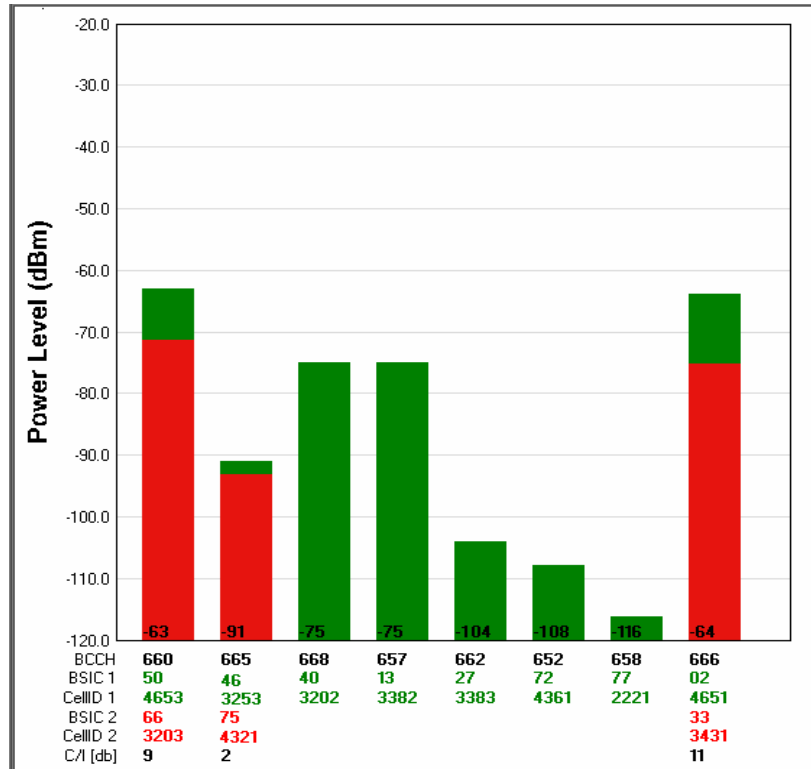
**GPS Longitude:** Longitude reported by the WIND3G internal GPS.

**GPS Latitude:** Latitude as reported by the WIND3G internal GPS.

**UTC Time:** Reports the current Greenwich Mean Time as measured by the internal GPS clock.

### Real-Time GSM Bar Graph

The Real-Time Bar Graph displays the power levels in dBm of the BCCH channels for the strongest eight sectors and their strongest interferer if they are within 18 dB C/I measured by the WIND3G receiver.



The green bars show the power levels of each of the strongest sectors. If the WIND3G measures a second sector that reuses the same BCCH carrier frequency, then a red bar will show the power level of the interfering sector.

The number at the bottom of the column always displays the power level in dBm of the stronger of the two sectors (i.e. it refers to the power in the green column).

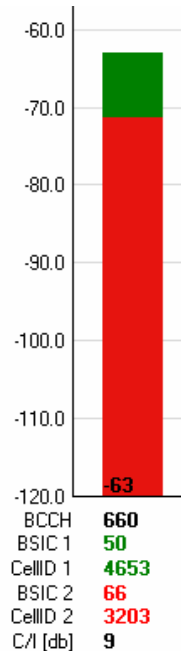
The WIND3G will often measure more than two cells using the same BCCH frequency, and that information is captured in the output file. However, the real-time display only shows the two strongest for each BCCH frequency.

Additional information for the measured sector is available at the bottom of the graph. If the WIND3G decodes the BSIC or Cell ID of the strongest of the displayed sectors, that information is reported beneath the BCCH channel number as BSIC 1 and CellID 1.

If the WIND3G receiver decodes the BSIC or Cell ID of an interfering sector, that information is reported as BSIC 2 and CellID 2.

For a displayed BCCH interferer, the difference in the power levels between it and the best server is reported in dB as the C/I.

In order to ease visual inspection during drive-testing, the BCCH columns are not sorted by BCCH or signal level. Instead a certain BCCH will keep its position as long as it remains in the top eight signals.



## Real-Time UMTS Bar Graph

The real time UMTS bar graph displays the signal level of the eight strongest scrambling codes that the WIND3G receiver is measuring on a single UMTS channel.

The green bars show the  $E_c/I_o$  levels of each of the eight strongest scrambling codes. Below each bar is more exact information. The  $E_c/I_o$  is reported in dB values to the closest 10th of a dB in the first line below each bar in the graph. The signal level for each measured scrambling code is reported in dBm values on the second line. The third line reports the measured scrambling code number. The fourth line reports the cell ID if it is decoded.

At the bottom of the pane there is a drop down box which lets you choose which UMTS channel's information you want to view in the bar graph if the WIND3G is measuring more than one channel.

