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SEMTECH

WIRELESS AND SENSING PRODUCTS

RGPSD212 SlimGPS™ Evaluation Kit

User's Guide

Table of Contents

1 INTRODUCTION, SYSTEM REQUIREMENTS

This kit is provided to demonstrate the performances of the Semtech RGPSM202 SlimGPS receiver based on the XE1610 chipset. The kit includes:

- 1 main interface board, including a sub-board to convert serial UART signals to USB, with a back-up battery
- 1 packaged active GPS antenna with a 5-meter coax cable
- 1 RGPSM202 OEM drop-in module soldered on the main board
- 1 USB cable
- 1 CD ROM that includes documentation, a GPS Monitor software and USB drivers

To operate, the minimum system configuration requires a PC running under Windows 98/NT/2000/XP with 1 USB port available.

Figure 1 – Hardware kit content

This basic configuration allows dialogue between the PC and the evaluation kit using serial communication (COM port) and NMEA character strings provided by and to the PVT module. Based on that NMEA string the GPS Monitor can display position, time, speed, satellite information, position plot and sky plot. It is also possible to operate the kit with commercial mapping software. The requirement for the software is that it should accept NMEA data on a serial COM port as input, which most, if not all, do.

2 HARDWARE INSTALLATION

First, plug the packaged antenna coax cable in the SMA connector on the back panel (see the figure below).
To operate the RGPSD012 kit there is no need for an external power supply; since it is powered directly by the USB port. However, if you don't have a USB port available, please go to section 4 below. Plug the USB cable in the USB connector on the side panel (see the figure below).
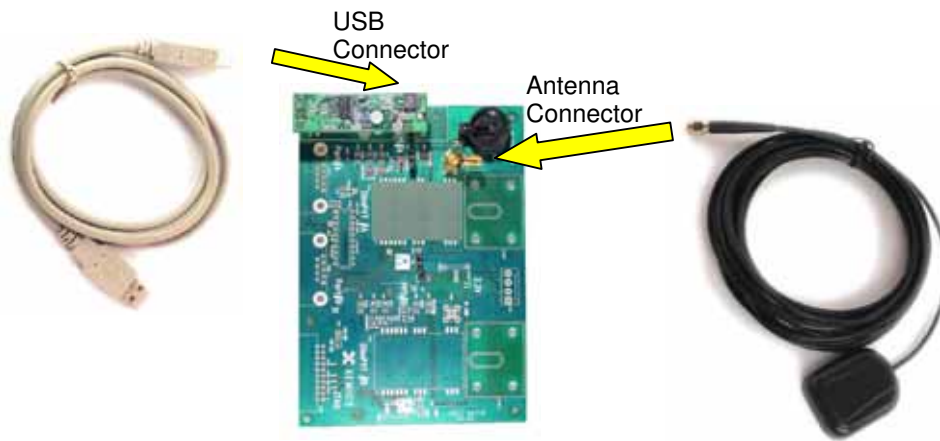

Figure 2 – Where to connect the USB and antenna cables

Finally, when your computer is turned on and ready for operation, BUT NOT BEFORE, plug the other end of the USB cable into the available computer USB port. The first time you do so, the operating system will ask you to install the driver for the serial USB connection. Simply follow the instructions described thereafter in Section 5 "Software Installation – USB Serial Port Driver"

3 HARDWARE CONFIGURATION

The main board of the kit has two jumpers and a switch to control the VDD, VBKP, and DELPOSN RGPSM202 module pins. They are located on both sides of the module (see below Figure 3). To operate the kit, both the VDD and VBKP jumpers must be "ON" (i.e. closed/connected), while the DELPOSN switch should remain "OFF" (i.e. open/disconnected). If, during operation, one needs to activate the DELPOSN pin (for details, see the RGPSM202 datasheet, Section 5.1), quickly turn it "ON", then "OFF" again.
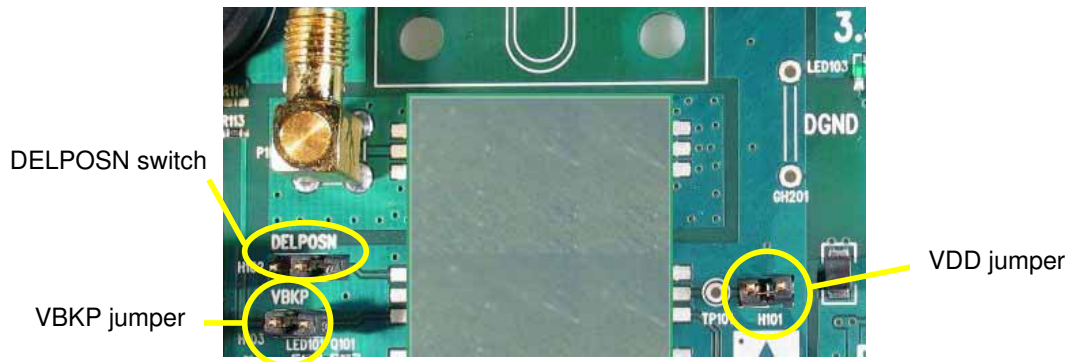

Figure 3 – Jumpers and switch position

WIRELESS AND SENSING PRODUCTS

4   SOFTWARE INSTALLATION – THE USB DRIVERS

The USB board uses the FT8U232AM USB UART chip from FTDI. The associated Virtual Com Port (VCP) drivers appear to the system as an extra COM Port, in addition to any existing hardware COM Ports. The application software accesses the USB device the same way it would access a standard hardware COM Port.

The drivers for Win'98/ME/2000/XP (with Plug&Play support) are included in the ftdi232usb_P8002104.zip file on the CD ROM. You may also find the latest revision of the driver on the FTDI web site at www.ftdichip.com/FTDriver.htm. Unzip the file in a directory of your choice.

To install the drivers, plug the USB cable into both the kit and the PC. Upon the first use of the kit, your system will detect a new device on the USB port. Follow the instruction on-screen to install the USB UART driver. First, set the Install Wizard to search for a suitable driver for the newly found device. Then, when it tries to locate the driver files, select the "CD-ROM drive" (if you use the supplied CD ROM) or the "Specify a location" (if you downloaded the driver from the FTDI website indicated above) search option. Then, the system will start the installation of the USB Serial Port device. Here too, follow the instructions on screen.

Upon completion, a new USB driver and a new COM port will be available. In the Windows Start menu check in Settings -> Control Panel and then System Properties -> Hardware -> Device Manager. Under Ports you see which COM port number is assigned to the USB Serial Port. It is recommended to select a port number between 5 and 8. This information is necessary to set up the GPS Monitor software. Double-click on it to modify the properties. Under the Port Settings tab, select 9600 Baud, 8 bit data, no parity check, 1 stop bit, no flow control. To modify the COM port number, click on Advanced and then select the COM port number you would like to assign. Click on OK to close the window, and click on OK to validate the new port settings. The VCP is now installed.

5   SOFTWARE INSTALLATION – THE GPS MONITOR SOFTWARE

There are two different GPS Monitors provided with the kit on the CD-Rom. Both run on a Windows 9x or NT/2000/XP platforms. In terms of PC hardware, both require a free USB port.

The first monitor is VisualGPS, a freeware that graphically displays SV's signal strength, position/drive, and sky plot in addition to text windows for the NMEA character strings, latitude/longitude/altitude, and other GPS indicators such as DOP's and headings. To install this VisualGPS Monitor, double-click on this VisualGPSv3o33Install.exe file to start the installation procedure and follow the instructions.

The second is GPS Diag, another freeware with similar functionality to VisualGPS, however with a less sophisticated graphical user interface. The main advantage of GPS Diag is its ability to send NMEA strings to the receiver. That feature is key when trying to use XEMICS' proprietary sentences to initialize the receiver or to retrieve internal data from it. To install this GPS Diag monitor, double-click on the GPSDiagSetup.exe file to start the installation procedure and follow the instructions. When completed, users may create on the desktop a shortcut to "C:\Program Files\GPSDiag\GPSDiag.exe"

These GPS Monitors directly interface with the interface board through the USB-based serial COM port.

6 GETTING STARTED

6.1 OPERATING THE KIT FOR THE FIRST TIME

The RGPSM202 module in the RGPSD212 evaluation kit you received has been preprogrammed in a specific sector of the embedded Flash memory (the "BBFLASH") with GPS data and position information collected in Taiwan. As a consequence, the module must be initialized upon first use at your location. There are several ways to initialize the module:

1. By initializing the approximate current position with a specific command using the GPS Diag monitor provided. This will supersede the position stored in the BBFLASH and the almanac won't be erased. As a result, the module will be in Warm Start condition. This is achieved by sending a TR command:

$PXEMSTR,SSIP,LL.LLL,OOO.OOO,200,-1*hh

where L.LLL is the latitude expressed in radian, O.OOO is the longitude expressed in radian, *hh is the checksum. For example, to set the position to Brussels, Belgium (coordinates being lat: 0.887, lon: 0.076), the full sentence should be $PXEMSTR,SSIP,0.887,0.076,200,-1*48. As soon as a fix is made, the BBFLASH content will be updated. For coordinates of more than 200 cities and countries around the world, please refer to the full technical note available at http://www.semtech.com

2. By sending a "Delete Initial Position" command using the GPS Diag monitor, or activating the DELPOSN input pin. Both actions have the same result. This deletes the initial position in the RAM portion of the MCU and triggers re-computation of the tracking set. This is achieved by sending the Delete Initial Position command:

$PXEMSTR,SSDI*29<CR><LF>

or alternatively by setting the DELPOSN input "low" for at least 100 millisecond, then setting it "high" again. After this, the receiver should make a position fix before it saves the updated GPS data in its back-up Flash memory. Note that the position will not be deleted if GPS fixes are already being generated. With a good sky view, the time to first fix should be less than a minute.

3. By sending a "Cold Reset" command using the GPS Diag monitor.
This command will erase GPS data in both RAM and BBFLASH, so the receiver will be in Cold Start condition. This is achieved by sending the Cold Reset command:

$PXEMSRT,C*3A<CR><LF>

With a good sky view, the time to first fix should approx. 2 minutes. As soon as the first satellite (SV) is tracked, it will take around 12.5 minutes to collect the full current almanac from SV's, which will then be stored in the BBFLASH sector.

If none of the initialization procedure described above is used, simply power up the kit and wait for the first position fix. To achieve this, the RGPSM202 receiver may have to automatically enter into its Split Search Mode described in the Semtech technical note TN1600.03 available at http://www.semtech.com. The time to first fix may vary from less than a minute to several minutes depending in time and location.

6.2 OPERATING THE KIT WITH THE GPS DIAG MONITOR

As said above, this monitor software should be used whenever XEMICS' vendor specific NMEA sentences must be sent to the GPS receiver. For example to initialize it or to retrieve internal data.

This first example describes how to send NMEA character strings to the receiver and how to display satellite data (CNo, azimuth, elevation, PRN), position, time, speed, course and various other GPS information. Follow the steps below to run it:

a) Make sure the hardware is installed as described in above and power is turned on. Make sure the antenna is outdoor, with a sky view. If you are sitting next to a building, there is a fairly good chance the antenna will "see" only partial sky only, which may delay time to first fix.

b) In the device manager of your PC (W2000: Start menu, then Setting → Control Panel → System → Hardware → Device Manager), verify that the COM port where you connected the Demo kit is set as 9600 Bd, no parity, 1 stop bit, 8 bit, no flow control.

c) Double-click on the GPS Diag icon (or on GPSDiag.exe in your C:\Program Files\GPSDiag\ directory) to launch the monitor program. When opened, here are the key settings you need to run it successfully:
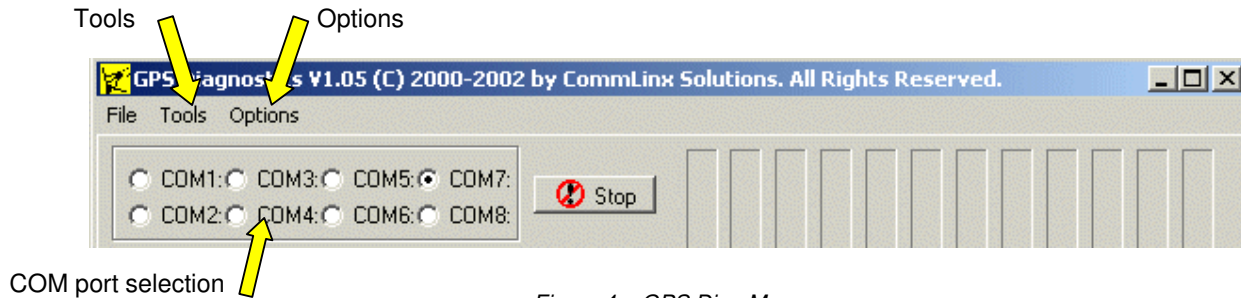
Tools   Options

COM port selection

Figure 4 – GPS Diag Menu

  i   In the COM port selection area (upper left) select the appropriate COM port where the kit is connected (see the "Software installation - USB driver" section above)

  ii In the Options → General options … menu set the Baud Rate to 9600 Bd and select only the Ignore invalid/unrecognized sentences option. Click on OK.

d) You should now see incoming character strings in the NMEA Window of the GPS Diag monitor. If you don't see the NMEA character string, you may have selected the incorrect COM port number or baudrate. The incoming NMEA sentences are decoded and the information is displayed in the main window as shown on the next page.
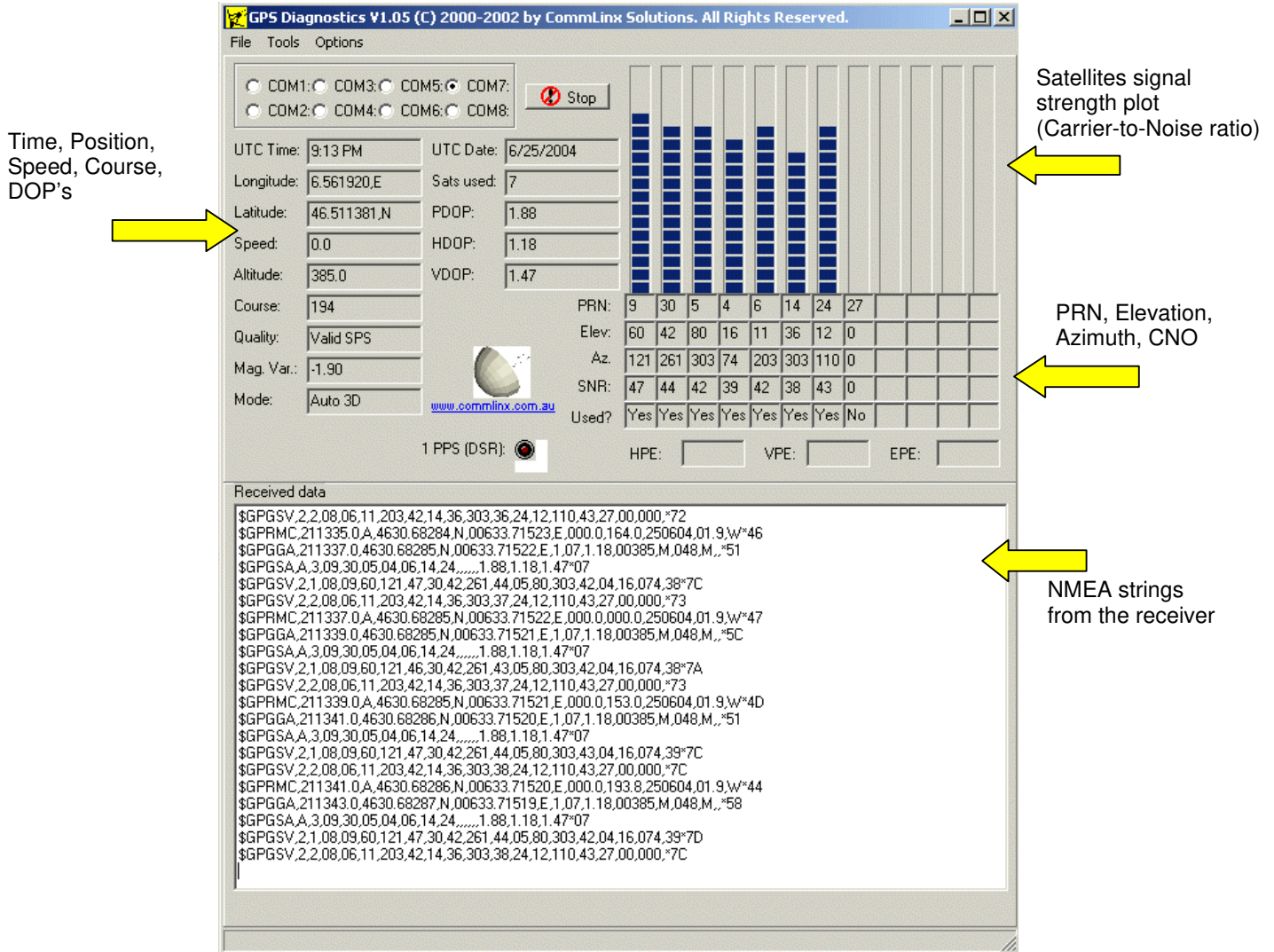
Figure 5 – GPS Diag window

e) To send Semtech vendor specific NMEA sentences, select Tools in the menu, then Send commands … The send command pop-up window will appear.
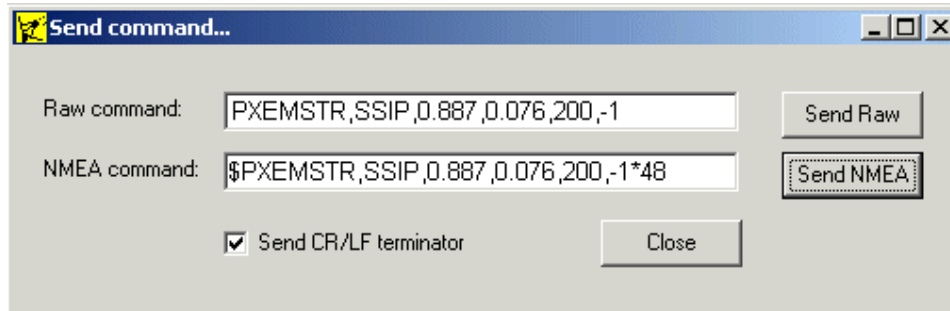

Figure 6 – Send command window

In the Raw command line, enter the sentence to send, without the leading "$" nor the trailing checksum characters. Make sure the Send CR/LF terminator is selected. Finally, click on the Send NMEA button to send the string to the receiver.

6.3 OPERATING THE KIT WITH THE VISUALGPS MONITOR

This second example describes how to display satellite data, position, time, speed, and various other GPS information, as well as a sky plot where the different satellite positions, status, and signal strengths are shown. It's also possible to plot the position in a 2D latitude-longitude grid. Follow the following steps for setting up the basic demonstration:

a) Make sure the hardware is installed as described in above and power is turned on. Make sure the antenna is outdoors, with a sky view. If you are sitting next to a building there is a fairly good chance the antenna will "see" only partial sky only, which may delay time to fix.

b) In the device manager of your PC (W2000: Start menu, then Setting → Control Panel → System → Hardware → Device Manager), verify that the COM port where you connected the Demo kit is set at 9600 Bd, no parity, 1 stop bit, 8 bit, no flow control.

c) Double-click on the VisualGPS monitor icon to launch the monitor program. Here are the key settings you need to run it successfully:
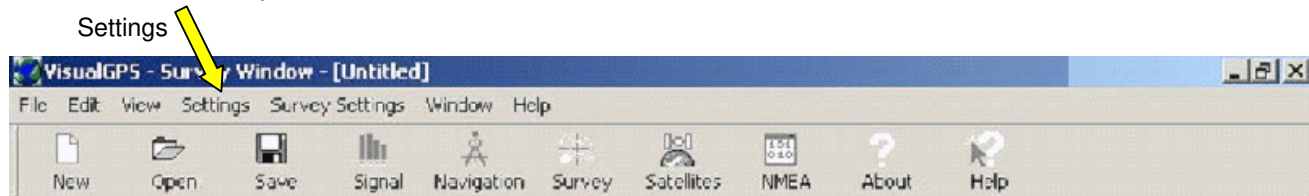
Settings

Figure 7 – VisualGPS menu

  i In the Settings → Communications menu select the appropriate COM port (see the "Software installation – USB drivers" section above) and the Baud Rate to 9600. Deselect both the Enable Logging and Enable Demo Mode item.

  ii In the Settings → NMEA Settings menu make sure GPGGA, GPGSA, and GPGSV are in the "Include" list.

  iii Open the 5 windows – Signal, Navigation, Survey, Satellites, and NMEA – by clicking on the corresponding icons in the menu bar. Then, in the Window menu select "Tile".

d) You should now see incoming character strings in the NMEA Window of the GPS Monitor program. If you don't see the NMEA character string, you may have selected the incorrect baudrate. The incoming NMEA sentences are decoded and the information is displayed in the main window as shown below
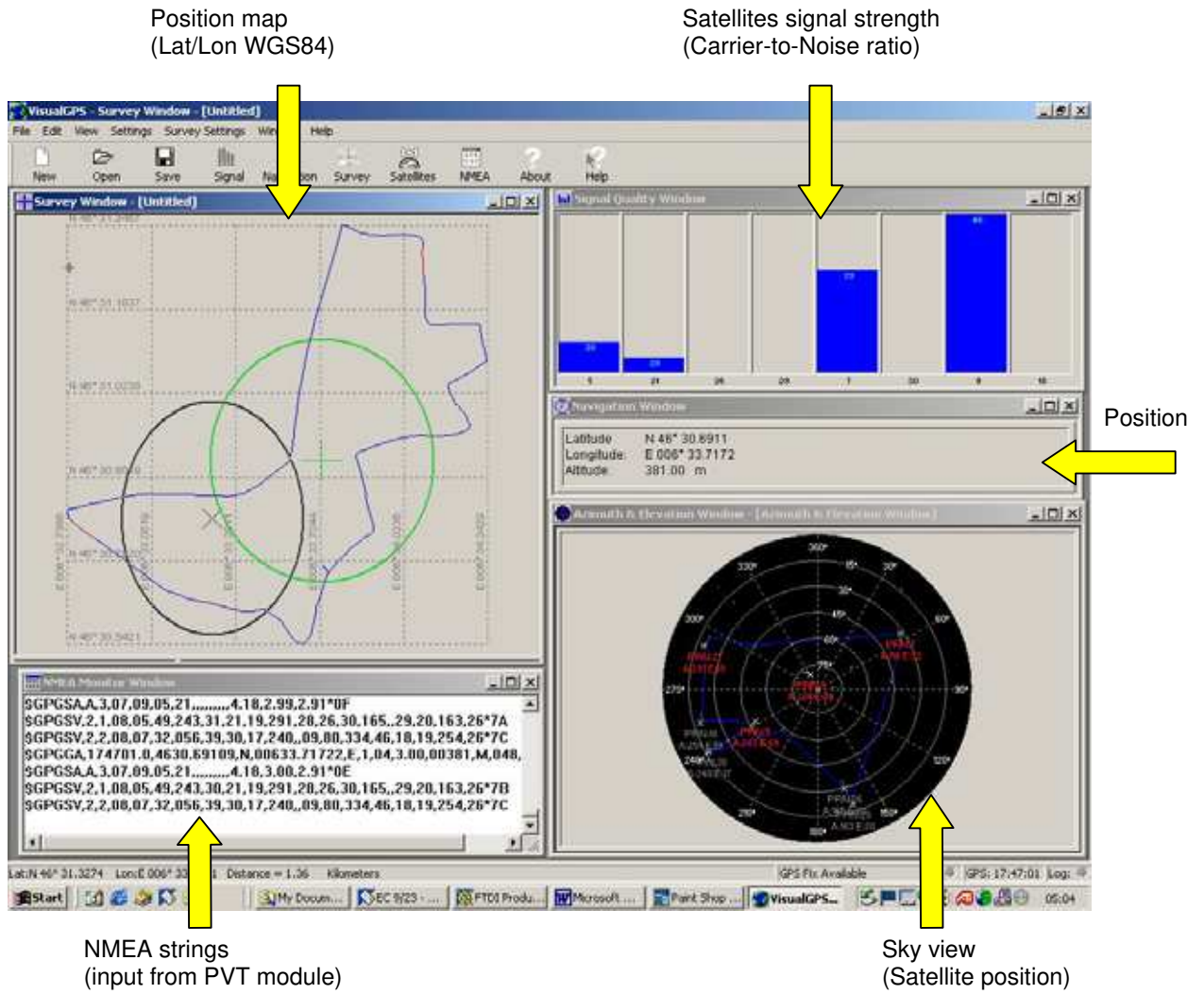
WIRELESS AND SENSING PRODUCTS

Position map
(Lat/Lon WGS84)

Satellites signal strength
(Carrier-to-Noise ratio)

Position

NMEA strings
(input from PVT module)

Sky view
(Satellite position)

Figure 8 – VisualGPS main windows

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7   DEMONSTRATION WITH NAVIGATION SOFTWARE

This demo directs the NMEA output string from the GPS module to a commercial navigation software package, which in turn will display the current location of the receiver on a street map and may give directions based on current position and target final destination. Follow these steps for setting up the demo with navigation software:

a) Use exactly the same set-up described above in the "Getting started" section.

b) Install the mapping software package (such as Delorme Map 'n Go, Microsoft AutoRoute Express, or Microsoft Streets&Trips) that accepts GPS NMEA input character string (most, if not all do).

c) Launch the mapping application and follow instructions that are specific to that package to display your current position. Make sure the COM port to receive the NMEA string is set to appropriate port number. You will now see your exact position on the map.
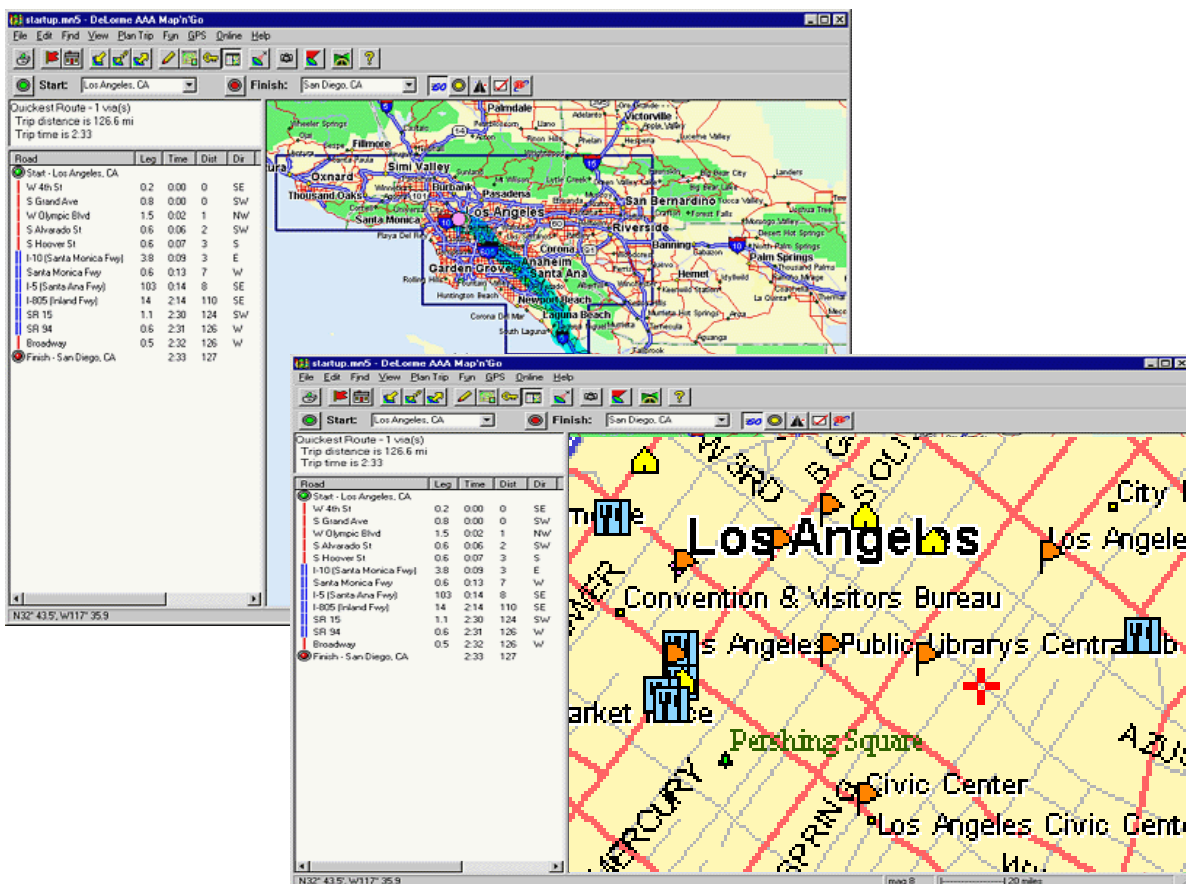
Figure 9 – Typical screen snapshot of commercial navigation software

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