

WinGEM2 PC Software

USER'S GUIDE

**Geophex GEM2
Sensor**

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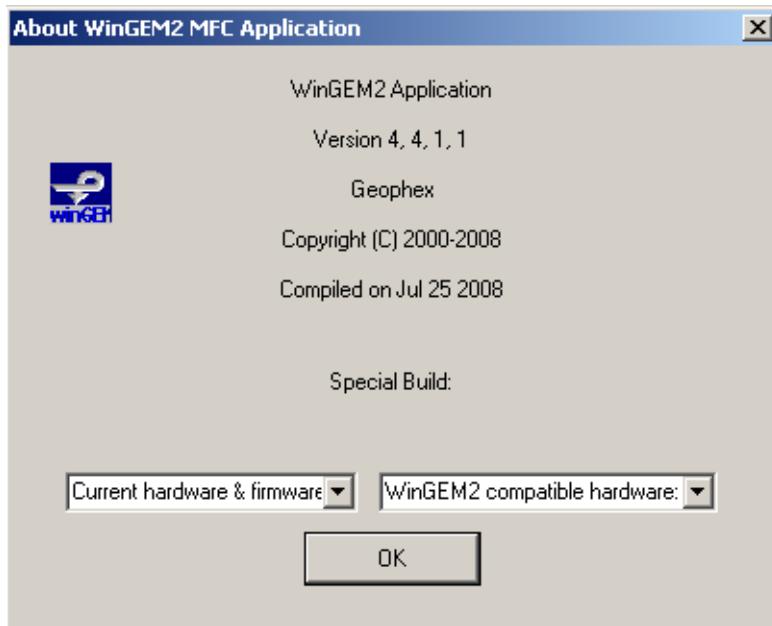
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Introduction

The WinGEM2 PC software runs on Windows-based PCs (both XP and Vista). When the GEM2 is attached to a PC, WinGEM2 can control the operation of the GEM2 Hand-held Sensor. It provides a backup for the iPAQ hand-held PC, to permit testing the system and for switching the GEM2 communications from RS-232 back to Bluetooth Wireless.

This manual documents the following version of WinGEM2:



WinGEM2 PC Software

Installing WinGEM2 on the PC

WinGEM2 is designed to run under Windows XP and Windows Vista. Administrator privileges are required during installation, but should not be necessary during normal usage.

The CD provided with the GEM2 should automatically start the installation process when placed in the computer's CD-ROM drive. If not, navigate to the PC_GEM2 directory on the CD and start the **setup.exe** program. Follow the prompts to complete installation. A WinGEM2 icon for starting the software will be placed on the desktop.

WinGEM2 can be removed using "Add and Remove Programs" in the control panel ("Programs and Features" in Vista.)

Using WinGEM2 on the PC

The basic functions of the WinGEM2 software are similar to the WinGEM2 software on the iPAQ:

- Configure the sensor and specify the frequencies to be used for a particular survey. These parameters are stored in a configuration (**.gem**) file.
- Visually display the individual/combined sensor data as I and Q.
- Store the data.

Starting the system is simple:

1. Connect a RS-232 cable between the GEM2 console and the PC (a RS-232-to-USB2 interface came with your GEM2 to permit connecting to a USB port on newer computers.)
2. Power on computer and wait for boot up.
3. Power on Sensor.
4. Start the WinGEM2 software on the computer.

On startup, the WinGEM2 software establishes communication with the sensor.

If communications does not occur, the GEM2 may be configured to use Bluetooth Wireless communications. If so, you may use the iPAQ "**Ports→Switch GEMPort to RS232**" command to move communications to the RS232 port. If you do that, remember to use WinGEM2's "**Setup→Ports→Switch GEMPort to Bluetooth**" command to move communications back to the Bluetooth port for the iPAQ when you are finished.

WinGEM2 Graphs

Figure 1 below shows the default layout of the WinGEM2 screen with a Time Graph (stripchart) window above and a Frequency Graph (EM spectrum) below. When transmitting, the Time Graph shows a time history of the inphase (solid lines) and quadrature (dashed lines) data for all frequencies. Typically, the last 25 seconds of acquired data are plotted. The Frequency Graph shows an instant EM spectrum. Both graphs are updated once per second.

The scale of the graphs may be altered by clicking the zoom buttons on the left side of the window. For example, the **z+** button zooms in (decreases) the upper limit of the axis scale. The **fit** button toggles auto scaling and rescales the axis to fit the currently plotted data. The size of these windows may be adjusted by 'clicking and dragging' the borders separating them.

Right clicking the Time Graph displays a context menu with several options:

- Show Points adds a docking window that lists data values for a particular curve (see figure 2). The drop down list that selects which curve to display also associates each curve's color and style (solid or dashed) with its frequency and type (inphase or quadrature).
- Point marks adds markers to the individual data points.
- Trace mouse coordinates displays the coordinates of the mouse cursor in axis units.
- Zoom ... Zoom tool displays a rectangle that can be repositioned by dragging. Then Zoom ... Apply zooms the graph so that the data in the selected area fills the axis space.
- Auto scale Y to recent data starts auto scaling like the fit button on the zoom toolbar, but it immediately rescales the Y axis to fit the most recent data (2.5 seconds). This function is so useful (e.g. after nulling) that it is assigned to the function key F8. Click on the Time Graph to make it active before pressing F8.
- Properties displays a property sheet that controls several aspects of the chart. In particular, you can specify the axis limits and hide/show individual curves.

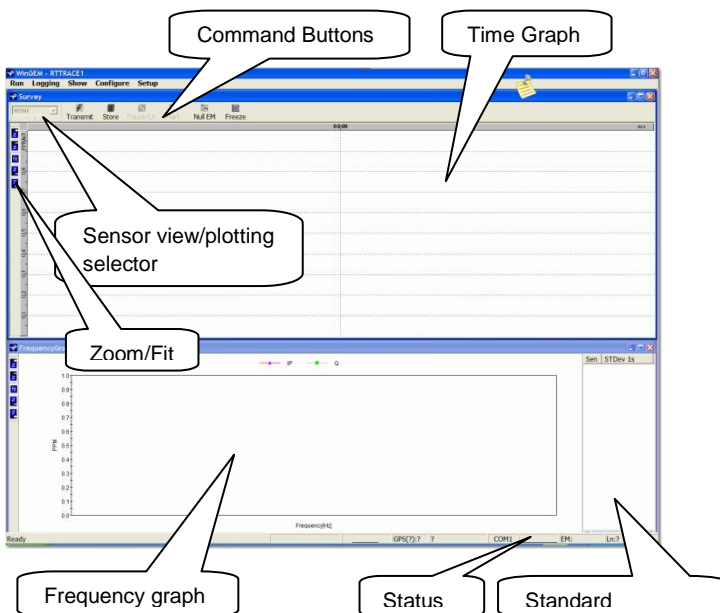


Figure 1.

WinGEM screen functions

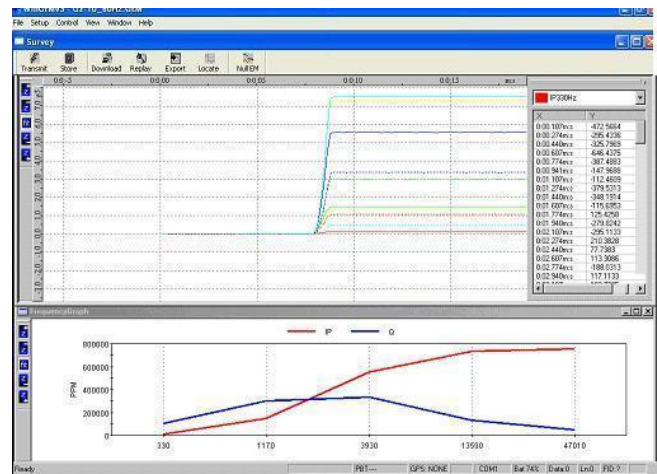
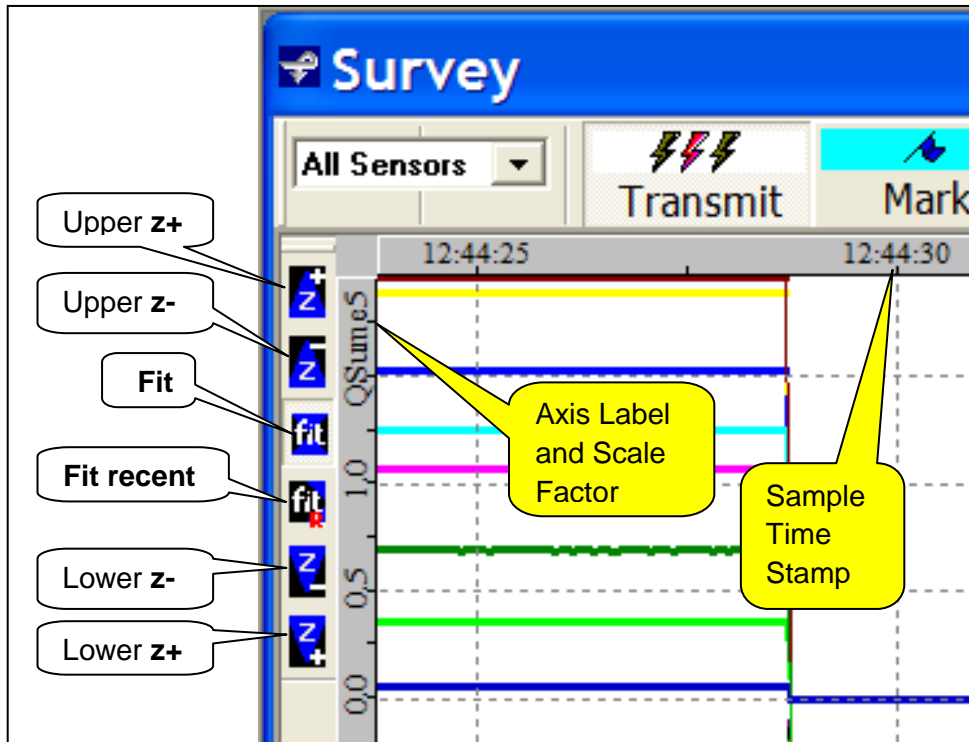


Figure 2.

Time and Frequency graphs showing the response to a target after nulling

Zoom Controls

Both Survey and FrequencyGraph windows have an identical set of Zoom Controls, located on the left-hand side of the graph:



The **fit** button toggles auto scaling ON/OFF and rescales the axis to fit the currently plotted data.

The **fit recent** button starts auto scaling like the **fit** button, but it immediately rescales the Y axis to fit the most recent data (2.5 seconds). This function is so useful (e.g. after nulling) that it is assigned to the function key F8 as well. Click on the Time Graph to make it active before pressing F8.

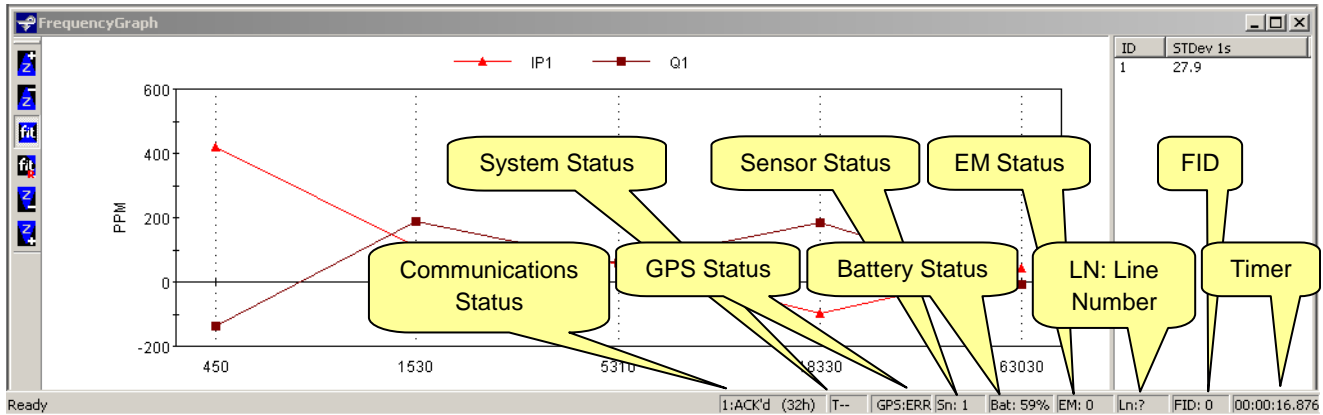
The Upper **z+** and **z-** buttons disable auto scaling and adjust the graph's upper bound up and down.

The Lower **z+** and **z-** buttons disable auto scaling and adjust the graph's lower bound up and down.

The X-axis is labeled with the sample time stamp every 5 seconds.

The Y-axis Label and Scale Factor indicate what is being displayed and the scaling factor to apply to the axis numbers shown ("QSum e5" means QSum data is being plotted and the Y-axis numbers are multiplied by 10e5, i.e. 0.5×10^5 , or 50000 ppm/division is shown here.)

Status Indicators



Status Indicators (bottom of screen, from the left)

Communications Status showing handshake signals during active communications.

System Status: "T" when transmitting, "S" store data active, "s" store data paused, "C" capture, "-" idle

GPS Status: displays the status of the optional GPS sensor (see below).

Sensor Status: single character "1" appears when sensor found ("?" if missing).

Battery Status: estimated battery capacity remaining, in %

EM Status: "0" OK, "1" overflow, "2" lost data, "4" low current.

LN: Line number, will increment when Transmitting, Storing and toggling the Pause/Ln button

FID: Will increment by pressing the Mark button; this function inserts a number in the "Mark" column in the data (FID = fiducial).

TIMER: Measures transmitter "ON" time or system idle time. HH:MM:SS format.

GPS Status Details:

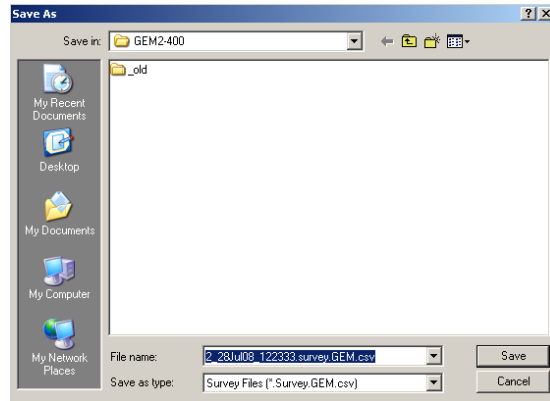
1. The single-character field in front of "**GPS:**" is independent of the GPS \$GPGGA string. It is derived from DSP status received every 5 seconds and may have the following values:
 - a. "?"—no communications with the DSP
 - b. " "—DSP status says no hardwired PPS signal is present.
 - c. "+"—DSP status says hardwired PPS signal is present.
2. The single-character field that follows "**GPS:**" is derived from the status field of the GPS serial I/O \$GPGGA string, as received by the DSP. The single digit may have the following values:
 - a. "?"—no communications with the DSP, thus no status
 - b. "-1"—communications with the DSP, but no GPS serial information available
 - c. "0"—GPS status available, "no fix"
 - d. "1"—GPS status available, "fixed"
 - e. "2"—GPS status available, "fixed + WAAS (or other) corrections applied"
 - f. If the GPS is capable of other status numbers, they are passed along by WinGEM2 and will show up in this field.

WinGEM2 Functions—Summary

The most commonly used functions can be initiated by clicking a button on the toolbar or via the menus. The Transmit and Store functions are also directly controlled from the navigation software without needing to switch back and forth between the two programs during a survey.

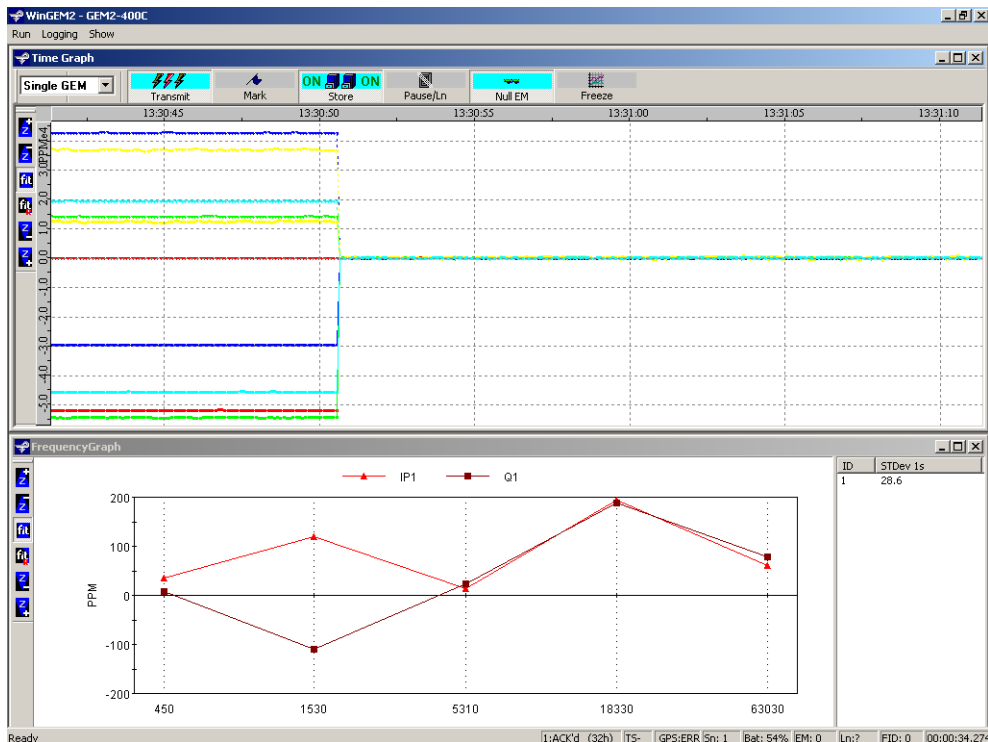
The **Transmit** button starts and stops activation of the transmitter coil.

The **Store** button toggles storing data directly onto the acquisition/control computer as is acquired in a text (.csv) format. A dialog box opens to specify a path and filename where the data will be stored:



A sequentially-numbered file name is automatically generated, or you can type in a custom file name if desired. Clicking on **Save** starts data storage.

The **Null EM** toolbar button toggles “nulling” of the data in the graph. When nulling is turned on, the next data sample acquired is taken as a background value that is subtracted from subsequently acquired data. The graphs then emphasize changes from this background state. Note that nulling only affects the displayed data—not the raw data being logged or stored to a file.



The **Mark** toolbar button changes the number being stored in the **Mark** column of the .csv file (for each sample) to match the **FID: nnn** number currently displayed, then increments the **FID: nnn** number (**FID** = fiducial.) This lets the operator "mark" an interesting event into the data set for review later. When WinGEM2 starts, "0" is initially stored in the **Mark** column for each sample and **FID:** is set = 1. Therefore, the first time the **Mark** button is pressed, "1" is then stored in the **Mark** column for each sample and **FID:** is incremented to the next number.

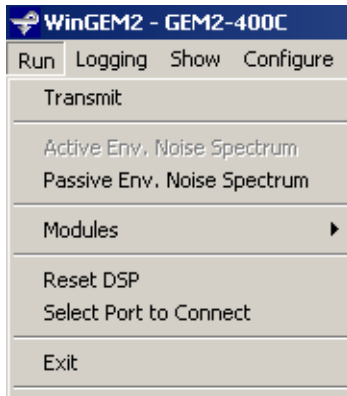
The **Pause/Ln** toolbar button toggles data storage on/off without closing the STORE files. It affects the first two columns of data in each .csv file ("Line" and "Sample") as follows:

1. The first sample stored in a new file has Line = 0 and Sample = 0.
2. Additional samples are stored with Line = 0 and the number in the Sample column incremented by 1.
3. When **Pause/Ln** is activated, sampling continues but samples are not stored.
4. When **Pause/Ln** is deactivated, the next sample is stored with the Line number incremented by 1 and the Sample number reset to 0. This is the beginning of a new "line" of data.
5. Every time **Pause/Ln** is cycled, the next sample stored always has a new Line number which is one greater than previous, and the Sample number is always reset to 0.

The **Freeze** toolbar button toggles display updating **OFF**, then back **ON**. This permits the operator to look at a desired event without it scrolling off the display. It does NOT affect sampling and storage of data. When **Freeze** is toggled back **OFF**, the graph jumps to catch up to the current sample time stamp.

WinGEM2 Functions—Detailed Menus

Run Menu



Starts and stops the transmitter. Duplicates TRANSMIT button on graphics display. When the transmitter is running:

1. The Transmit button face changes, and
2. The letter "T" appears in the System Status box at the bottom of the screen.

Run→Active Env. Noise Spectrum

Collects and stores one base period of time series data (.ts) while the transmitter is running.

WinGEM2 briefly displays the (.ts) file written when all data has been transferred. Use [Run→Modules→Time Series](#) to select and view any of these files.

This command is greyed out when the transmitter is not running.

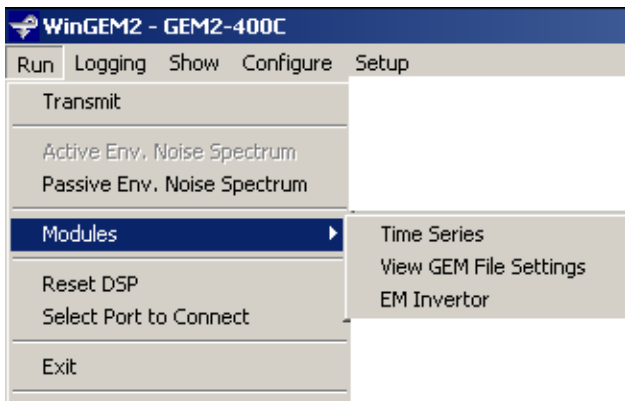
Run→Passive Env. Noise Spectrum

Collects and stores one base period of time series data (.ts) while the transmitter is stopped.

WinGEM2 automatically displays the Time Series plot when all data has been transferred. Use [Run→Modules→Time Series](#) to select and view any of these files later.

This command is greyed out when the transmitter is running.

Run→Modules



[Run→Modules](#) accesses external programs to process and view data. Only the modules described below are active in this version of WinGEM2.

Module: View GEM File Settings

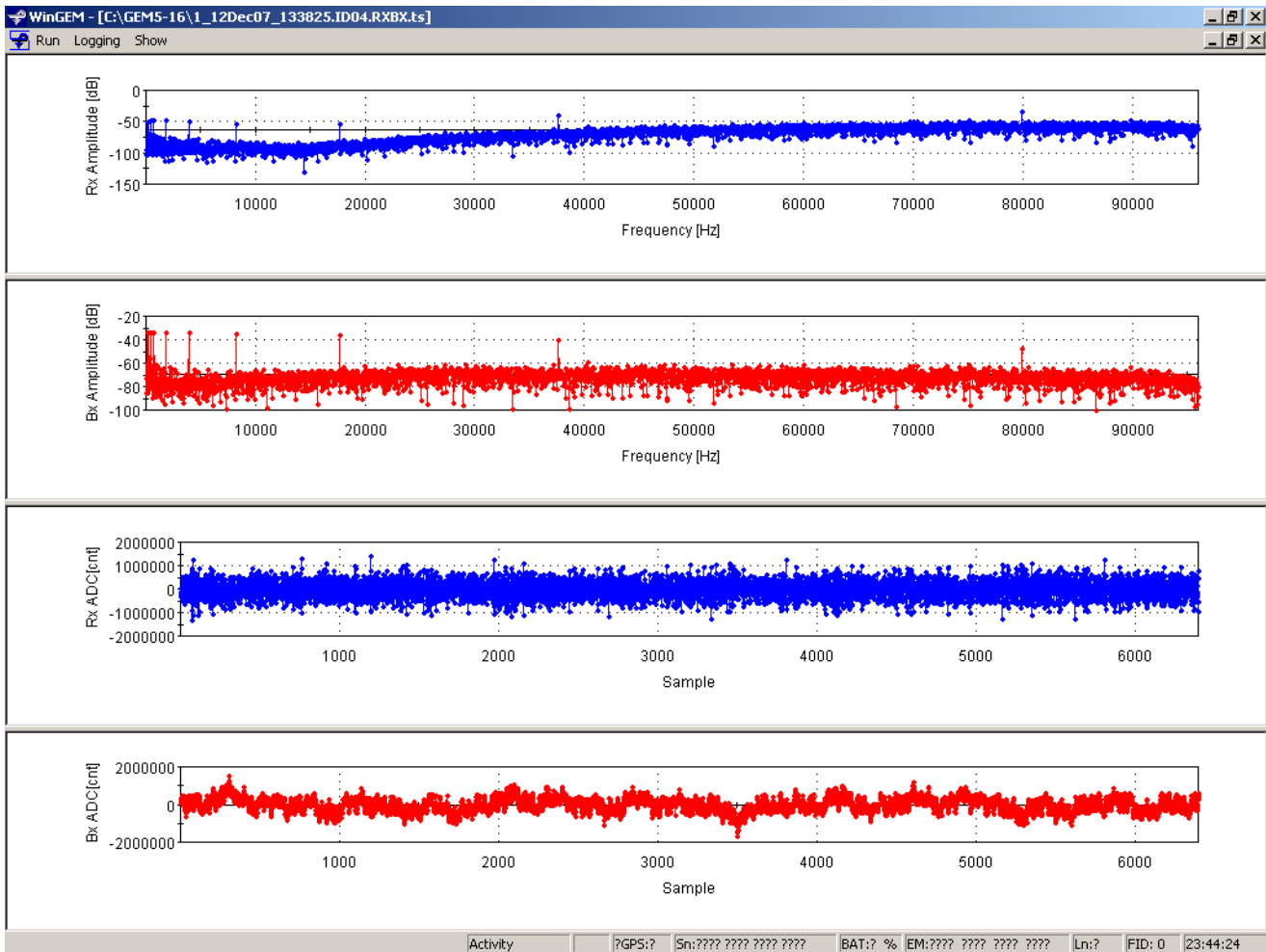
The **View GEM File Settings** module shows (in text mode) the configuration contents of a sensor (.gem) file. This is useful for diagnostics and to review survey data sensor parameters.

Module: EM Invertor

The **EM Invertor** module option runs the Geophex EM Invertor software.

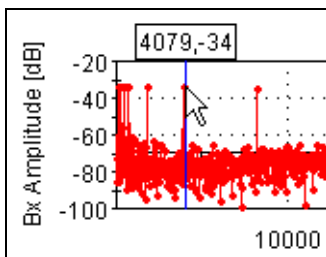
Module: Time Series

The **Time Series** module reads a previously collected sensor time series (.ts) data file and displays the RX and BX time series and frequency spectra as four graphs:

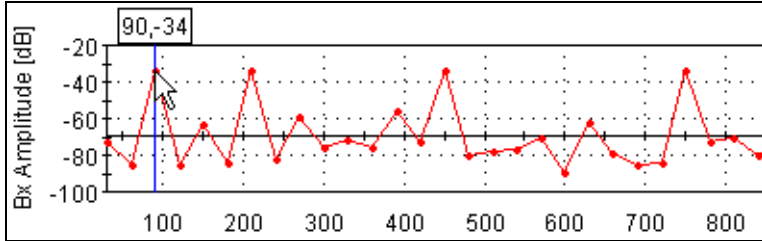


The upper two graphs show the sensor's RX and BX frequency spectra. The lower two graphs show the sensor's RX and BX time series. "RX" is the sensor's receiver channel. "BX" is the sensor's reference channel.

Move the mouse inside a graph's window to show the cursor's X and Y position in a small dynamic window above the cursor:



Zoom the X-axis of the graph by holding down the left-mouse button and dragging the mouse to highlight a portion of the graph (in the X-axis direction). Release the button to zoom the graph in and display the highlighted data:



A single right-click of the mouse while the cursor is inside the graph zooms back out to the full display.

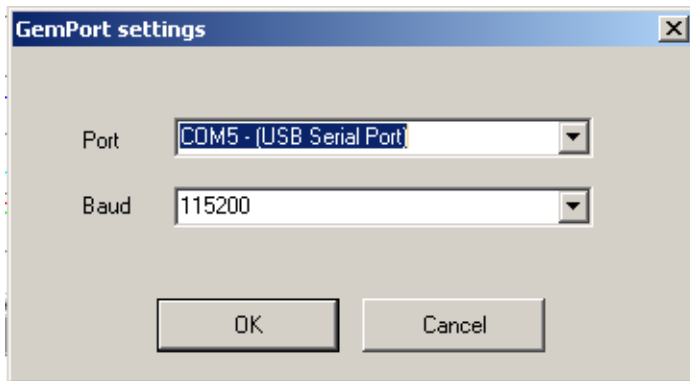
Make one of the graphs bigger by moving the upper- and lower-window frames of that graph up and down to make more space for it (grab the frame bar with the left-mouse button.)

Closing the Time Series module window always resets the graph sizes for the next use.

Run→Reset DSP

Issues command to soft-reboot the DSP in the GEM2 console. Provides soft recovery if system hangs up for some reason. Permits resetting the DSP without resetting GPS or other devices that would be upset by a power-off sequence.

Run→Select Port to Connect



Sets the PC serial I/O port and default baud rate for communicating with the GEM2.

The port is the Window's-assigned COM port for the RS232 communications. The Baud rate is always 115200.

The port used by the GEM2 may be different from the one shown in the example here.

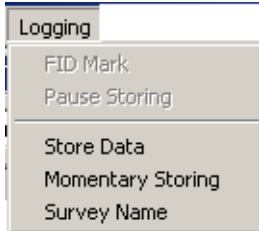
Run→Close

Close this window.

Run→Exit

Exit WinGEM2.

Logging Menu



With the exception of **Momentary Storing** and **Survey Name**, these are duplicate functions of buttons on the graphic display.



Logging → FID Mark

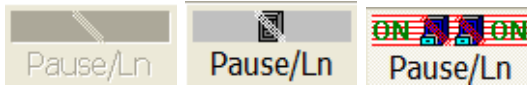
When the transmitter is running and data is being stored, the operator may click on the **Mark** button (or **Logging → FID Mark**) to change the number in the "Mark" column of the **.csv** data file at that sample. The **FID** (fiducial) counter in the lower right-hand corner of the screen will increment each time this feature is used. This lets the operator record what was interesting at that mark in his log book. The **Mark** button is grayed out (not available) when storing or transmitting is not active.

Typical sensor .csv data file with Mark example

```
;3729          Total Samples In File
;Date: Wednesday, December 12, 2007,   Time:124208
;Note1:
;Note2:
Line,Sample,Mark,Status,GPSSStat,Time[ms],PowerLn,I4_1830Hz,Q4_1830Hz, ...
0,  0,  0,0,0,45850191.300,    0.2,-6.8095094e+004, 1.5174768e+004, ...
0,  1,  0,0,0,45850257.900,    0.2,-6.8096570e+004, 1.5174475e+004, ...
0,  2,  0,0,0,45850324.600,    0.2,-6.8096438e+004, 1.5172790e+004, ...
. . .
0, 647, 0,0,0,45893324.900,    0.2,-6.8104727e+004, 1.5164980e+004, ...
0, 648, 0,0,0,45893391.500,    0.2,-6.8107891e+004, 1.5161309e+004, ...
0, 649, 0,0,0,45893458.200,    0.2,-6.8105734e+004, 1.5165128e+004, ...
0, 650, 1,0,0,45893524.900,    0.2,-6.8103289e+004, 1.5162729e+004, ...
0, 651, 1,0,0,45893591.500,    0.2,-6.8102148e+004, 1.5166178e+004, ...
0, 652, 1,0,0,45893658.200,    0.2,-6.8106719e+004, 1.5166925e+004, ...
. . .
```

In the example shown above, the **Mark** button was pushed just before sample #650 was taken. At that time, "0" was being stored in the **Mark** column and **FID: 1** was on display. After the **Mark** button was pushed, "1" is now stored in the **Mark** column for each sample and **FID: 2** is on display (to be used the *next* time the **Mark** button is pushed.)

Logging → Pause Storing



When the transmitter is running and data is being stored, the operator may click on the **Pause/Ln** button (or **Logging → Pause Storing**) to pause the storing of data (perhaps for the end of a line.) Click the **Pause/Ln** button again to resume storing data with the next line number noted in the files. The **Ln:?** indicator in the lower right-hand corner of the display will now indicate **Ln:1** (for the line being stored) and will be incremented every time the **Pause/Ln** button is cycled. This can be used for discrete line surveys where the data outside the line ends is not desired. The **Pause/Ln** button is grayed out when storing or transmitting is not active.

Typical sensor .csv data file with Pause/Ln example

```

;3729          Total Samples In File
;Date: Wednesday, December 12, 2007, Time:124208
;Note1:
;Note2:
Line,Sample,Mark,Status,GPSSStat,Time [ms],PowerLn,I4_1830Hz,Q4_1830Hz, ...
0, 0, 0,0,0,45850191.300, 0.2,-6.8095094e+004, 1.5174768e+004, ...
0, 1, 0,0,0,45850257.900, 0.2,-6.8096570e+004, 1.5174475e+004, ...
0, 2, 0,0,0,45850324.600, 0.2,-6.8096438e+004, 1.5172790e+004, ...
. . .
0, 828, 2,0,0,45905391.600, 0.2,-6.8110531e+004, 1.5163113e+004, ...
0, 829, 2,0,0,45905458.300, 0.2,-6.8110156e+004, 1.5162982e+004, ...
0, 830, 2,0,0,45905525.000, 0.2,-6.8111594e+004, 1.5165521e+004, ...
1, 0, 2,0,0,45914858.300, 0.2,-6.8111789e+004, 1.5165265e+004, ...
1, 1, 2,0,0,45914925.000, 0.2,-6.8109891e+004, 1.5164514e+004, ...
1, 2, 2,0,0,45914991.600, 0.2,-6.8112188e+004, 1.5165851e+004, ...
. . .

```

In the example shown above, the **Pause/Ln** button was pushed just after sample #830 was taken. When **Pause/Ln** was pushed again to start storing samples, the **Line** number was incremented to "1" and the **Sample** number was reset to "0" for the next sample stored.

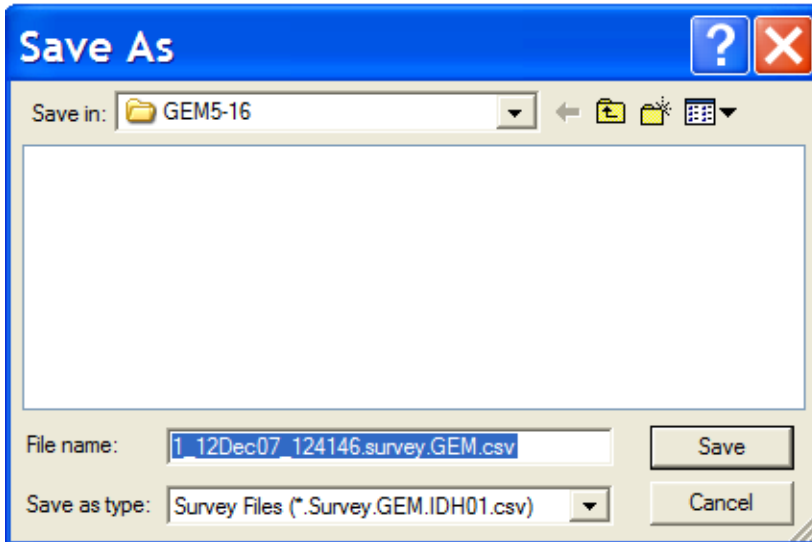
Note: while storing is paused, the capital "S" in the System Status box at the bottom of the screen changes to a lower-case "s" to indicate data storage is paused.

Logging→Store Data



The **Store** button (or **Logging→Store Data**) may be used at any time (Transmitter ON or OFF) to start or stop storing of data to the PC hard drive. A check mark is present next to **Store Data** in the **Logging** menu when storing is enabled (and the **Store** button says "ON" on the graphical display.)

When storing is requested, the **Save As** window pops up:



After checking the storage directory name (and changing to a new one for a new survey job), either accept the automatically-generated sequential file name or type in a different one. Use **Logging→Survey Name** (below) to set a different Survey Name for automatic use. Click **Save** to proceed with storage.

Click **Store** a second time to stop storing data.

NOTE: WinGEM2 uses the directory name and path chosen here as the default directory for file operations occurring with other menu commands. When starting a new job, I recommend creating a new directory for that job, then cycling through the Store command (with transmitter stopped) to choose that new directory as the default directory for WinGEM2.

Logging→Momentary Storing

This option permits setting an exact length of time to store data, followed by an automatic execution of the **Pause/Ln** button. When executed, a window pops up asking the length of time to store data:



Enter in the storage interval (in seconds) desired and click **OK**. Momentary storing mode is now active, and a checkmark is displayed next to **Momentary Storing** in the **Logging** menu to remind the operator it is active.

Now, once **Store** is activated (along with **Transmit**), data will be collected for the interval specified. Then a ***BEEP*** will sound and the **Pause/Ln** button appears pressed down. Data storage is paused at this time. After adjusting the target or moving the equipment, click on the **Pause/Ln** button to resume data storage (the transmitter has been on and running all this time.) A ***BEEP*** will sound, sampling will resume and the **Ln**: line counter (lower right-hand corner of display) will increment and show the next line number being stored. This process repeats until **Store** or **Transmit** is turned OFF.

NOTE: The system remembers this setting *until WinGEM2 is exited*. If used, it must be reset to 0 afterwards so that continuous data acquisition will be permitted once again.

Logging→Survey Name

Logging→Survey Name opens the **Survey info** window.

If nothing is entered for **Survey Name**:, then survey file names will be automatically generated using a leading sequence number, followed by date and time, and completed with a unique identifier for that sensor. For example, the survey file name for sensor IDH3 might look like this: "3_09Oct07_122636.Survey.GEM.IDH3.csv"

If a Survey Name is entered in the box, then survey file names will use the Survey Name in place of the date-and-time. For example, if the Survey Name is "The-Survey_Name", then the survey file name for sensor IDH3 might look like this: "3_The-Survey_Name.Survey.GEM.IDH3.csv"

Text entered for "Note Line 1" and "Note Line 2" appears as commented lines of text at the beginning of the .csv data files:

```

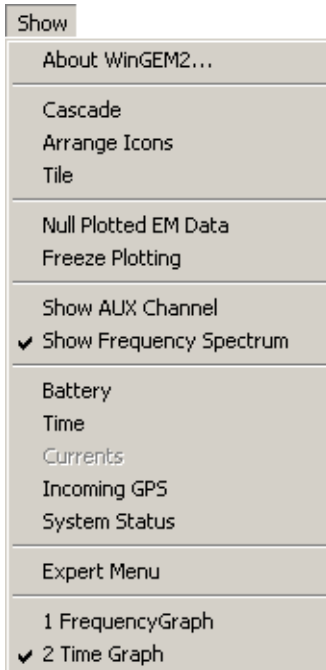
;Date: Tuesday, October 09, 2007, Time:133514
;Note1:Text for Note Line 1
;Note2:Text for Note Line 2
Line,Sample,Mark,Status,GPSStat,Time[ms],PowerLn,I3_210Hz,Q3_210Hz,...
0, 0, 0,0,0,48915088.900, 64.3,-2.1174536e+003, 1.9015216e+002, ...
0, 1, 0,0,0,48915255.600, 14.2,-2.1176033e+003, 1.9151123e+002, ...
0, 2, 0,0,0,48915422.200, 14.2,-2.1175610e+003, 1.9151123e+002, ...

```

Note: the Survey Name must follow the Windows XP file name rules; otherwise, the STORE button will not appear to work.

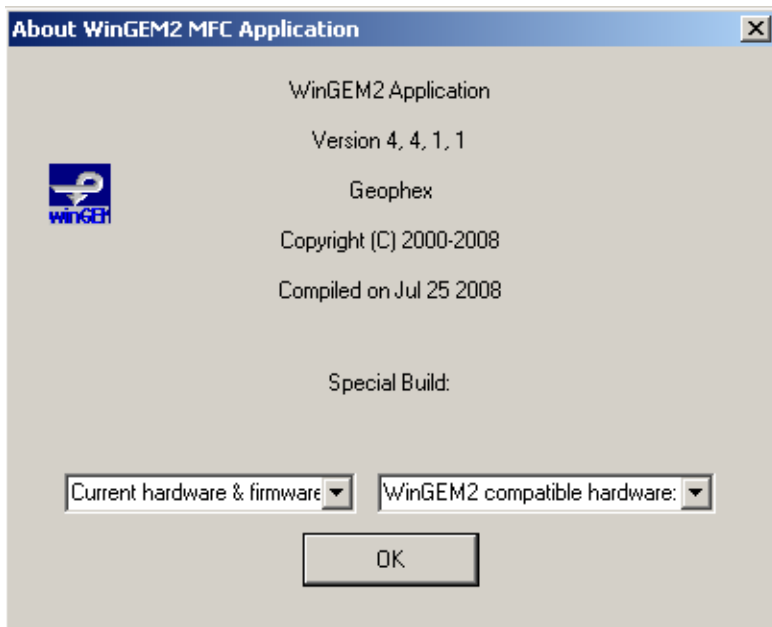
If the Survey Name is being used for file name creation, then **Logging→Survey Name** will have a check mark next to **Survey Name** on the drop-down menu.

Show Menu



Show → About WinGEM2...

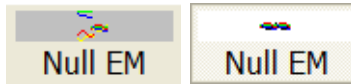
Displays the WinGEM2 version and DSP firmware versions.



Arrangement of Windows

Show → Cascade, **Show → Arrange Icons**, and **Show → Tile** are standard commands for arranging the displayed windows on the PC screen. The default startup display is **Show → Tile**.

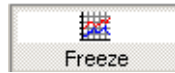
Show→Null Plotted EM Data



Measures and remembers the value of each displayed data line being plotted, then subtracts that value from incoming plot data to effectively "NULL" the display. Does not affect the data being stored to file—only the display is NULL'ed. Executing a second time turns off the nulling effect (it toggles.)

Duplicates the **NULL** button on the PC screen.

Show→Freeze Plotting



Stops the scrolling of the data plots without affecting the storing of data to file. Gives the operator time to view an interesting event without affecting the survey. Executing a second time causes the plot to jump to the time of the next incoming data being plotted.

Duplicates the **FREEZE** button on the PC screen.

Show→Show AUX Channel

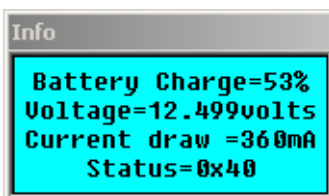
Opens a window which displays the serial I/O text being received on the AUX channel. This is not used in the GEM2 system.

Show→Show Frequency Spectrum

Turns on the FrequencyGraph window normally seen in the lower half of the display. Used to restore this graph if that window is closed.

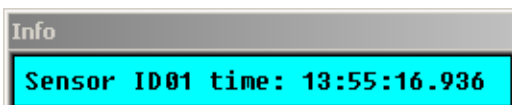
Show→Battery

Displays the smart battery status.



Show→Time

Diagnostic tool that shows the current time stamp of the console DSP.



Show→Currents

Requests the BX magnitudes of each active frequency, then converts and displays those magnitudes as equivalent TX coil current for each frequency.

ID	Freq	Ipredicted[A]	Measured[A]	%
1	450	6.66	6.26	93
1	1530	2.08	1.91	91
1	5310	0.60	0.56	93
1	18330	0.17	0.17	94
1	63030	0.05	0.04	82

Setup→Tx Error Monitoring contains the **Tx-Ical** scaling factor for this computation and should not be changed from the factory calibration value. Useful for seeing how much current is allocated to each frequency.

Show→Incoming GPS

Opens a window which displays the serial I/O text being received on the GPS channel.

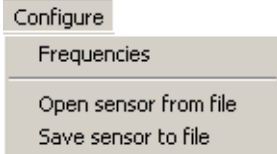
Show→Expert Menu

Enables the display of the Expert Menu command tab which contains diagnostic and factory-level commands not used during normal operation. Toggles ON/OFF each time it is chosen. Normally OFF. Checkmark displayed when ON.

List of Windows being Displayed

Variable-length list of active windows for viewing. Normally shows the FrequencyGraph and Time Graph windows.

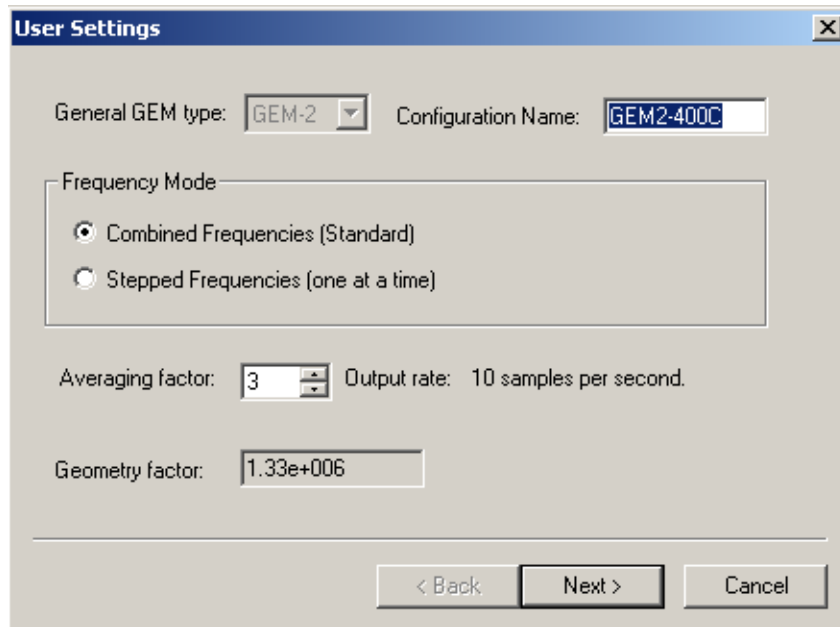
Configure Menu



Configure → Frequencies

Menu for setting GEM2 frequency operating parameters.

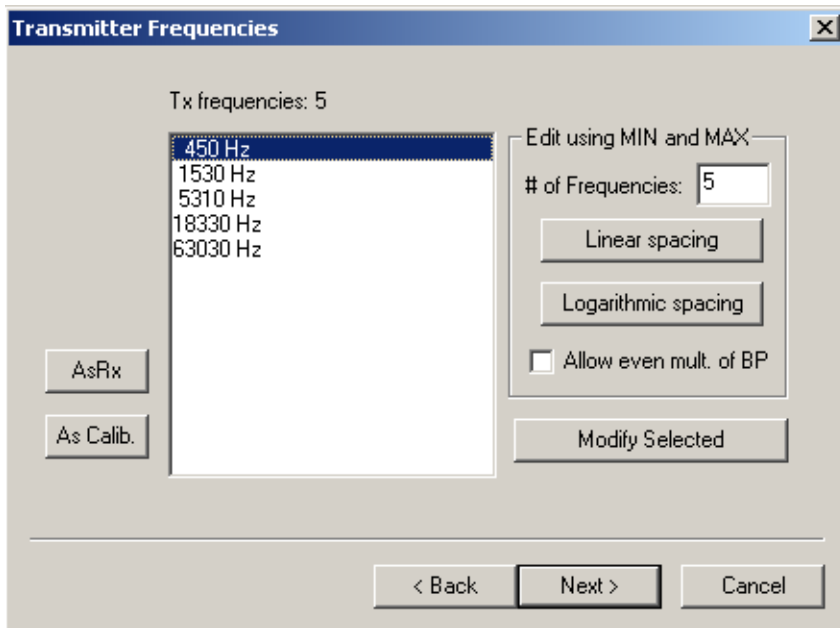
The **User settings** configuration window displays:



For **Frequency Mode**, choose **Combined Frequencies** (Standard) or **Stepped Frequencies** (one at a time). The first setting runs all chosen frequencies simultaneously (and continuously) during the survey. The second setting rapidly switches from one frequency to the next during the survey, concentrating all the transmitter energy into just one frequency for a better signal-to-noise ratio (but less survey resolution.)

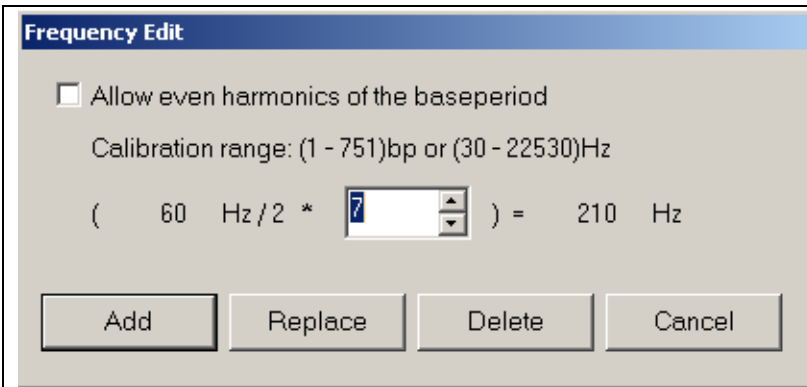
Then set Averaging factor to downsample the base period (BP) data to an update rate less than the base frequency implies (for example: 30 samples a second for a 30 Hz base frequency.) The BP samples will be averaged together by the sensor DSP and a single "averaged" sample will be transmitted to the PC at the **Output rate** shown. This reduces the amount of data stored and improves signal-to-noise ratio through averaging. Slower-moving surveys can make good use of this feature.

When finished with the **User settings** window, click on Next to proceed to the **Transmitting frequencies** window:



There are many ways to choose frequencies:

1. Click on **[AsRx]** to set the Tx frequencies to match the existing Rx frequencies (as seen on the **Processing frequencies** window that follows this window.)
2. Click on **[As Calib.]** to set the Tx frequencies to match the sensor calibration frequencies.
3. Highlight one frequency with the mouse (single left-click on the frequency), then click on the **[Modify Selected]** button to pop open the **Frequency Edit** window for that frequency.
4. Simply double left-click on a frequency to pop open the **Frequency Edit** window for that frequency (quicker than #3 above).
5. Set the lowest and highest desired frequencies using the **Frequency Edit** window, then move over to the "**Edit using MIN and MAX**" sub-box in the upper right-hand section of the window. Enter in the number of frequencies desired, then click on **Linear spacing** or **Logarithmic spacing** to automatically generate the appropriate frequencies for the transmitter. Optionally, check the **[Allow even mult. of BP]** box before generating the frequencies to include even harmonics of the base period as transmitter frequencies (normally left unchecked.)

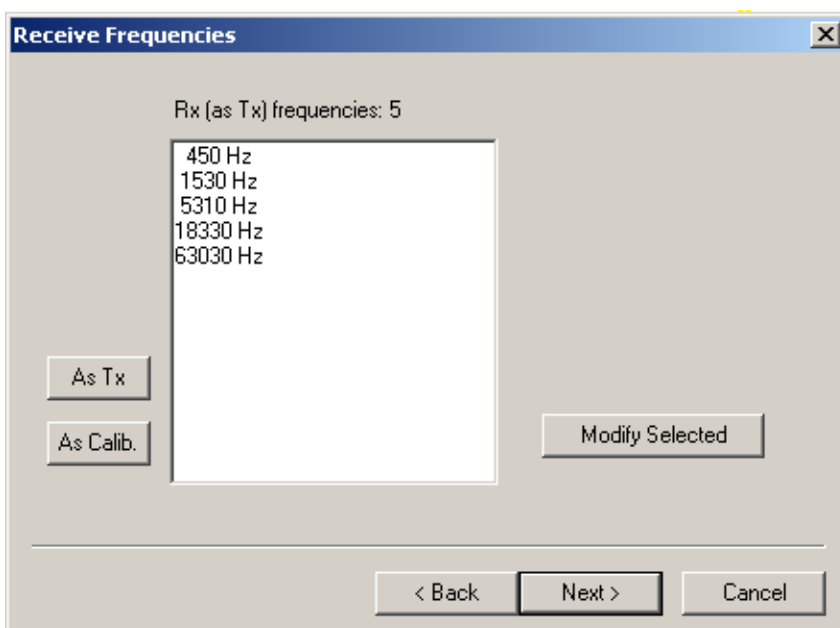


This is the **Frequency Edit** box that pops up. Either type in the harmonic desired (the "7" shown above), or use the left mouse button on the up- and down-arrow buttons to rapidly scroll through the possible harmonics (and frequencies.) This scrolling accelerates as you continue to hold the left-mouse button down, so release it early before zooming past the desired frequency. If an even harmonic of the base period is desired, check the **[Allow even harmonics of the baseperiod]** box first.

When the desired frequency is displayed, click **[Add]** to add the frequency to the list. Click **[Replace]** to replace the old selected frequency with the new frequency. Click **[Delete]** to delete the old frequency without adding a new frequency. And **[Cancel]** closes this window without changing the selected frequency.

Note: all frequencies must be within the **Calibration range** (inclusive) for that sensor. The **Frequency Edit** box displays those values while a new one is being chosen.

When finished with the **Transmitting frequencies** window, click on Next to proceed to the **Receive frequencies** window:



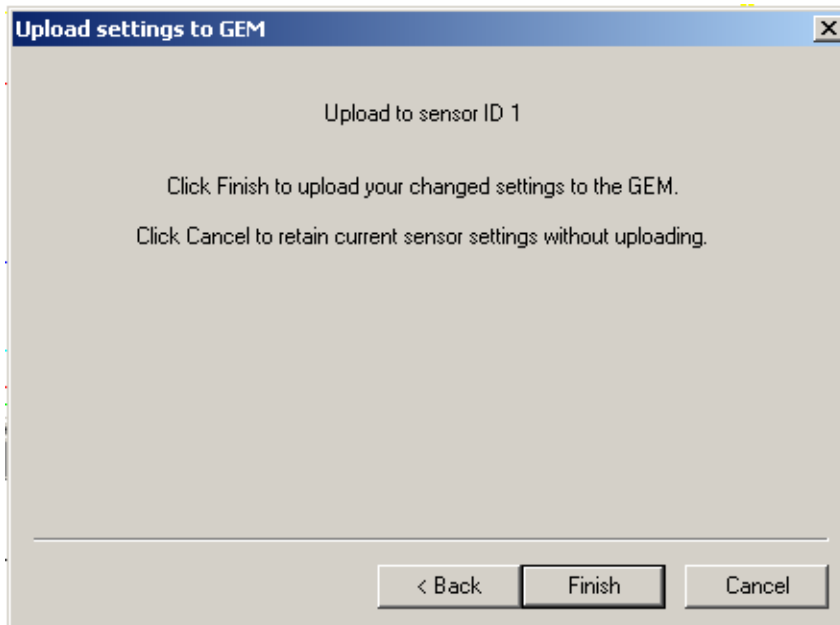
No changes are usually required here. It is possible to add additional frequencies for monitoring, including even-harmonic frequencies.

Frequency	IP-Coef.	Q-Coef.	IP-Offset	Q-Offset
450Hz	-0.99914	-0.013274	-21347	5303.4
1530Hz	-1.0101	-0.0092139	-19612	1813.5
5310Hz	-1.0116	-0.0019639	-19341	616.48
18330Hz	-0.98553	-0.0021762	-17338	449.67
63030Hz	-0.69378	-0.014292	17247	-2193.4

< Back Next > Cancel

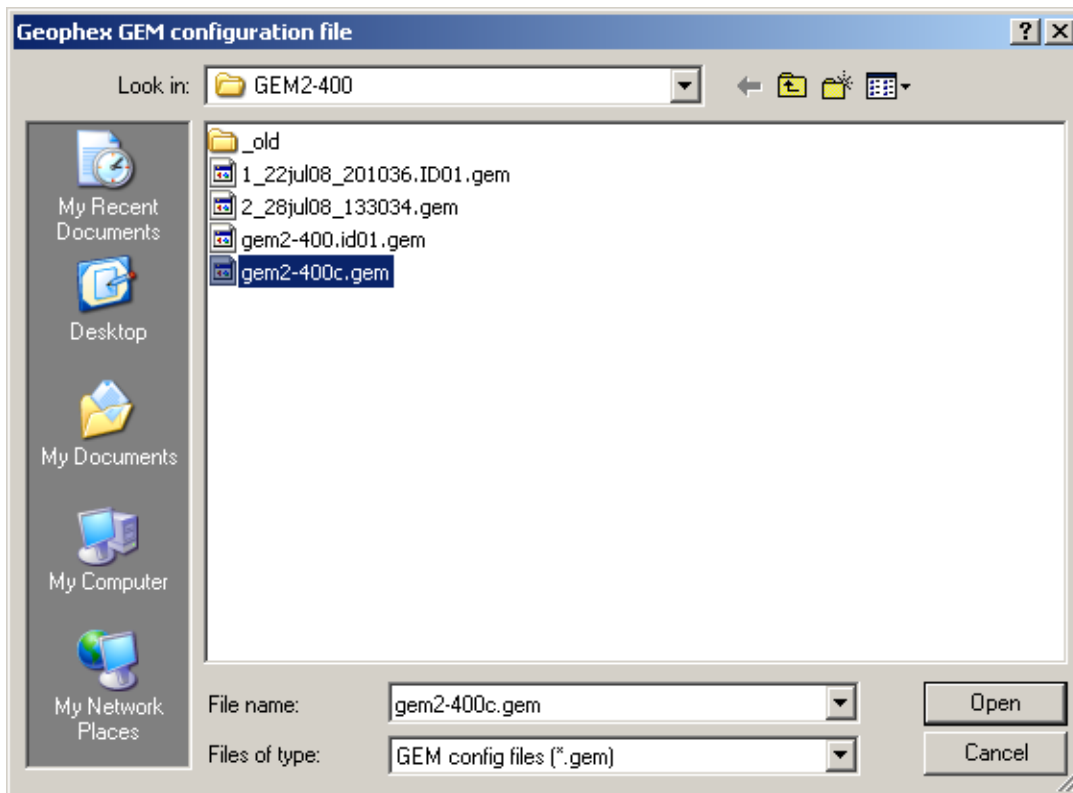
When finished with the **Receive frequencies** window, click on Next to see the **Corrections** (coefficients) window. This display is informative, showing the computed correction coefficients applied to each chosen frequency.

Once all editing in the **Transmitting frequencies** window is finished, click **[Next]** to proceed to the **Upload settings to GEM** window:



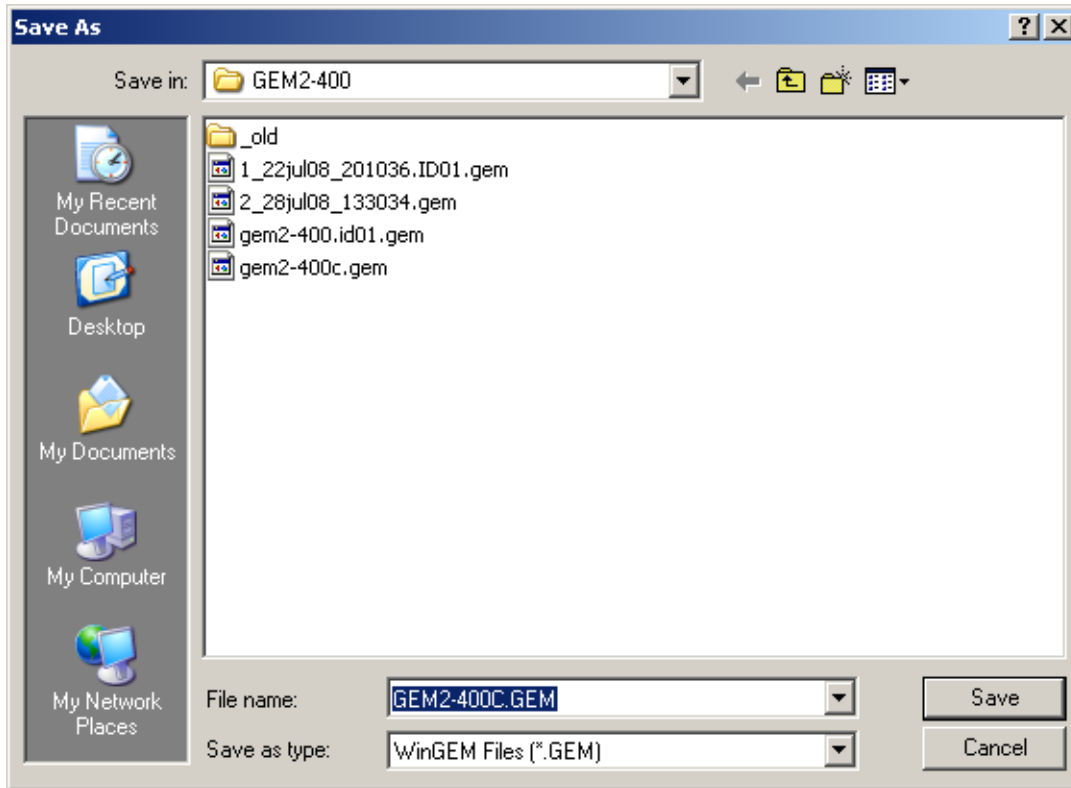
Click on **Finish** to load the new configuration to the sensor DSP, or click on **Cancel** to keep the current settings. The GEM2 should update its sensor quickly...

Configure → Open sensor from file



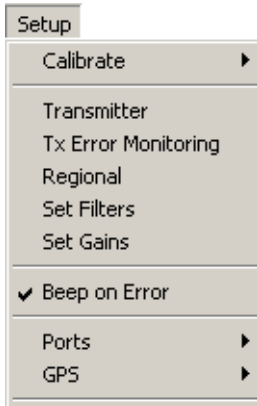
Choose the sensor file (**.gem**) to load into the GEM2. This can be the factory default sensor file (retrieved from the CDROM that shipped with the instrument) or a sensor file saved from a prior configuration. Click on **Open** to load the file.

Configure → Save sensor to file

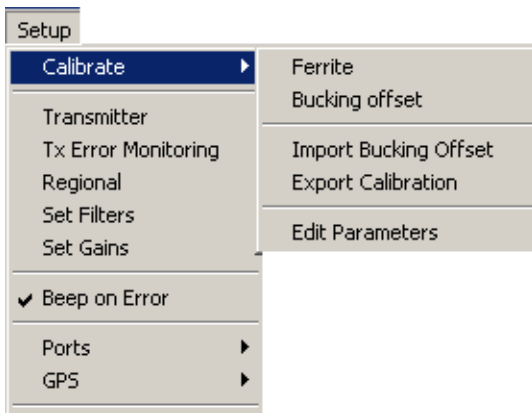


Check the **Save in:** directory location (usually the default directory last used by the **Store** function). Then either accept the **File name:** shown or change as appropriate.

Setup Menu



Setup → Calibrate



Setup → Calibrate → Ferrite

This feature needs further documentation in this manual.

Setup → Calibrate → Bucking offset

This feature needs further documentation in this manual.

Setup → Calibrate → Import Bucking Offset

This feature needs further documentation in this manual.

Setup → Calibrate → Export Calibration

Reads the calibration settings and writes those settings to a (.txt) file for viewing (Example: 3_15Oct07_155403.ca1.txt)

Setup → Calibrate → Edit Parameters

Requires password to access (see section on WinGEM2 passwords, p.35). Displays the Calibration Parameters editing screen:

Frequency	IP-Coef.	Q-Coef.	IP-Offset	Q-Offset
450 Hz	-0.99914	-0.013274	-21347	5303.4
1530 Hz	-1.0101	-0.0092139	-19612	1813.5
5310 Hz	-1.0116	-0.0019639	-19341	616.48
18330 Hz	-0.98553	-0.0021762	-17338	449.67
63030 Hz	-0.69378	-0.014292	17247	-2193.4

Buttons:

Edit using MIN and MAX freq
of Frequencies:

System
GEM type:
Geometry Factor:

These are hardware-specific parameters determined through calibration processes and instrument physics. The calibration frequencies are displayed here and may be different from the current operating frequencies. The **GEM type** is **GEM-2**. The **Geometry Factor** is factory set.

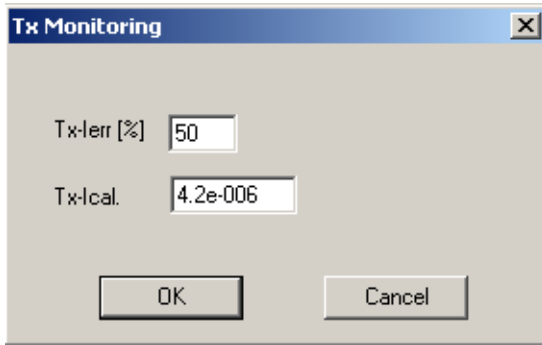
Setup → Transmitter

Requires password to access (see section on WinGEM2 passwords.) Displays the transmitter parameters used for waveform generation.

Requires second password to change Current Limit when >10 amps.

Do not change these parameters without consulting Geophex's engineers!

Setup → Tx Error Monitoring



Tx-lerr (%) sets the threshold for the monitored transmitter current. When the monitored TX coil current falls below this threshold (a percentage of the predicted full-scale current, as measured by the reference coil), WinGEM2 will sound a warning alarm and display an error message on the screen:



This can occur when

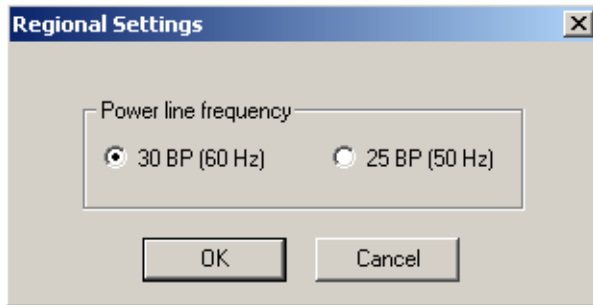
1. a transmitter fault occurs (current to the coil exceeds 15A, tripping an electronic overcurrent detector) or
2. a loss of power occurs anywhere between the battery, transmitter and TX coil.

If monitoring during a survey is not desired, set **Tx-lerr (%)** = 0 to disable monitoring. To view the monitored TX coil currents, use [Show → Currents](#) while the transmitter is running.

Txl-cal. is the factory-determined conversion constant which scales the signals seen by the reference coil so they represent the transmitter coil currents at the frequencies being transmitted. Do not change this constant without instructions from Geophex's engineers.

Only the lowest transmitter frequency is monitored for this error message.

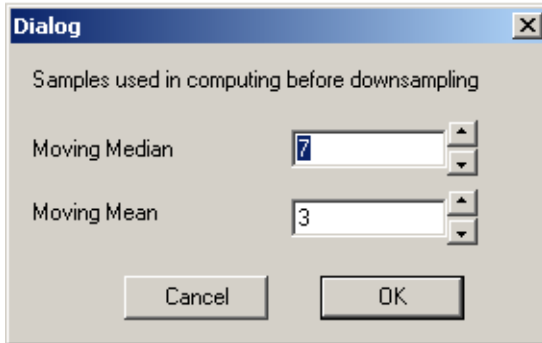
Setup → Regional



Sets the GEM2 base period (BP) frequency for the region of operation. Typically chosen to be one-half of the local power line frequency. This permits sharp filtering of the power line fundamental and harmonic frequencies (all become even harmonics of the base frequency) and enables operation of the GEM2 in the quiet odd harmonic regions.

Changing the power line frequency setting adjusts the individual sensor calibration factors by re-assigning each old calibration frequency to the nearest new odd BP harmonic frequency, based on the chosen power line frequency. Checking the **Allow even multiples of BP** option permits WinGEM2 to re-assign a calibration frequency to an even BP harmonic if it is closer.

Setup → Set Filters



Each sensor DSP has two filtering algorithms which can be applied to the data computed for one base period (BP) *before downsampling occurs*: **Moving Median** and **Moving Mean**.

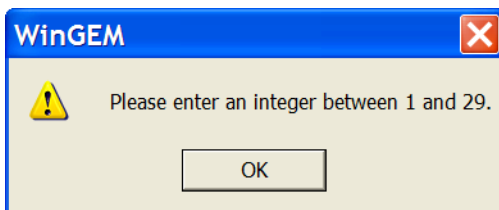
They can be individually disabled by setting = 1.

Moving Median executes first: if set > 1, it puts the new raw BP sample at the head of a list, removes the oldest raw BP sample from the tail, searches through the number of raw BP samples set above, picks out the median, then passes it along to the next stage. If set = 1, the new raw BP sample is passed along as the answer. This is useful for removing the effects of a single noise spike in the raw BP data.

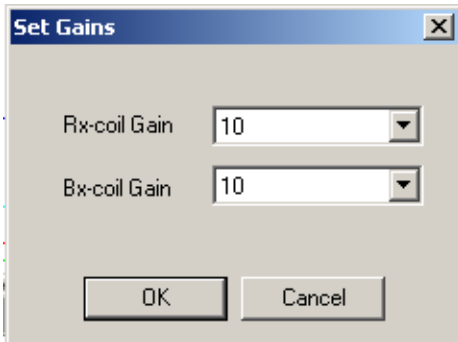
Moving Mean executes next: if set > 1, it puts the BP sample result from **Moving Median** at the head of a list, removes the oldest BP sample from the tail, averages all the samples in the list to compute the mean, then passes it along to the next stage. If set = 1, the BP result is simply passed along to the next stage. This is useful for noise reduction using a moving window on the data.

The final BP sample result out of these is then averaged together with other BP samples, as defined by the **Averaging Factor** in [Configure → Frequencies](#), to compute the downsampled result transmitted to WinGEM2.

Note: If **Moving Median** or **Moving Mean** is set too large, an error message pops up:



Setup → Set Gains

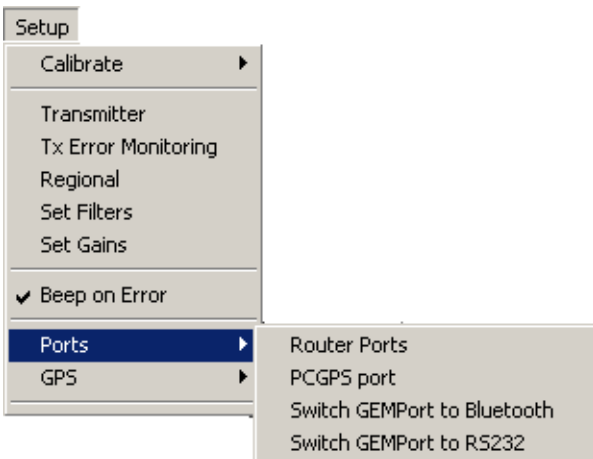


Chooses the final-stage amplifier gains for the GEM2. Instrument is calibrated for RX and BX gains = 10. Do not change the gain from these numbers unless a noisy environment is continuously overloading the instrument. Only then do you change the gains to equal smaller numbers (like 5 and 5) to see if that makes surveying possible.

Setup → Beep on Error

Tells WinGEM2 to generate sounds when an error condition is detected. Normally **ON**.

Setup → Ports



Setup → Ports → Router Ports

Used to route the GPS sensor serial data.

Setup → Ports → PCGPS port

Optional.

Setup → Ports → Switch GEMPort to ...

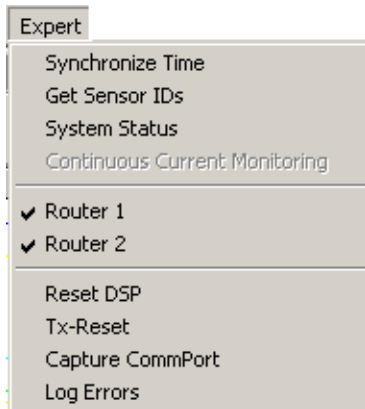
Switches GEMPort between Bluetooth and RS232 operation. Used with PC RS232 interface to switch GEMPort back to Bluetooth communications (used by the iPAQ).

Setup → GPS →

Optional.

Expert Menu

The following menu is available when [Show→Expert Menu](#) has been enabled and the transmitter is **ON**:



Expert→Synchronize Time

Commands all DSP boards to synchronize their clocks.

Expert→Get Sensor IDs

Causes WinGEM2 to go through the whole sensor ID initialization process normally seen when it starts up. The transmitter must be stopped for this option to be available.

Expert→System Status

Reads and displays the technical status of each Sensor DSP board for diagnostic purposes.

Expert→Continuous Current Monitoring

Opens a standard window showing the computed TX coil currents. Unlike [Show→Currents](#), window stays open and is updated every few seconds. Used for diagnostic purposes.

Expert→Router 1

Enables or Disables Data Router #1. Toggles ON/OFF. Normally **ON**. Used for diagnostic purposes.

Expert→Router 2

Enables or Disables Data Router #2. Toggles ON/OFF. Normally **ON**. Used for diagnostic purposes.

Expert→Reset DSP

Executes a soft-reset of all DSP's in the array. Not available (grayed-out) if transmitter is running. Used for diagnostic purposes.

Expert→Tx-Reset

Disables or Enables the Transmitter while the system is running. Captures the reference coil signal levels and phases the first time **Tx-Reset** is checked **ON** so that the ppm-equivalent noise levels can be seen in real time while the transmitter is **OFF**. The captured reference coil signal levels and phases **continue to be used** when **Tx-Reset** is unchecked **OFF** (turning the transmitter back **ON**.) The operator must stop transmitting (toggle **OFF** the **TRANSMIT** button) to restore normal operation of the GEM2. Used for diagnostic purposes.

Expert→Capture CommPort

Captures the raw incoming serial data from the GEM2 into a file on the PC. Asks for file name when first started. Click on **Expert→Capture CommPort** again to toggle serial data capture **OFF**. Normally **OFF**. The capture file (example: 1_15Oct07_215328.gem.cap) contains binary data for analysis.

Expert→Log Errors

Creates and Opens `DBG.log` for logging errors. Text file format. Diagnostic purposes.

Data Structure

The EM data is stored as a (*.CSV) file and can be viewed with Excel or imported to Geosoft or Surfer. If GPS is used with the system a Merger program is provided to locate the EM data with the X,Y coordinates of the GPS. Sample column represent the number of samples numerically incremented up to 65000 and rotate there after.

Line	Sample	Mark	Status	GPSStat	Time[ms]	I1_210Hz	Q1_210Hz	I1_750Hz	Q1_750Hz	I1_1470Hz	Q1_1470Hz	I1_5850Hz	Q1_5850Hz	I1_21690Hz	Q1_21690Hz	Q1_Sum
0	0	0	0	0	72601135	3.60E+03	-1.53E+02	3.66E+03	-2.92E+02	3.79E+03	-5.79E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	1	0	0	0	72601201	3.60E+03	-1.51E+02	3.66E+03	-2.91E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	2	0	0	0	72601268	3.60E+03	-1.49E+02	3.66E+03	-2.91E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	3	0	0	0	72601335	3.60E+03	-1.48E+02	3.66E+03	-2.92E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	4	0	0	0	72601401	3.60E+03	-1.48E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	5	0	0	0	72601468	3.60E+03	-1.48E+02	3.66E+03	-2.92E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	6	0	0	0	72601535	3.60E+03	-1.48E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	7	0	0	0	72601601	3.60E+03	-1.48E+02	3.66E+03	-2.89E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	8	0	0	0	72601668	3.60E+03	-1.48E+02	3.66E+03	-2.89E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	9	0	0	0	72601735	3.60E+03	-1.47E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	10	0	0	0	72601801	3.60E+03	-1.48E+02	3.66E+03	-2.90E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	11	0	0	0	72601868	3.60E+03	-1.47E+02	3.66E+03	-2.91E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	12	0	0	0	72601935	3.60E+03	-1.47E+02	3.66E+03	-2.92E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	13	0	0	0	72602001	3.60E+03	-1.47E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	14	0	0	0	72602068	3.60E+03	-1.47E+02	3.66E+03	-2.89E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	15	0	0	0	72602135	3.60E+03	-1.46E+02	3.66E+03	-2.91E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	16	0	0	0	72602201	3.60E+03	-1.46E+02	3.66E+03	-2.91E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	17	0	0	0	72602268	3.60E+03	-1.45E+02	3.66E+03	-2.90E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	18	0	0	0	72602335	3.60E+03	-1.46E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	19	0	0	0	72602401	3.60E+03	-1.46E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	20	0	0	0	72602468	3.60E+03	-1.46E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	21	0	0	0	72602535	3.60E+03	-1.46E+02	3.66E+03	-2.90E+02	3.79E+03	-5.78E+02	6.07E+03	-2.46E+03	3.57E+04	-1.04E+04	-2.12E+04
0	22	0	0	0	72602601	3.60E+03	-1.46E+02	3.66E+03	-2.89E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	23	0	0	0	72602668	3.60E+03	-1.45E+02	3.66E+03	-2.90E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04
0	24	0	0	0	72602735	3.60E+03	-1.45E+02	3.66E+03	-2.89E+02	3.79E+03	-5.77E+02	6.07E+03	-2.46E+03	3.57E+04	-1.05E+04	-2.12E+04

Sample of EM Data file

\$GPGGA	201002	3545.722	N	7839.372	W	2	7	1.2	81.967	M	-33.036	M	1	1023*78
\$GPGGA	201003	3545.722	N	7839.372	W	2	7	1.2	81.959	M	-33.036	M	1.4	1023*71
\$GPGGA	201004	3545.722	N	7839.372	W	2	7	1.2	81.962	M	-33.036	M	1.2	1023*7B
\$GPGGA	201005	3545.722	N	7839.373	W	2	8	1.1	83.329	M	-33.036	M	1	1023*70
\$GPGGA	201006	3545.722	N	7839.373	W	2	8	1.1	83.245	M	-33.036	M	1.4	1023*72
\$GPGGA	201007	3545.721	N	7839.373	W	2	8	1.1	83.597	M	-33.036	M	1.2	1023*74
\$GPGGA	201008	3545.721	N	7839.373	W	2	8	1.1	83.59	M	-33.036	M	1	1023*74
\$GPGGA	201009	3545.721	N	7839.373	W	2	8	1.1	83.765	M	-33.036	M	1.4	1023*73
\$GPGGA	201010	3545.722	N	7839.373	W	2	8	1.1	83.361	M	-33.036	M	1.2	1023*7E
\$GPGGA	201011	3545.721	N	7839.373	W	2	8	1.1	83.584	M	-33.036	M	1	1023*77
\$GPGGA	201012	3545.722	N	7839.373	W	2	8	1.1	83.645	M	-33.036	M	1.4	1023*7E
\$GPGGA	201013	3545.722	N	7839.373	W	2	8	1.1	83.607	M	-33.036	M	1.2	1023*78
\$GPGGA	201014	3545.722	N	7839.373	W	2	8	1.1	83.534	M	-33.036	M	1	1023*7D
\$GPGGA	201015	3545.722	N	7839.373	W	2	8	1.1	83.503	M	-33.036	M	1.4	1023*7D
\$GPGGA	201016	3545.722	N	7839.373	W	2	8	1.1	83.496	M	-33.036	M	1.2	1023*71

Sample of the GPS file

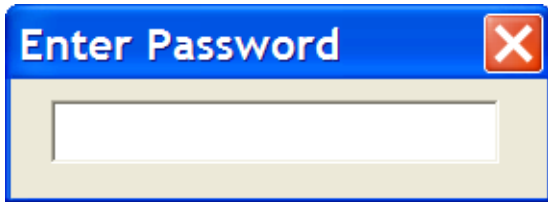
X	Y	GPSQ	GPSmsOfDay	I1_210Hz	Q1_210Hz	I1_390Hz	Q1_390Hz	I1_750Hz	Q1_750Hz	I1_1470Hz	Q1_1470Hz
711892.97	3960087.3	22	72992208	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.81E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992274	3.58E+03	-1.16E+02	3.61E+03	-1.44E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992341	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72992408	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992474	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72992541	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.81E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72992608	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992674	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72992741	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72992808	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992874	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72992941	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993008	3.58E+03	-1.16E+02	3.61E+03	-1.44E+02	3.64E+03	-2.79E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72993074	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.81E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72993141	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.81E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993208	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.77E+03	-5.71E+02
711892.97	3960087.3	22	72993274	3.58E+03	-1.16E+02	3.61E+03	-1.44E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993341	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993408	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.77E+03	-5.71E+02
711892.97	3960087.3	22	72993474	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.77E+03	-5.71E+02
711892.97	3960087.3	22	72993541	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.81E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993608	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72993674	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72993741	3.58E+03	-1.16E+02	3.61E+03	-1.44E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993808	3.58E+03	-1.16E+02	3.61E+03	-1.46E+02	3.64E+03	-2.81E+02	3.78E+03	-5.71E+02
711892.97	3960087.3	22	72993874	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72993941	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72994008	3.58E+03	-1.17E+02	3.61E+03	-1.45E+02	3.64E+03	-2.79E+02	3.78E+03	-5.72E+02
711892.97	3960087.3	22	72994074	3.58E+03	-1.16E+02	3.61E+03	-1.45E+02	3.64E+03	-2.80E+02	3.78E+03	-5.71E+02

Sample of "merged" GPS and data

WinGEM2 ADVANCED Menus

Passwords

Some of the WinGEM2 menu options require a password to gain access. This warns the operator away from commands that can reduce performance and/or damage the instrument if used improperly.



Standard Parameter Password(s)

"1234" – unlocks parameter once for changing. Must re-enter next time parameter is accessed. This is recommended password to use; it doesn't disable future warning passwords.

"geophex" or "ff" – special for development and testing; unlocks all future parameter password requests until WinGEM2 is exited. Not recommended for normal use.

Transmitter Operating Current Password

Changing the Transmitter Operating Current to any setting above 10 amps requires a special password, independent of the above passwords: "ignore". Do not go above the design limit of 10 amps unless otherwise authorized by Geophex engineers.

Configuration

Changing power line frequency and averaging factor

The GEM2 provides base frequencies for operation: 25Hz and 30Hz. These are used in environments where AC power generation at 50Hz or 60Hz is expected. The odd harmonics of the base frequency (75, 125, 175, ... Hz for a 25Hz base frequency example) provide quiet bands to transmit and listen on. The even harmonics can be monitored for presence of activity in the local environment (power lines, generators.)

Use **Setup→Regional** to choose which base frequency to operate with.

Check the **Allow even harmonics** box if passive monitoring of power line harmonics will be used. Clicking **OK** starts the process of updating all the sensor DSP's for operation at the new base frequency.

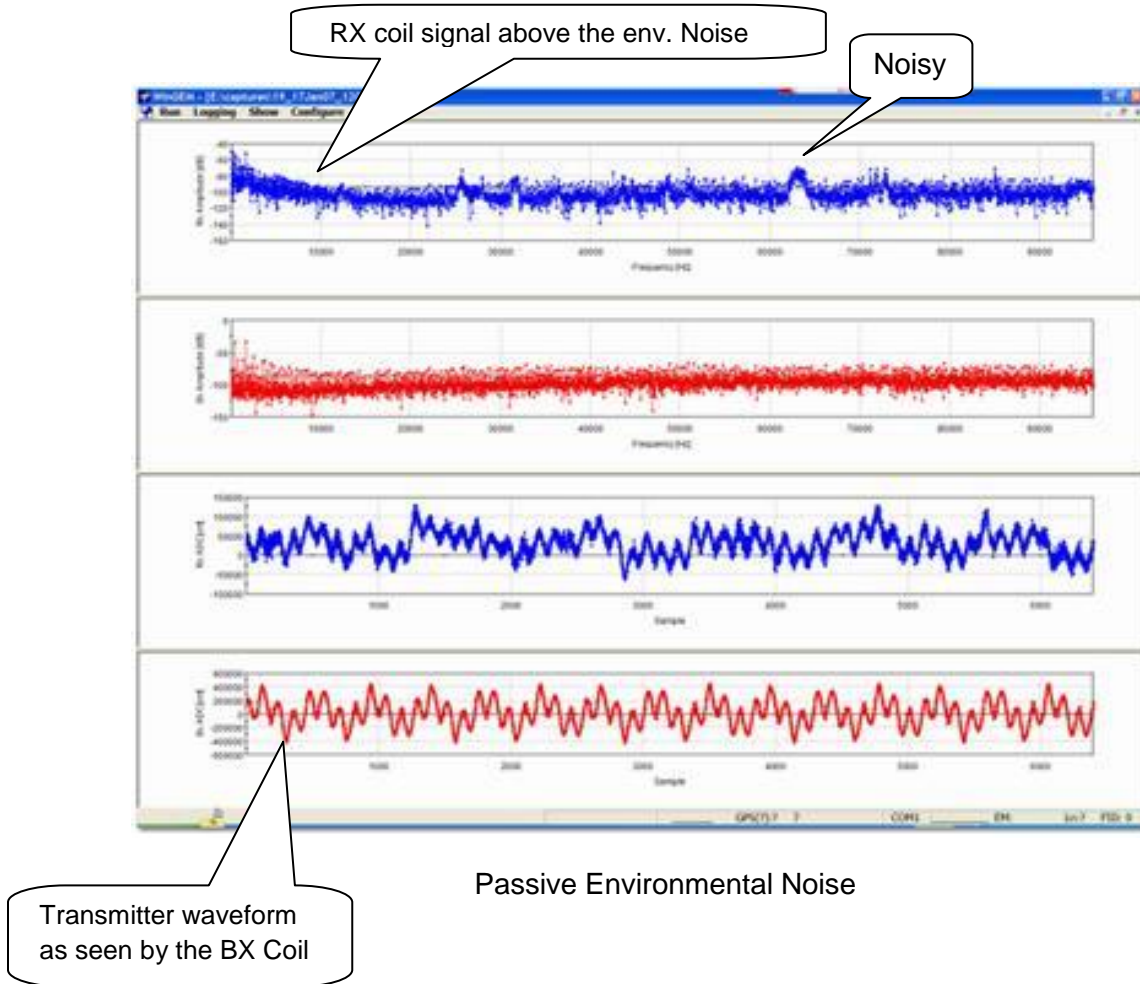
Checking for Interference

With the transmitter stopped, choose which sensor (or all sensors) to sample. Then use **Run→Passive Env. Noise Spectrum** to collect the local noise spectrum with the transmitter off. The time series data samples are collected and stored in the directory previously used by the **Store** function. The time series file names have (.RXBX.ts) appended to the standard name (example: `3_08Oct07_110933.ID03.RXBX.ts`.)

When all the data is collected, the first sensor's data is automatically displayed using **Run→Modules→Time Series**. When finished viewing that sensor's graphs, close the window (inner [X] button in the upper right-hand corner of the window) to return to the main display. To view another sensor's graphs, use **Run→Modules→Time Series** to open a file selection window and choose another (.ts) time series file to display. Remember, all the (.ts) files collected at the same time will have the same numeric prefix (`3_08Oct07_110933_` in these examples).

Look for spikes and bumps in the RX frequency spectra plot to locate signs of interference. Zoom in and use the cursor position within the graph to identify single or bands of frequencies to avoid

(transmitting) or monitor (passive receiving.)



Passive and active monitoring

Use [Run→Passive Env. Noise spectrum](#) and [Run→Active Env. Noise Spectrum](#) to view and check the signals reaching the GEM2 sensor coils ([Run→Modules→Time Series](#) processes and displays the raw time series data collected by these functions.)

Calibration

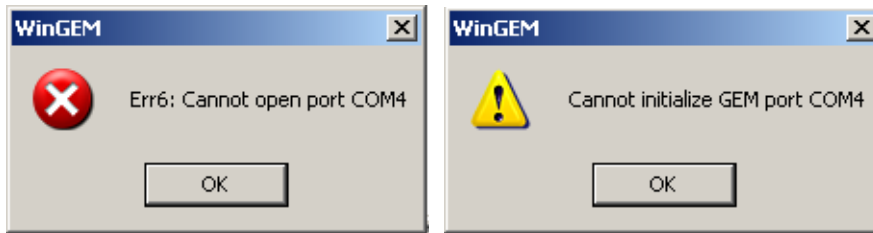
Use [Setup→Calibrate→Ferrite](#) to check and recalibrate each sensor one-at-a-time. Select a single sensor in the Survey window first, then go through the calibration procedure, following the prompts on the screen for putting the ferrite rod IN and OUT for the selected sensor coil.

Troubleshooting

Starting WinGEM2

No COM port

When WinGEM2 starts, it looks for the PC serial I/O COM port assigned to the GEM2. This is an external RS-232—to—USB adapter plugged into the PC's USB port. If it is not plugged in, you will see the following error messages, one after the other:



Click on OK for both messages. Then, if you just want to run a post-processing module, do so.

If you want to run the GEM2, then exit WinGEM2 and plug in the serial I/O adapter. After the PC finds and connects to the adapter, restart WinGEM2 to continue.

If you get this error message and the adapter is attached to the PC, exit WinGEM2. Unplug the adapter and see if the PC acknowledges its removal. Then plug the adapter back in and see if the PC finds it. If it does, restart WinGEM2 and proceed.

If you continue to get this error message after exiting and restarting WinGEM2, then do a power shutdown of the PC (cold reboot) to reset the hardware and try again. This is necessary only when WinGEM2 exits abnormally without freeing the COM port and the operating system thinks it's still in use.

Finally, if the PC won't shut down (power off), you may need to hold down the PC's power button for at least 5 seconds to force a shutdown. This is the last resort, as you may lose information if files were open for data storage.

Running WinGEM2

Continuous storing not working

WinGEM2 seems to store data for a period of time, then stops (and the **Pause/Ln** button appears pressed down.)

To solve: go to **Logging→Momentary Storing** and reset the interval to 0 seconds, disabling momentary storing.

Closing and re-starting WinGEM2 also disables momentary storing.

Appendix A: Quick Verification Procedure—Single Ferrite

The quick verification procedure can be done at any time following these steps:

1. Start the transmitter running and let it stabilize.
2. With the transmitter running, activate the **Null EM** button (de-activate it first if it was already on for a previous sensor.) The Survey and FrequencyGraph plots should all go close to zero.
3. Position the ferrite rod at the long end of the ski (away from the console). Stand it on end, about 3 inches in from the end of the ski, in the center of the ski.
4. Observe the plots with the ferrite rod present. All the inphase responses should be fairly noticeable and of the same magnitude for all frequencies. All the quadrature responses should be close to 0 for all frequencies.

Calibration is done using this same process, except **Setup→Calibrate→Ferrite** is used to compute and store new ferrite calibration values.