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Instruction Manual

GK-405

Vibrating Wire Readout

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1. INTRODUCTION

The GK-405 Vibrating Wire Readout is made up of two components:

- The Readout Unit, consisting of a Windows Mobile handheld PC running the GK-405 Vibrating Wire Readout Application
- The GK-405 Remote Module is housed in a weatherproof enclosure and connects to the vibrating wire gage to be measured.

Figure 1 - GK-405 with Handheld PC in Cradle (Shown with the FPC-2)

The two components communicate wirelessly using Bluetooth®, a reliable digital communications protocol. The Readout Unit can operate from the cradle of the Remote Module (as shown in Figure 1) or, if more convenient, can be removed and operated up to 20 meters from the Remote Module. (Note: In most cases 20 meters will be the maximum but differences in battery, atmospheric and geographic conditions may reduce the actual effective range.)

1.1 Features

Rugged, general purpose, reliable readout based on a Windows Mobile handheld PC:

- All the benefits of a Windows compatible device (Windows file system, RS-232, USB and wireless connectivity)
- Long battery life
- Ease of use

Lightweight and simple Remote Module:

- Lithium battery (8+ hours of continuous use)
- One button operation; automatic power down when Bluetooth connection is dropped or after several minutes of inactivity
- Reliable connection to standard vibrating wire gages and load cells is accomplished via two 10-pin bulkhead connectors (see Figure 2)
- Housed in a durable aluminum enclosure

Figure 2 - Vibrating Wire Gage and Load Cell Connectors (Shown with the FPC-1)

1.2 GK-405 Accessories

The GK-405 is sold with the following accessories:

- GK-403-2 flying leads
- CHG-04 universal charger
- Universal power adapter
- Three replacement fuses

1.3 GK-405 Vibrating Wire Readout Application

The GK-405 Vibrating Wire Readout Application (GK-405 VWRA) installs and runs on a ruggedized handheld PC (see Figure 3) and is designed to communicate via Bluetooth with Remote Modules connected to vibrating wire gages.

Figure 3 - Handheld PC (FPC-2) Running GK-405 VWRA

1.4 Before using the GK-405 Vibrating Wire Readout

The readout software runs as an application under Windows Mobile 5 or 6 operating system installed on a handheld PC.

- Please familiarize yourself with the handheld PC and the Windows Mobile OS.
- It is assumed in the instructions below that you can launch applications from the Start button including File Explorer and the Bluetooth Settings manager.
- It is assumed that you can tap the keyboard icon as needed and use the onscreen keyboard to enter text and numbers.

2. INSTALLATION AND OPERATION

NOTE: For those users that have purchased a complete GK-405 system the Field PC has been pre-programmed to operate with the GK-405. This includes the Bluetooth pairing between the Field PC and the GK-405.

The steps described in Sections 2.1 and 2.2 are an attempt to guide the user through the process of launching the GK-405 VWRA, connecting to the sensor, and taking a reading. If all parts of the GK-405 are purchased as a system, Geokon makes every effort to ensure that the system is completely set up and working before it leaves the factory. Other times, the user may already own the handheld PC and are setting up their hardware and software for the very first time. The steps below attempt to cover all cases and refer the user to the appropriate section when more information is needed.

For those users that have purchased a complete GK-405 system, a workspace with the name of "GK405" will have been predefined and the handheld unit will already be paired with the Remote Module. Note that the workspace name can be changed at any time (see Section 4) or new ones can be created (see Section 3.4). When purchasing a GK-405 system, Sections 2.2 through 2.4 can possibly be skipped but a quick review is recommended.

2.1 Connecting Sensors

2.1.1 Sensors with 10-pin Connectors Attached

Align the grooves on the sensor connector (male), with the appropriate connector on the readout (female connector labeled senor or load cell). Push the connector into place, and then twist the outer ring of the male connector until it locks into place. For more information on the sensor connectors of the remote module, refer to Appendix A.

2.1.2 Sensors with Bare Leads

Attach the GK-403-2 flying leads to the GK-405 by aligning the grooves on connector of the flying leads (male), with the connector on the unit (female). Push the connector into place and then twist the outer ring of the male connector until it locks into place. Attach the bare leads of a Geokon vibrating wire sensor by connecting each of the clips on the leads to the matching colors of the sensor conductors, with blue representing the shield (bare).

2.2 Initial Quick Start Sequence

The following steps are a guide to the typical operation of the GK-405 and, if followed, should result in a successful sensor measurement:

1) If the Remote Module has been previously paired with the handheld unit, then press the button labeled "POWER ON (BLUETOOTH)". A blue light should turn on and begin blinking, signifying that the Remote Module is waiting to connect to the handheld unit.

If the Remote Module was purchased separately from the handheld unit, see Section 2.3, “Establishing Contact with the Remote Module”.

Launch the GK-405 VWRA by tapping on “Start” from the handheld PC’s main window, then tap “Programs”, and then tap the GK-405 VWRA icon (shown to the right).

If the GK-405 Vibrating Wire Readout Application has not been installed, please see Section 2.4, “Installing the GK-405 VWRA”.

2) After a few seconds the Live Readings Window will be displayed (Figure 4). If the window shown in Figure 5 is displayed instead of the Live Readings Window, please refer to Section 2.5, “Starting the Vibrating Wire Readout the first time”. If the Live Readings Window is displayed but no Thermistor or Vibrating Wire output is shown, please refer to Appendix A, “GK-405 Connections”.

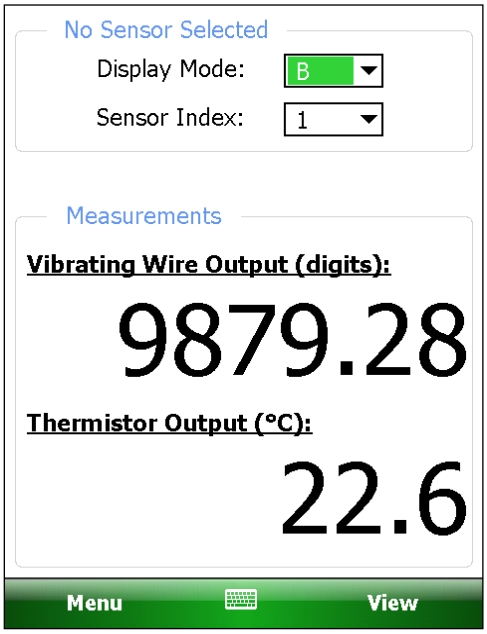

Figure 4 - Live Readings – Raw Readings

Figure 5 - Select Workspace Name

3) From the Live Readings Window, different display modes may be selected as appropriate for the sensor (see Section 3.2.1, “Display Mode”). If a sensor is connected that contains more than one vibrating wire “cell”, the “Sensor Index” may be changed to view the vibrating wire output for each “cell”, or the average may be displayed.

4) If displaying sensor output in engineering units is desired, tap on “View” then “Sensor Selection Screen” to select a predefined sensor or to create a new sensor configuration. Please refer to Section 3.3, “Sensor Selection Screen” as well as, Section 4.2, “Sensor Configuration”.

5) To close the GK-405 VWRA from the Live Readings Screen, tap “Menu” then “Close GK-405”.

2.3 Establishing Contact with the Remote Module

In general, this should only need to be done once and is typically done before it leaves the factory. Follow the steps below to ensure the 'partnership' with the remote is established before using the readout software:

1) Use the Bluetooth Settings Manager on the handheld PC to set up the link to the remote. Read about setting up a Bluetooth "partnership" in Chapter 9 of the handheld PC's Reference Guide. See Figure 6 below for two examples of how to start Bluetooth Manager.

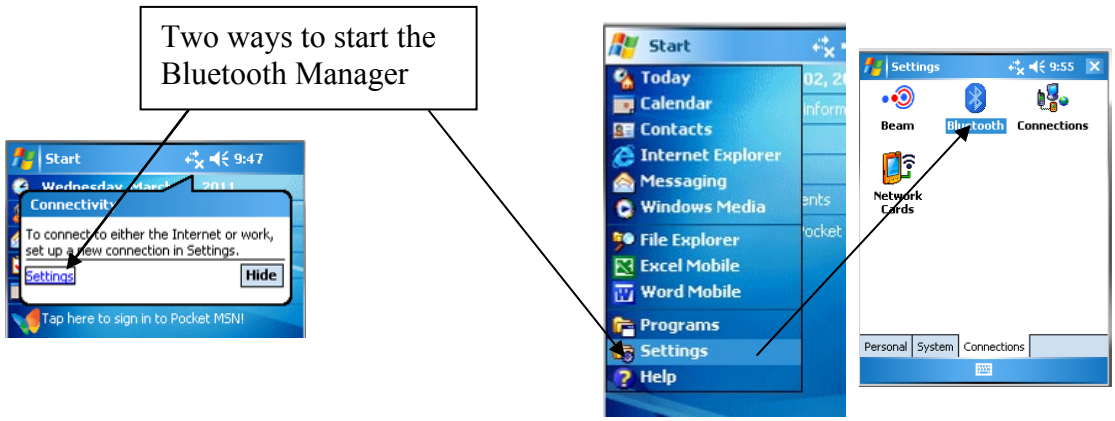

Figure 6 - Starting Bluetooth Manager

2) Once in the Bluetooth Settings Manager, click on the "Mode" tab and then make sure that the box next to "Turn on Bluetooth" is checked (Figure 7).

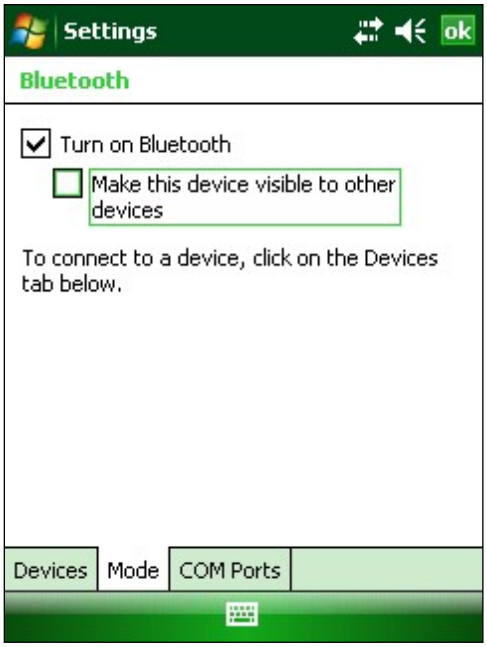

Figure 7 - Turn on Bluetooth

3) Click on the “Devices” tab, if it shows a “Geokon” device (name will start with “GK405” and contain the remote’s serial number), go to step six. Otherwise, turn on the remote module (should see a blue indicator on the remote) and select “Add new device…”.

Figure 8 - Add New Device

4) When a suitable remote is discovered, highlight the device and tap “Next”.

Figure 9 - Select a Bluetooth Device

5) A prompt will be displayed for a password; tap “Next”. If a partnership with the device is successfully established, the screen will momentarily display the prompt shown at the bottom of Figure 10 and then return to the Bluetooth Devices screen. Click “Cancel” on the Enter Passcode screen then click “Done”.

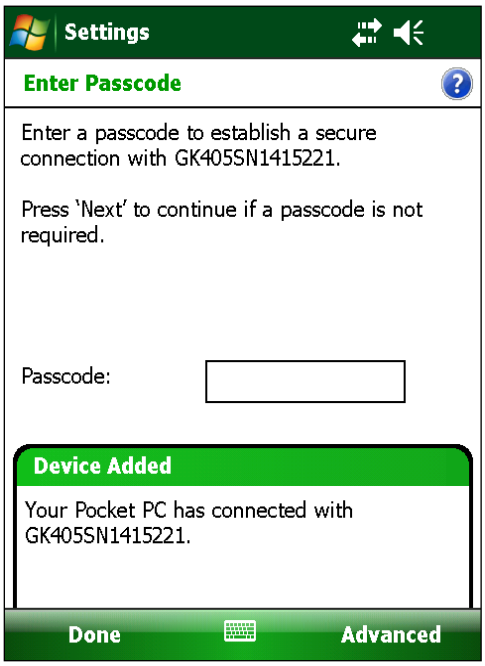

Figure 10 - Enter Passcode

6) Click on the COM Ports tab, if the “Geokon” device is already assigned to a COM Port skip to step nine. If no COM Port is assigned, tap on “New Outgoing Port”. In the example shown in Figure 11, there is no COM Port assigned to a “GK405” device.

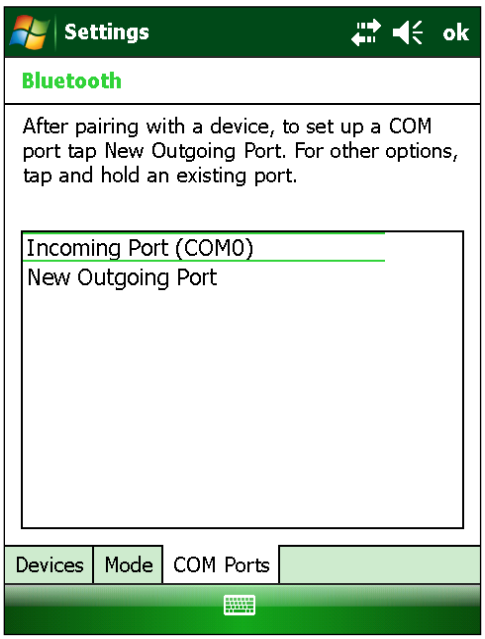

Figure 11 - New Outgoing Port

7) The screen shown in Figure 12 will be displayed. Select the appropriate device from the list and tap “Next”.

Figure 12 - Add a Device

8) From the “Port:” dropdown list, select a COM port (COM5 is the default). Be sure to remember the number of the COM port as you may have to select it later in the readout software (see Section 3.5.3). Make sure to “uncheck” the “Secure Connection” checkbox (Figure 13). Tap “Finish” when done to return to the Bluetooth Settings “COM Ports” screen. **Note:** If using a Nautiz X7, COM5 may be available, depending on the model.

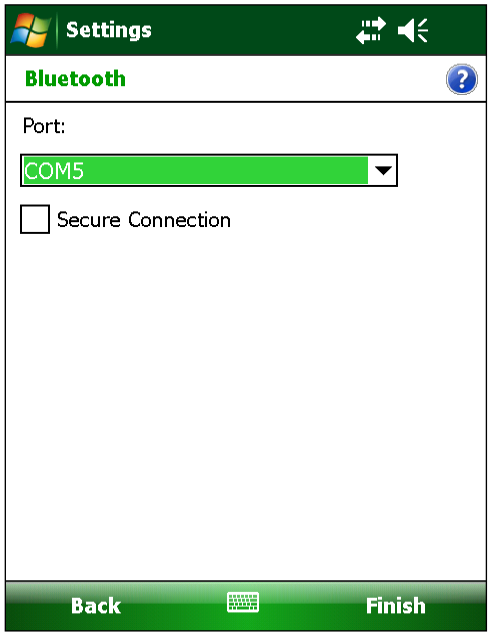

Figure 13 - COM Port Selection

9) Lastly verify that the Bluetooth device is set for Serial Port operation. From the "Devices" tab of the Bluetooth Settings manager, tap the device to be used to communicate with the remote. Figure 14 will be displayed. Ensure that the "Serial Port" checkbox is checked. Tap "Save" to complete the Bluetooth Settings.

Figure 14 - Serial Port Check Box

NOTE: After "Save" is selected, you will be brought back to the "Devices" window. There will be a "Connect" button available at the bottom of the screen. See Figure 15 below.

DO NOT USE THE "CONNECT" BUTTON TO TEST THE CONNECTION!

It will always fail after the pairing has been made successfully. Test the pairing by entering the GK-405 VWRA application.

Figure 15 - Connect Button

2.4 Installing the GK-405 VWRA

The installation of the GK-405 VWRA requires the following:

- A Handheld device (HHD) running Windows Mobile Classic 5.X (6.X recommended) or higher with at least 50 Mbytes of free memory.
- HHD must be Bluetooth enabled and able to assign a Bluetooth connection to a COM port.
- Windows .NET 3.5 Compact Framework (CF) and .NET framework English Language Messages Package installed on HHD.
- Both "CAB" file installers are included in the GK-405 VWRA installer "Zip" file, available on Geokon's website (http://www.geokon.com/GK-405).
- Microsoft ActiveSync version 4.5.0 or higher installed on the host PC if host PC operating on Windows XP (see Figure 16). If host PC's operating system is Vista, Windows 7 or Windows 8 then Windows Mobile Device Center should be installed on the host PC (Figure 17 on the following page). An active connection between the host PC and the HHD must be established either via a physical link or Bluetooth.

Note: For customers using a PC running Window 10 operating system; Windows Mobile Device Center (WMDC) may no longer operate as it should because of an operating system update (released October of 2017) called "Fall Creator Update". If WMDC no longer launches when a mobile device is connected via USB cable or will not manually launch, the link below should help fix the issue. Please note that administrative privileges are need to launch some of the files involved in the fix so your local IT person may need to be involved. The fix can be accessed via the following link:
https://www.handheldgroup.com/support-rugged-computers/knowledgebase-KB/22996/

Should the link above fail to fix the WMDC launch problem, the link below offers another possible solution:
http://www.junipersys.com/Juniper-Systems-Rugged-Handheld-Computers/support/Knowledge-Base/Support-Knowledge-Base-Topics/Desktop-Connection-ActiveSync-or-Windows-Mobile-Device-Center/WMDC-in-Windows-10

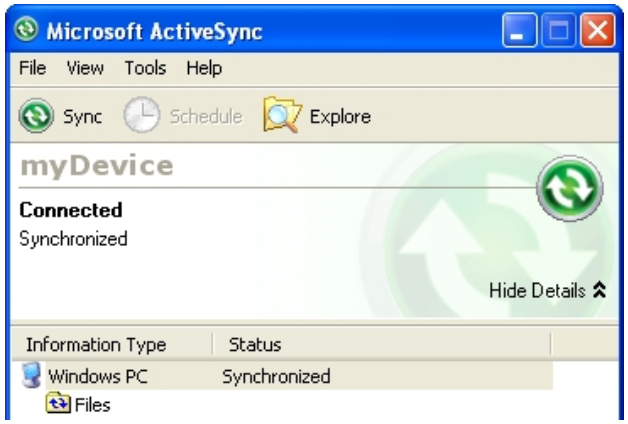

Figure 16 - ActiveSync Window Showing Active Connection

Figure 17 - Windows Mobile Device Center

2.4.1 Launching the GK-405 Installer

1) From the Windows Mobile Device Center window on the PC (see Figure 17 above) click on the folder icon labeled “Browse the contents of your device” to call up an Explorer Window for the HHD (see Figure 18). The procedure for ActiveSync is very similar.

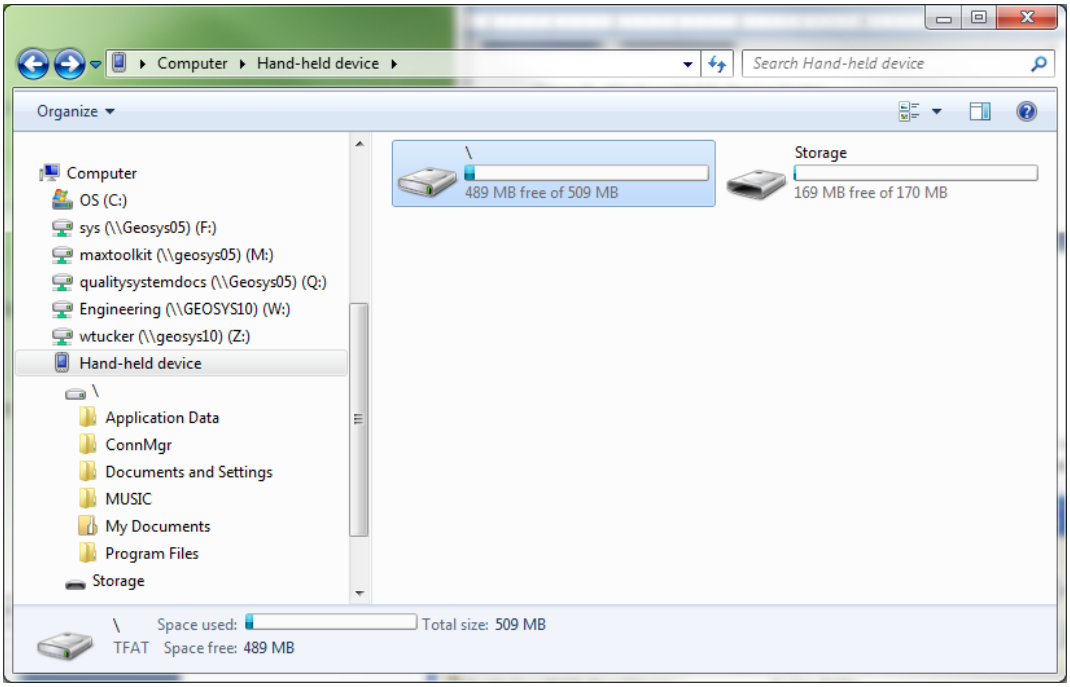

Figure 18 - Windows Explorer Window Displaying HHD Root Folder

2) In the Explorer Window, double-click the icon labeled “\” to navigate to the handheld PC’s system root shown in Figure 19.

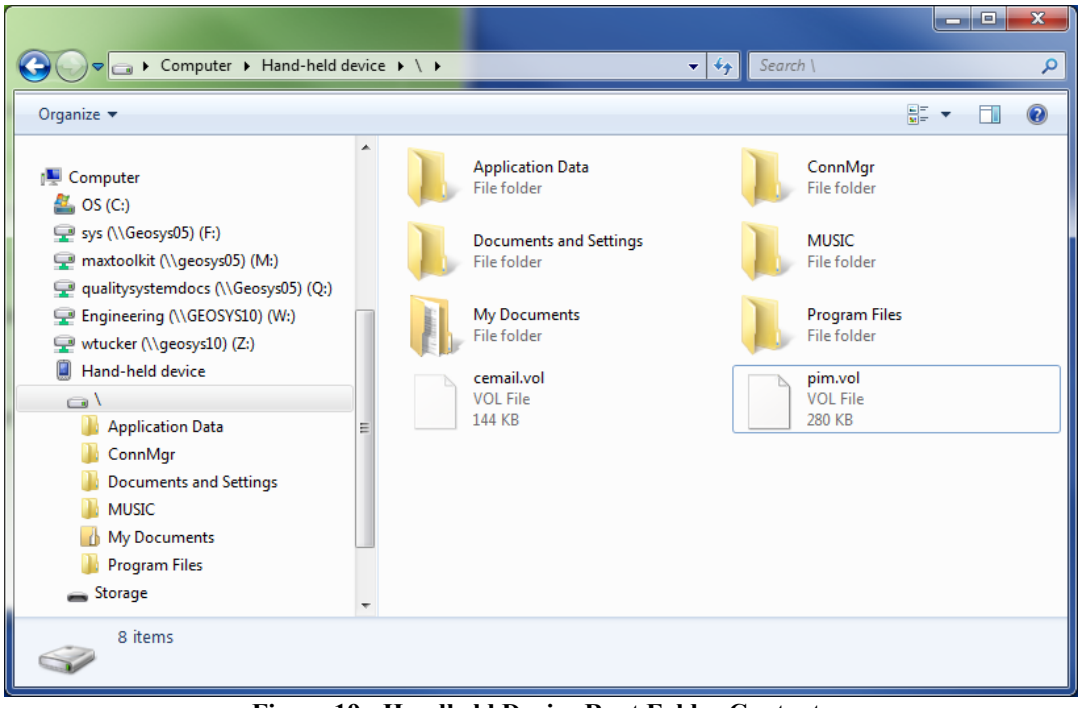

Figure 19 - Handheld Device Root Folder Contents

3) Unzip the installer (downloaded from Geokon's website), open a new Windows Explorer window, and then navigate to the root folder of the installation folder (Figure 20).

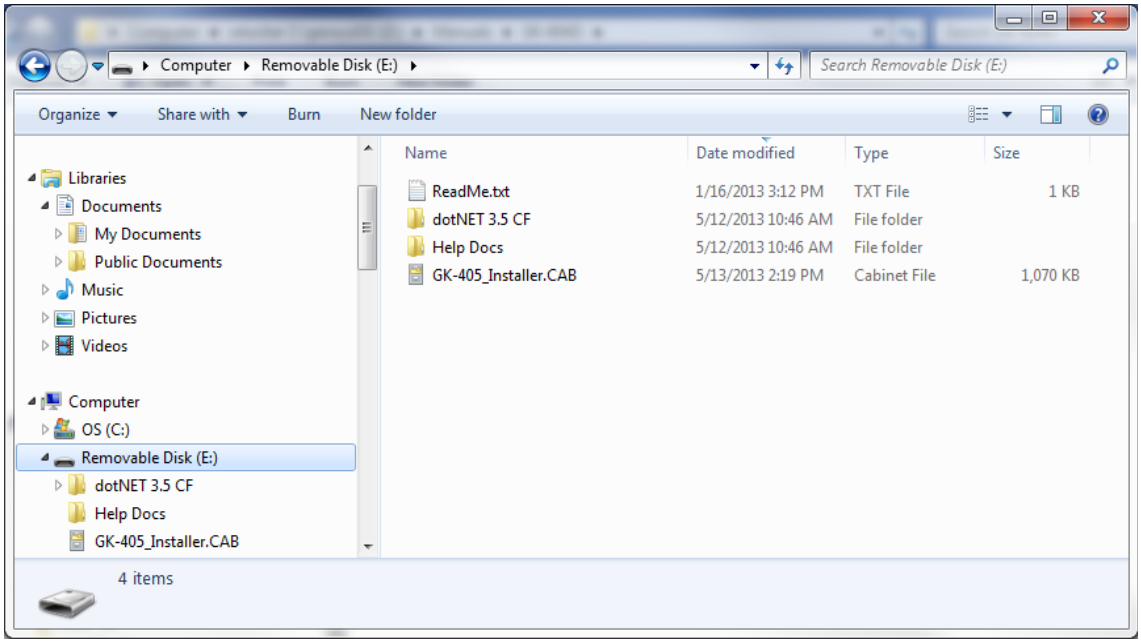

Figure 20 - Installation Folder Contents

4) Copy the file, "GK405_Installer.CAB" from the installer folder to the HHD system root folder. From the HDD, navigate to the system root folder using File Explorer (Figure 21) and tap the file, "GK405_Installer" to execute the installer.

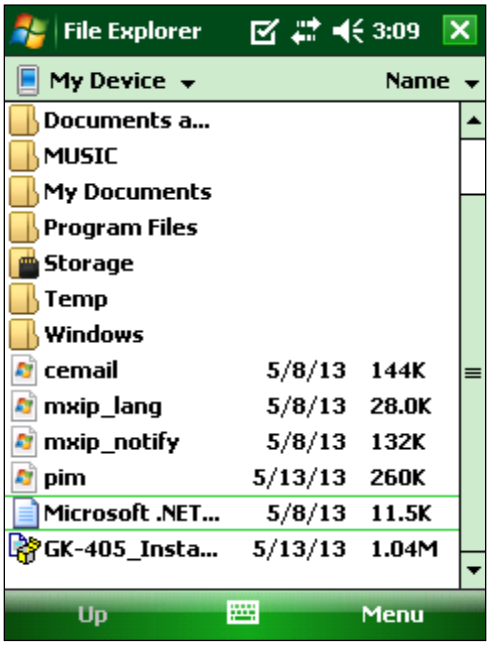

Figure 21 - GK-405 Installer at Root of HDD

5) If there is a storage card installed in the HHD then the user will be prompted to choose the location for the installation (Figure 22). It is recommended that “Device” be selected then tap “Install” with the stylus to initiate the install process.

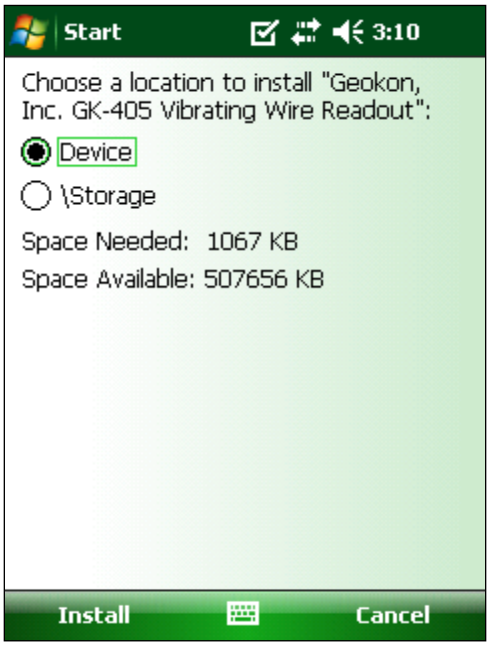

Figure 22 - GK-405 Install Screen

6) The file, GK405_Installer.CAB can be now deleted from the system root folder to free up memory. The GK-405 VW Readout application is now installed and its icon should appear in “Start->Programs” (Figure 23).

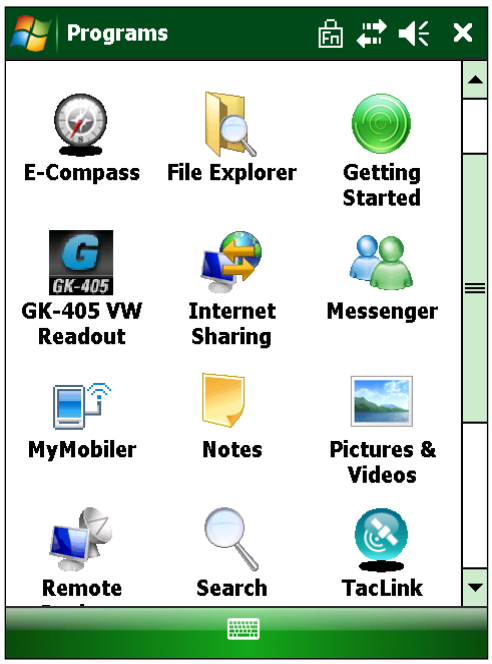

Figure 23 - GK-405 VWRA Icon in Start->Programs

2.5 Starting the Vibrating Wire Readout the First Time

The readout software is launched by tapping the Start button (or clicking Programs) and then selecting the GK-405 icon (shown on the right).

When starting the GK-405 Vibrating Wire Readout Application (GK-405 VWRA) for the first time, you will be prompted to create a workspace name (Figure 24). The workspace name can be any combination of letters and numbers and should be descriptive in nature. After creation, this name will be displayed in the Project Explorer window.

Figure 24 - Select Workspace Name

Once the name of the workspace is selected, you will be prompted to choose or create a folder on your handheld device where all the workspace elements will be stored (Figure 25). As can be seen below, the default workspace location is in a folder name the same as the workspace name under a special shared folder reserved for workspaces. For Windows Mobile devices, this folder is located at: \Application Data\Geokon\GK-405\Workspaces.

GK-405 VWRA appends the name of the new workspace to this shared folder (see Section 5) and uses it as the default location for the new workspace. The user is free to select their own location, either by entering it directly, or the Browse button (...) may be used to navigate to a different folder location or to create a new folder (see below). This workspace location will be stored in the GK-405 VWRA configuration for subsequent application access. After workspaces are created, all future user access to workspaces is always by name.

Figure 25 - Workspace Folder Selection

Note: If the newly selected workspace folder contains an existing workspace, GK-405 VWRA will display a dialog asking the user if they want to import the workspace as is or to rename it with the previously specified new workspace name (Figure 26).

Figure 26 - Workspace Exists

After the initial workspace is created, the GK-405 VWRA will attempt to connect to a remote module. If no remote module can be found, then the error message shown in Figure 27 will be displayed. By default, the GK-405 VWRA looks for a remote module connection on COM5, but will remember the COM number of the last successful connection. Please see Section 2.3 for more information regarding establishing a connection with the remote module.

If the connection attempt is unsuccessful, the newly created workspace will be opened by default and you will be able to create new project(s) and add new sensor configurations to your workspace (Figure 28).

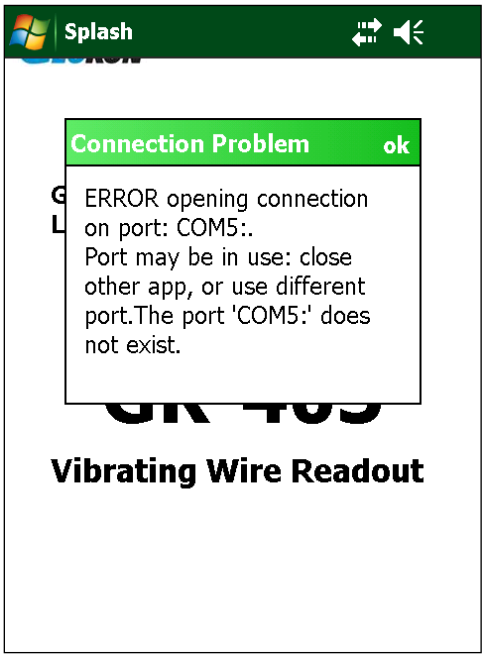

Figure 27 - Remote Module Not Found

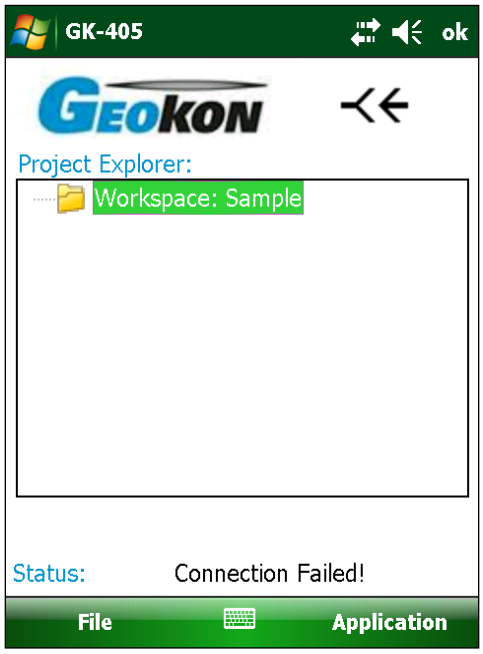

Figure 28 - Default Initial Screen

Note: With all subsequent attempts to connect to the Remote Module, please ensure that the "Power On" button on the Remote Module has been pressed (blue light will be on) before launching the GK-405 VWRA.

3. USER INTERFACE

3.1 Overview

Following a successful Bluetooth connection, the GK-405 VWRA will boot up displaying the screen shown in Figure 29. This is the Live Readings screen and it is shown in “Raw Readings” mode, meaning that output will be displayed in “raw” form (usually digits) since no sensor has been selected to supply parameters for engineering unit display. The following sections describe the GK-405 VWRA user interface in detail.

3.2 Live Readings Screen – Raw Readings

Figure 29 shows a typical vibrating wire piezometer output in digits and thermistor output in degrees Celsius.

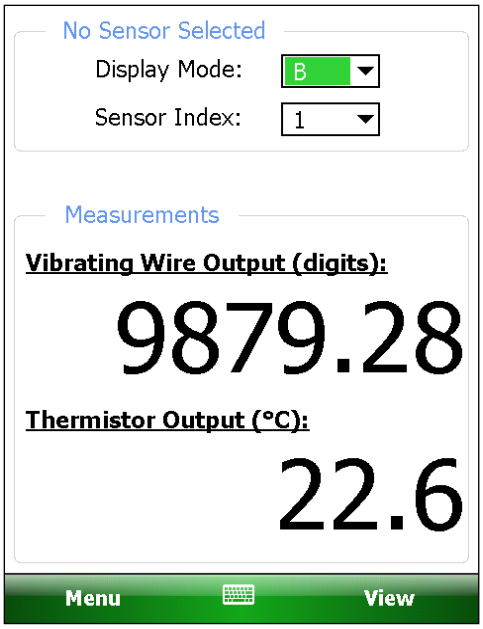

Figure 29 - Live Readings – Raw Readings

In “Raw Readings” mode, the two onscreen controls that control gage measurement are “Display Mode” and “Sensor Index”.

3.2.1 Display Mode

Display Mode selects preprogrammed parameters, which are optimized for different gages. Each option has different scaling and processing characteristics. Figure 30 depicts the options available from the Display Mode dropdown menu. See Table 1 to determine the best choice for the sensor to be measured.

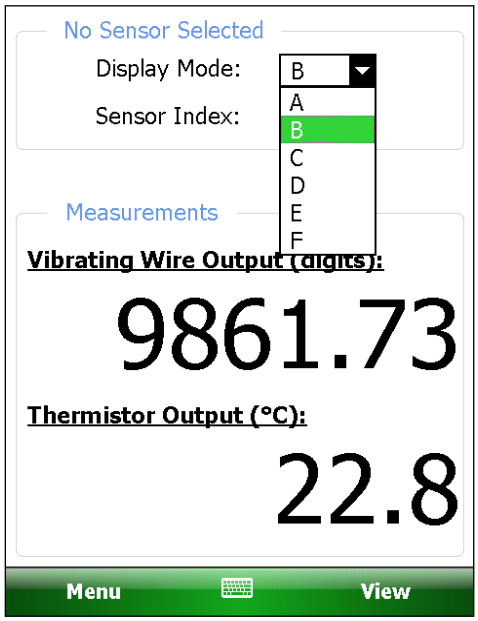

Figure 30 - Display Mode Dropdown Menu

Display Mode	Geokon Model #	Calculation	Units	Sweep Freq.(hz)
A	All	Period, T	Microseconds	450-6000
B	4300BX, 4400, 4500,4600, 4700,4800,4900	F2 x 10-3 [(1)]	Digits	1400-3500
C	4000	F2x10-3x4.062	Microstrain	450-1200
D	4200	F2x10-3x3.304	Microstrain	450-1200
E	4100	F2x10-3x0.39102	Microstrain	1400-3500
F	4300EX	F2 x 10-3	Digits	2500-6000

Table 1 - Display Mode options (A-F)

Notes:
[1] F = 1 / T

3.2.2 Sensor Index

Some Geokon instruments are comprised of more than one sensor. For instance, a Geokon load cell may contain three, four, or six individual vibrating wire sensors per load cell. The Sensor Index control (shown open in Figure 31) allows reading the individual sensors in an instrument as well as an average of all sensors.

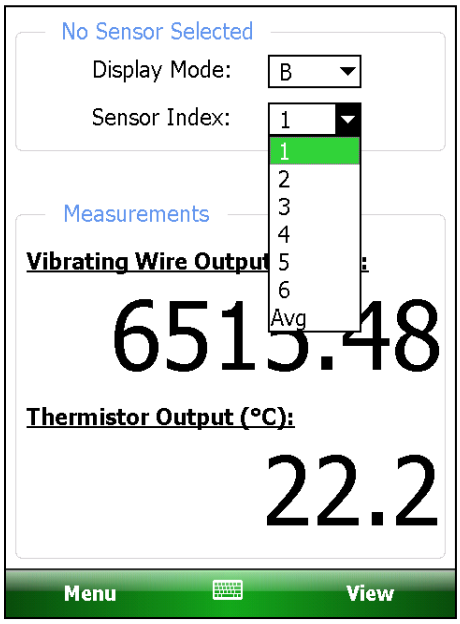

Figure 31 - Sensor Index Dropdown Control

In addition to the controls described in Sections 3.2.1 and 3.2.2, Menu Options (Figure 32) and View Options (Figure 33) allow functionality such as storing, saving and viewing data. In "Raw Readings" mode, the only Menu Option enabled is "Close GK-405" while valid View Option choices are "Sensor Selection Screen" (described further in Section 3.3) and "Landscape Mode". "Landscape Mode" and its converse, "Portrait Mode", allow the orientation of the screen to be changed.

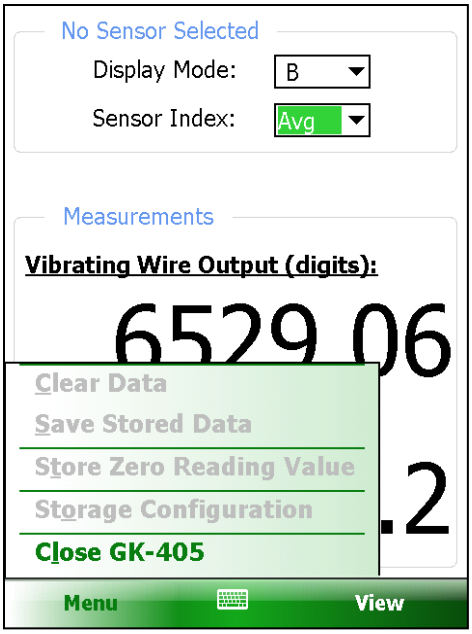

Figure 32 - Menu Options

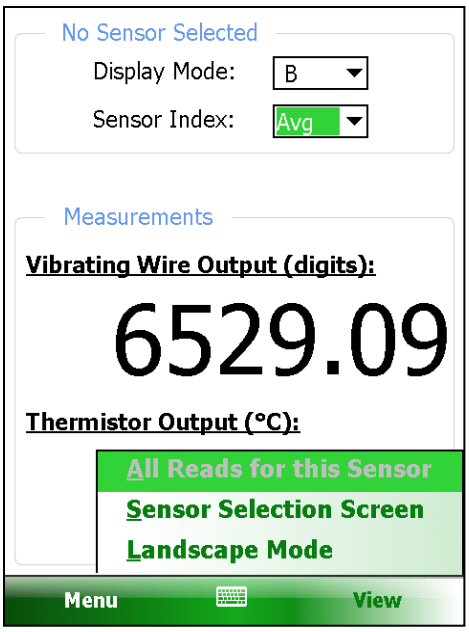

Figure 33 - View Options

3.3 Sensor Selection Screen

The Sensor Selection Screen (Figure 34) contains a number of navigation controls designed to make job of selecting application elements and functions easier. These navigation controls present an organizational view of the active workspace, inform the user about the state of the application, and provide the user with tools to configure and control Geokon devices.

Figure 34 - Sensor Selection Screen

The Sensor Selection Screen is comprised of several core components:

Project Explorer:	Element selection tool. Context (dropdown) menu. See Section 3.4.
Application Menu:	Allows display changes, workspace, project and sensor configuration as well as connection to the remote module. See Section 3.5.
File Menu:	File and project explorer element exporting and importing. Data file viewing and deleting options. See Section 3.6.
Status Area:	Displays the connection status of the application.

Table 2 - Sensor Selection Components

Note: While the operator is using the functions and features of the Sensor Selection Screen, the Remote Module may timeout and drop the Bluetooth connection after about six minutes to conserve battery power. This is normal and the connection can easily be restored using "Remote Connect with…" Application menu option (see Section 3.5.3 for more information).

3.4 Project Explorer

The Project Explorer is the primary navigation mechanism for moving around the GK-405 VWRA workspace. The Project Explorer presents a view of the workspace, which includes projects and sensors. These views reflect the hierarchical relationship between these elements. The highest element in the workspace hierarchy tree is a project. Projects allow a GK-405 VWRA user to group sensors into organizational units based on the user's preference. A project can reflect a specific site where sensors have been installed such as a construction project. This organizational feature makes it easy to find sensor configurations along with related data files. The list of sensors defined under the project (Figure 35) can be viewed by selecting a specific project and expanding its branch in the explorer view by clicking on the + sign preceding project name.

In the hierarchy of the project explorer, sensors are child elements of a project. Sensor settings can be edited by selecting the desired sensor in the explorer tree. Once selected, sensor settings can be displayed using “Edit Settings” from the context menu (see Section 3.4.1.5 below) or by using the Application Menu (see Section 3.5).

Figure 35 - Project Explorer with Expanded Projects

3.4.1 Context Menu

From the Project Explorer, new workspace elements can be added by using the context menu. Access the dropdown menu by tapping and holding the explorer element that is to be operated on. A menu is then displayed that is context sensitive in that, based on the current selection, the appropriate elements will be enabled, and others will be disabled. Figure 36 below shows the dropdown menu with the menu item, “Add Sensor”, enabled (not grayed out) since a “project” element is selected in the Project Explorer. Additional information for each context menu item is described in the subsections below.

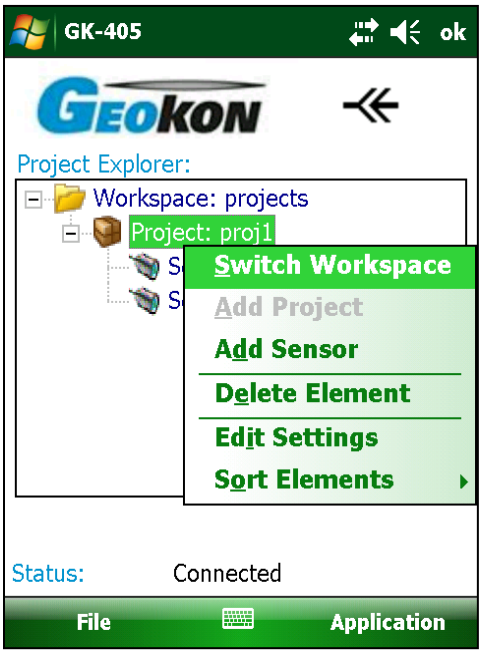

Figure 36 - Context Menu

3.4.1.1 Switch Workspace:

Use this context menu item to open any previously opened workspace, select a workspace from the file system, or create a completely new workspace. Click this menu item to display the Workspace Selection window (Figure 37). Click on the dropdown control to display the available workspaces (Figure 38).

Figure 37 - Workspace Selection Window

Figure 38 - List of Workspace Names

Alternatively, a new name can be entered in the workspace name selection box. If the GK-405 VWRA recognizes the name as a workspace it has opened before, it will reopen the existing workspace.

If the workspace name is new to the GK-405 VWRA then a workspace folder selection window is displayed (Figure 39). Select the appropriate folder (or use the default) and a new workspace is created with the name entered above.

Figure 39 - Workspace Folder Selection

3.4.1.2 Add Project

This menu item allows new projects to be created and added to a workspace. After tapping on this Context Menu item, the Project Settings Dialog will be displayed and can be edited. See Section 4.1 for more information regarding project configuration. This menu item will only be enabled when the workspace is selected.

3.4.1.3 Add Sensor

This menu item allows new sensor configurations to be created and added to a project. After tapping on this Context Menu item, the Sensor Settings Dialog will be displayed and can be edited. See Section 4.2 for more information regarding sensor configuration. This menu item will only be enabled when a project is selected.

3.4.1.4 Delete Element

Project Explorer Elements can be deleted using this Context Menu item. A confirmation dialog will be displayed before the element is deleted.

3.4.1.5 Edit Settings

This menu item allows configuration editing of the selected Project Explorer Element. See Section 3.5.2 for more information regarding configuration editing.

3.4.1.6 Sort Elements

Project and Sensor explorer elements can be sorted by newest or oldest first by selecting the appropriate "Sort Elements" sub-item (Figure 40).

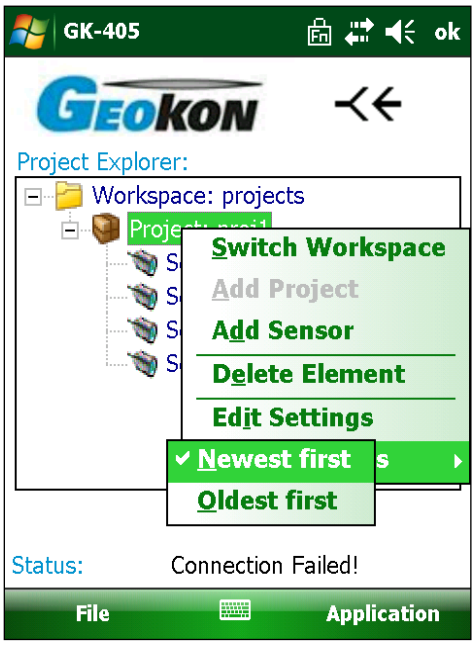

Figure 40 - Sort Elements Sub-Items

3.5 Application Menu

The GK-405 VWRA Application Menu provides access to the high-level application functionality. It is located in the lower, right corner of the main window frame (Figure 41). The "Edit Settings" menu item can also be accessed via the context menu.

Figure 41 - Application Menu

3.5.1 Live Readings- With Selected Sensor

This menu item will only be enabled if a successful connection has been established with the remote module. A successful connection is indicated by the icon to the right of the "Geokon" label as well as, a status of "Connected" at the bottom of the main screen. Both of the connection indicators are shown inside red ovals in Figure 42 (see Section 2.3 and 3.5.3 for information regarding connecting to the remote module).

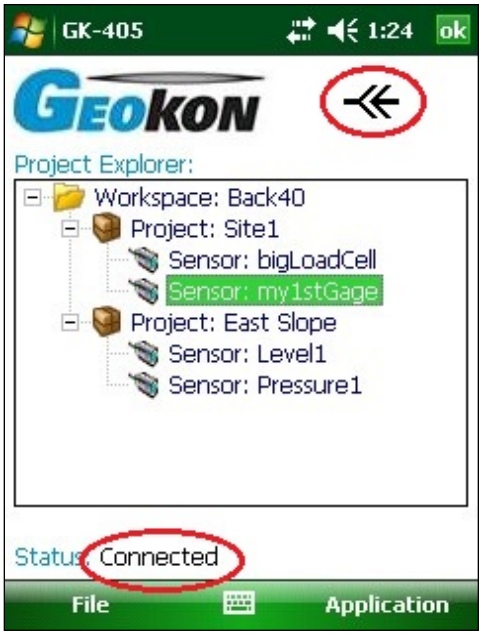

Figure 42 - Sensor Selection Screen, Remote Module Connected

Tapping on the "Live Readings" menu item displays the sub-menu shown in Figure 43. Tap on "With Selected Sensor". (For information on the "Raw Readings" option, see Section 3.2.)

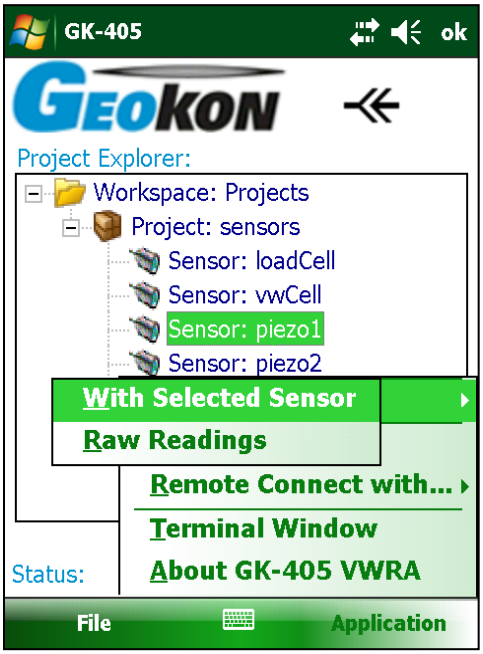

Figure 43 - Live Readings Menu Selections

Tapping this menu item will cause the Live Readings screen to be displayed with its parameters initialized for the specific sensor selected (Figure 44). Please refer to Appendix A for information regarding sensor connections.

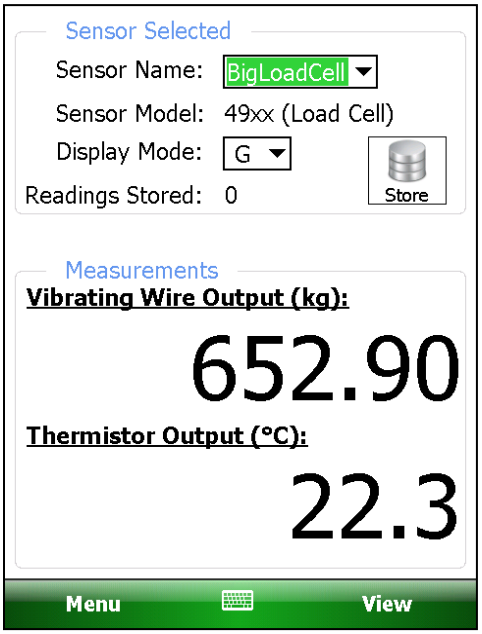

Figure 44 - Live Readings Screen (Sensor Selected)

Much like in "Live Readings – Raw Readings" (See Section 3.2), Display Mode contains selections "A – F", corresponding to different sensor "pluck" frequencies (see Table 1). The "Live Readings - With Selected Sensor" window also contains a "G" selection for Display mode (the default when entering this window) which cause the raw sensor output to be converted to engineering units. (See Section 4.2, "Sensor Configuration", for more information on engineering units.)

Note that when a sensor is selected, Live Readings contains a "Store" button (shown on the right) that allows multiple readings to be stored for a particular sensor. With each tap on this button, a new reading is stored for the selected sensor. Each time a reading is stored, a "beep" will be heard from the handheld unit.

A different sensor can be selected for measurement by accessing the dropdown box to the right of the "Sensor Name:" label. The new sensor can be chosen from the list of all sensors in the project.

3.5.1.1 Menu Options

The Menu options may be opened by clicking on “Menu” in the lower, left corner of the screen (Figure 45). The available Menu options are outlined below.

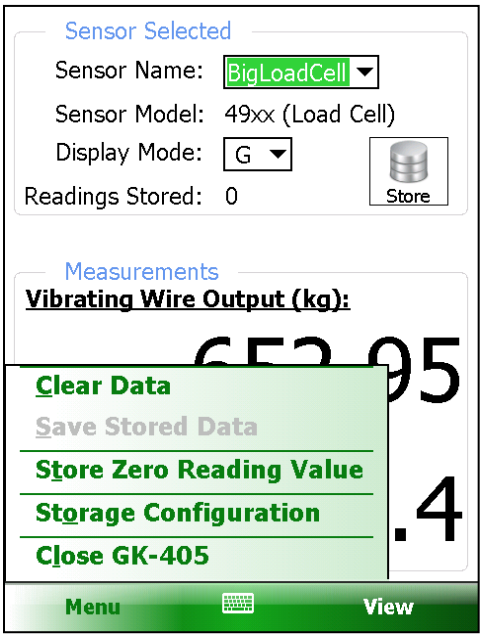

Figure 45 - Menu Options

Clear Data: Allows clearing of all readings stored (in the current session) for the selected sensor. Tapping this menu option displays the warning shown in Figure 46. Tapping “Yes” will clear all data (from the current session) and will reset the “Readings Stored:” counter to “0”. This feature has no effect on previously saved data.

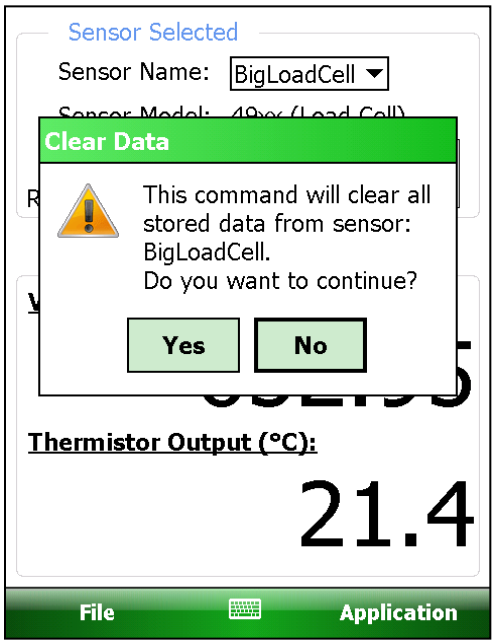

Figure 46 - Clear Data Warning

Save Stored Data: Saves all stored data (from the current session) for the selected sensor. A message is displayed informing the user how many readings were stored. The "Readings Stored:" counter will also be reset to "0". The readings are saved to a file contained in a special data folder under the sensor configuration folder structure. The readings are either saved to a new data file or appended to an existing data file. Please refer to the "Storage Configuration" section below for more information.

Store Zero Reading Value: This feature allows the currently displayed reading to be used and the sensor configuration's "Zero Reading" value. When this menu item is tapped, a snapshot of the current reading is taken and converted to digits. Before storing this raw value in the sensor configuration, a confirmation dialog is displayed giving the user the opportunity to see the value before continuing.

Storage Configuration (Figure 47**):** Under the grouping of "Auto Store Settings" are two parameters that allow multiple readings to be taken over time. Select "Auto Store: Enable" as well as an interval in seconds to enable readings to be stored periodically without intervention from the user. At any time this feature can be turned off by selecting "Auto Store: Disable" and tapping "Save".

Under the grouping of "Data Saving Settings" is a parameter that determines whether data is appending to a previous data file or if a new file is created each time stored data is saved. As shown in Figure 47, the last saved data file is displayed when the "Append to Previous File" is selected. The "Last saved data file" has no meaning if "When saving data:" is set to "Create New File" and is not shown.

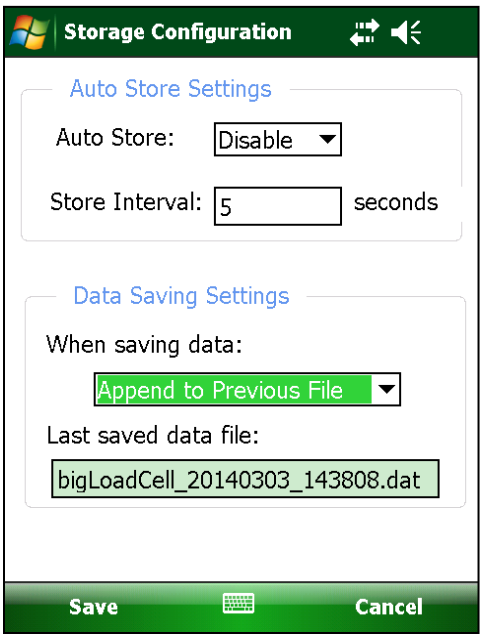

Figure 47 - Storage Configuration Dialog

Close GK-405: Shuts down the application and breaks the connection to the Remote Module. The user will be given the opportunity to save any stored data (from the current session).

3.5.1.2 View Options

The View options may be opened by clicking on "View" in the lower, right corner of the screen (Figure 48). The available View options are outlined below.

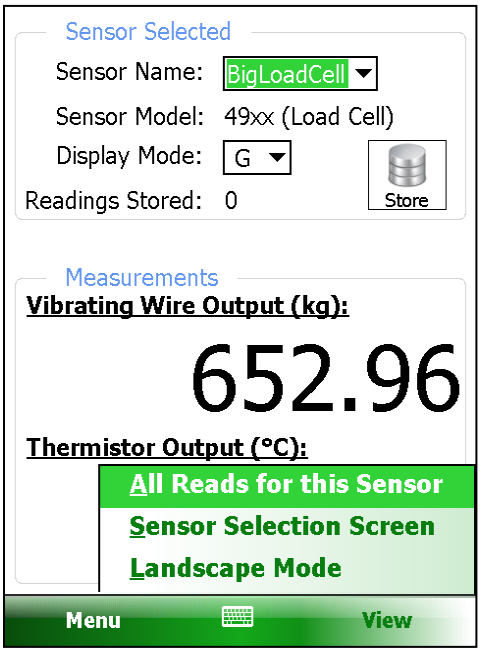

Figure 48 - View Options

All Reads for this Sensor: This feature displays a window showing all stored reads for the selected sensor in the current session (Figure 49). The display is an abbreviated version of one used in Section 3.6.4, "View Data"; only the date and time, sensor read (in engineering units) and temperature will be displayed.

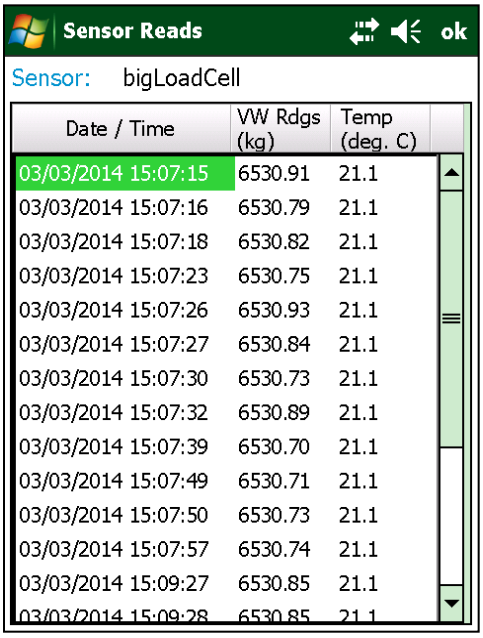

Figure 49 - Displayed Sensor Readings

Sensor Selection Screen: This option returns operation to the "Sensor Selection Screen" where other sensors may be selected, edited, or created. See Section 3.3 for more information.

Landscape Mode: This "View" option and its converse, "Portrait Mode", allow the orientation of the screen to be changed. Figure 50 shows the "Live Readings – With Selected Sensor" screen in "Landscape Mode".

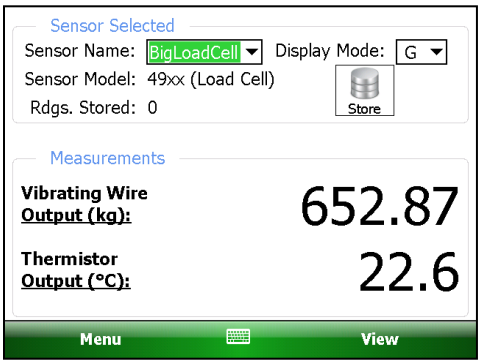

Figure 50 - Live Readings - With Selected Sensor (Landscape Mode)

3.5.2 Edit Settings

As with the Context Menu (Section 3.4.1), tapping the "Edit Settings" menu will invoke the Settings Editor for the currently selected Project Explorer element. See the Section 4.1, "Project Configurations" for more information on these settings.

3.5.3 Remote Connect with…

If the application displays the status, "Connection Failed" as shown in Figure 51 and Figure 52 at any time, the steps listed on the following page should be taken.

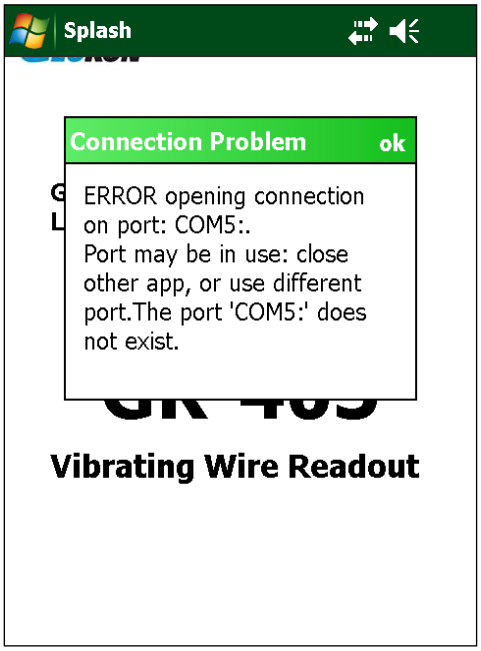

Figure 51 - Remote Module Not Found

Figure 52 - Default Initial Screen

1) Make sure the remote is turned on (blue light on).
2) Select the "Application" menu option "Remote Connect with" (Figure 53) and pick the COM port previously established in Section 2.3 (Figure 54).

Figure 53 - Remote Connect With...

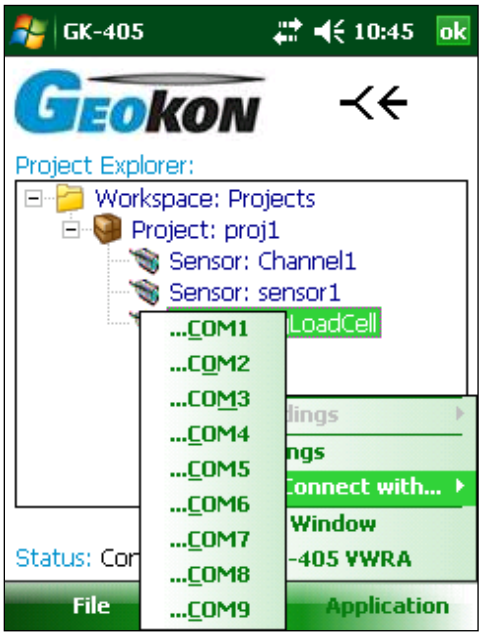

Figure 54 - Select COM Port

A successful connection is reflected in the Main Screen status as shown by the red ovals in Figure 55.

Figure 55 - Sensor Selection Screen, Remote Module Connected

3.5.4 Terminal Window

This feature requires an active Bluetooth connection to the Remote Module. If enabled, tapping this menu option calls up the screen shown in Figure 56. Using the "Terminal Window" requires the use of the onscreen keyboard to enter simple one or two character commands to the Remote Module. See Appendix C for more information regarding the Remote Module command structure.

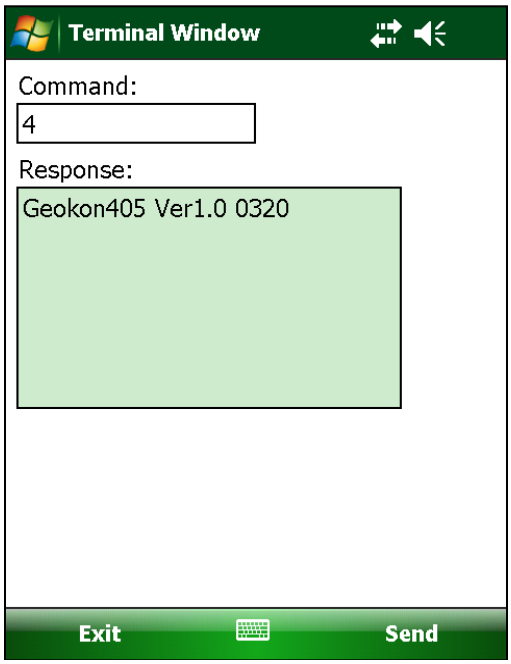

Figure 56 - Terminal Window

After typing a command in the "Command:" text box, tap the "Send" menu to issue the command to the Remote Module. Repeated taps of "Send" will reissue the same command. Typing a command in the "Command:" text box, followed by a keyboard "Enter" will cause the Remote Module to execute the command one time only.

3.5.5 About GK-405 VWRA

Select this option to show the details of the GK-405 VWRA operating system.

3.6 File Menu

The file menu may be opened by clicking on “File” in the lower, left corner of the screen (Figure 57). The file menu is used to import and export Project Explorer element settings along with data export, viewing and report generation. It also is used to delete previously saved sensor data files.

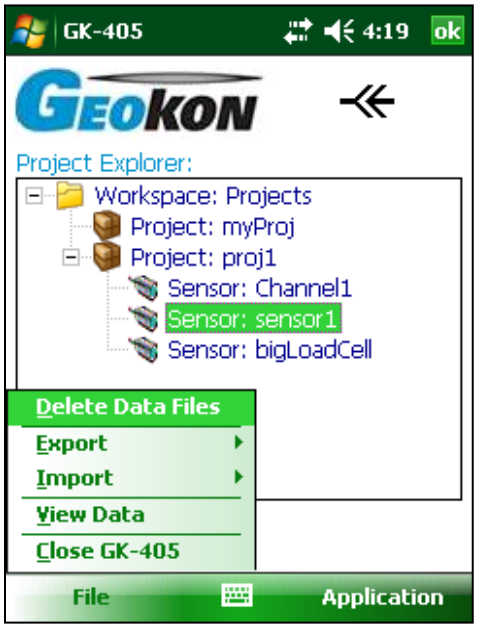

Figure 57 - File Menu Options

3.6.1 Delete Data Files

If a sensor is selected and contains data files, then tapping on the “Delete Data Files” File Menu option displays the window shown in Figure 58. Select one or more individual files or use the “Select All Files” checkbox to select all files. Tapping on “Select” will cause the GK-405 VWRA to prompt the user to confirm that they really want to delete the selected files. Tap on “Yes” to finish the deletion.

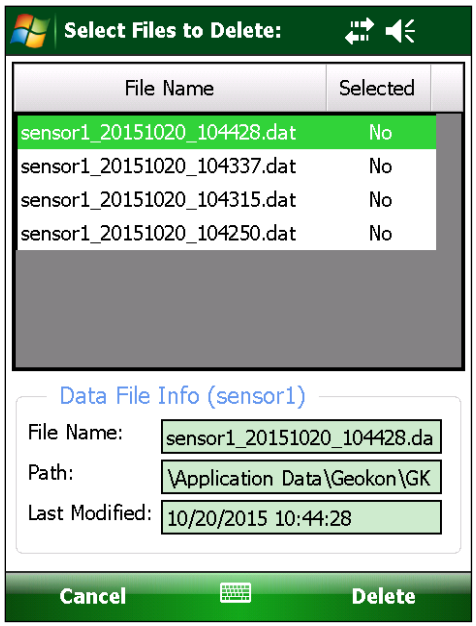

Figure 58 - Delete Data Files Window

3.6.2 Export Menu

The Export menu is used to export sensor data and project element settings to a folder of the user's choosing (Figure 59).

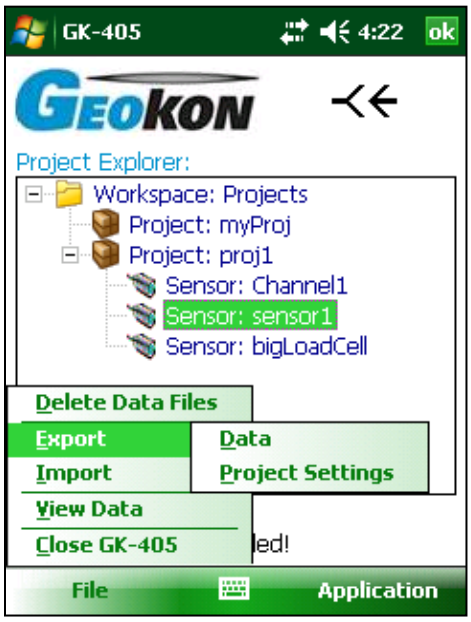

Figure 59 - Export Menu

3.6.2.1 Export Data

The Export Data Menu Option allows exporting of data from the current sensor, selected via the Project Explorer. Figure 60 shows the files available for sensor, "bigLoadCell". A file may be selected (or deselected) by tapping in the "Select" column. Multiple files may be selected for exporting. If a selected file name is too long to fit in the "File Name:" text box, tap inside the text box and use the arrow keys on the handheld's external keypad to scroll left or right.

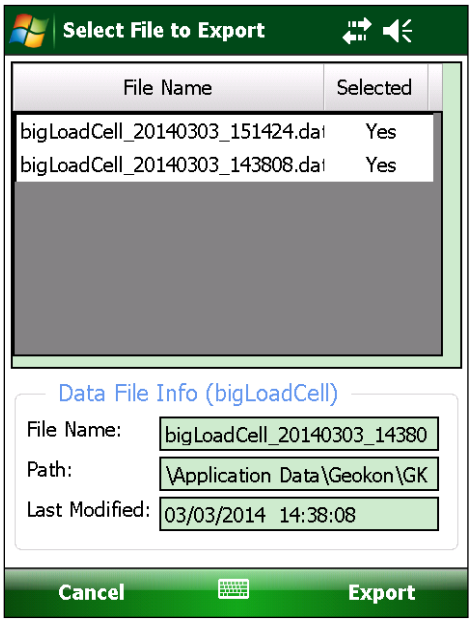

Figure 60 - Export Data Window

Once all the desired files are selected, tap “Export” to display the “Save File” window (Figure 61) where a new name and folder may be specified for each file. If more than one file was selected then a checkbox is displayed allowing the same folder to be used for each file, if desired.

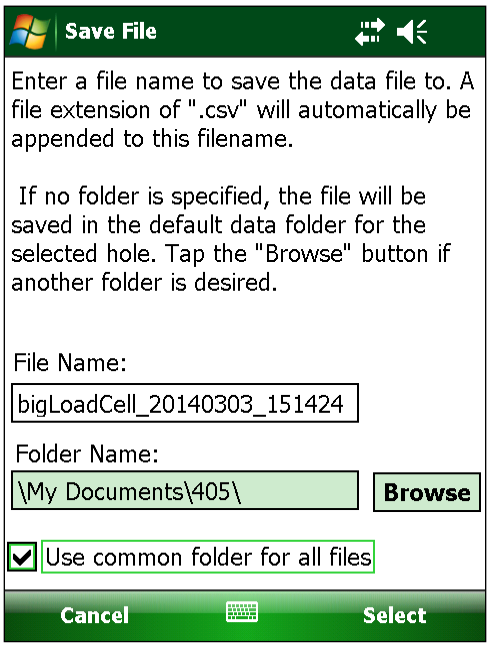

Figure 61 - Save File Window

After all the paths for each file have been specified, the Extended Format window will be displayed (Figure 62).

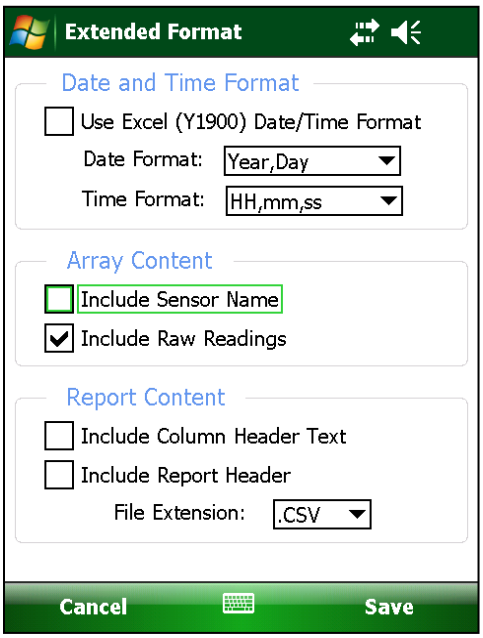

Figure 62 - Extended Format Window

The Extended Format Window allows additional formatting options to be applied to the data before exporting. These options are described on the following page.

Date and Time Format: If the "Use Excel (Y1900) Date/Time Format" checkbox is checked, the Date and Time format dropdown controls below it will be disabled. The date and time is saved in a numeric format that can be readily formatted in MS Excel and is equal to the number of seconds since 1/1/1900 (the fractional part amounts to the elapsed time, the day the measurement took place). If the "Use Excel (Y1900) Date/Time Format" checkbox is not checked, the Date and Time formats can be individually set via their respective dropdown controls.

Array Content: The array content can be changed to include or exclude the sensor name as well as the raw readings (the default selection) (before conversion by the gage factor) of the sensor. Some Geokon sensors may contain up to six individual vibrating wire gages, therefore checking "Include Raw Readings" will add seven additional columns (six cells plus the average) to the export data.

Report Content: The data "report" can be changed to include or exclude column header text as well as report header text. Please refer to Appendix D for an example of column header and report header text. The file extension for the generated file can also be changed from ".csv" to ".txt". If ".txt" is selected as the data file extension, then all the column data will be separated by tabs instead of commas. If ".csv" file extension is selected and Regional Settings of the handheld unit are not set to "English (United States)" then all column data will be separated by a semicolon (;) instead of a comma (,)

In addition to exporting data files from a single sensor, an entire project's worth of data can also be exported. If a project element is selected (in the Project Explorer) when "File" menu item, "Export – Data" is tapped, the initial window shown will be a dialog similar to the Export Data window (Figure 60 above), but instead of selecting files, the dialog window allows the user to select the sensors that data will be exported from (Figure 63).

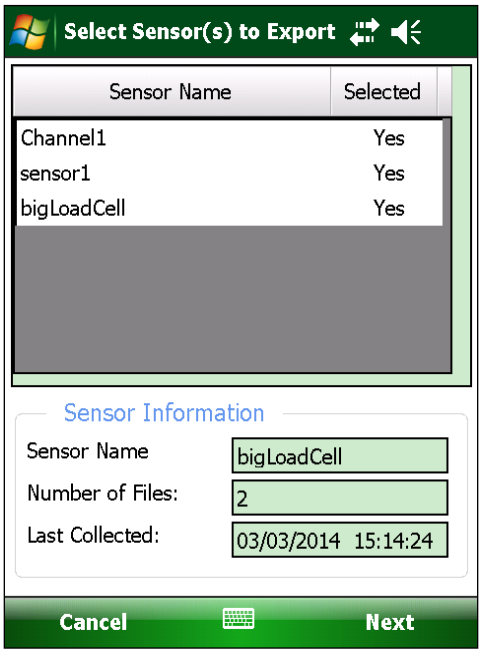

Figure 63 - Select Sensor(s) to Export

After selecting the appropriate sensors for export, tap on “Next” to display a dialog allowing an export folder to be selected, as well as other export “mode” parameters (Figure 64).

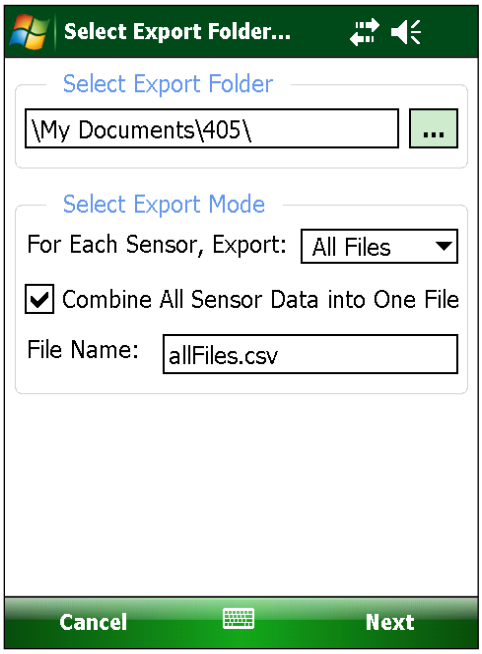

Figure 64 - Select Export Folder and Mode

The mode parameters allow export “All Files” or only the “Newest File” for each sensor. Additionally, all eligible files can be combined into one export file if desired. If “Combine All Sensor Data into One File” is not “checked” then no file name selection is possible and multiple data files will be formatted and exported to the export folder.

Tapping “Next” again displays the same “Extended Format” dialog as for single sensor data export. See Figure 62 above and the accompanying description for more information about Extended Formatting.

3.6.2.2 Export Project Settings

Clicking on this menu item displays the “Select Export Path” window, from which a path to export the project settings file can be chosen (see Figure 65 below).

All sensor configurations and their respective data files within the project are compressed into a single export file. The naming format for the project export file is: `<Selected Path> + <Project Name> + ".lvpe"`

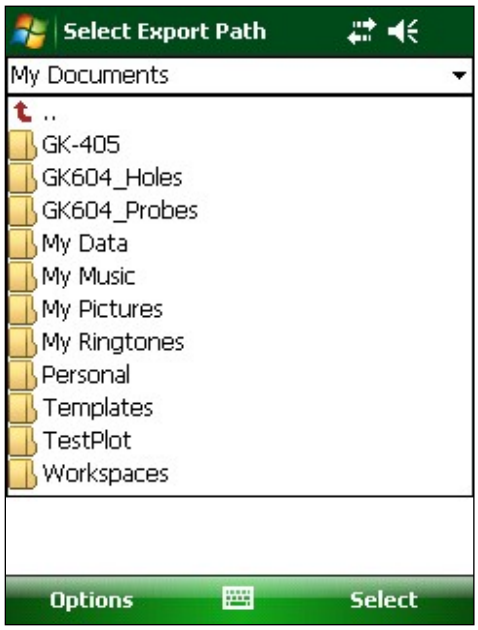

Figure 65 - Export Path Selection Window

If no project is selected in the Project Explorer, an error message will be displayed (Figure 66).

Figure 66 - No Project Selected Error

3.6.3 Import Menu

The Import Menu is used to import Project Explorer element settings that were previously exported using the Export Menu functions (see Section 3.6.2.2 above).

Clicking on this menu item displays the “Select .LVPE File” window (Figure 67 below), from which a project export file can be selected. After selection, a new “Project” will be created in the current workspace. This new project will contain all the settings and any sensors (and accompanying data) that were contained in the project export file.

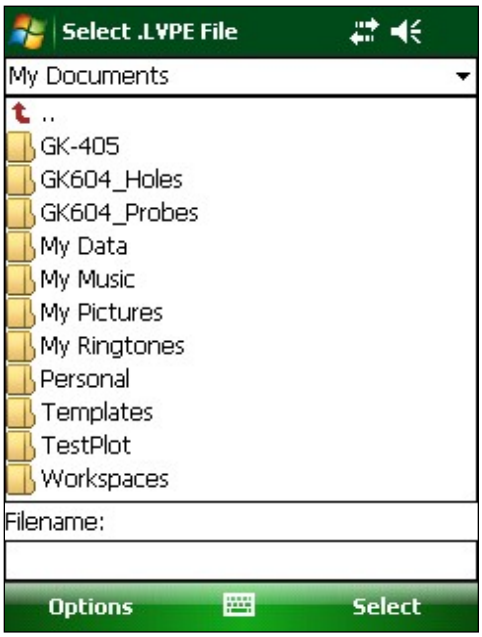

Figure 67 - Select Project Export File

If a project with the same name already exists in the current workspace, an error message will be displayed and the project import will be cancelled.

3.6.4 View Data

When the View Data Menu is clicked and a sensor has been previously selected, the "Select File to View:" window is displayed. Figure 68 shows the files available for sensor, "bigLoadCell". A file may be selected for viewing (or deselected) by tapping in the "Select" column.

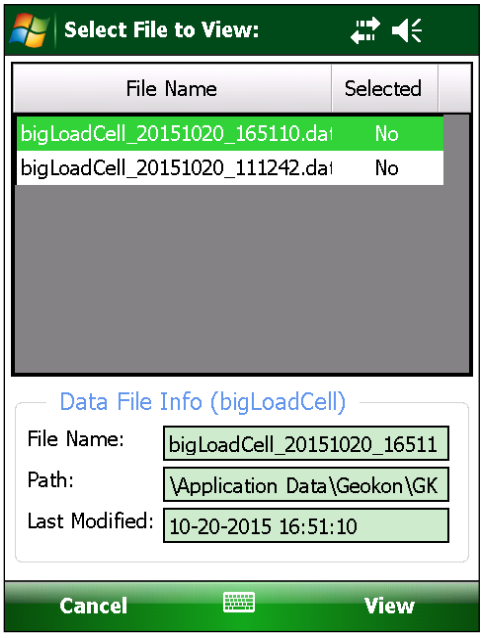

Figure 68 - Data File Selection Window

Tap “View” when done to display the “Sensor Reads” window (Figure 69). The scrollbar at the bottom of the screen can be used to display columns that are currently out of view.

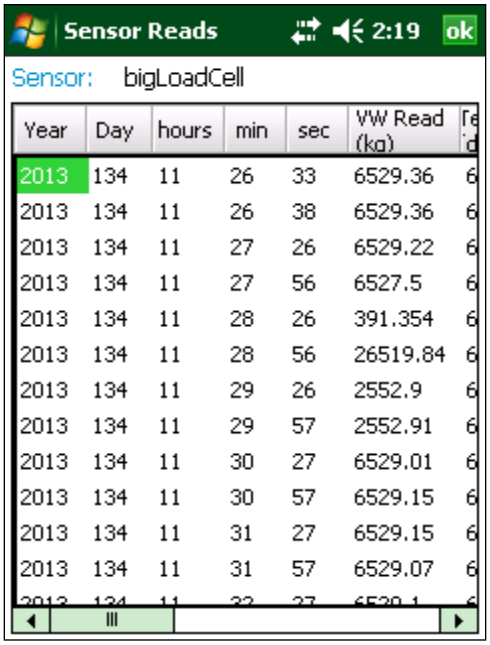

Figure 69 - Sensor Reads Window

3.6.5 Close GK-405

Tapping on this menu item will cause the program to cease execution. This behavior is the same as tapping on “ok” in the upper-right corner of the display screen.

4. CONFIGURING PROJECT EXPLORER ELEMENTS

Each Project Explorer Element has settings that can be configured. For some, like Workspace and Project, the settings consist only of a name and description. Sensor elements require more parameters such as gage factor, initial (zero) reading, and engineering units. These settings can be adjusted to meet the user's needs and the specifications of the sensor. Each element's settings can be adjusted using the Edit Settings option from the Context or Application Menu.

4.1 Project Configuration

Figure 70 depicts the Projects Settings window. The fields in the Project Settings window are described below.

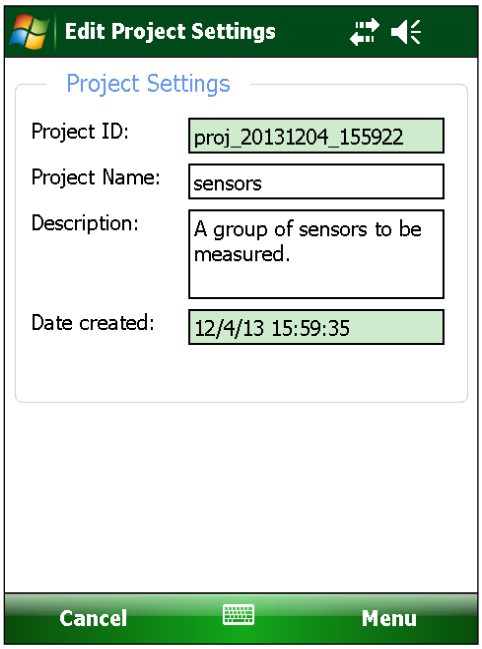

Figure 70 - Project Settings

Project ID: Read-only value, generated when the project was created. Used internally by the GK-405 VWRA.

Project Name: Use the onscreen keyboard to enter a unique and descriptive name for the project.

Description: Using the onscreen keyboard, enter a brief description pertaining to the project.

Date created: Read-only date and time value, generated when the project was created.

When done editing, project settings can be saved via the "Menu->Save Settings" option. Workspace configuration is similar to project configuration in that only the name and description are editable.

4.2 Sensor Configuration

The Sensor settings window (Figure 71) manages sensor configuration options through several different screens. The user can easily navigate between screens by tapping on the left and right arrows near the bottom of the screen ( ).

4.2.1 Sensor Settings Page One, General Sensor Information

A detailed explanation of the parameters for the General Sensor Information window appears below.

(Note: At this time, sensors are always "Enabled" and the selection box located at the top-right hand side of the window will be inactive.)

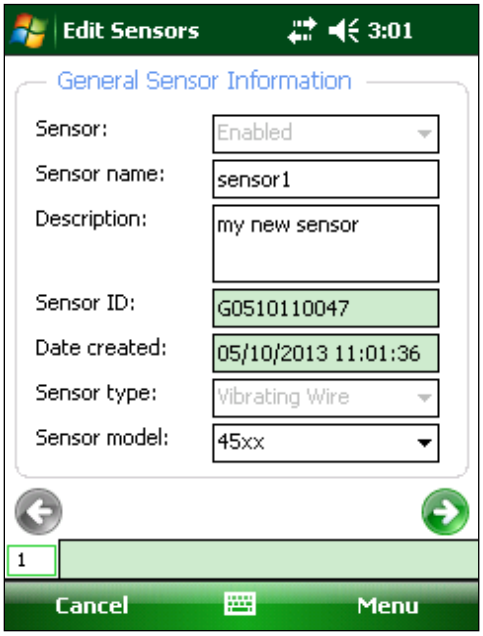

Figure 71 - General Sensor Information Window

Sensor name: This is a user assigned sensor name, which is displayed in the project explorer. A descriptive name allows the user to quickly pick the sensor from the list.

Description: Verbose description of the sensor, which can provide clues to its location, purpose, etc.

Sensor ID: This is a system-generated sensor ID assigned at the time of sensor configuration creation. This value uniquely identifies the sensor to this application and cannot be changed by the user.

Date created: The system-generated date of the sensor creation is useful for audit purposes. This field cannot be edited and is set to the date when the sensor is enabled.

Sensor Type: The sensor type is selected from the list of supported sensor types. (Vibrating Wire is currently the only supported sensor type.)

Sensor Model: The sensor model is selected from the list of supported sensor models, i.e., “45xx”. When the selected sensor model is “49xx” another parameter is displayed to allow the number of sensors per gage can be entered (see Figure 72 below). This parameter is used to detect missing gages in a multi-gage load cell.

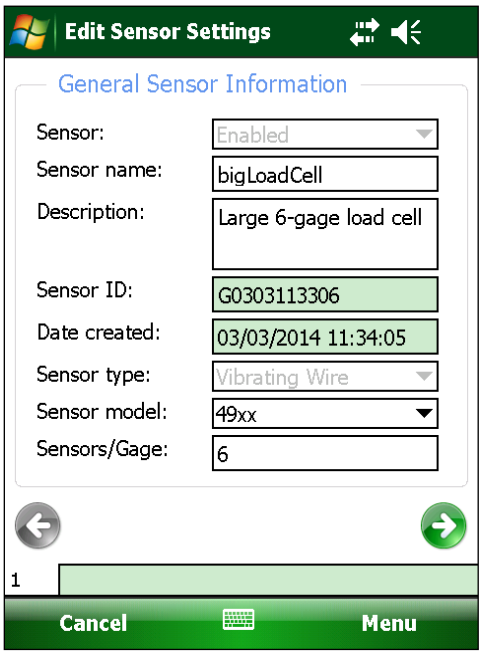

Figure 72 - Sensor Model 49xx Selected

4.2.2 Sensor Settings Page Two, Conversion Method and Coefficients

The second page of the Sensor Setting window contains parameters that determine how sensors are converted from Digits to Engineering Units. The upper portion of the screen contains radio buttons to select either the Linear or Polynomial conversion method (Figure 73). Each conversion method and the corresponding coefficient options are described in the subsections below.

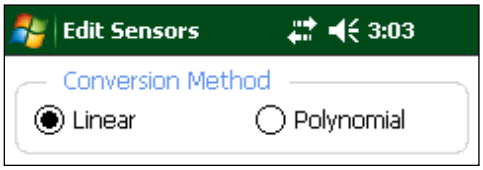

Figure 73 - Conversion Method Radio Buttons

4.2.2.1 Linear Conversion Method

Selecting this radio button will cause the GK-405 VWRA to apply a linear conversion factor to convert subsequent readings from Digits to Engineering Units. This also enables the Linear Coefficients parameters (Figure 74). A detailed description of each of the available parameters appears below.

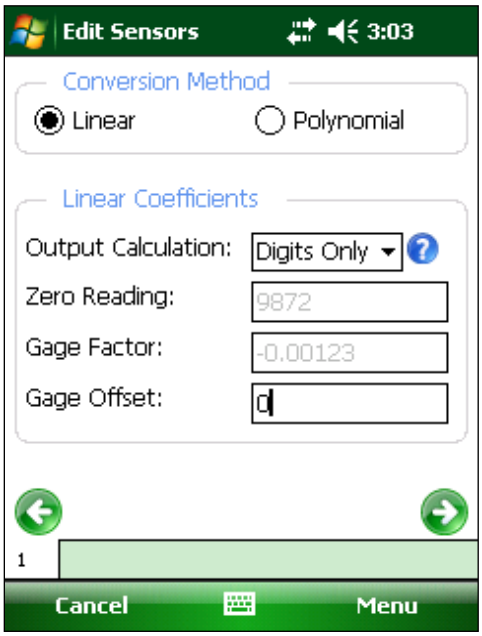

Figure 74 - Linear Coefficients

Output Calculation: This parameter **must** be set for each sensor before sensor settings can be saved. This parameter ensures that the "gage factor" (below) will be correctly signed if entered directly as printed on the calibration sheet.

Valid selections are: "G(R0 - R1)", "G(R1 - R0)" and "Digits Only". When this parameter is set to "Digits Only" (as shown in Figure 74), no gage factor needs to be entered. The GK-405 VWRA will display "raw" digits readings. (See Section 3.2 for information on raw readings). Please consult the calibration sheet for each sensor to determine which formula, **G(R0 - R1) or G(R1 - R0)**, to select for the setting above.

Zero Reading: This parameter may be set manually from a previously taken reading. Please consult your sensor manual regarding various techniques for taking a zero reading.

Gage factor: This parameter may be entered directly from the Transducer Calibration Sheet, Linear Gage Factor value.

Offset: This parameter can be set to any value representing some initial condition. This value will be added to all subsequent readings.

4.2.2.2 Polynomial Conversion Method

Selecting this radio button will cause the GK-405 VWRA to apply polynomial conversion factors to convert subsequent readings from Digits to Engineering Units This also enables the Polynomial Coefficients parameters (Figure 75). A detailed description of each of the available parameters appears below.

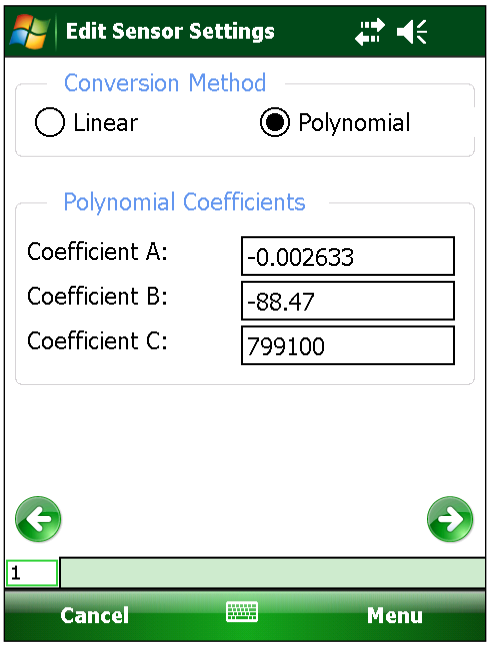

Figure 75 - Polynomial Coefficients

Coefficient A: Enter the Polynomial Gage Factor A from the Sensor Calibration Sheet for this parameter.

Coefficient B: Enter the Polynomial Gage Factor B from the Sensor Calibration Sheet for this parameter.

Coefficient C: This parameter should be calculated from a field zero reading. Please refer to your transducer manual for further details on how to calculate Coefficient C.

4.2.3 Sensor Settings Page Three, Units Conversion

The third page of the Sensor Setting window (see Figure 76 on the following page) contains parameters that allow a conversion factor to be applied to data (in Engineering Units), converting it into a user selected unit of measure. A detailed explanation of the parameters for the Unit Conversion window appears below.

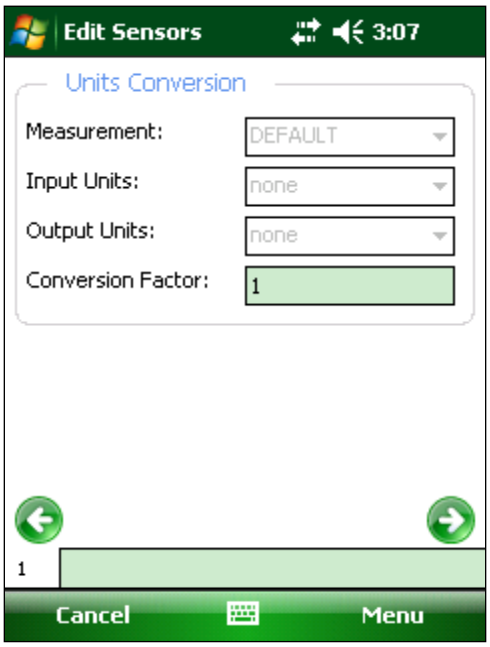

Figure 76 - Units Conversion

Measurement: The choices for this parameter are DEFAULT (digits), PRESSURE, LOAD, DISTANCE, and STRAIN. **Note:** If the conversion method is set to "Linear" AND the "Output Calculation" parameter is set to "Digits Only" (see Section 4.2.2.1) then this parameter will be have no affect and will be disabled.

Input units: Native engineering units of the sensor. Choices are dependent on Measurement selection above and can be metric (SI) or English (US customary) units. (Note: If the "Measurement" parameter is set to "STRAIN" then the only valid "Input units" parameter is "digits".)

Warning! Please consult the calibration sheet that came with your sensor. Selecting Input units that are different from those specified on the calibration sheet may have unexpected consequences.

Output units: Engineering units of values read and/or logged by the GK-405. The choices for this parameter are dependent on the Measurement and Input units selected above and can be metric or English units.

Conversion Factor: This parameter is dependent on Measurement, Input units and Output units selections above. This value is calculated by the GK-405 VWRA and is not editable. The Gage factor (see above) is multiplied by this factor before converting sensor reads to engineering units.

Note: If the "Measurement" parameter is set to "STRAIN" then the Gage factor (see Section 4.2.2.1) entered is the "batch" factor sent with all strain gages, while the Conversion Factor is the strain range like that which is typically set in the Display Mode, values "C", "D" and "E" (see Section 3.2.1).

4.2.4 Sensor Settings Page Four, Temperature Settings

The fourth page of the Sensor Setting window (Figure 77) contains parameters that allow a temperature correction factor to be applied to collected data. A detailed description of all the parameters on this page appears below:

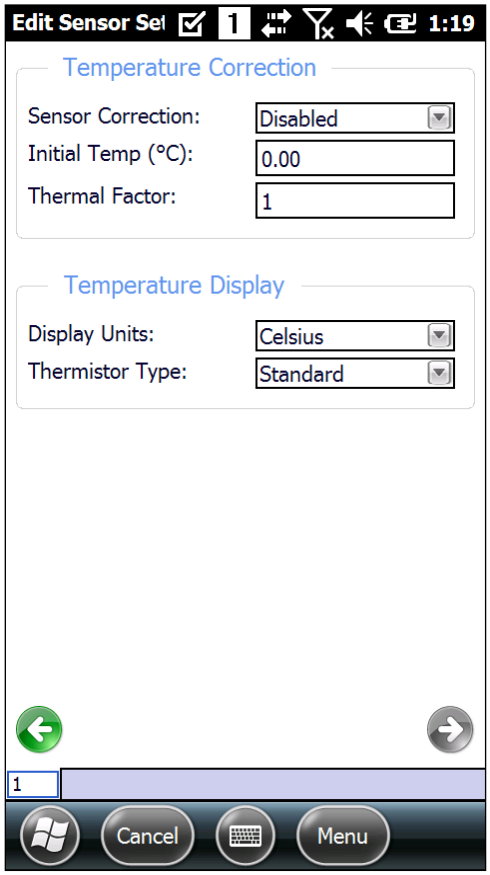

Figure 77 - Temperature Settings (Nautiz X8 Shown)

4.2.4.1 Temperature Correction Feature:

(Note: Temperature Correction feature does not apply to all sensors and will be disabled (grayed out) when the following sensor models are selected: "4200", "4202", "4204", "421X", "44xx", and "49XX".)

Sensor Correction: The choices for this parameter are “Enabled” or “Disabled”. Select “Enable” to enable correction of any errors in the sensor reading due to temperature.

Initial Temperature: Initial temperature reading taken when performing a "Zero Reading" of the sensor.

Thermal Factor: Factor to multiply temperature difference by using the following formula: Corrected Reading = Sensor Reading - ((Current Temperature - Initial Temperature) * Temperature Factor).

Temperature Display: Selects which units to display the temperature in. The choices are Celsius or Fahrenheit. This feature is not affected by sensor type and is always enabled to allow temperature units to be selected.

4.2.4.2 Temperature Display Feature:

Display Units: Selects which units to display the temperature in. The choices are "Celsius" or "Fahrenheit". This feature is not affected by sensor type and is always enabled to allow temperature units to be selected.

Thermistor Type: Allows selection of the Thermistor type. Valid selections are "Standard", "High-Temp 8.2K", "High-Temp 10K" or "Other". The first three are Geokon thermistor offerings based on the type of sensor purchased. Selecting the "Other" choice causes four more text boxes to be displayed (Figure 78) where up to four thermistor coefficients may be entered if a nonstandard thermistor is used. (Note: If a thermistor only uses three coefficients, enter the A, B and C coefficient and set the D coefficient to zero.)

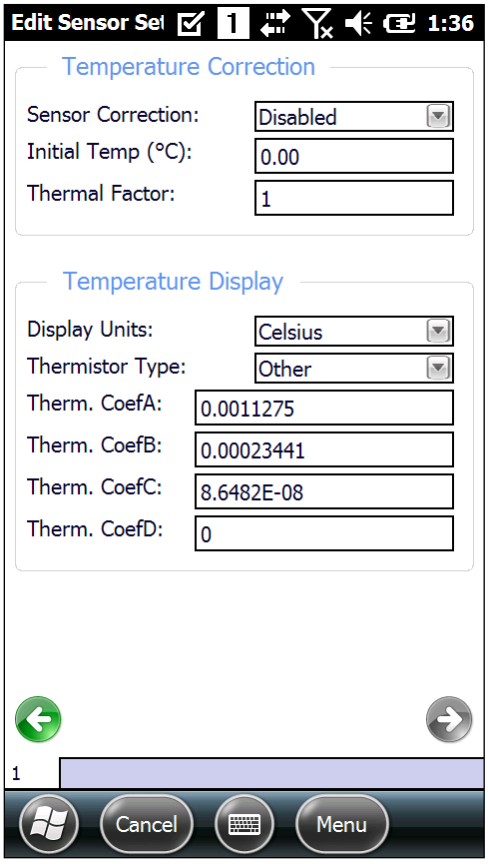

Figure 78 - Nonstandard Thermistor Coefficients

5. FILES, FOLDERS AND TRANSFERRING DATA

The GK-405 VWRA uses several types of files and dedicated folder locations to keep track of Workspaces and Project Explorer element configuration files, such as sensor configuration files and data files. The default locations and names for some of these appear in Table 3.

Warning! Manual editing any of the configuration files and/or renaming folders is strongly discouraged and may cause all configuration data to be lost!

Purpose	Default Folder	Filename
GK-405 VWRA preferences and configuration	\Application Data\Geokon\GK-405\	Config.xml
Workspace repository	\Application Data\Geokon\GK-405\Workspaces\	N/A
Project repository (Workspace)	\Application Data\Geokon\GK-405\ Workspaces\<WRK_SPC_FLDR>\ (1)	.wkspc
Sensor repository (Project)	\Application Data\Geokon\GK-405\ Workspaces\<WRK_SPC_FLDR>\<PROJECT ID>\ (2)	.proj

Table 3 - Folder paths and File Names

Notes:
[1] <WRK_SPC_FLDR> is usually the same as the workspace name but is not required to be.
[2]<PROJECT ID> can be found in each Project's settings.

5.1 File Transfer

In general, the only files generated by the GK-405 IRA that will have to be transferred are the sensor data files, although periodically archiving others on a "master" PC is recommended. Connecting the Field PC to a desktop or laptop PC using the supplied USB cable (Type A to mini B) is straight forward and allows the user to view the Field PC's storage as a flash drive on the desktop/laptop; you can then drag the files around to any folder on the desktop/laptop.

If you are using Windows XP you will need to download and install the program, "ActiveSync". This application is available free from the Microsoft site (www.microsoft.com and search for "Active Sync download"). Once installed (generally requires a reboot), connect the USB cable from the Field PC to the computer. Open "My Computer" on the XP machine and double click on "PDA" under drives to see the folders in the Field PC.

If you are using Windows Vista or later operating system, Microsoft includes software called Windows Mobile Device Center and you should be able to immediately connect to the Field PC and see it in the "Computer" window.

It is not necessary to set up any 'syncing' options although it can easily be accomplished. Another Bluetooth partnership can also be set up from your desktop/laptop (assuming they have Bluetooth modules) to the Field PC and transfer files that way.

All of these options (and more) are described in the Field PC's Reference Guide, available in the "Help Docs" folder of the GK-405 Installer ".zip" file. The GK-405 Installer can be downloaded from Geokon's website: www.geokon.com/content/software/GK-405_Installer.zip.

5.2 Backing up configurations

To guard against accidental data loss and as a matter of good computer technique, critical data and configuration files should be periodically backed up.

Entire projects can be backed up using the Project Export function from the File menu. After exporting, the resulting ".lvpe" file should be transferred to a desktop PC using the techniques described in Section 5.1.

Although backing up a project automatically includes any data files stored as part of the project element "sensor" structure, data files can be individually backed up per hole using the Data Export function from the File menu. After exporting, the resulting ".csv" file should be transferred to a desktop PC using the techniques described in Section 5.1.

6. TROUBLESHOOTING

6.1 Bluetooth Setup and Connection

The following sections show common error messaging that may be displayed when setting up and trying to connect to the Remote Module via Bluetooth. Also included are potential solutions to the errors shown.

6.1.1 "Cannot Connect…the passcode is incorrect"

"Cannot connect. Your device did not connect with GK405SNxxxxxxxxx. The connection failed or the passcode is incorrect."

Figure 79 - Cannot Connect Error Message (Nautiz X8 Shown)

The message shown in Figure 79 is most commonly caused by tapping the "Connect" menu item from Bluetooth Device Context Menu (see Figure 80 on the following page) after a successful pairing has been established. If the Connect menu item has been pressed and the error message from Figure 79 is seen, the pairing is not corrupted and does **not** need to be set up again.

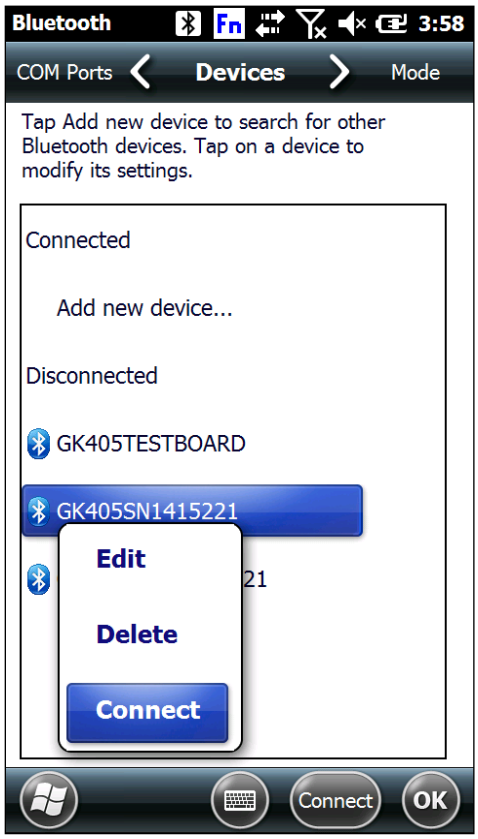

Figure 80 - Bluetooth Device Context Menu

This connection method will **never** be successful and should **not** be used to test the pairing. To test the pairing, use the GK-405 VWRA as outlined in Section 3.5.3.

6.1.2 “Connection Problem” Error

“ERROR opening connection on port: COM_:” Port may be in use: close other app, or use different port. The port ‘COMN:’ does not exist.”

Figure 81 - Connection Problem Error (Nautiz X8 Shown)

If the error shown in Figure 81 occurs, first verify which COM port is being used by the GK-405 by checking in the COM Port section of the Windows Bluetooth settings (see Figure 82 on the following page). Select that COM Port from the GK-405 application’s COM sub-menu of the “Remote Connect with…” menu (Figure 83) then tap to reconnect. See Section 3.5.3 for more information.

If the connection attempt fails multiple times when the verified COM port is selected, perform a full power down and restart of the Field PC, and attempt to connect again through the GK-405 VWRA.

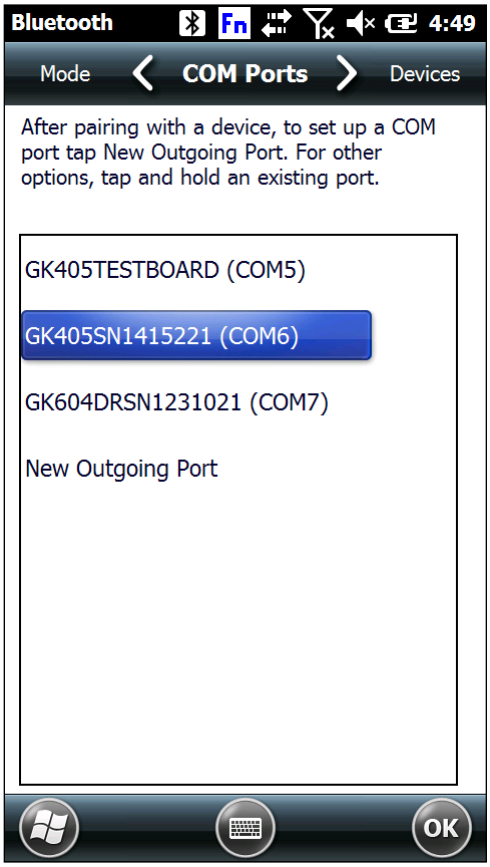

Figure 82 - Bluetooth Settings Window, COM Ports Tab

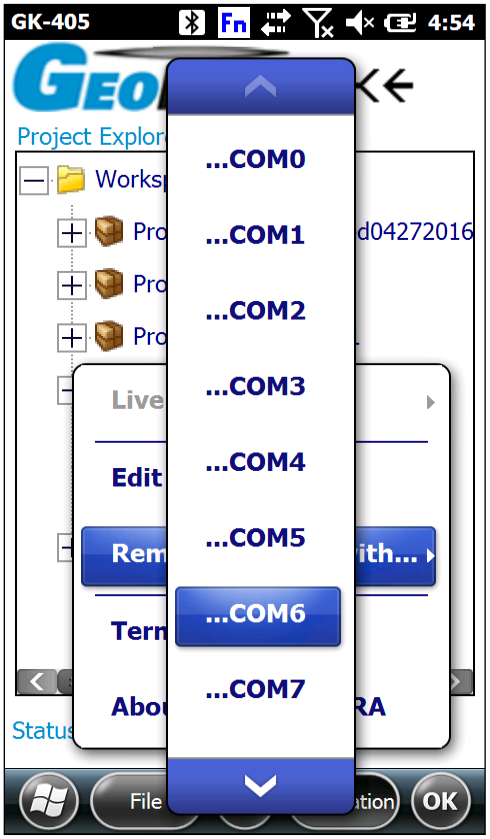

Figure 83 - Remote Connect With...

6.2 Common Troubleshooting Solutions

PROBLEM:	SOLUTION:
FPC-2 does not power up.	Attach FPC-2 charger for two hours then try again.
When launched, GK-405 VWRA displays an error that COMx is not found, press OK, Application > Remote Connect with COMx.	Ensure the Remote Module has been turned on and the Bluetooth button is blinking.
The blue indicator light does not turn on when the "POWER ON (BLUETOOTH)" button is pressed on the Remote Module.	Attach Remote Module charger for two hours, then try again.
After tapping on the "Live Readings" a "Communications error" screen is displayed.	Check the Bluetooth status on the FPC-2 and ensure Bluetooth is "On." Check that there is a valid Bluetooth pairing in the Bluetooth Setting window of the FPC-2. Refer to Section 2.3.
The GK-405 appears to be "hung" or "frozen" and will not respond to any key.	Check for a "background" error message. An error message may exist behind the main window that requires user input. Tap on the "Windows" logo ( ) and then "Task Manager" to see if there is another window hidden.

APPENDIX A. GK-405 CONNECTIONS

A.1 Single Sensor Connection

Figure 84 shows a close-up view of the 10-pin bulkhead "Sensor" connector. Table 4 lists the pinout for this connector.

Figure 84 - Single Sensor Connector

10-pin Bulkhead (PT06F-12-10P)	Alligator Clip Boot Color (Flying Leads)	Signal Description
A	Red	Vibrating Wire Gage +
B	Black	Vibrating Wire Gage -
C	White	Thermistor +
D	Green	Thermistor -
E	Blue	Shield
F		
G		
H		
J		
K		

Table 4 - Single Sensor Pin-out

A.2 Load Cell Connection

Figure 85 shows a close-up view of the 10-pin Bulkhead "Load Cell" connector. Table 5 lists the pinout for this connector.

Figure 85 - Load Cell Connector

10-pin Bulkhead (PT06F-12-10P)	Signal Description
A	Vibrating Wire Gage 1 +
B	Vibrating Wire Gage 2 +
C	Vibrating Wire Gage 3 +
D	Vibrating Wire Gage 4 +
E	Vibrating Wire Gage 5 +
F	Vibrating Wire Gage 6 +
G	Shield Common
H	Vibrating Wire Gage – (Common)
J	Thermistor +
K	Thermistor -

Table 5 - Load Cell Connector Pin-out

A.2.1 Connecting to a Load Cell with 10-pin attached

For load cells that have a 10-pin connector attached to the read out cable, align the grooves on load cell connector (male), with the (female) connector on the unit marked Load Cell. Push the connector into place and then twist the outer ring of the male connector until it locks into place.

A.2.2 Connecting to a Load Cell with Flying Leads

Attach the GK-403-2 flying leads to the GK-405 by aligning the grooves on connector of the flying leads (male), with the (female) connector on the GK-405 marked **Sensor**. Push the connector into place and then twist the outer ring of the male connector until it locks into place.

Next, connect the flying leads of the GK-405 to the leads of the load cell. The individual leads will be identified as shown in the wiring diagram in Table 6. Each sensor is read in turn by clipping either the red or black clip to the lead marked “common” and the black or red clip in turn to the leads marked #1, #2, #3, etc. The blue clip should be connected to the cable shield and the green and white clips to the cable leads marked “thermistor”.

10 pin Bulkhead PT06A-12-10P	Function	3 Gage VW Load Cell Geokon Purple Cable	4 Gage VW Load Cell Geokon Purple Cable	6 Gage VW Load Cell Geokon Orange Cable
A	Gage #1	Red	Red	Red
B	Gage #2	Red's Black	Red's Black	Red's Black
C	Gage #3	White	White	White
D	Gage #4	NC	White's Black	White's Black
E	Gage #5	NC	NC	Green
F	Gage #6	NC	NC	Green's Black
G	Shield	All Shields	All Shields	All Shields
H	Common	White's Black[1]	Green	Blue
J	Thermistor	Green[1]	Blue	Yellow
K	Thermistor	Green's Black	Blue's Black	Yellow's Black

Table 6 - Load Cell Connector and Cable (Standard Wiring)

Notes:

[1] White's black and Green wires are switched on Geokon three gage VW load cells prior to serial number 3313.

A.3 Charger Connections

To charge the remote module, plug the CHG-04 into the charger port shown in Figure 86. The CHG-04 has an LED indicator, which indicates red when the unit is charging and green when it is fully charged.

Figure 86 - Charger Connection

APPENDIX B. CHANGING A FUSE

1) Remove the eight Philips head screws that hold the faceplate of the remote module in place.

2) Remove the faceplate by gently pulling on the readout unit cradle (Figure 87).

Figure 87 - Removing the Face Plate

3) Turn the faceplate over and locate the fuses on the circuit board (Figure 88).

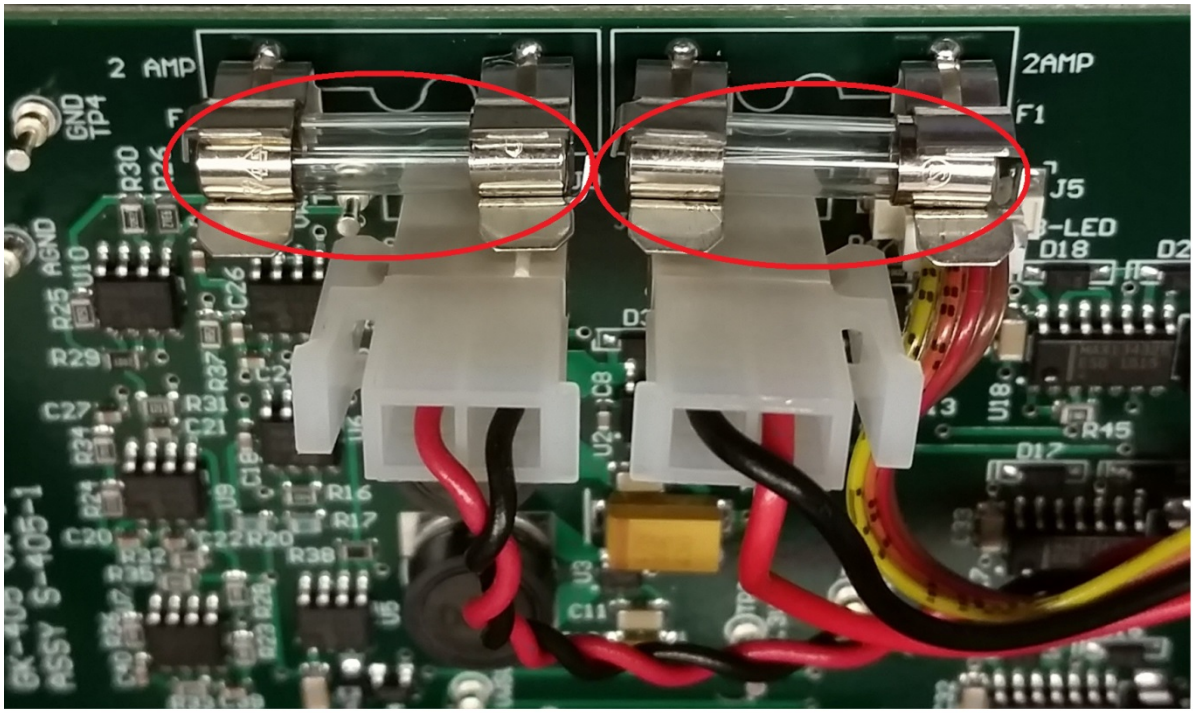

Figure 88 - Fuse Location

4) Remove the defective fuse and replace.

5) Make sure the rubber gasket beneath the faceplate is in place and flat against the internal flange.

6) Carefully place the faceplate back into the remote module, taking care not to pinch the exterior rubber gasket while doing so.

7) Reinstall the eight seal screws into the faceplate. Make sure the seal rings on the underside of the screws seal against the faceplate. Do not over tighten the seal screws, this can deform the black overlay on top of the faceplate.

APPENDIX C. REMOTE MODULE COMMAND STRUCTURE

COMMAND	FUNCTION	SYNTAX	RETURN VALUE
0	N/A		
1	N/A		
2	N/A		
3	N/A		
4	READ FIRMWARE VERSION	4	VER#.#
5	N/A		
6	N/A		
7	N/A		
8	N/A		
9	N/A		
V6	REQUEST 6 READS	V6	####### 0000000 0000000 0000000 0000000 0000000
V6%	SET GAGES SPECTRUM	V6(A – F)	%%%%%%
V7	TAKE BATTERY READING	V7	<sp><sp>+#.#
V8	TAKE +5V READING	V8	<sp><sp>+#.#
VT	SENSOR TEMPERATURE (°C)	VT	(+/-)##.####

Table 7 - Remote Module Command Format

Example 1: READ FIRMWARE VERSION
Reads the firmware version of the Remote Module:
Command: `4<CR>`
Response: `Geokon405 Ver1.0 0320`

Example 2: REQUEST 6 READS:
Get sensor readings for up to six Vibrating Wire "cells"
("0000000" returned for unconnected gages):
Command: `V6<CR>`
Response: `0200000 0000000 0000000 0000000 0000000 0000000`

Notes:

- The above response shows that there is one gage (of six) connected
- Raw gage values are in units of nanoseconds
- Frequency (F, in Hz) = 1 / T (sec); F = 1 / 0.0002 = 5000 Hz
- Digits = F2/1000 = (5000)2/1000 = 25000

Example 3: SET GAGES SPECTRUM:
Set the operating "pluck" spectrum to the "B" range (1400 – 3500 Hz) for each gage:
Command: `V6B<CR>`
Response: `BBBBBB`

Example 4: TAKE BATTERY READING:
Display the current voltage level of the lithium battery:
Command: `V7<CR>`
Response: `+7.6`

APPENDIX D. DATA FILE FORMATS

D.1 Raw Data Text Report

When exporting, "raw" text data is the default for the Extended Format options of the "Export Data Menu" (see Section 3.6.2.1).

```
2013,140,10,28,28,.83,21.8,9196.9,0.0,0.0,0.0,0.0,0.0,9196.9,1
2013,140,10,28,38,.4,21.8,9545.7,0.0,0.0,0.0,0.0,0.0,9371.3,2
2013,140,10,28,48,.65,21.8,9345.8,0.0,0.0,0.0,0.0,0.0,9362.8,3
2013,140,10,28,58,.8,21.8,9218.6,0.0,0.0,0.0,0.0,0.0,9326.7,4
2013,140,10,29,8,1.27,21.8,8842.8,0.0,0.0,0.0,0.0,0.0,9230.0,5
2013,140,10,29,18,2.39,21.8,7929.2,0.0,0.0,0.0,0.0,0.0,9013.2,6
2013,140,10,29,28,3.03,21.8,7405.9,0.0,0.0,0.0,0.0,0.0,8783.5,7
2013,140,10,29,38,.01,21.8,9866.1,0.0,0.0,0.0,0.0,0.0,8918.9,8
2013,140,10,29,48,.01,21.9,9863.3,0.0,0.0,0.0,0.0,0.0,9023.8,9
2013,140,10,29,58,2.33,22.9,7977.8,0.0,0.0,0.0,0.0,0.0,8919.2,10
2013,140,10,30,8,1.74,23.5,8458.7,0.0,0.0,0.0,0.0,0.0,8877.3,11
2013,140,10,30,18,.03,23.5,9847.6,0.0,0.0,0.0,0.0,0.0,8958.2,12
```

The comma-delineated columns above represent the following:

Column 1 represents the year when the array was stored
Column 2 represents the Julian day when the array was stored
Column 3 represents the hour when the array was stored
Column 4 represents the minute when the array was stored
Column 5 represents the second when the array was stored
Column 6 represents the vibrating wire reading in engineering unit if applicable
Column 7 represents the sensor temperature in degrees C or degrees F
Column 8 represents the raw vibrating wire reading in digits (cell 1)
Column 9 represents the raw vibrating wire reading in digits (cell 2)
Column 10 represents the raw vibrating wire reading in digits (cell 3)
Column 11 represents the raw vibrating wire reading in digits (cell 4)
Column 12 represents the raw vibrating wire reading in digits (cell 5)
Column 13 represents the raw vibrating wire reading in digits (cell 6)
Column 14 represents the raw vibrating wire reading in digits (average of 1 – 6 above)
Column 15 represents the array number

Note: The number (and definition) of columns may change as "Export Data→Extended Format" options are changed (see Figure 62 in Section 3.6.2.1).

D.2 Data Text Report with Column and Report Headers

Figure 89 illustrates additional report formatting capability by adding column and report headers (shown in Excel format for clarity). Note that the sensor name has also been included and the date and time appear as one field by using the Y1900 Date/Time option.

Sensor Data

Project Name: Site 1
Sensor Name: sensor1
Sensor Model: 45xx (Piezometer)
File Name: sensor1_20130703_142209.CSV

Sensor Name	Date and Time	VW Rdgs (psi)	Temp Rdg (deg. C)	Raw Rdgs 1 (dig.)	Raw Rdgs 2 (dig.)	Raw Rdgs 3 (dig.)	Raw Rdgs 4 (dig.)	Raw Rdgs 5 (dig.)	Raw Rdgs 6 (dig.)	Raw Rdgs Avg (dig.)	Array#
sensor1	7/3/2013 14:21:13	1.06	22.2	8610.6	0	0	0	0	0	8610.6	1
sensor1	7/3/2013 14:21:20	0.99	22.1	8040.9	0	0	0	0	0	8325.7	2
sensor1	7/3/2013 14:21:27	0.96	22	7778.4	0	0	0	0	0	8143.3	3
sensor1	7/3/2013 14:21:30	0.88	21.9	7132.5	0	0	0	0	0	7890.6	4
sensor1	7/3/2013 14:21:34	1.14	21.9	9227	0	0	0	0	0	8157.9	5
sensor1	7/3/2013 14:21:38	1.14	21.9	9214.6	0	0	0	0	0	8334	6
sensor1	7/3/2013 14:21:41	1.14	21.9	9222.5	0	0	0	0	0	8460.9	7
sensor1	7/3/2013 14:21:45	1.08	21.9	8776.1	0	0	0	0	0	8500.3	8
sensor1	7/3/2013 14:21:50	1.21	21.9	9795.2	0	0	0	0	0	8644.2	9
sensor1	7/3/2013 14:21:54	1.2	21.8	9696.8	0	0	0	0	0	8749.5	10
sensor1	7/3/2013 14:21:59	0.6	21.9	4878.6	0	0	0	0	0	8397.6	11
sensor1	7/3/2013 14:22:01	0.84	21.9	6768.6	0	0	0	0	0	8261.8	12
sensor1	7/3/2013 14:22:03	0.88	21.9	7109.2	0	0	0	0	0	8173.2	13

Figure 89 - Enhanced Data Text Report

APPENDIX E. SPECIFICATIONS

E.1 GK-405 (Remote Module) Specifications

Vibrating Wire Readout:	
Excitation Range	450 Hz to 6000 Hz, 5 volt square wave
Measurement Resolution	1ns
Time base Accuracy	±0.025%
Temperature Readout:	
Sensor Type	Thermistor, Dale #1C3001-B3 (YSI 44005)
Sensor Accuracy	±0.5° Celsius
Measurement Range	–50° to +150° Celsius
Measurement Resolution	0.1° Celsius
Measurement Accuracy	0.5% to 1.0% FSR
Communications:	
Wireless protocol	Bluetooth®, 5.0 +EDR, Class 1, range 20 m
Bluetooth profile	Serial Port Profile (SPP)
Parameters	9600 baud, eight data bits, one stop bit, no parity, full duplex, non-configurable
Transmission Format	ASCII
Physical:	
Dimensions (L×W×H)	210 mm × 165 mm × 185 mm (8.25" × 6.5" × 7.25")
Weight	2.45 kg (5.40 lbs.)
Temperature Range	-10° to +50° Celsius
Battery	7.4 volt, 2600 mAHr Li-Ion
Operating Time	Approximately 40 hours

E.2 Handheld Device (FPC-2) Specifications

Processor	Texas Instruments 4470 dual-core @ 1.5 GHz
Operating System	Microsoft® Windows® Embedded Handheld 6.5.3
Included Software	Microsoft® Office Mobile 2010; multiple languages
Memory / Disk	1GB RAM / 4GB iNAND Flash
Storage Expansion	User accessible MicroSD/MicroSDHC slot
Display	FWVGA (854x480); IPS; 600 nits, capacitive multi-touch Asahi Dragontrail, chemically strengthened glass
Keyboard	Numeric backlit keypad with three programmable function keys. Onscreen QWERTY keyboard.
Connections	USB A Host, USB micro (PC sync and charging), DB9 RS-232 serial, 3.5 mm headset (stereo and mic)
Case	IP67 waterproof
Camera	8-megapixel, rear-facing with autofocus and LED illumination.
Environmental	Tested to MIL-STD810G for water, humidity, sand, dust vibration, altitude, shock and temperature
Power / Battery Life / Charge Time	5200 mAh, 3.7 V, Li-Ion warm-swappable battery / approx. 8.5 hours / approx. five hours (4000 mAh)
Wireless Connectivity	Internal Bluetooth® Class 2; WLAN: Integrated 802.11b/g/n supports AES TKIP, WEP, WPA and WPA2
Operating	-30°C to 60°C
Storage Temperature	-40°C to 70°C
Shock Survival	Multiple drops from 1.22 m onto concrete
Dimensions (L x W x	191 mm (7.5") x 80 mm (3.2") x 35 mm (1.4")
Weight	490 g, with battery