Elkins Earthworks, LLC

Envision HCH™ Landfill Gas Analyzer

User Manual

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1 Introduction

Elkins Earthworks® would like to welcome you to the Envision® HCH gas analyzer system. The Envision® HCH gas analyzer, designed by Elkins Earthworks® is manufactured in the United States. The equipment was designed for the field technician as well as project managers. The Envision® gas analyzer is a two-part system, the sensor unit (Envision®) and the tablet computer. This unique pairing makes field activities more productive by giving the user the ability to expand functionality by using GPS, bar-coding, and other features that the Windows® operating system can offer.

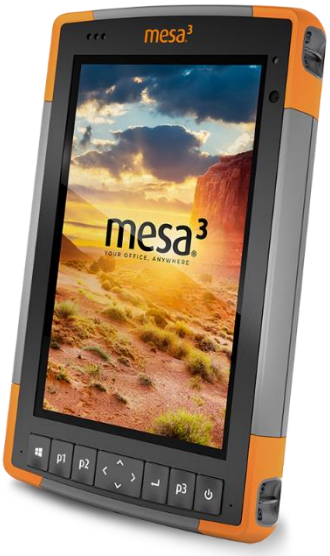
1.1 Tablet Computers

Elkins Earthworks® currently offers and/or supports 2 models of tablet computers that can run the Gas Analyzer proprietary software to operate the Envision® sensor unit.

1.1.1 Juniper Mesa 2

Juniper's Mesa 2, 8.5" x 5.5", IP68 ruggedized tablet comes with the Windows 10 operating system and runs 8 – 10 hours on a single charge. It has options for Bluetooth, Wi-Fi, 4G LTE, camera, GPS, barcode scanner, RFID, and hot-swappable batteries.

1.1.2 Juniper Mesa 3



Juniper's Mesa 3 Ruggedized tablet features a 7" display and updated processor. The table is IP68 rated and runs Windows with hot-swappable battery and battery life of 8 – 10 hours. The Mesa 3 offers Wi-Fi, USB and GPS connectivity. Barcode scanner, RFID, 4G LTE are available as options.

1.2 Envision® Gas Analyzer

The HCH Envision® gas analyzer houses the gas and pressure sensors. The gas analyzer utilizes infrared sensors to measure CH_4 and CO_2. The Envision® uses an electrochemical cell to measure O_2 concentration and an accurate thermistor temperature probe (or wireless BlueProbe Bluetooth Temperature Probe) to measure wellhead gas temperatures. The Envision® HCH model includes additional sensors to measure CO, H_2S and H_2 gases. Data generated by the Envision® gas analyzer is relayed to the tablet PC via Bluetooth several times per second.

1.2.1 Gas Ports

The HCH Envision® gas analyzer models have four quick connect ports located on the front of the unit.

Port listing from right to left:

Calibrate/Static/Sample port – This port is used to calibrate the unit with calibration gas, to measure static wellhead pressure, and to sample for gas quality.

Impact Port – This port is used to generate a differential pressure for calculating flow. Do not connect pressurized calibration gases to this port.

Available – This port is used to acquire an available (system) vacuum at the monitoring port. Do not connect pressurized calibration gases to this port.

Exhaust – This port is used to exhaust the gases that are pumped through the sample train for measurement. Only connect an exhaust hose to this port. Do not apply pressure to the exhaust port.

1.2.2 Cable Ports

Charger port – This port is used to charge the unit with the supplied wall charger. The Envision should run a full, normal working day without needing to be recharged. Plug the charger in overnight to charge the unit. It usually takes about 4 hours to fully charge an Envision. The charging circuit will turn off automatically when the unit has reached a full charge. Do not plug the charger into the unit in an explosive environment.

Thermistor Port – The wired thermistor plugs in to this port. If you have purchased a wireless (Bluetooth) thermometer from Elkins Earthworks, it may be used in place of the wired thermistor.

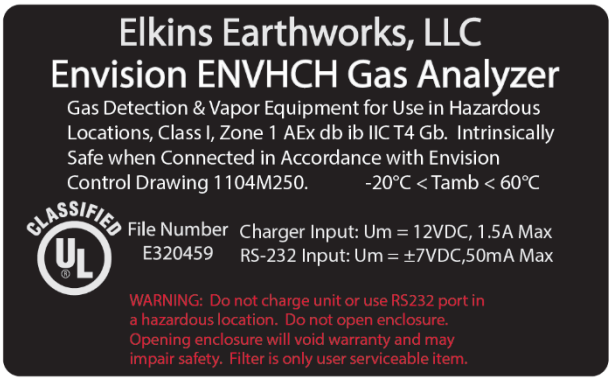
PDA Port – Used for factory/lab purposes only. Should not be connected in the field.

2 Safety

Landfill gas is normally safely extracted from landfills and conveyed to appropriate control devices. However, during the course of monitoring each extraction point, exposure may occur. As such, it is important to follow all site-specific safety protocols when monitoring. Working at a landfill typically requires site specific health and safety plans. While performing monitoring at a landfill, the user should be aware of the items included in the site specific health and safety plan. It is important to know that all personal protection equipment and safety protocols as appropriate must be used when using this instrument. All vents on the meter are designed to exhaust to the atmosphere, and not into the included backpack. New HCH (an non HCH) Envision® gas analyzer packages include a short exhaust tube for the purpose of venting through a backpack. Since landfill gas contains methane, no smoking is permitted while using the instrument. Calibration gases must be handled with utmost care and with adequate ventilation. Field calibration of HCH Envision® gas analyzers should not be performed in offices, cars or any enclosed areas without proper ventilation.

It is the sole responsibility of the user of the Envision® sensor unit and tablet computer to determine the appropriate location that either unit can be utilized within as monitoring conditions may change. The Envision® sensor unit and tablet PC are not intended for use in confined space entries but for the continuous monitoring of gases within a landfill gas collection system.

3 Certification



The Elkins Earthworks Envision® model HCH has been UL certified for use in hazardous locations (Class 1, Zone 1, AEx db ib IIC T4 Gb) when connected in accordance with 1104M25002 Hazardous Area Control Drawing. Although models ENV100, ENV200 and ENVAUS are based on a similar design, these models have not been certified for use in Group IIC explosive atmospheres. It is important that this manual be followed closely and that any repair to the Envision® gas analyzer is made at the approved Elkins Earthworks® repair facility. Opening the Envision® gas analyzer and breaking the housing warranty seals may result in voiding the unit's warranty as well as compromising the user's safety. The charger should not be connected when an explosive atmosphere is present.

The Envision® sensor unit meets FCC regulations for a Class A Digital Device Part 15, Subpart B, Sections 15.107b & 15.109b

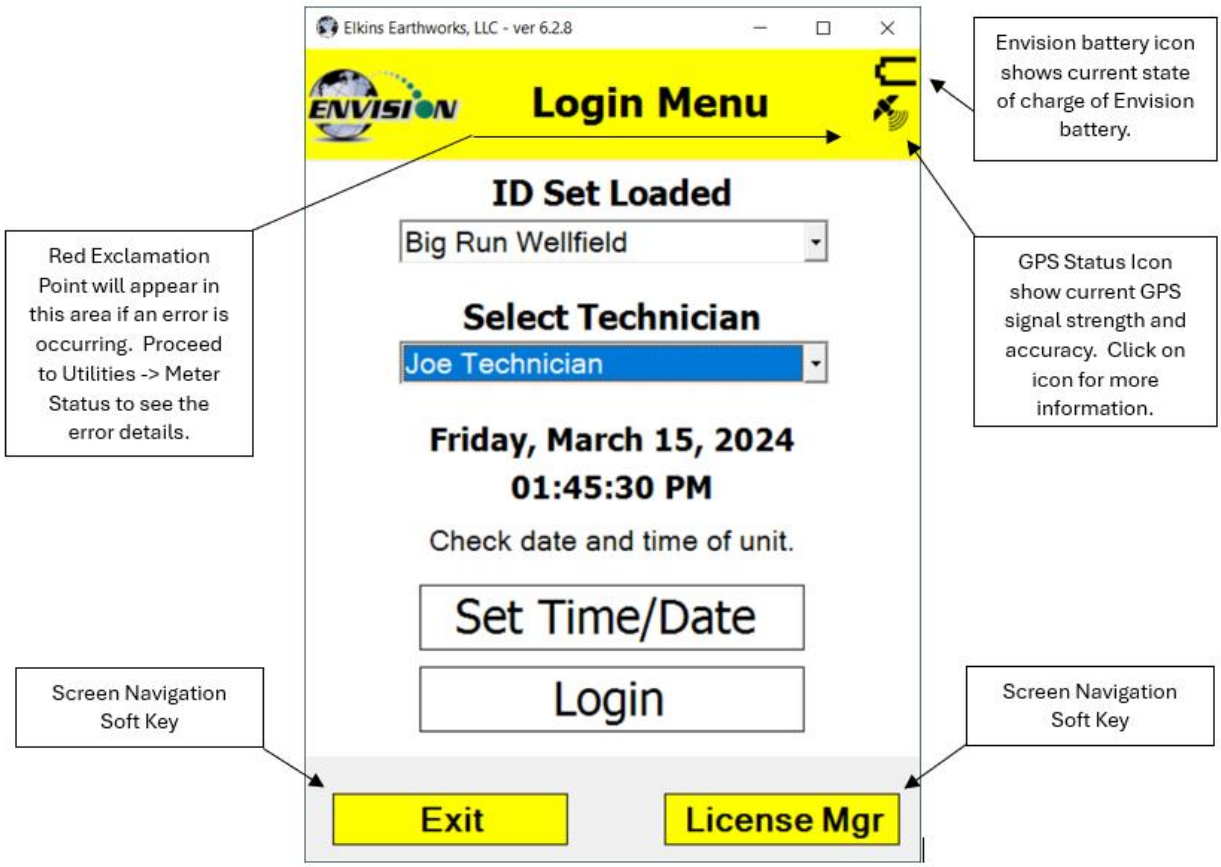
4 Envision® Gas Analyzer Application

The “Elkins Gas Analyzer” program is the software developed to run the Envision® HCH gas analyzer. To activate the Elkins Gas Analyzer program, follow the steps below:

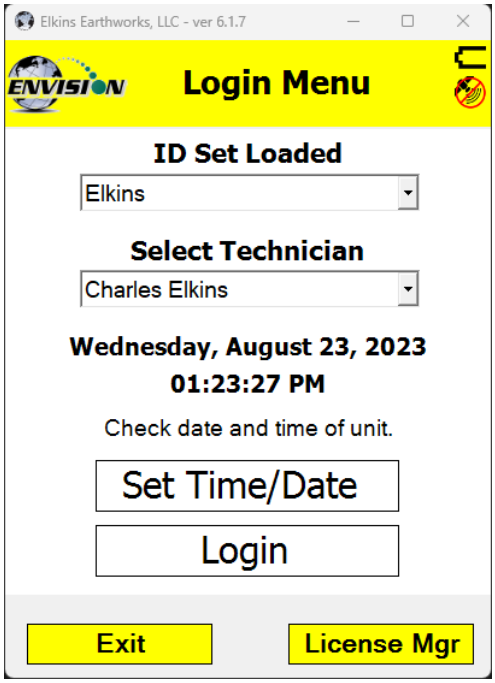
A desktop shortcut will automatically be added when the EGA software is installed. Alternately, the application will be listed in the programs list in a folder called “Elkins Earthworks LLC”. Click either of these shortcuts to start the program.

4.1 Software Screen/Header Properties

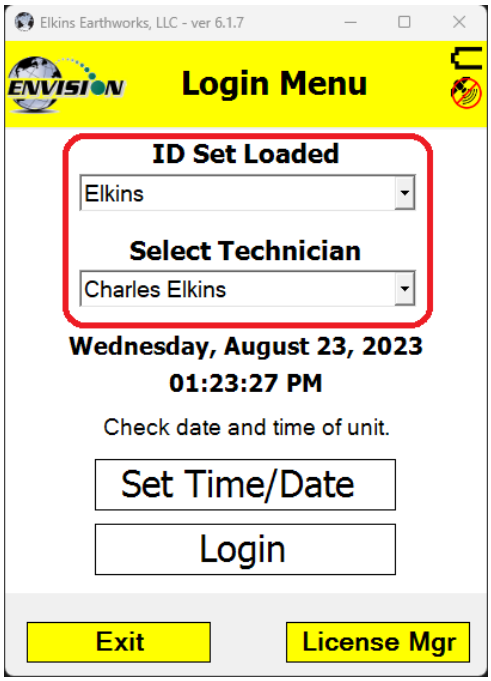
The detail below illustrates the main features common to each screen of the Elkins Gas Analyzer Program.



4.2 Login Screen

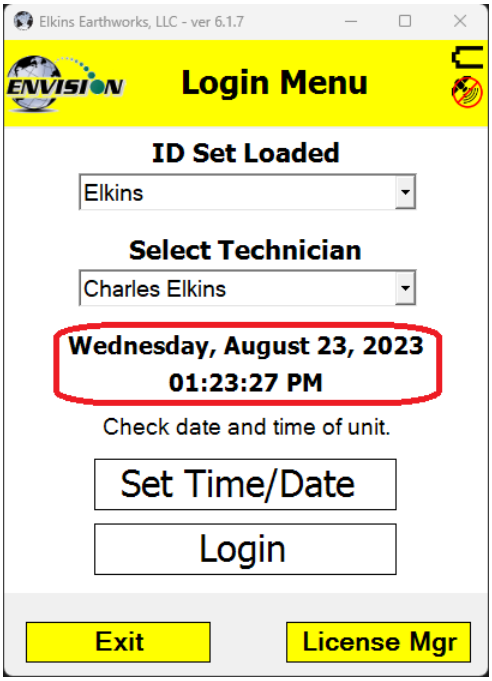


Once the Elkins Gas Analyzer program is started from the "Start Menu" the "Login Menu" will appear. This screen is intended to allow the user to login to the Elkins Gas Analyzer program.

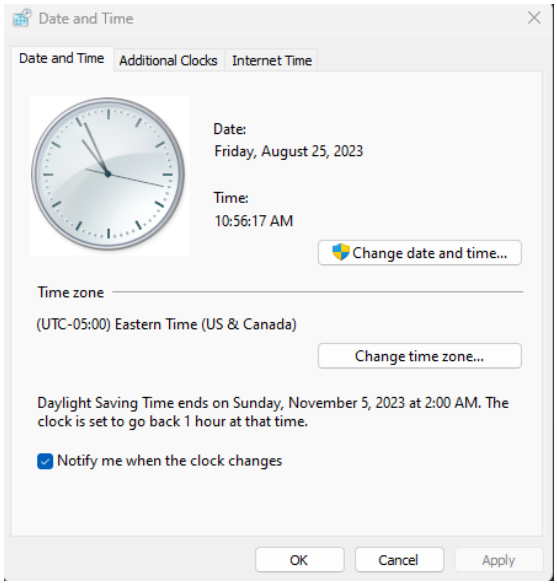


1. Select the Desired ID set and the name of the Technician who will be using the Envision® gas analyzer from the drop down menu located at the center of the "Login Menu" screen. ID sets may be added to this drop down menu by utilizing the "Elkins Earthworks® Configuration Editor" software that may be installed on your personal computer. The "Elkins Earthworks® Configuration Editor" software is provided on the Elkins Earthworks® software Flash drive included in the original packaging of the Envision® gas analyzer. Both ID sets and technician names may also be added directly from the drop down list on the Login Menu.

When adding a new ID set, the user may be prompted to choose either English or Metric units of measurement.



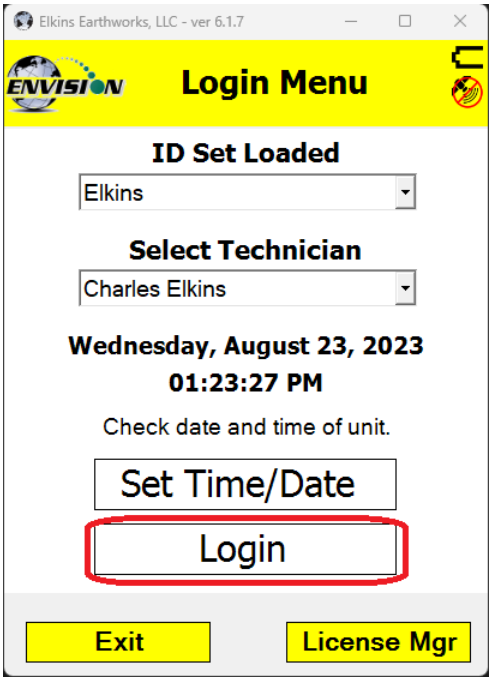
2. Verify that the date and time is correct as displayed on the login screen.



3. If date and/or time is incorrect then tap the “Set Time/Date” button.

4. The “Set Time/Date” screen will appear and you may then adjust to the correct date and/or time.

5. Tap the “OK” button when the date and time have been corrected. This will return the user to the Login Screen.



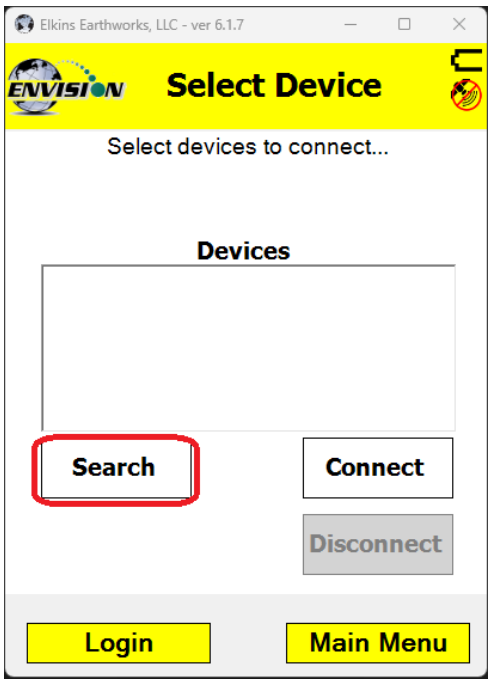
6. If the user name and time are now correct, then tap the “Login” button at the bottom of the screen.

4.3 Connecting and Disconnecting the Envision® Gas Analyzer

4.3.1 Bluetooth Connection

Once the user is logged in, the user can now search for and connect to an Envision® gas analyzer.

1. On the tablet computer make sure that the "Select Meter" screen is displayed.
2. Turn on the Envision® gas analyzer by pressing the power button on the front of the Envision® gas analyzer.
3. The Envision® gas analyzer will maintain a solid green light next to the power button.
4. Next press the Bluetooth® button on the face of the Envision® gas analyzer. The blue light on the Envision® gas analyzer will blink signaling that it is now discoverable by tablet computers.



5. The user should now tap the "Search" button on the "Select meter" screen on the tablet computer.

6. The tablet computer screen will display "Searching…" above the "Meters" box and will change to "Select Meter to connect" once the Envision® gas analyzer is discovered.

7. The Envision® gas analyzer should be displayed in the box titled “Devices”. Each discoverable Envision® unit should appear and will be defined by the name “HCH” followed by the unit’s serial number.

   The Envision® HCH will not show up in versions of software earlier than version 6.0. If you do not see your gas analyzer in the list, confirm that you are using the newest software. The newest software can be downloaded on the Elkins Earthworks, LLC website in the “Downloads” section.

8. Select the desired analyzer by tapping the Envision® Meter ID (serial number) and then tapping “Connect”. If you are using a Blueprobe temperature probe or Envision® Autocalibrator, you may also select it and connect to it at this time.

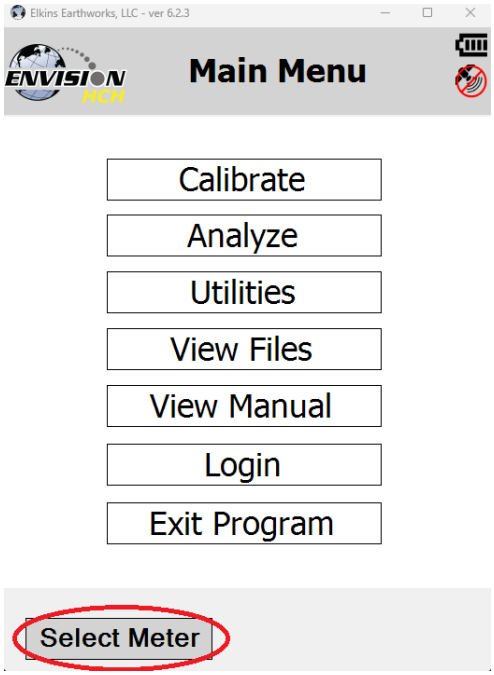
9. Once the connection is made the words “Connected to ….” will be displayed in green above the “Meters” screen. The blinking blue light on the Envision® gas analyzer will stop blinking and will now show solid blue. The battery strength indicator located in the header box will now display the approximate battery level of the Envision® gas analyzer.

   Note: The software color scheme changes from yellow to gray when connecting to an HCH Envision® gas analyzer. It will turn back to yellow if the “ENV200 Mode” setting in the “Utilities” screen is enabled.

10. Once connected, tap the “Main Menu” button in the lower right-hand corner of the screen.

4.3.2 Disconnecting from the Envision®

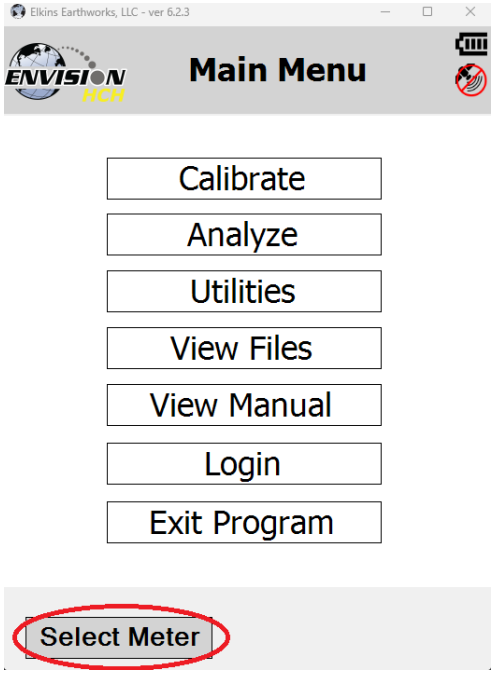
To disconnect from the Envision® gas analyzer follow the steps listed below:



1. From the "Main Menu" tap the "Select Meter" button on the lower left corner of the touch screen.

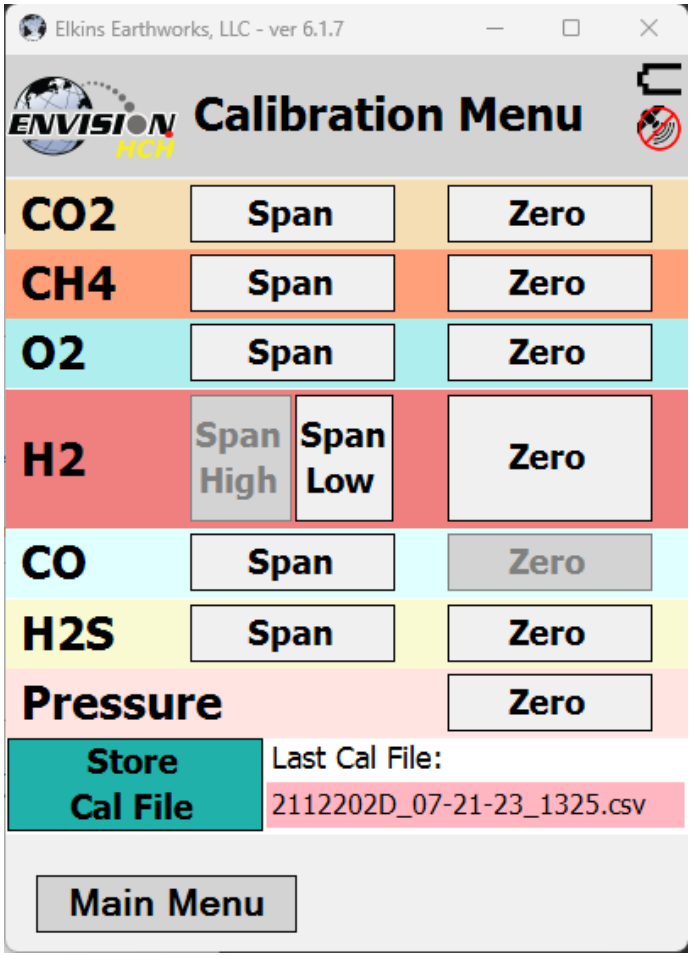
2. Uncheck any devices intended to be disconnected from.
3. Tap the "Disconnect" button.

4.4 Main Menu



The “Main Menu” is the user’s access point for the features included in the Elkins Gas Analyzer software. On this screen the user may select any one of the functions indicated on the buttons or the user may return to the “Select Meter” screen by tapping the “Select Meter” button in the lower left-hand corner of the touch screen. The following sections will walk the user through each of the functions indicated on the “Main Menu” screen.

4.5 Calibrate



The Envision® gas analyzer has up to six internal gas measurement sensors (CH_4, CO_2 , O_2, H_2, CO, and H_2S) and five pressure sensors that have been calibrated in the factory. The factory calibration results are stored within the Envision® gas analyzer and can only be altered in the factory. The Envision® gas analyzer should be field calibrated prior to each monitoring event. The field calibration file is stored within the tablet computer.

To enter the calibration area of the software, tap the "Calibrate" button on the "Main Menu" screen. The calibration process of the Envision® gas analyzer was built to be simple for the field user. Follow the calibration procedure described below to accurately calibrate the Envision® gas analyzer.

Each gas sensor should be calibrated with a zero gas and a span gas. The technician should calibrate the sensors in the recommended order, shown below. Failure to follow the recommended order of calibration may cause decreases in sensor accuracy. It is also recommended that when one gas sensor is calibrated, all sensors should be calibrated (zeroed and spanned).

The calibration menu for the HCH Envision® gas analyzer is shown below. The CSV (comma separated variable) file containing the last calibration information is stored on the tablet. This file may be opened in any text editor (or Microsoft Excel). This is stored in the Calibration folder in the Elkins Earthworks directory located at the root folder of the hard drive (C:\Elkins Earthworks\Calibration).

4.5.1 Recommended Field Calibration Procedure Order

For HCH Envision® gas analyzers, it is recommended to follow the factory recommended procedure when performing Field Calibrations. Following this procedure will decrease the likelihood of issues and increase the accuracy of readings taken with the instrument.

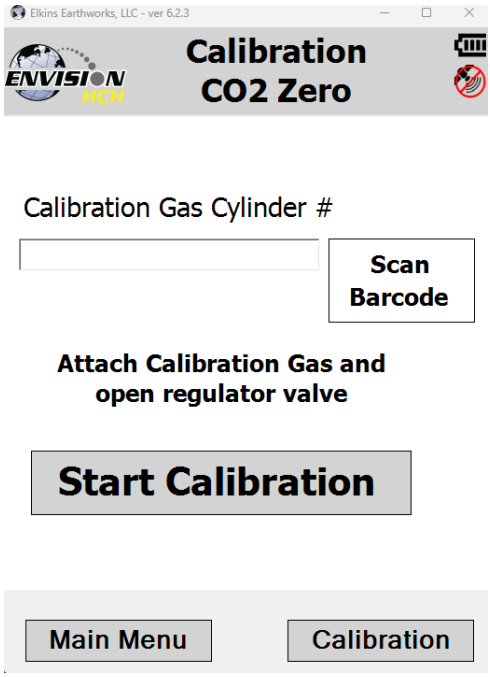
The recommended calibration procedure is to zero all of the sensors from the top of the list down, span the sensors from the top of the list down (skipping H_2 High) and then go back and span H_2 High.

The software will grey out certain options on the calibration screen to ensure that the most important steps in this procedure are followed. It will grey out the H_2 Span until everything else has been completed, and it will grey out the CO Zero until the H_2 zero has been completed.

H_2 and O_2 Zeroes must be performed with 100% Nitrogen gas. All other zeroes can use any of the following three options (in order of preference):

1) 100% Nitrogen.
2) O_2 Span Gas.
3) Ambient air (not recommended).

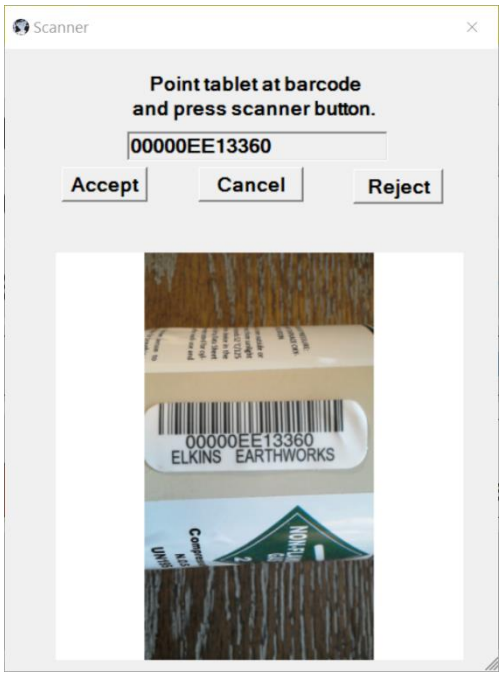
4.5.2 Zero Gas Calibration



1. Tap the "Zero" button of the gas that is to be calibrated. This action will take the software to the "Calibration … Zero" screen.

2. Enter the Calibration Gas Cylinder # in the field. The last number will be automatically populated in the field.

   The automatically populated last number will be tied to The Envision® device serial number, not the tablet.

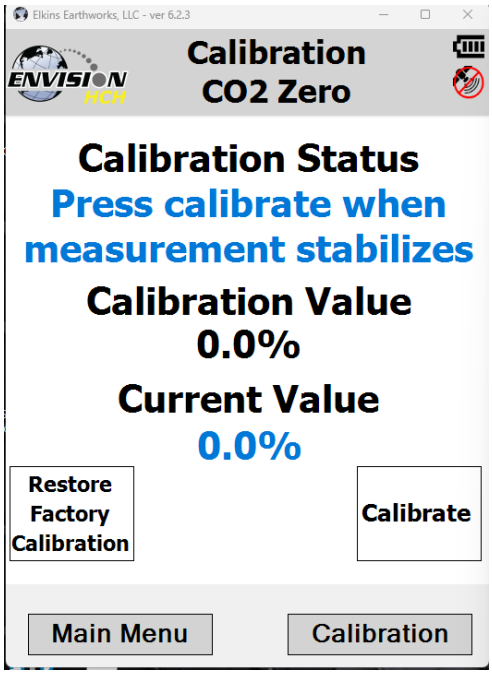


The user now has the ability to scan the barcode on the calibration cylinder. Tap the "Scan Barcode" button and aim the tablet device camera at the barcode on the calibration gas cylinder being utilized. The barcode number will automatically populate the "Calibration Gas Cylinder #" text box. The user can manually type in the bottle lot# using the on screen keyboard or the user may proceed without entering a cylinder number. This data will be recorded in the calibration .csv file that is stored during the calibration process.

3. Attach the calibration gas to the Static sample port located on the front of the Envision® gas analyzer and open the regulator valve. Elkins Earthworks® strongly recommends the use of a Demand Flow regulator.

   Warning: If using a tunable regulator (not recommended), use a setting of .5 LPM and attach the calibration gas only to the Static port. Do not attach the calibration gas to the Exhaust, Impact or Available ports. Pressures greater than +/- 200" H_20 on any port may result in a damaged pressure sensor.

4. Tap the "Start Calibration" button. This action will turn on the sample pump and will change the tablet computer display.



5. When the "Current Value" is less than 0.25% (for O_2), 1% (for 0-100% range sensors) or 100 PPM (for 0-2,000 PPM range sensors) the Calibration status will display "Press calibrate when measurement stabilizes". This does not mean that the sensor has fully stabilized but that the unit is within the tolerance allowed when zeroing. Tap the "Calibrate" button once the current value has stabilized.

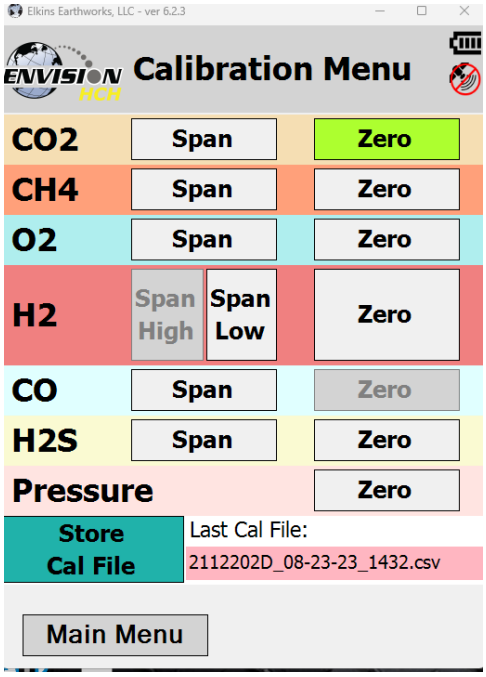
   If the measurement continues to fall after the button is pressed, it is ok to press the calibrate button again to get a better zero.

Errors that may occur:

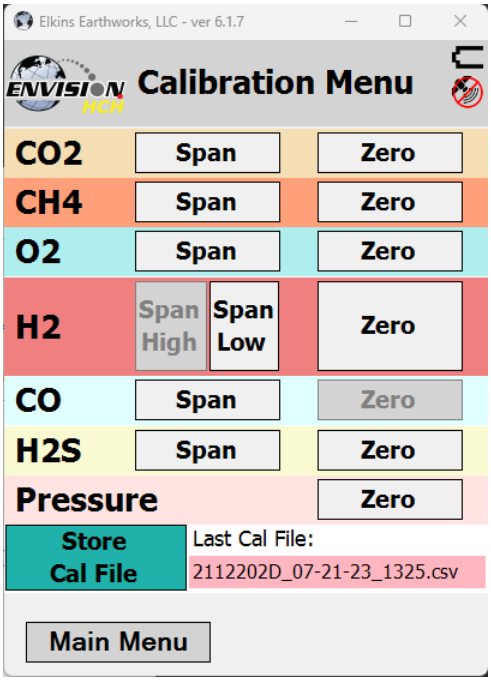
a. If the calibration button is pressed before the measurement is fully stabilized, the calibration will be inaccurate and, in some cases, make the Envision® unable to pass a future span calibration.
b. If the "Current Value" is greater than the currently allowed tolerance, then the tablet computer will display the following message "Current measurement is outside of expected range. Please verify calibration gas value and/or restore factory calibration." The technician may discard the field calibration value and restore the factory calibration value by tapping the "Restore Factory Calibration" button on the "Calibration … Zero" screen. The technician should then try to recalibrate. If the unit will not calibrate then the user should contact technical support at Elkins Earthworks® at 330-725-7766.

If the “Current Value” is within the allowable tolerance, then the tablet computer will adjust and store your calibration once the user taps the “calibrate” button.

6. The pump will continue to run and the current measurement will be displayed until the user returns to the “Calibration” menu by tapping the “Calibration” button in the lower right hand corner of the touch screen.



7. Now that the tablet computer has returned to the “Calibration Menu” the user will notice that the parameter that has been calibrated is now highlighted in green. The user may now select the next gas to calibrate.

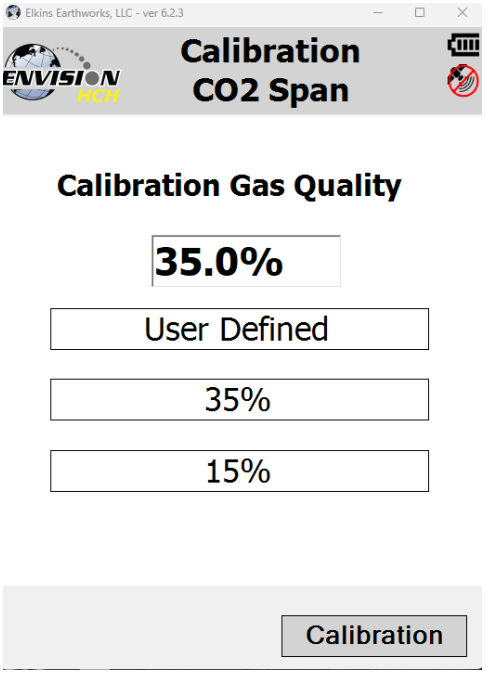


H_2 and O_2 Zero must be performed with 100% Nitrogen "Zero" gas. Other Zero calibrations can be performed with either ambient air (not recommended), O_2 Span gas or Nitrogen.

The CO Zero and H_2 Span High buttons are initially disabled, indicated by being colored gray. The CO Zero button will become active once the H_2 gas has been zero calibrated. H_2 Span High will become active after H_2 Span low, CO Span and H_2S Span have been completed.

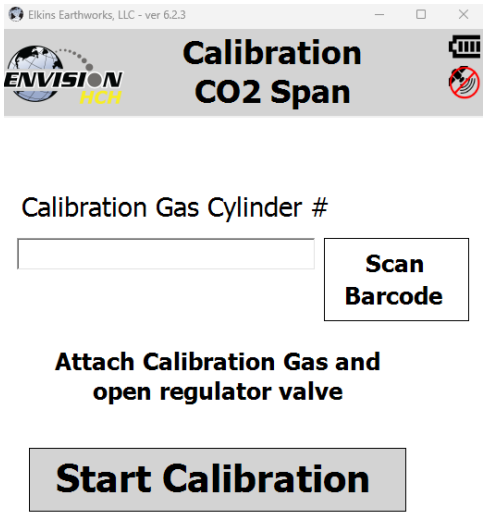
4.5.3 Span Gas Calibration

1. On the "Calibration Menu" tap the "Span" button of the gas that is to be calibrated. This will take the user to the "Calibration … Span" screen.



On this screen there are two preset calibration gas values and one text box that the user can type in a user defined calibration gas value using the on screen keyboard. If selecting a user defined gas quality, the user must enter a value 0.1% to 100% (for percent range gases) or 0-2,000 (for PPM range gases). If the user types in a span gas value, they must first type in the desired gas quality then tap the "User Defined" button.

User defined values can be entered in percent or PPM format, as long as the "%" or "PPM" specifier is included. If nothing is specified, the software will assume it is in percent.



8. Enter the Calibration Gas Cylinder # in the field. The last number will be automatically populated in the field.

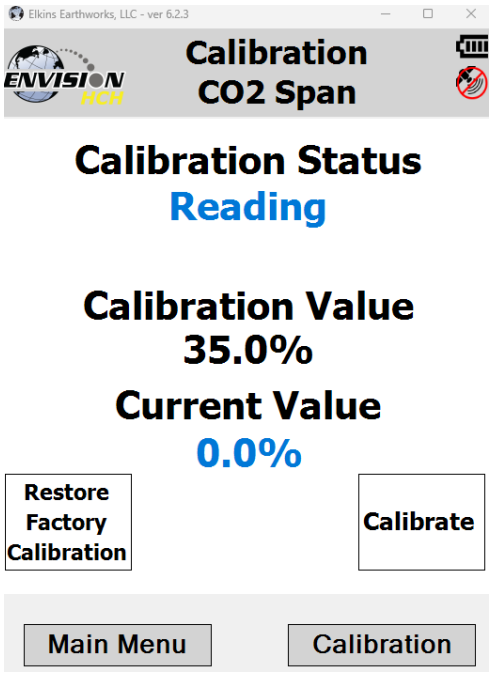
   The automatically populated last number will be tied to The Envision® device serial number, not the tablet.

The user now the ability to scan the barcode on the calibration cylinder. Tap the "Scan Barcode" button and aim the Camera at the barcode on the calibration gas cylinder being utilized. The label number will automatically populate the "Calibration Gas Cylinder #" text box. The user can manually type in the bottle lot# using the on screen keyboard or the user may proceed without entering a cylinder #. This data will be recorded in the calibration .csv file that is stored at the end of the calibration process.

2. Attach the calibration gas to the Static sample port located on the front of the Envision® gas analyzer and open the regulator valve. Elkins Earthworks® strongly recommends the use of a Demand Flow regulator.

   Warning – If using a tunable regulator, use a setting of 0.5 LPM and attach the calibration gas only to the Static port. Do not attach the calibration gas to the Exhaust, Impact or Available ports. Pressures above +/- 200" H_20 on any port may result in a damaged pressure sensor.

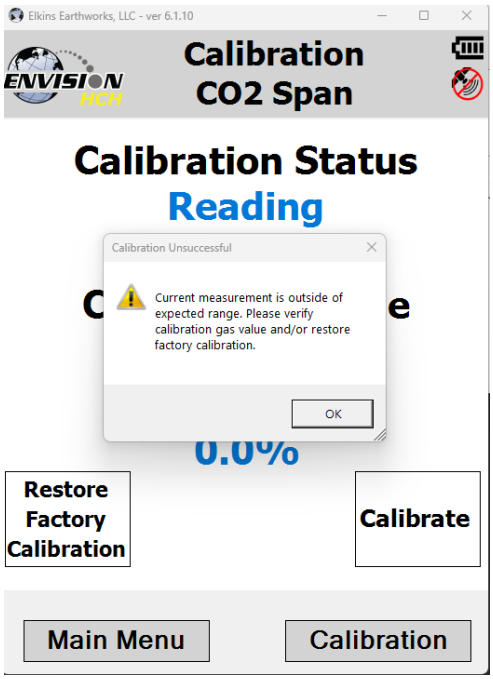
3. Tap the “Start Calibration” button. This action will turn on the sample pump and will change the display. The “Calibration Value” located in the middle of the touch screen should be the same as the gas quality that is being used for calibration and will not fluctuate.



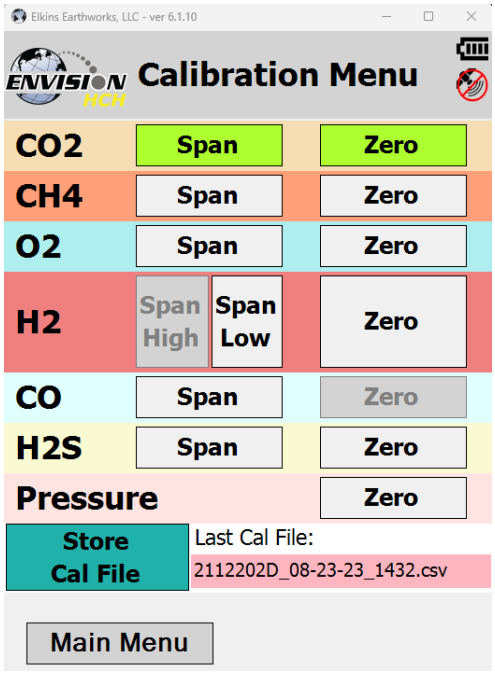
4. Once the sensors are initiated and warmed up the “Current Value” will fluctuate. When the “Current Value” is within the allowable tolerance of the calibration gas value the Calibration status will display “Press calibrate when measurement stabilizes”. Tap the “Calibrate” button once the current value has stabilized.

   If this button is pressed before the measurement is fully stabilized, the calibration will be inaccurate.

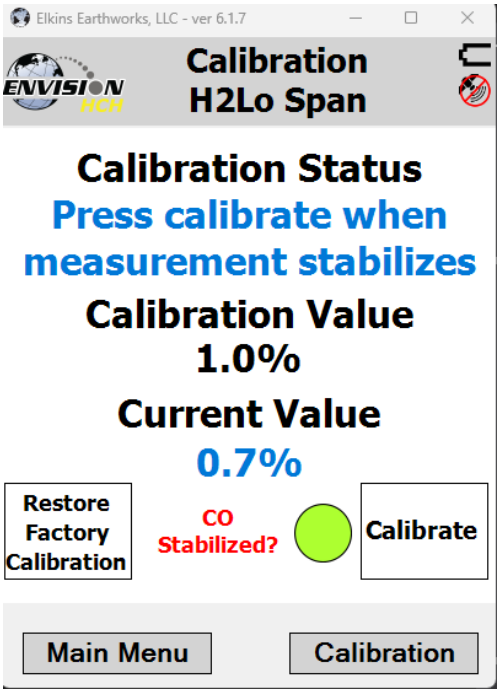
   If the measurement continues to change after the button is pressed, it is ok to press the calibrate button again to get a better span.



Errors that may occur:
If the “Current Value” is outside of the allowable tolerance of the calibration gas value, then the tablet computer will display the following message “Current measurement is outside of expected range. Please verify calibration gas value and/or restore factory calibration.” The technician may discard the field calibration value and restore the factory calibration value by tapping the “Restore Factory Calibration” button on the “Calibration … Span” screen. The technician should then try to recalibrate. If the unit will not calibrate then the user should contact technical support at Elkins Earthworks® at 330-725-7766.



5. Now that the tablet computer has returned to the "Calibration Menu" the user will notice that the parameter that has been calibrated is now highlighted in green. The user may now select the next gas to calibrate.

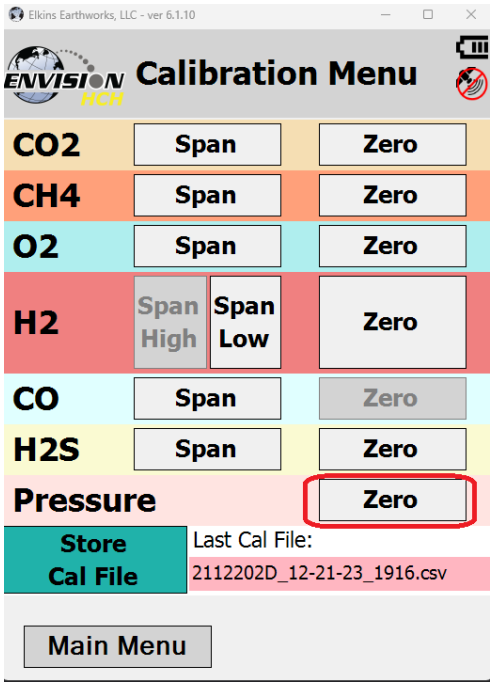


When calibrating the H_2 Low Span, CO Span and H_2S Span gases a stabilization indicator will appear. This indicator will progress from red, to yellow, to green to indicate whether the reading has met Elkins Earthworks requirements for stabilization. For H_2 Low, this indicator will show CO stabilization NOT H_2. See screen to the left with CO stabilized and within the allowable tolerance range. For H_2, if the stabilization indicator never progresses to green, the option to calibrate H_2 only will be available. A pop up message will allow the use of the factory value for CO cross sensitivity. This is meant to be a "last resort option", accuracy of the CO sensor will not be guaranteed when calibrated this way.

If the "CO Stabilized" indicator does not progress to green, this can indicate an issue with the CO or H_2S sensor. Please contact Elkins Earthworks to create an RMA for a CO sensor replacement.

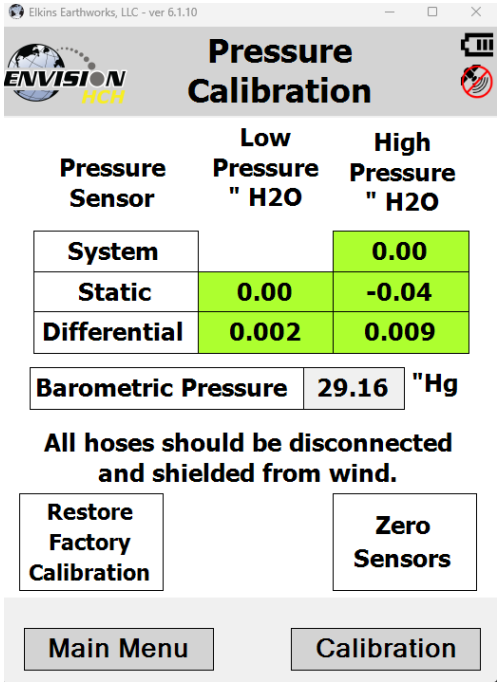
4.5.4 Pressure Sensor Calibration

The Envision® gas analyzer has 5 internal pressure sensors. These sensors should be field calibrated at the beginning and periodically during the monitoring event. The pressure sensors may be zeroed from two different locations in the Elkins Earthworks® Analyzer software.



From the "Calibration Menu":

1. Tap the "Pressure Zero" button. The screen will change to the "Pressure Calibration" screen.



1. On the "Pressure Calibration" screen allow the pressures in the 5 pressure blocks to stabilize.

2. Ensure that the sample fittings are disconnected from the wellhead and shielded from the wind

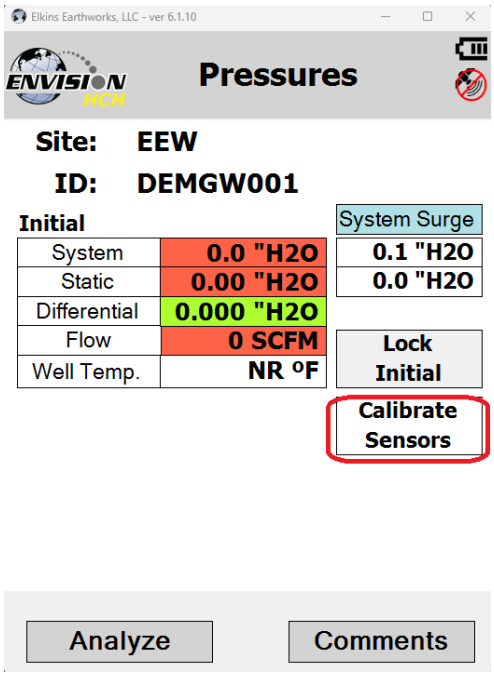
3. Tap the “Zero Sensors” button on the lower right-hand part of the screen.

4. The values in the green pressure boxes should now read close to 0.00” H_2O. Due to the high sensitivity of the sensors the values may still fluctuate but they should be close to the target value.

5. The user may also restore the factory calibration by tapping the “Restore Factory Calibration” button.

6. Tap the “Calibration” button on the lower right of the screen to return to the main “Calibration” screen. The pressure sensor calibration menu is also accessible from the pressure measurement screen in the analyze portion of the software. On the read “Pressures” screen tap the “Calibrate Sensors” button. This action will take you to the pressure sensor calibration screen that was just described in the previous section.

From the "Pressures Screen":

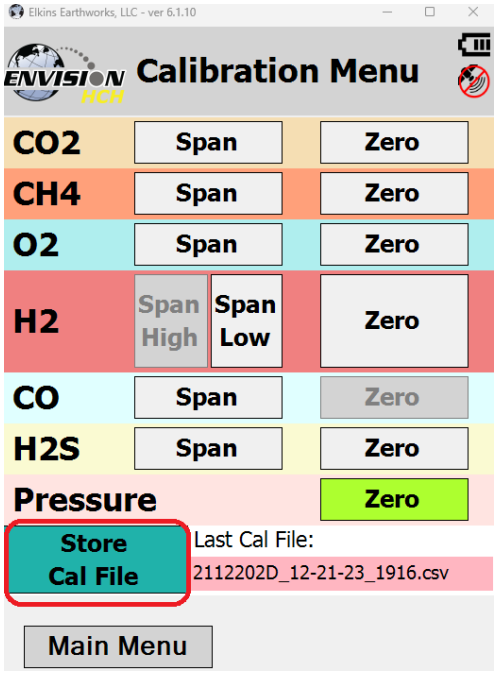


Pressure Sensors can also be zeroed at any point if a technician notices that there is an issue.

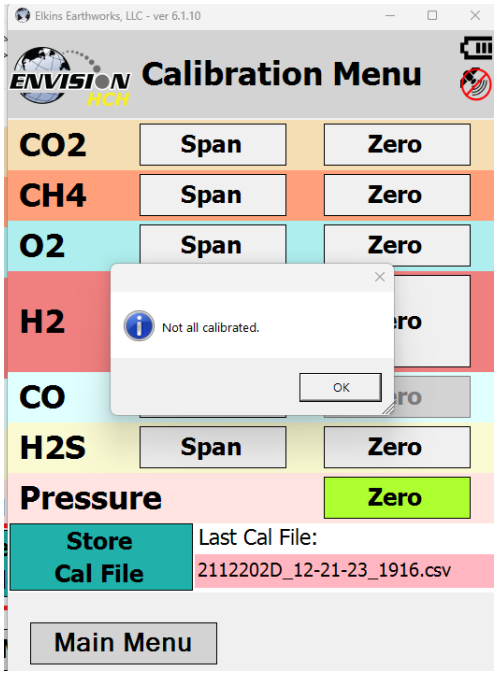
Follow the same pressure calibration procedure as detailed in the previous section then tap the Analyze button in the lower right corner of the screen.

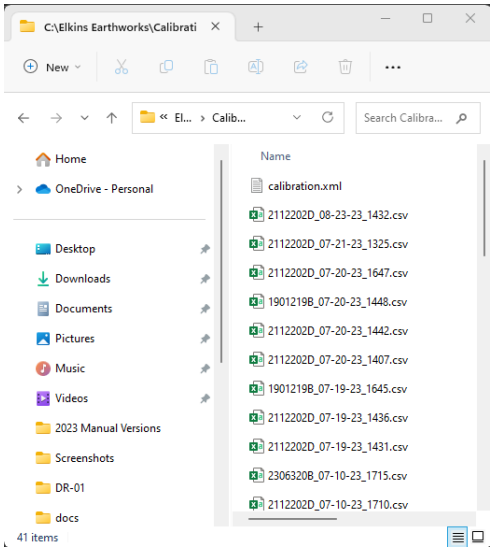
Warning: Never apply vacuums greater than -200" H_20 or pressure greater than +200" H_2O to any of the pressure sensors during calibration or measurement activities. These extreme pressures can damage the pressure sensors within the Envision® gas analyzer.

4.5.5 Storing a Calibration File



Once all of the calibration gases have been calibrated, the user may then select the option to "Store Calibration File". This feature will generate a .csv file with all of the calibration information generated during the calibration activity.



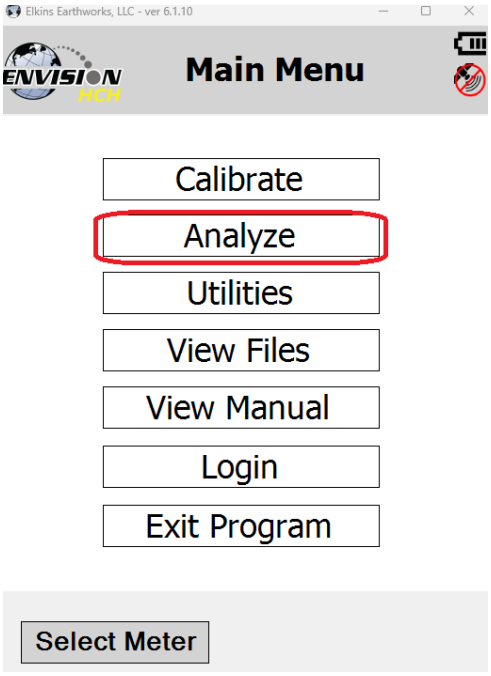


If the user has failed to calibrate all of the parameters a warning screen will appear and will indicate “Not all calibrated”.

This is a warning box so that the user can go back and calibrate the remaining parameters, if desired. If the user taps the “OK” box in the warning message it will return the screen back to the “Calibration Menu” so that the remaining parameters can be calibrated. If the user does not calibrate the remaining parameters and taps the “Store Calibration File” button again the unit will store a “Calibration File” but will place NA in the fields that were not calibrated. Elkins Earthworks® recommends that each parameter be calibrated at least once during each monitoring event.

Once the “Store Calibration File” button is selected the tablet computer will store the calibration file in the tablet computer in C:\Elkins Earthworks\Calibration. The file is named as such: meter serial number_month-day-year_time (i.e. 000108_7-20-2008_1028).

4.6 Analyze

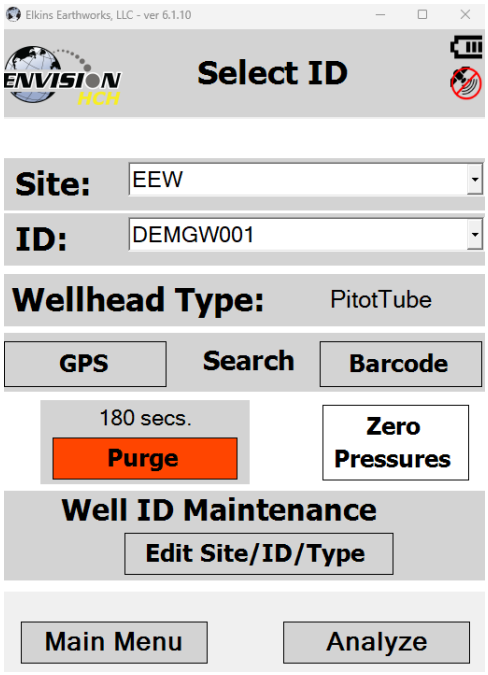


The Analyze feature of the Envision® software allows the user to measure and record gas qualities, associated pressures and comments for selected monitoring points. To enter the "Analyze" portion of the software go to the main menu and tap the "Analyze" button. The tablet computer will automatically progress to the "Select ID" screen.

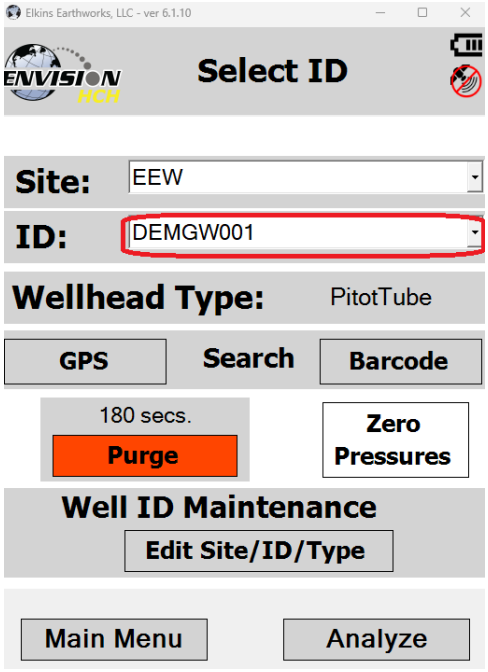
4.6.1 Select ID

To make it easier for a user to locate and identify a well or location to monitor, the Envision® software utilizes three different search methods: manual, GPS or barcode scanner. In The Envision® Gas Analyzer Configuration Editor Software section there are specific instructions on how to configure an ID set.

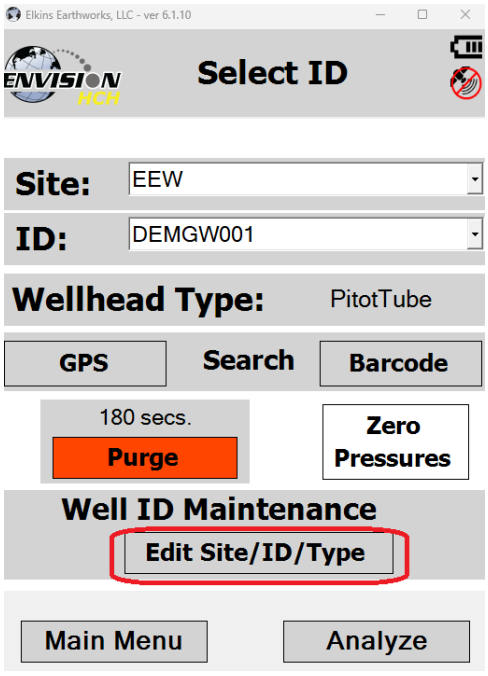
4.6.1.1 Manually Select ID



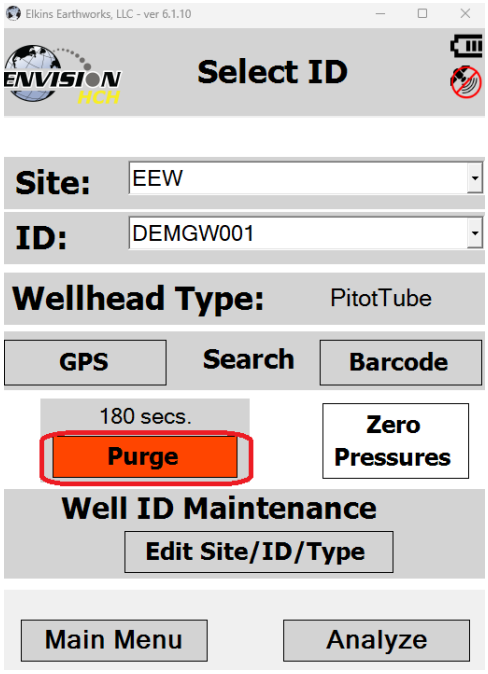
On the "Select ID" screen you may manually select the monitoring point by following the instructions below:



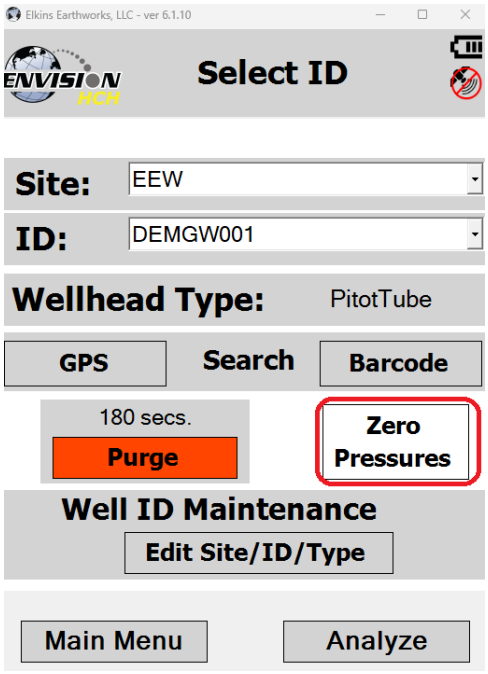
1. Use the combo boxes labeled "Site" and "ID" to locate the monitoring point that is to be monitored.



2. If the "Site" or "ID" is not stored in the ID list, the user can manually create a Site and/or ID within the "Well ID Maintenance" feature accessible via the "Well ID Maintenance" button at the bottom of the "Select ID" screen. Instructions on how to Use the "Well ID Maintenance" function can be found in 4.9.1 "Well ID Maintenance".



3. Once the correct ID is selected the user should tap the "Purge" button. The sample pump will turn on and the button will turn green. The timer will count down 90 seconds or until the O_2 percent in the meter is at least 18% then the pump will turn off. The purge cycle may end if either the Envision® meter detects that the sample train is clear of methane or the user taps the "Purge" button again. Purging will also look at readings for CO. H_2 and H_2S gases.

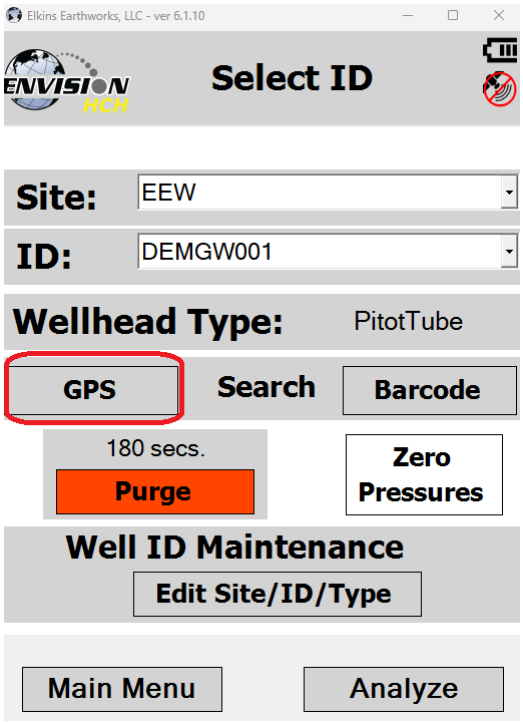


4. Once the purge is complete keep your sample trains disconnected and shielded from the wind then tap the “Zero Pressures” button. The user can also decide to skip the “Zero Pressures” feature and go directly to the Analyze screen by pressing the “Analyze” button in the lower right corner of the screen.

4.6.1.2 GPS Selection of ID

If the user desires to locate the monitoring point via GPS, then follow the instructions detailed below:

1. Stand at the location to be monitored – The first connection may take several minutes for the GPS to lock after the tablet computer is first turned on. Each location after this should be instantaneous.



2. Tap the GPS button on the tablet computer's touch screen.

3. Once the "GPS" button is pushed a status message will be displayed above the Site text box that will indicate "Reading GPS", then either "GPS not locked", "Site/ID selected by GPS", or "Failed to find GPS match".

4. The tablet computer will automatically populate the "Site" and "ID" text box with the nearest monitoring point.

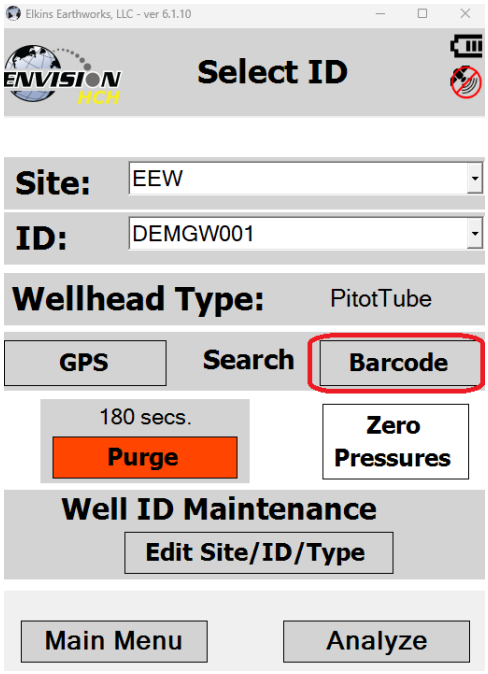
5. If the GPS does not find a monitoring point, then the status will change to "Failed to find GPS match". If the ID is known, the user can manually select the "Site" and "ID" then tap the "Well ID Maintenance" button to mark the GPS coordinates for that location. Instructions on how to use the "Well ID Maintenance" function can be found in section 4.9.1.

If sample points are located within 30 feet of each other, then the GPS function will select the closest point to your location.

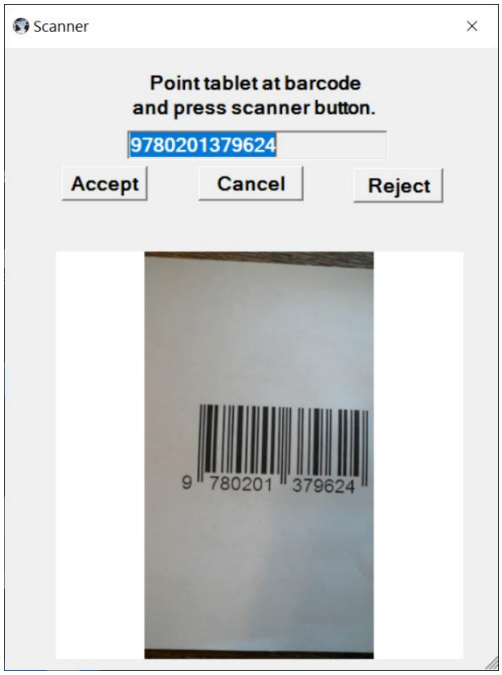
4.6.1.3 Barcode Selection of ID

If you desire to select the well to be measured by barcode, please follow the instructions below:

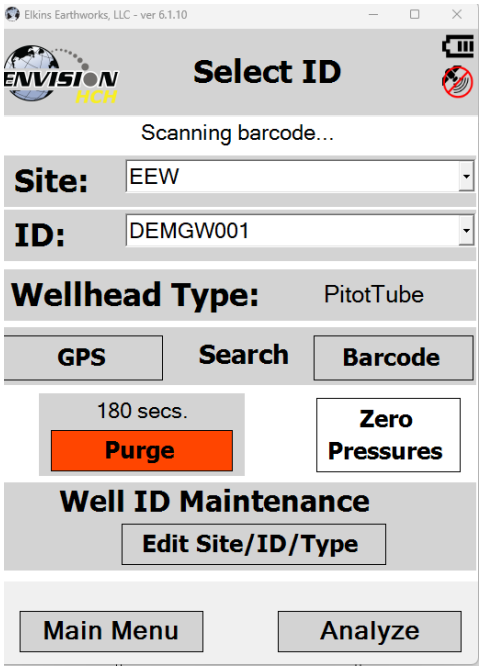
1. Walk up to the point to be monitored.
2. Locate the barcode on the item to be monitored.



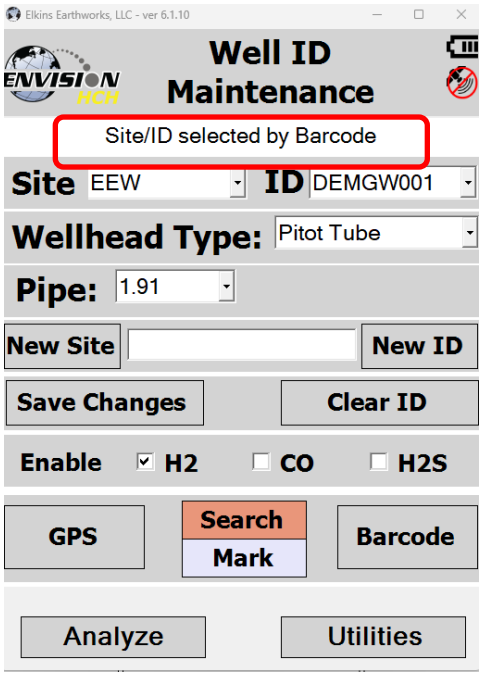
3. On the “Select ID” screen tap the “Barcode” button.



4. Aim the camera at the barcode and press Accept.

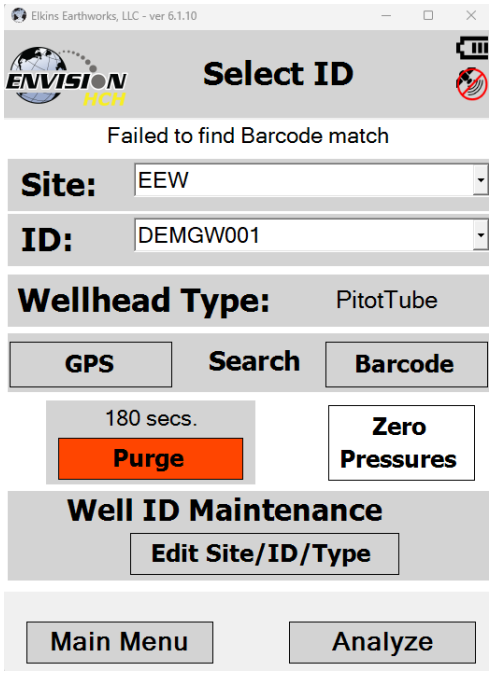


5. A status message will be displayed above the “Site” that will indicate “Scanning Barcode”



6. Once the barcode has been verified the status will change to “Site/ID selected by Barcode”

7. The tablet computer will automatically populate the “Site” and “ID” text box with the correct monitoring point.



8. If the barcode does not find a monitoring point, then the status will change to “Failed to find Barcode match”. If the ID is known, the user can manually select the Site and ID then tap the “Well ID Maintenance” button to mark the barcode for that location. Instructions on how to Use the “Well ID Maintenance” function can be found in section 4.9.1.

4.6.2 Analyze

This feature allows the user to measure the gas qualities and pressures for a selected sample point. The "Analyze" screen is accessed by pressing the "Analyze" button in the lower right of the "Select ID" screen.

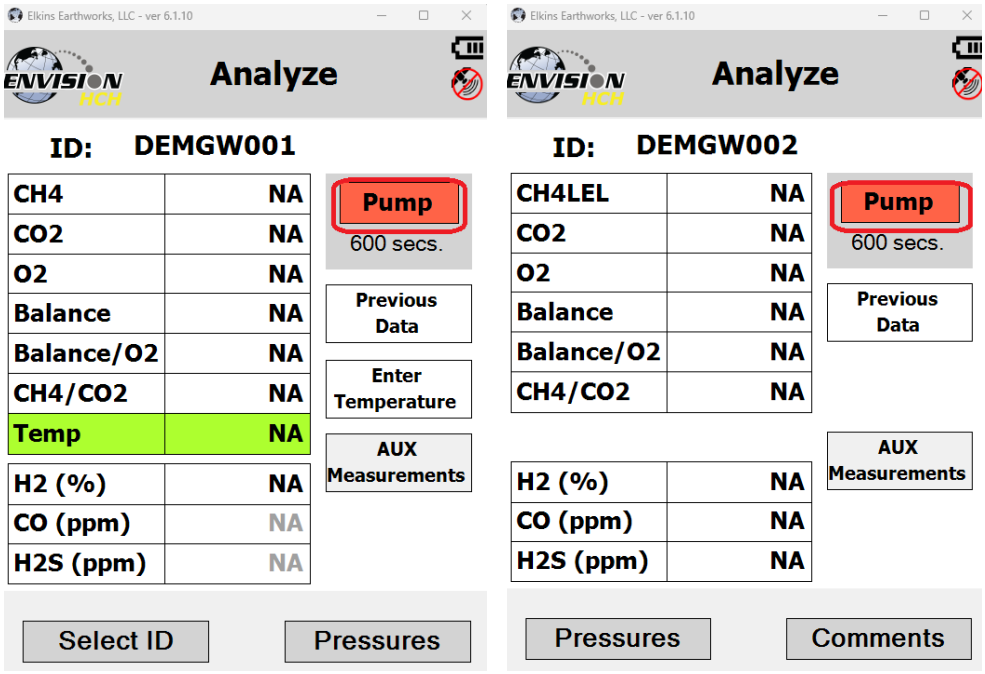
Note: *The typical screen progression is from gas concentration analysis to pressure analysis. However, if the wellhead type is set to "Probe", the screen progression is reversed.*

4.6.2.1 Analyze Screen

4.6.2.1.1 Pump

This button activates the sample pump located within the Envision® gas analyzer.

The left screen is for a typical well. The right screen is for a probe.



The button is red when the pump is off and green when activated. The default on time for the pump is 600 seconds. To activate the pump, tap the "Pump" button once. The sensor will then go through a 20 second warm-up before actual gas values will appear. The pump may be turned off by tapping the "Pump" button again. If the pump is turned off, then the gas values will return to the default "NA". To lock the gas values the user must tap the "Lock Readings" or "Read Pressures". The pump time can be changed within the Configuration Editor as described in The Envision® Gas Analyzer Configuration Editor Software section.

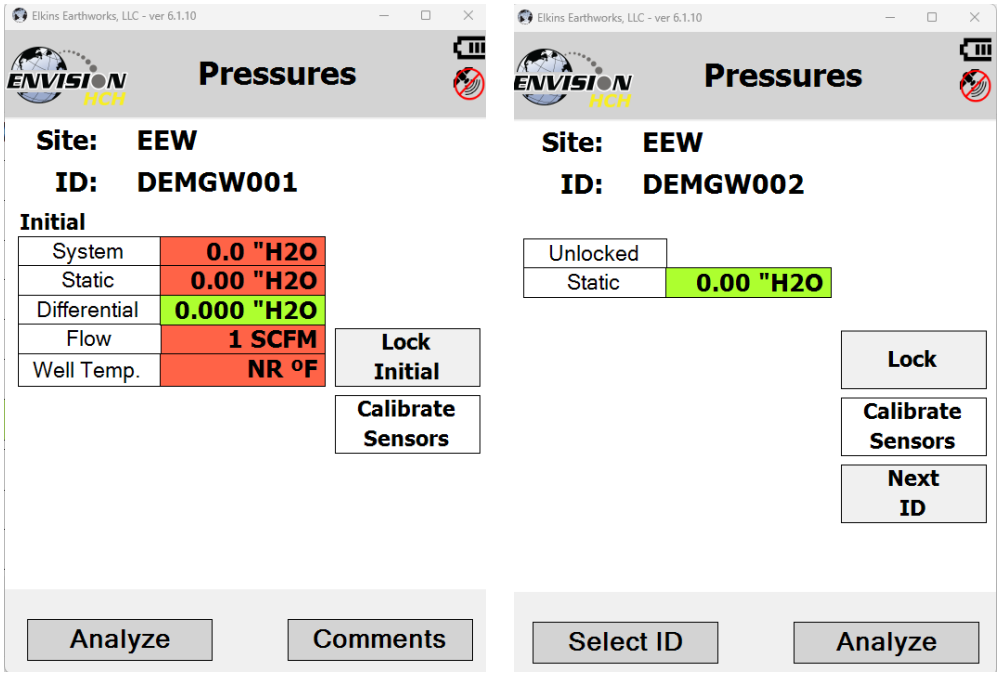
When the pump button is pressed, the Envision® will begin to measure CH_4, CO_2, O_2, and H_2. If the H_2 level is below the safe threshold, then CO and H_2S may also be measured. This is described in the Lock Readings section below. The user will not be able to measure CO and H_2S gases until H_2 has been measured for 20 seconds. This is to prevent damage to the CO and H2 sensors from high levels of H_2.

It is possible to disable each of the 3 HCH gas measurements (H_2, CO, and/or H_2S) on the well configuration screen. However, if H_2 is disabled, CO and H_2S will automatically be disabled. This is to prevent damage to the CO and H_2S sensors due to a possible high H_2 level.

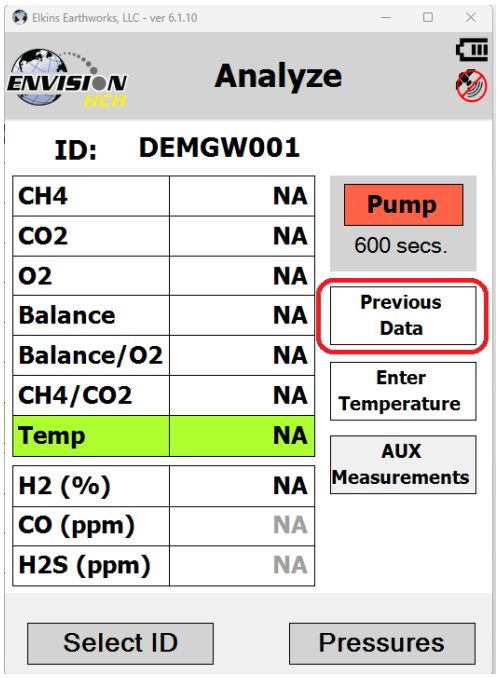
4.6.2.1.2 Read Pressures

The Envision® unit measures Available, Applied, and Differential pressures. To view and record these pressures, the user must go to the "Read Pressures" screen.

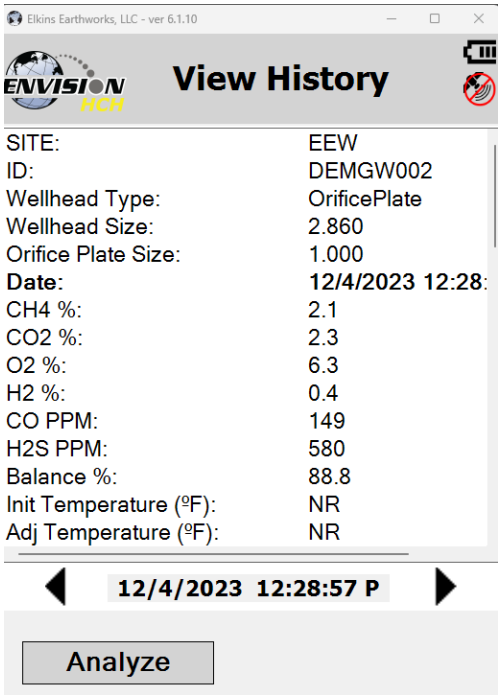
The left screen is for a typical well. The right screen comes up if the Wellhead Type is set to "Probe".



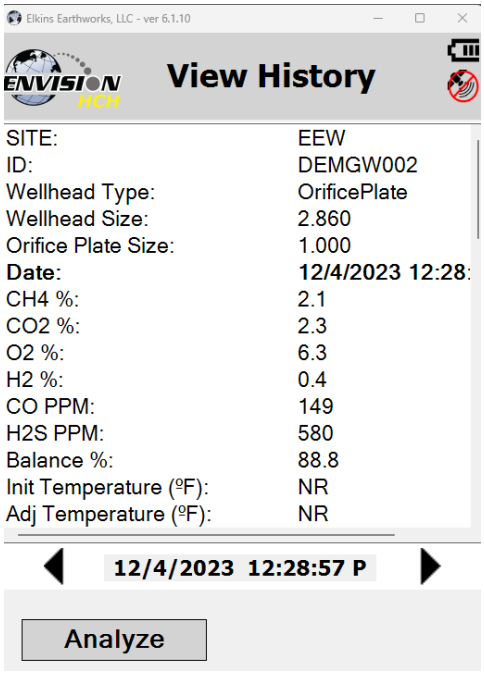
4.6.2.1.3 Previous Data



If the user desires to view data previously recorded on the tablet, then the Previous Data button should be tapped.

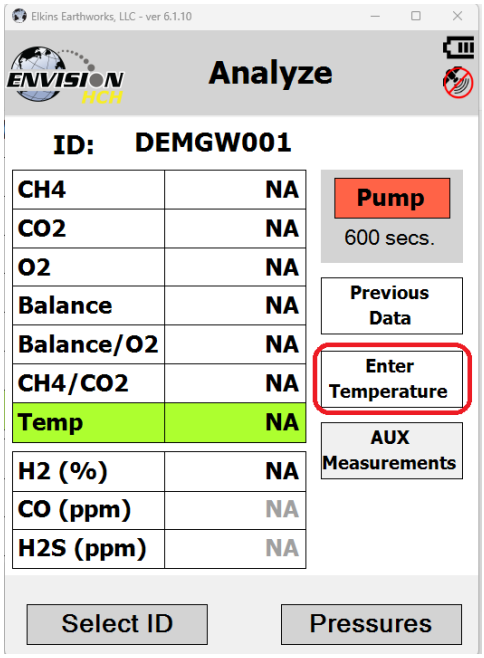


This button will take the tablet computer to the “View History” screen. The “View History” screen will display any historical well data for the selected ID located in the site’s current month output file located on the tablet computer.

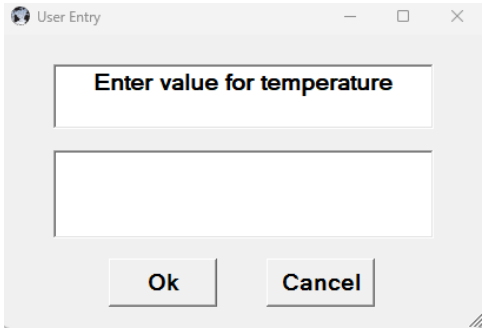


To return to the “Analyze” screen tap the Analyze button in the bottom left-hand corner of the screen.

4.6.2.1.4 Enter Temperature

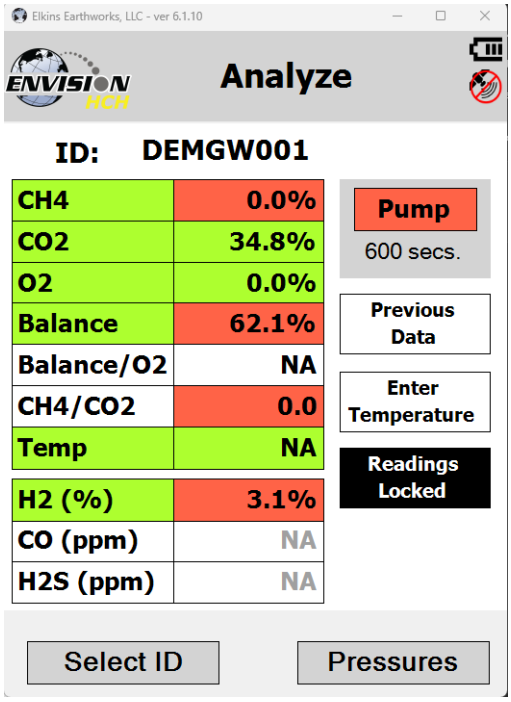


1) Press the "Enter Temperature" button to allow manual entry of well temperature. This will override any thermistor that happens to be attached to the Envision®.



2) Use the on screen keyboard to enter a temperature value, then hit Ok.

4.6.2.1.5 Lock Readings



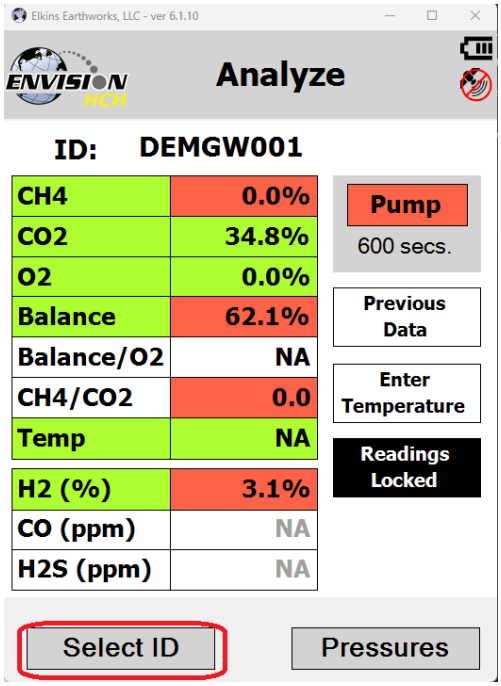
The "Lock Readings" button is designed to lock the gas values and to turn off the pump. This feature locks the readings so if you decide to come back to this screen your readings will not change. This feature does not actually "Store" the gas qualities into the .csv file.

CO and H_2S readings can only be taken if H_2 is below 1.25%. The Lock Readings button will switch to "AUX Measurements" when the meter is ready to take these readings. In order for the button to switch, two conditions must be met.

1. H_2 should read below 1%.
2. The pump must have been running for 20 seconds.

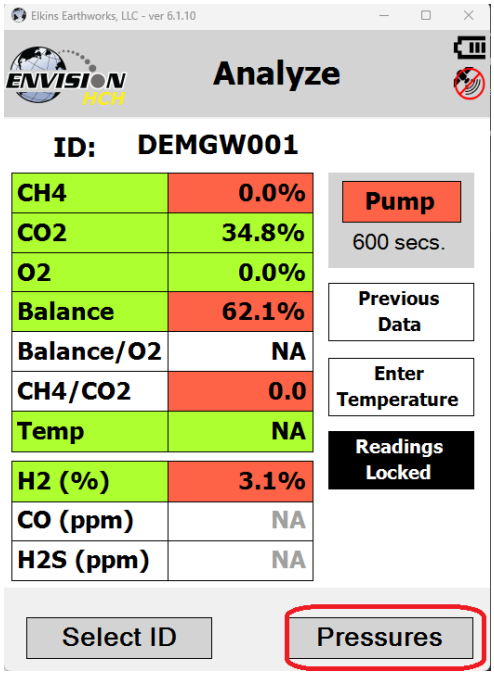
If the meter reads more than 1.25% H_2 or the CO/H_2S sensors read above their range while making "AUX Measurements", the Envision® HCH will show a warning dialog. When this dialog appears, the user must disconnect any gases from the sample port and allow the unit to purge. The duration of the "Purge" routine depends on the concentration of gases, the Envsion HCH will monitor the sensor readings and stop the purge routine when the gases have been safely purged. Failure to follow recommended purge dialogs can result in damage to the sensors.

4.6.2.1.6 Select ID



This button will return you to select ID screen so that another ID can be selected without having to proceed through the entire sample procedure. However, this will not store any of the data that you have gathered for the current ID.

4.6.2.1.7 Pressures

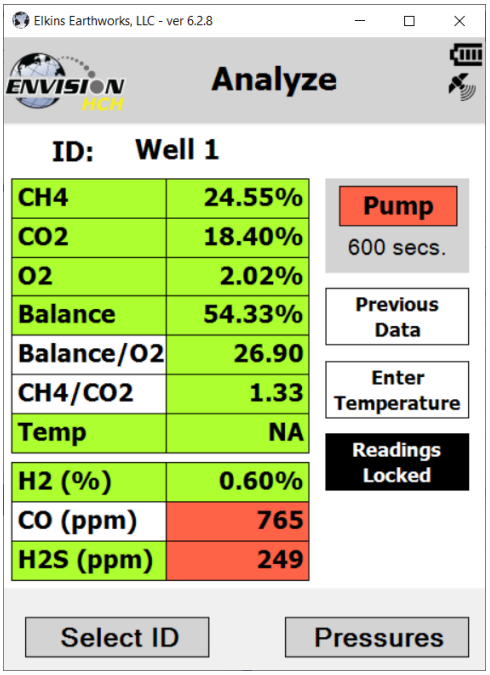


This button will exit the user from "Analyze" and take the user to the "Pressures" screen. However, this will not store any of the data that you have gathered for the current ID.

4.6.2.2 Gas Quality and Gas Quality Ratios

The Envision® gas analyzer measures concentrations of 6 gases: H_2, CO, H_2S, CH_4, CO_2 and O_2. The balance gas is calculated by subtracting the total of these three gas qualities from 100%.

4.6.2.2.1 Gas Qualities



CH_4 – Methane: CH_4 is measured via an internal Infrared sensor. The measurement range of the sensor is 0-100% CH_4.

CH_4 – LEL (Lower Explosive Limit): By tapping the CH_4 box the tablet computer will display the CH_4 LEL%. The user can return to the standard CH_4% by tapping the CH_4 box again. Note: 100% LEL is equal to 5% CH_4.

CO_2 – Carbon Dioxide: CO_2 is measured via an infrared sensor. The measurement range of the sensor is 0-100% CO_2.

O_2 – Oxygen: O_2 is measured via an electrochemical sensor. The measurement range of the sensor is 0 – 25% O_2.

H_2 – Hydrogen: H_2 is measured using a thermal conductivity sensor. This sensor has two ranges, 0-1% and 1%-100%. This sensor is used to decide whether the CO and H_2S measurements are available for a given sample gas.

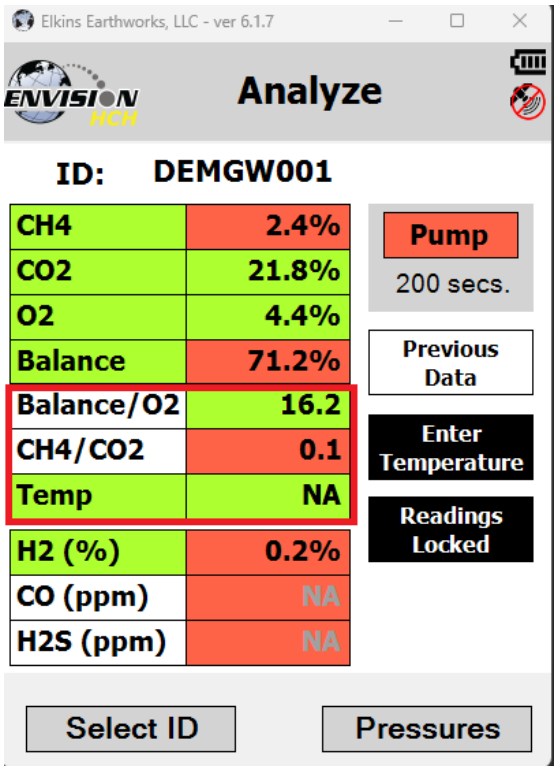
CO – Carbon Monoxide: CO is measured using an electrochemical sensor. The sensor range is 0-2000 PPM CO. The CO sensor is H_2 compensated up to 1% (10,000 PPM) H_2, and CO measurements are only available for sample gases with H_2 concentrations less than 1%.

H_2S – Hydrogen Sulfide: H_2S is measured using an electrochemical sensor. The sensor range is 0-2000 PPM CO. The H2S sensor is H_2 compensated up to 1% (10,000 PPM) H_2, and H_2S measurements are only available for sample gases with H_2 concentrations less than 1%.

Balance Gas:

- Balance gas is a calculated value. It is calculated as follows:
- Balance gas (without AUX Measurements) = 100%- CH_4- CO_2- O_2- H_2
- Balance gas (with AUX Measurements) = 100%- CH_4- CO_2- O_2- H_2- H_2S- CO

4.6.2.2.2 Gas Ratios



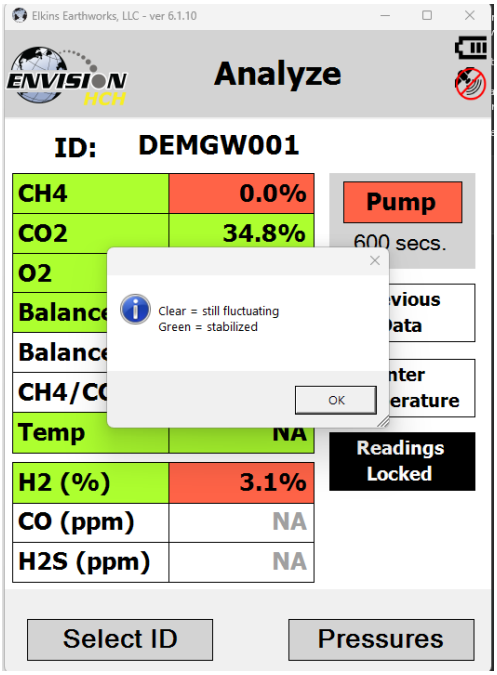
Balance/ O_2

- Results near "4" indicate a direct air leak into the sample train, sample fitting or wellhead.
- User should be familiar with interpreting the range of ratios for Balance/ O_2. Information is available within the SWANA Landfill Gas O&M Manual available at www.swana.org.

CH_4/ CO_2

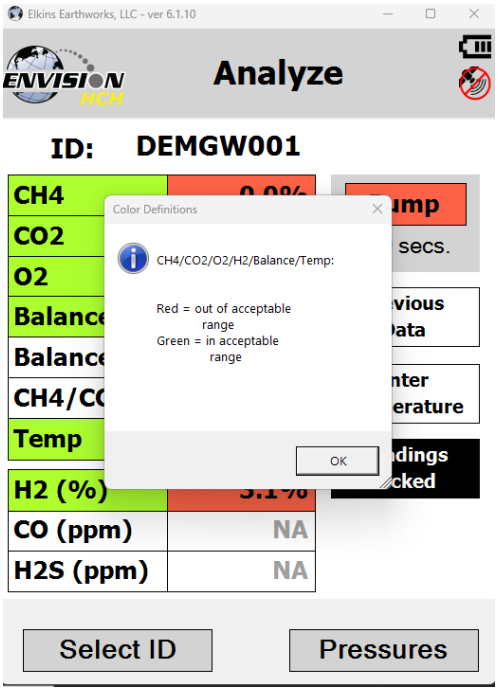
- Ratio lower than 1.1 may indicate potential for stressed conditions on a landfill gas well.
- The ratio may assist in drawing attention to different phases of landfill gas production.
- User should be familiar with interpreting the range of ratios for CH_4/ CO_2. Information is available within the SWANA Landfill Gas O&M Manual available at www.swana.org.

4.6.2.3 Color Definitions



The Elkins Gas Analyzer software has been programmed to help the user make tuning decisions by using acceptable ranges which have been set up using the Configuration Editor software. When the gas sensor is in the acceptable range the gas quality text box will turn from red to green. The color key can be displayed by touching the gas quality text box. Tap "OK" to close the color key.

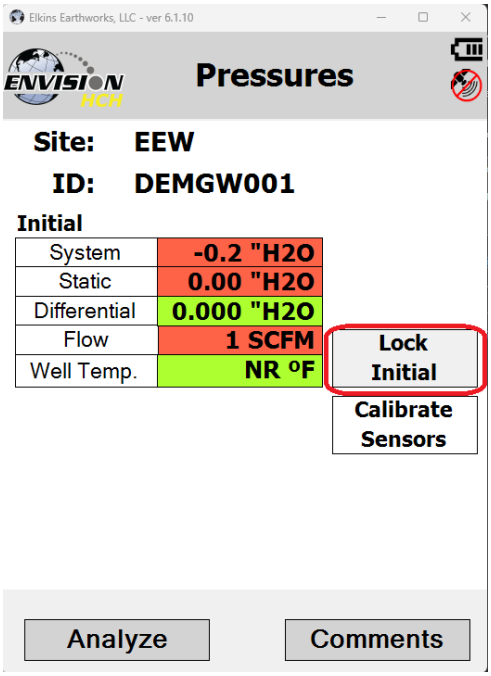
These ranges are programmable for each well by utilizing the Configuration Editor as detailed in section 4.12.



The software is also programmed to detect when the gas sensors have stabilized. When the gas sensor has stabilized the gas quality text box will turn from clear to green. The color key can be displayed by touching the sensor title. Tap "OK" to close the color key.

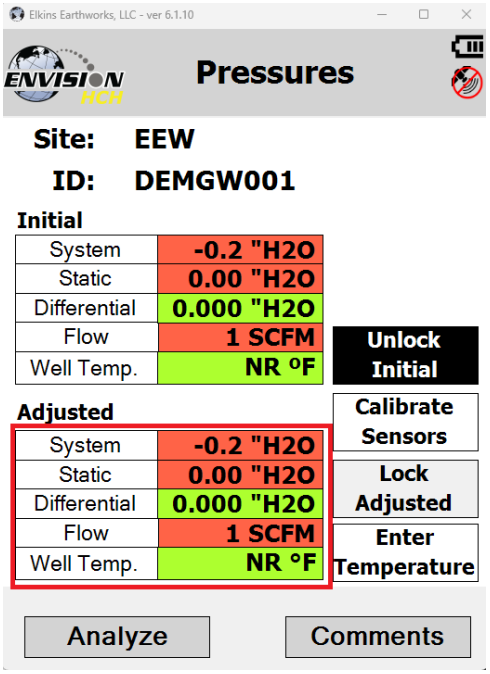
The user may progress to the next screen by pressing the Pressures" button. The user may also elect to go back to the Select ID screen by tapping the "Select ID" button.

4.6.2.4 Wellhead

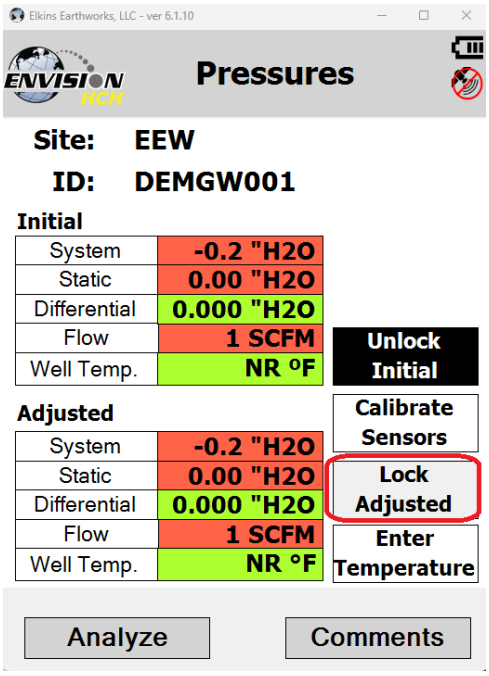


When the pressure sensors are in the acceptable programmed range, as programmed by the user in the Configuration Editor, the pressure text box will turn from red to green. The color key can be displayed by touching the gas quality text box. Tap "OK" to close the color key.

When the user is satisfied with the Initial pressures they may tap the Lock Initial button to lock in the initial pressures.

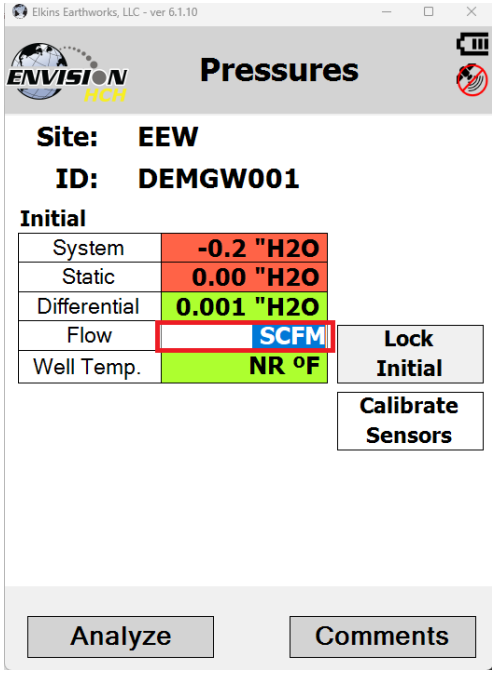


Once the lock initial pressure button is tapped the "Adjusted" pressures will appear and will start fluctuating.



Once the user makes an adjustment and the sensors have stabilized the user can tap the "Lock Adjusted" button. The button will then change to "Unlock Adjusted". If the "Unlock Adjusted" button is pushed it will unlock the adjusted values allowing them to fluctuate. The user may now lock the value again. Failure to lock the values will result in the adjusted values not being stored in the output file.

The user may also access the pressure sensor calibrate (zero pressures) screen from these screens. Make sure that the hoses are disconnected and sheltered from the wind when calibrating the pressure sensors. For calibration instructions refer to section 4.5.4.

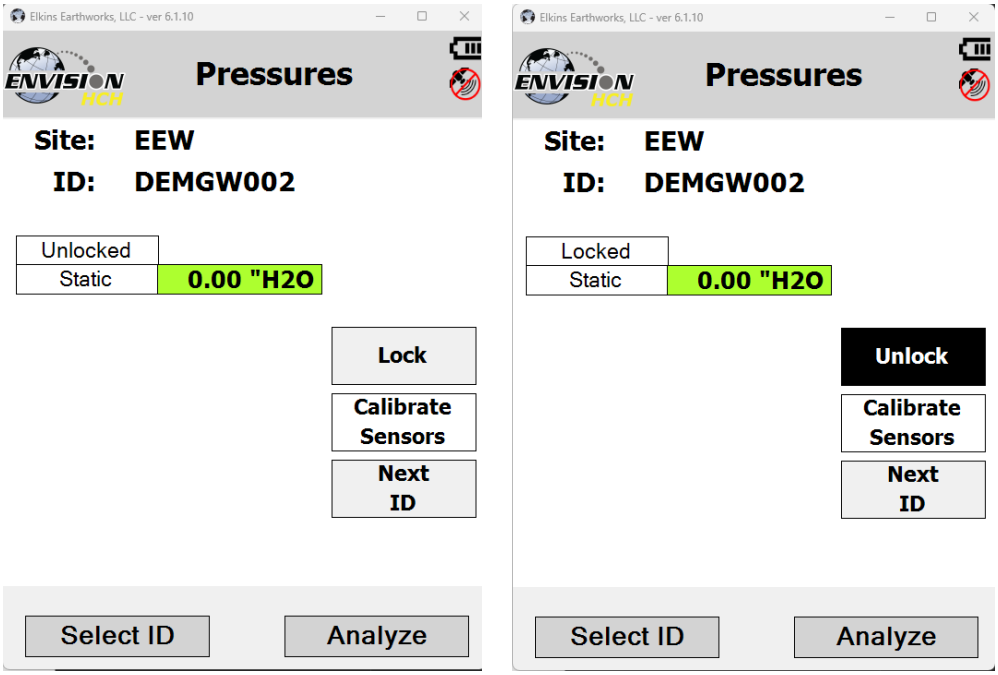


If the user has defined this monitoring point as "User Defined" then the user may type in a flow measurement for both the Initial and Adjusted flows.

Use the "Comments" button to progress to the next screen or tap the "Analyze" button to go back to the "Analyze" screen.

4.6.2.5 Probe

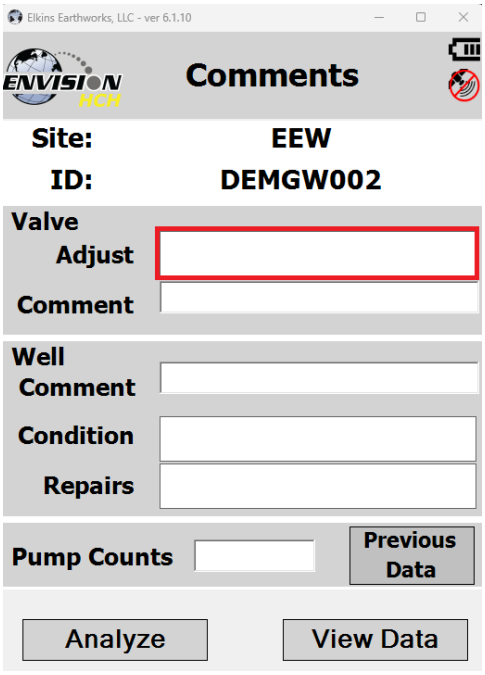
If the Wellhead type is Probe, the screen progression begins with a pressures measurement and ends with gas concentration measurements. This screen is complete when the user presses the “Lock” button. Select the “Analyze” button to continue to the gas concentration measurement screens.

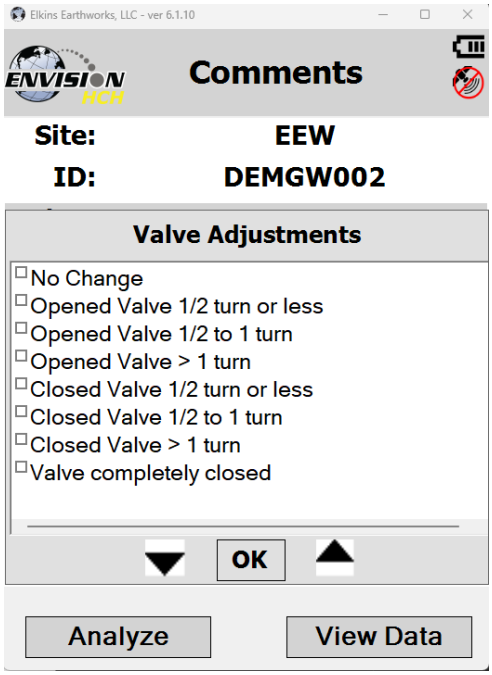


4.7 Comments

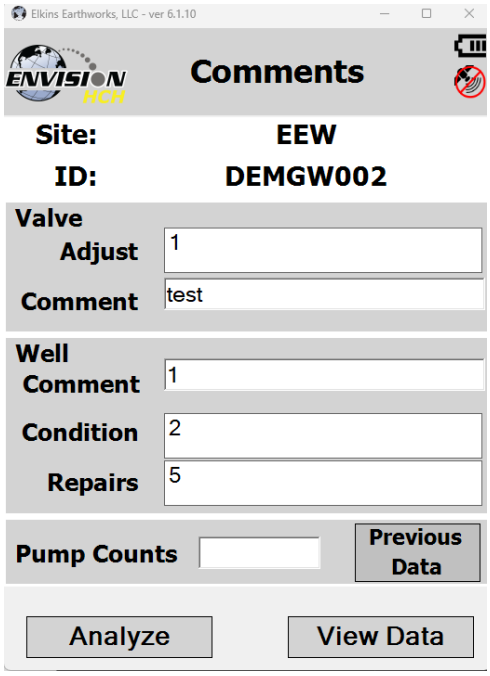
The comments screen is accessed from the “Pressures” screen (or from the “Analyze” screen for probes). The “Comments” screen is designed to give the user several opportunities to comment on the sample point.

The user may check boxes from a group of populated comments. These comments are populated by using the Configuration Editor as described in section



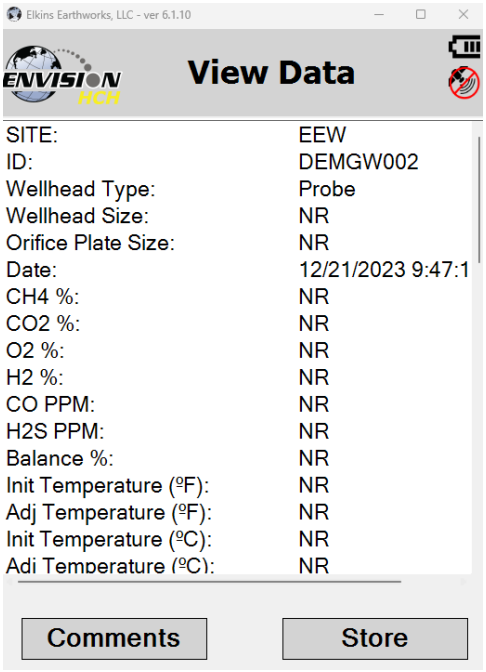


The open text boxes can be populated by tapping on the text box and tapping the keyboard symbol to open the touch screen keyboard. The user may then type in any comment that is needed.



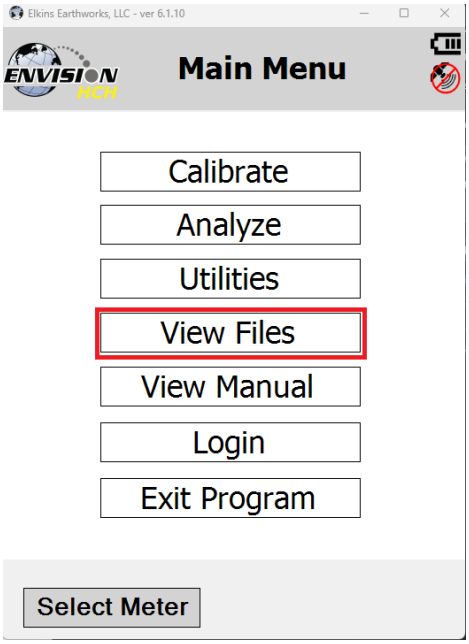
Once the user is done making comments they may progress to the next screen by tapping the “View Data” button. The user may also return to the Pressures Screen by tapping the “Pressures” button.

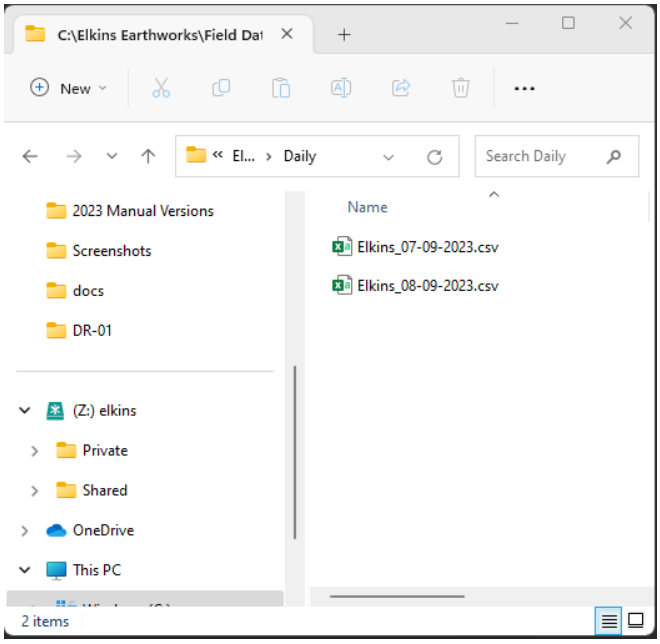
4.8 View and Store Data



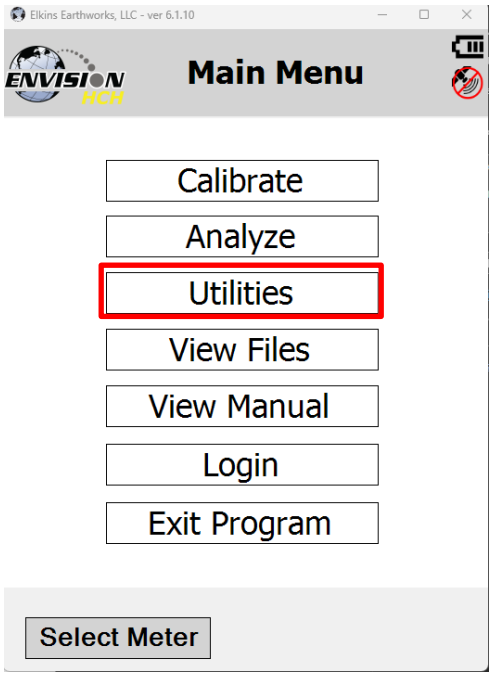
The "View Data" screen is intended to let the user view all of the data collected for this ID. If the user is satisfied with the data viewed on this screen, then the user can tap the "Store" button to save the data in the .csv file. If the user is not satisfied with the results, then the user may tap the "Analyze" button to go back and take the reading again.

Once the store button is tapped the data is stored in a .csv file on the tablet computer. The data may be accessed by either pressing "View Files" on the Main Menu or "Browse File" on the Analyze screen. The files are located in the directory as shown below.



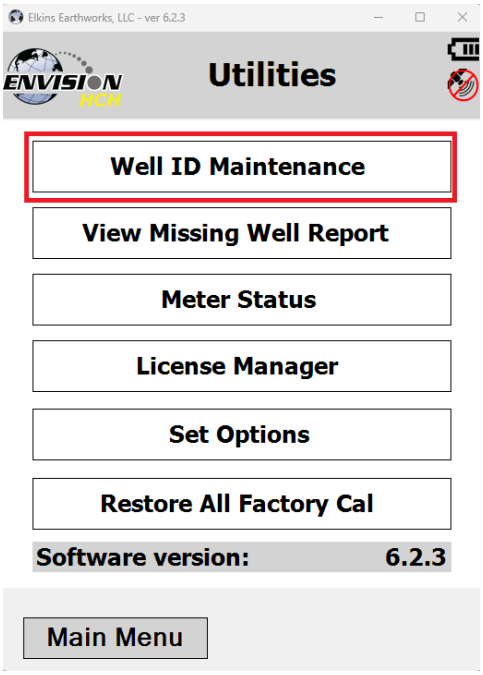


4.9 Utilities



The “Utilities” menu is accessible from the main menu. The “Utilities” menu contains the information needed to assist in keeping the user informed about the status of the Envision® gas analyzer.

4.9.1 Well ID Maintenance

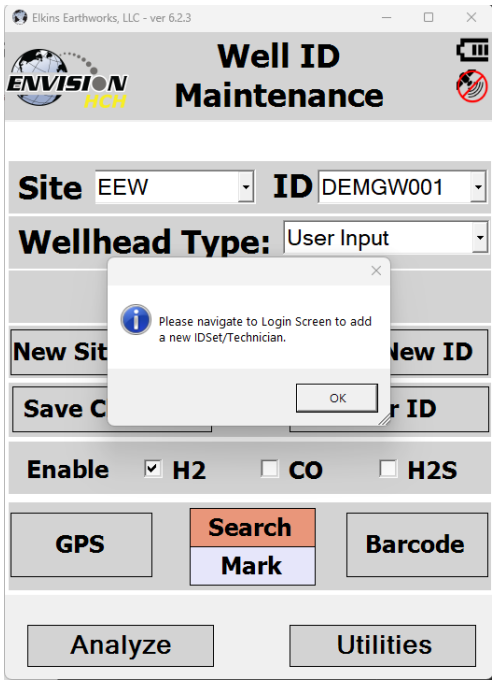


The “Well ID Maintenance” feature of the utility menu is intended to allow the user to create, modify or delete ID’s while in the field.

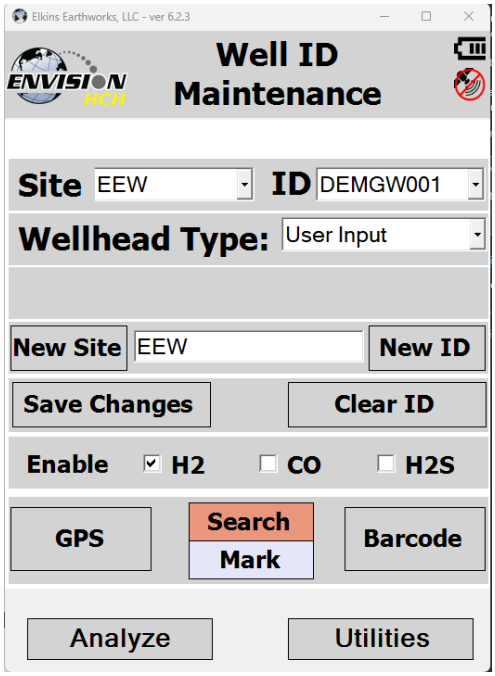
Tapping the “Well ID Maintenance” button will take the user to the “Well ID Maintenance Screen”.

4.9.1.1 Create New Site

The Well ID maintenance screen will allow the user to make a new ID for the existing ID set installed in the tablet computer. If the user tries to add a new site, the software will instruct them to return to the login page and select Add Site from the Site select pulldown. Note: In later versions of the gas analyzer software, the “Clear Site” button has been removed to protect the user from inadvertently deleting all wells associated with a certain site. The site may still be cleared using the Configuration Editor software.



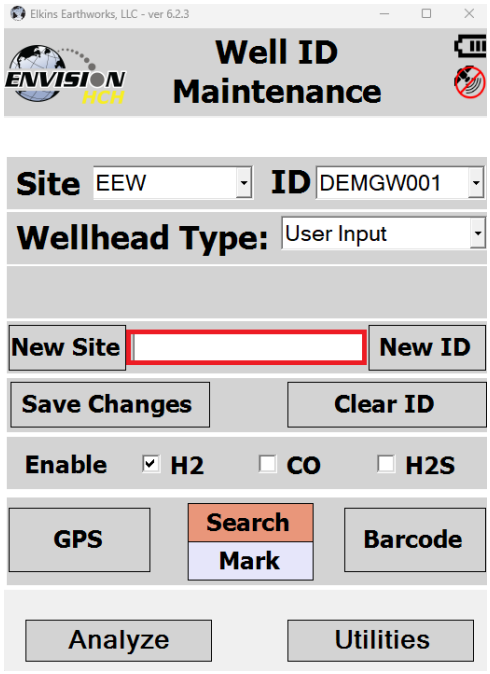
1. If you tap the “New Site” button, you will be directed to the Login Screen.



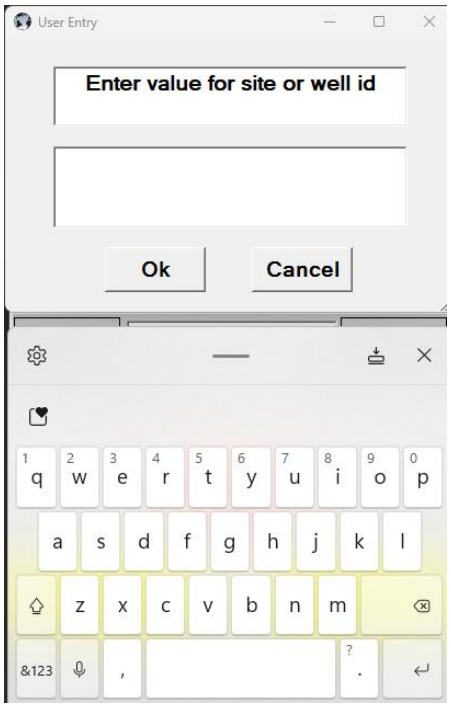
2. After entering the site on the login screen, the new site name will now appear in the “Site” text box and a default ID will be generated.

4.9.1.2 Create New ID

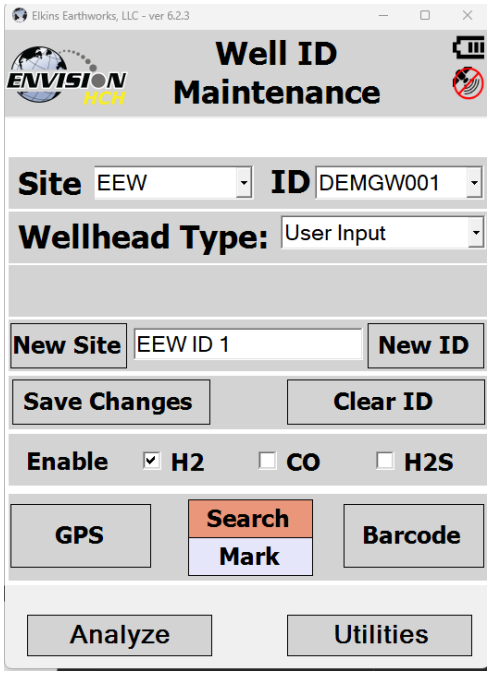
The Well ID maintenance screen will allow the user to make a new Well ID for the existing ID set installed in the tablet computer.



1. Tap the text box between the “New Site” and “New ID”

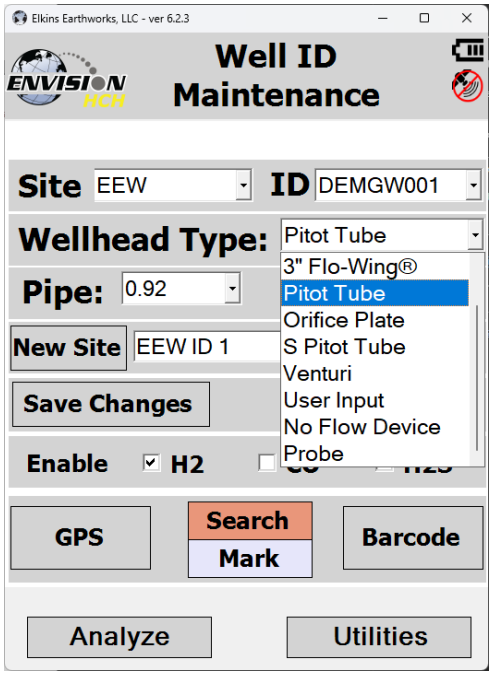


If the on-screen keyboard does not automatically appear, open the touch screen keyboard by tapping the keyboard Icon at the bottom of the touch screen.

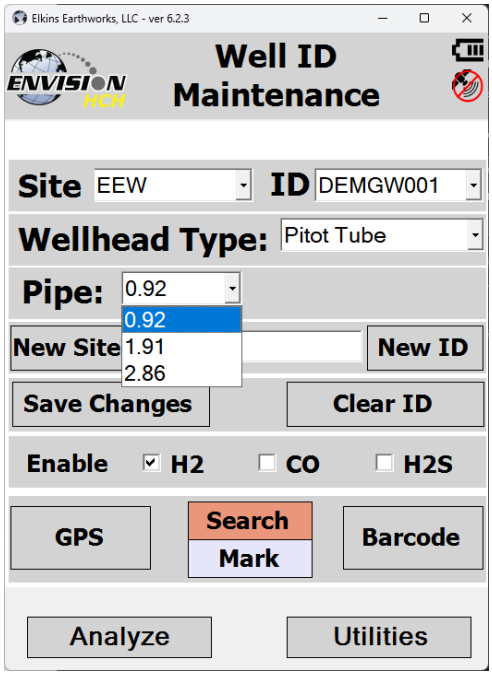


2. Type in the name of the new Well ID.

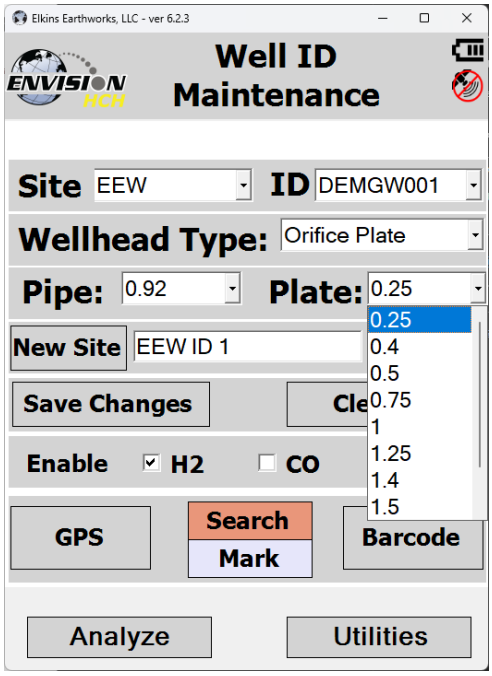
3. Drop down the keyboard by tapping the keyboard button.



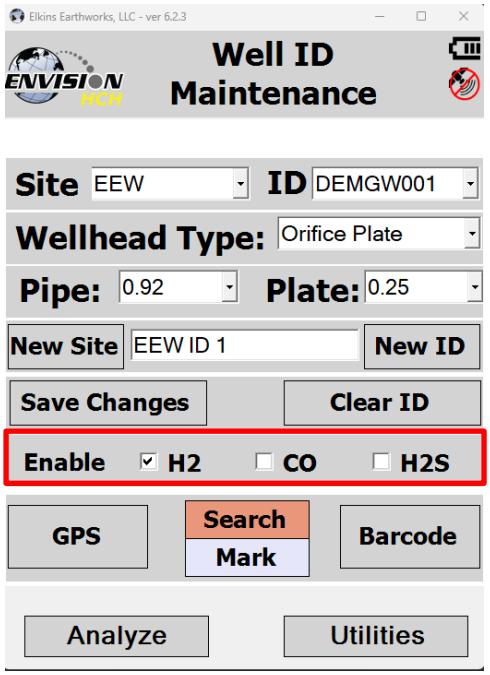
4. Select the Wellhead Type. If the user desires to manually type in a flow at the selected point each time, then the user may select user input.



5. Select the appropriate wellhead “Pipe” size (When applicable).



6. Select the appropriate “Plate” if using an orifice plate.



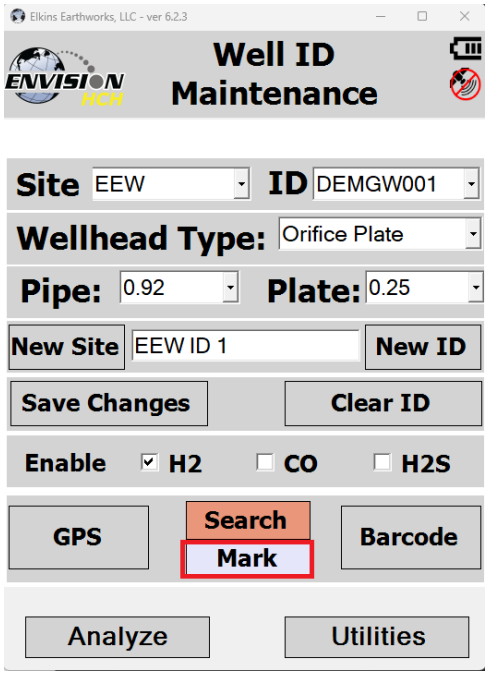
7. When connected to an HCH Envision® gas analyzer, the Well ID Maintenance screen will now have a section for disabling/enabling HCH gases. Each gas has its own check box, the user must check the boxes they wish to measure. This gives the user the option to disable/enable gases for individual wells. Ensure that these are set correctly for each well.

8. Once all of the parameters are correct tap the “New ID” button

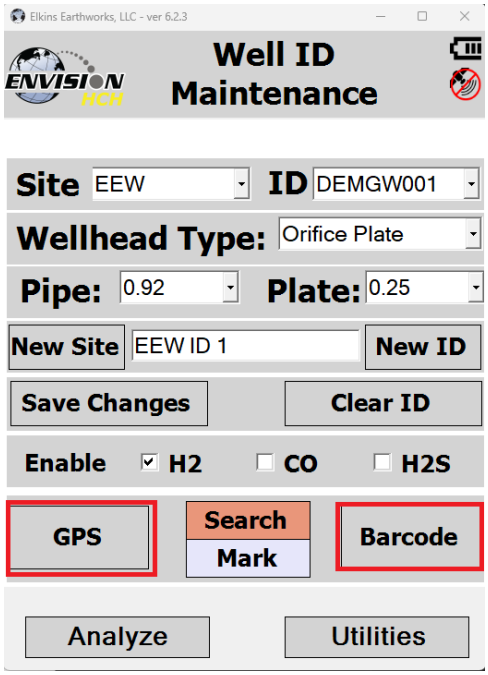
9. The new ID name will now appear in the “ID” text box.

10. The new ID is now located on the tablet computer.

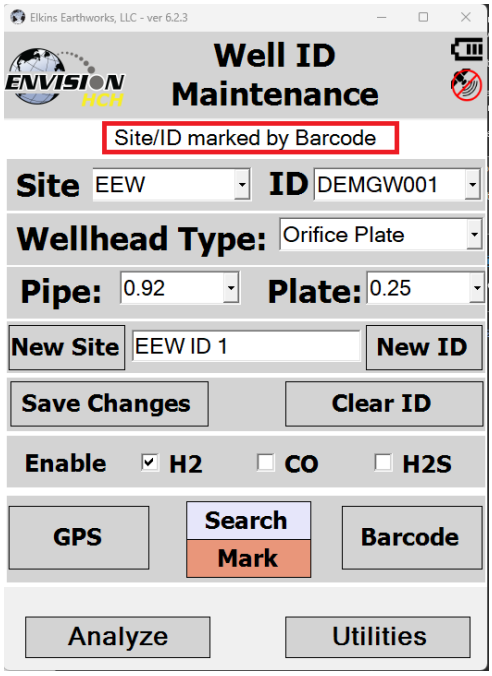
11. If the user is at the monitoring point, the GPS location or Well Barcode may now be recorded by using the mark feature.



12. Tap the “Mark” button so that it is highlighted in red



13. Tap the GPS button to mark the GPS coordinates or tap the Barcode button to mark the Barcode.



14. Once the GPS location or Barcode has been recorded then a comment will appear at the top of the screen “Site/ID marked by GPS” or “Site/ID marked by Barcode”. If the location failed to mark, then the message will read “GPS data not valid” or “Failed to find Barcode”.

15. The new ID is now updated and located on the tablet computer.

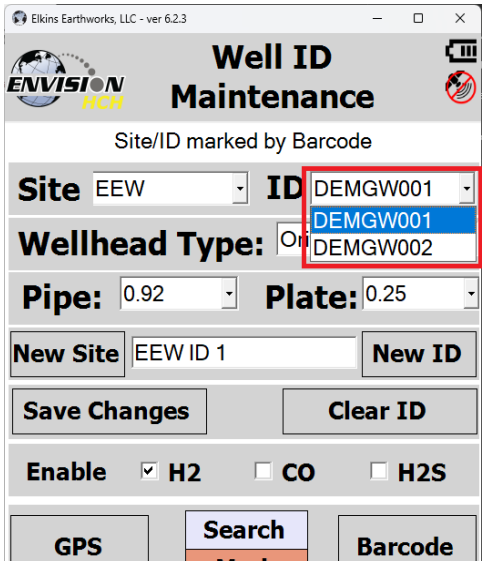
4.9.1.3 Edit Well Information

The Wellhead Type, Pipe, and Plate sizes may also be changed for any existing ID. Simply select the ID and choose the corresponding parameters. Be sure to hit “Save Changes” when complete.

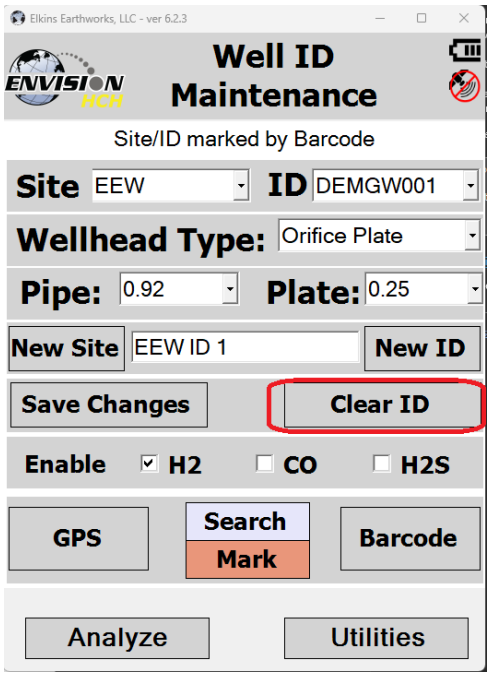
4.9.1.4 Delete Well ID

The software on the tablet computer will let the user delete an ID from the ID set loaded on the tablet computer. Deleting the ID will NOT delete any data stored in the .csv data files.

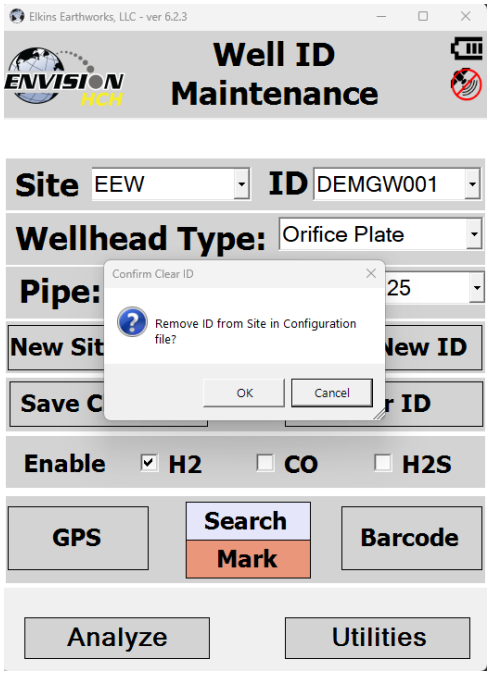
1. Open the "Well ID Maintenance Screen"



2. Select the ID that is to be deleted from the dropdown menu.



3. Tap the "Clear ID" button

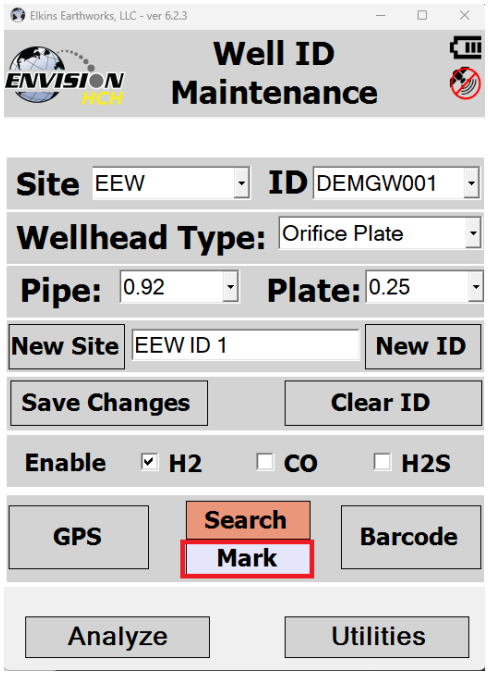


4. The “Remove ID from Site in Configuration file” message will appear. If the user is sure that they wish to delete that ID, then they can tap the “OK” button. If the user does not want to delete this ID, then tap “Cancel”.

5. The user may now return to the Analyze or Utilities menu by tapping the “Analyze” or “Utilities” button at the bottom of the touch screen.

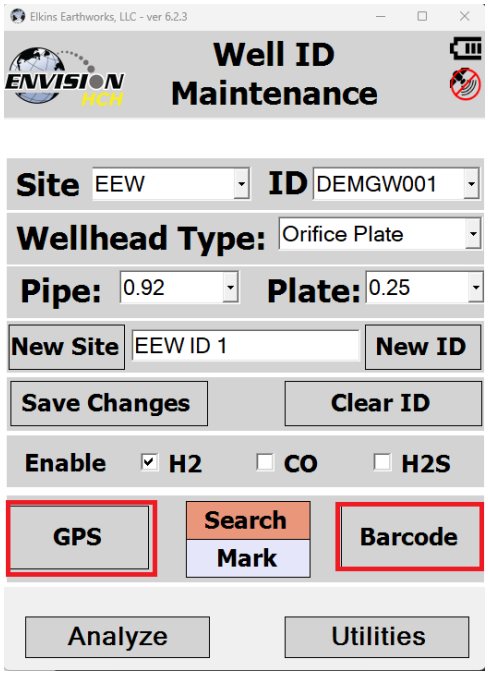
4.9.1.5 Mark Location

If the user is at the monitoring point, the GPS location or Well Barcode may now be recorded by using the mark feature. This feature is located in the "Well ID Maintenance" section of the program and may be accessed from the Utilities screen or the "Select ID" screen.

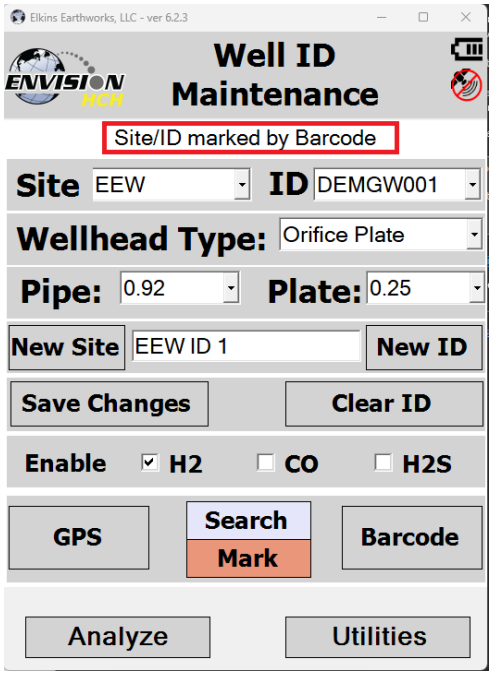


1. Using the dropdown menu for site and ID, select the ID that is to be marked.

2. Tap the "Mark" button so that it is highlighted in red.



3. Tap the GPS button to mark the GPS coordinates or tap the Barcode button to mark the Barcode.



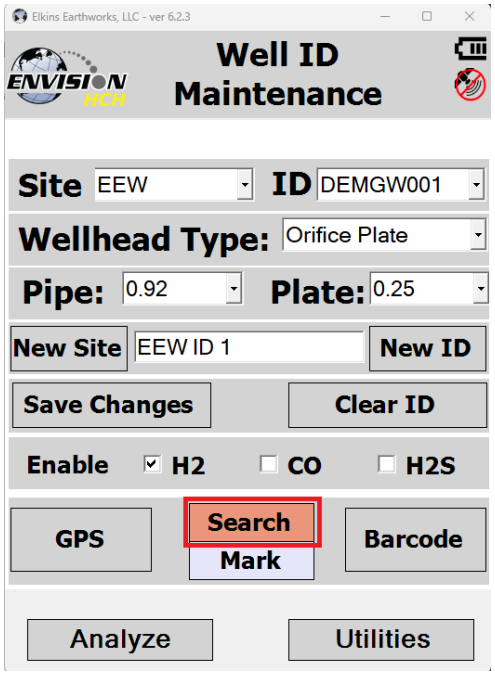
4. Once the GPS location or Barcode has been recorded then a comment will appear at the top of the screen "Site/ID marked by GPS" or "Site/ID marked by Barcode". If the location failed to mark, then the message will read "GPS data not valid" or "Failed to find Barcode".

5. The ID is now updated and located on the tablet computer.

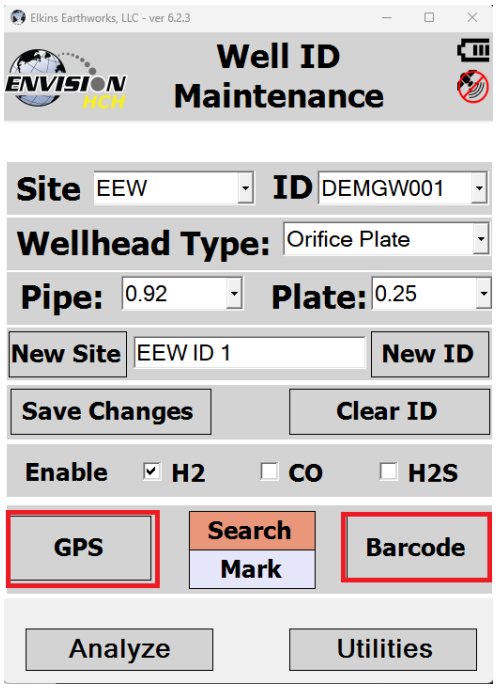
4.9.1.6 Search Location

If the user is uncertain about the name of an ID that they want to modify then the user can use the search mode on the "Well ID Maintenance" screen.

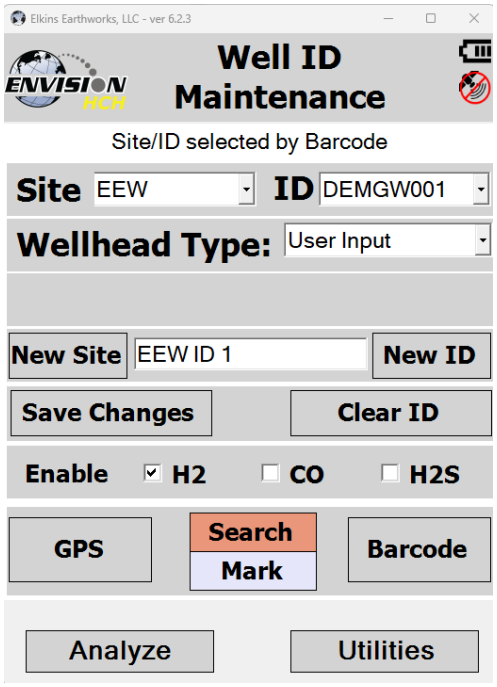
1. If the user's ID set contains stored GPS coordinates and/or Barcode information, then the user may use the search method to populate the Site and ID of their current location.



2. While at the monitoring location the user must tap the "Search" button.



3. The user may then select if the search will be performed by the use of the GPS or the Barcode. The user must tap one of the options.

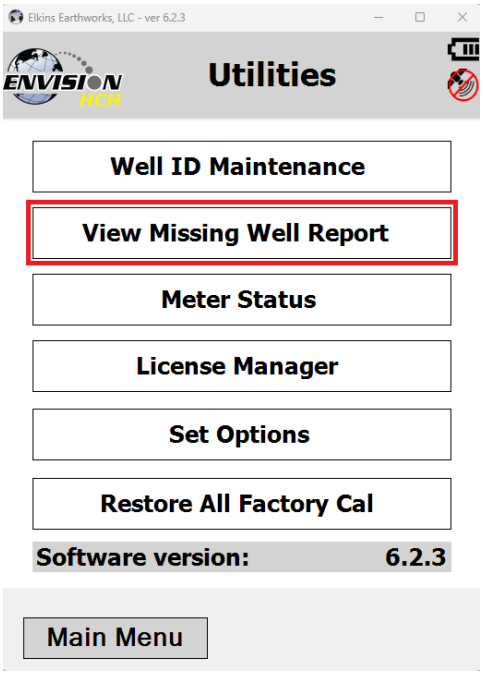


4. The software will then automatically populate the Site and ID with the correct information. The message “Site/ID selected by GPS” or “Site selected by Barcode” will appear. If there is no barcode or GPS location stored in the ID set, then the message will read “Failed to find GPS match” or “Failed to find Barcode match”.

5. The user may now perform any ID maintenance desired.

4.9.2 View Missing Well Report

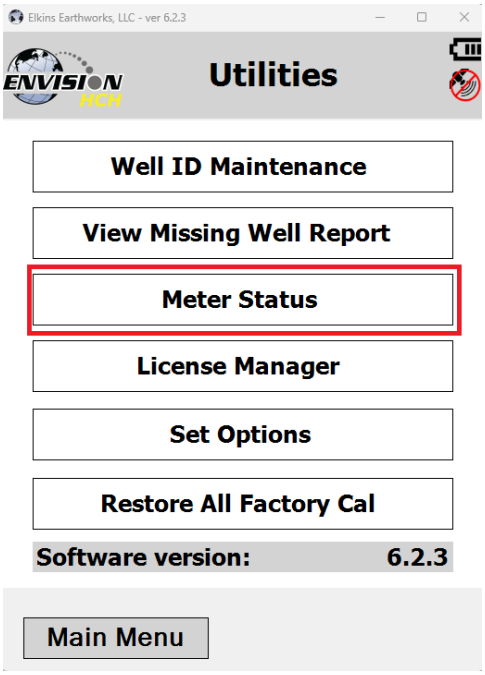
The View Missing Well Report was designed so that the user may determine if there are any monitoring points that have not been measured during the current month.



The software compares the site monitoring points stored in the configuration file to the data that has been stored in the current month's .csv file.

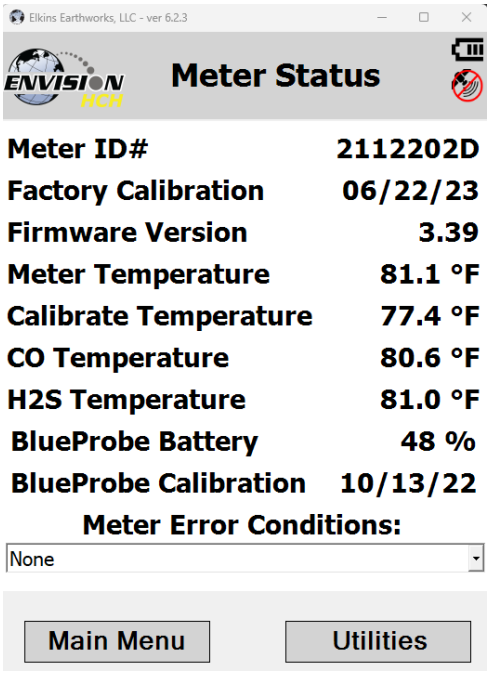
The user may return to the Main Menu or the Utilities screen by tapping one of the buttons at the bottom of the touch screen.

4.9.3 Meter Status



The meter status screen is accessible from the Utilities screen. This screen is intended to provide critical operational information to the user. This screen is accessible from the utilities screen.

The “Meter Status” screen gives the user useful information about the status of the Envision® meter.



Meter ID: the ID of the currently connected HCH Meter.

Factory calibration: The date indicated is the last date the Envision® gas analyzer was last calibrated at the factory.

Firmware version: Indicates the firmware version installed in the Envision® gas analyzer.

Meter Temperature: This displays the internal temperature of the Envision® gas analyzer.

CO Temperature: The temperature measured at the CO sensor.

H_2S Temperature: The temperature measured at H_2S sensor.

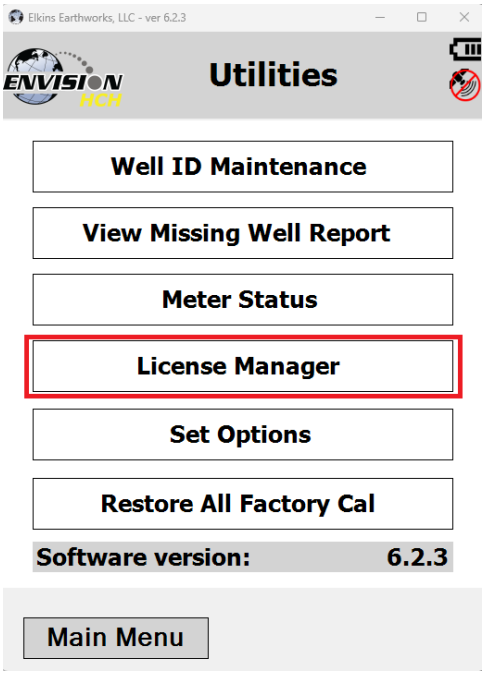
BlueProbe Battery: The current battery level of the connected BlueProbe.

BlueProbe Calibration: The date displayed is the last date the BlueProbe was calibrated at the factory.

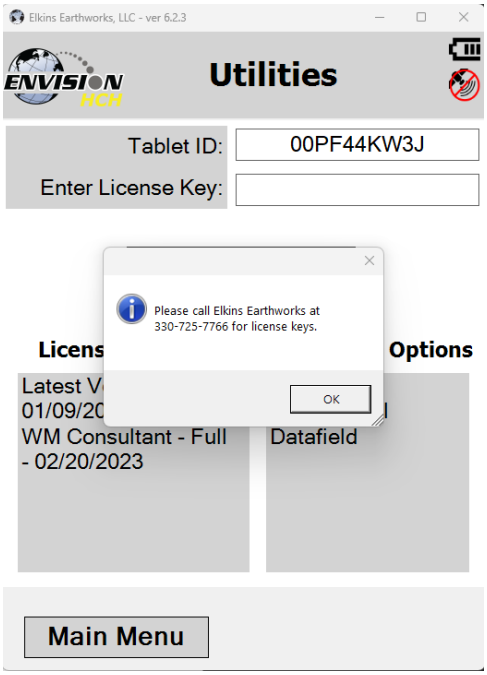
Meter Error Conditions: Will display the last 10 meter error conditions. This is useful when talking to tech support staff at Elkins Earthworks®. Refer to section Errors and Troubleshooting for a more detailed explanation of this.

4.9.4 License Manager

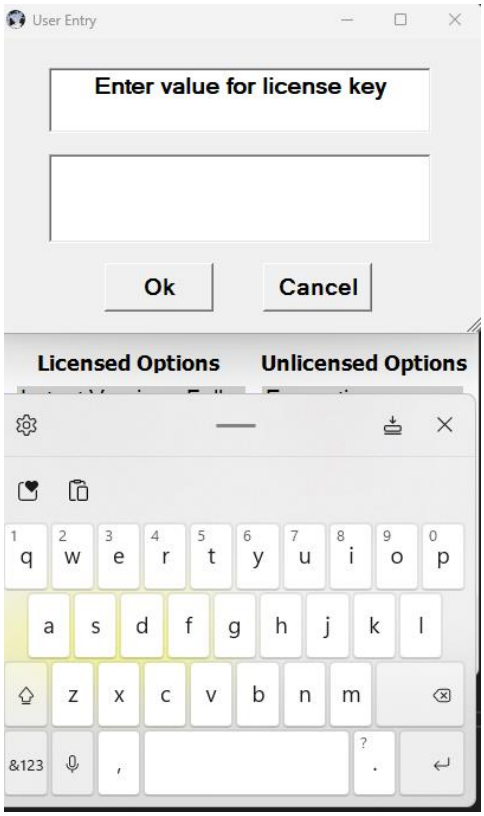
The Elkins Gas Analyzer software will not run unless a license is activated. Licenses not yet activated will appear as “Unlicensed Options”. Once activated, licenses will show as “Licensed Options”. To activate your Elkins Gas Analyzer package, complete the following steps.

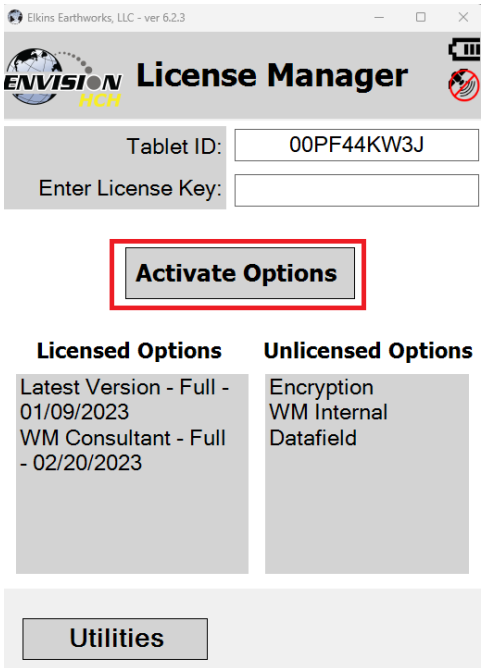


1. Select “License Manager” in the “Utilities” screen.



2. Enter your license key in the designated area. Call Elkins Earthworks (330-725-7766) to obtain license keys. Be prepared to provide the “Tablet ID: “ number shown on the screen.

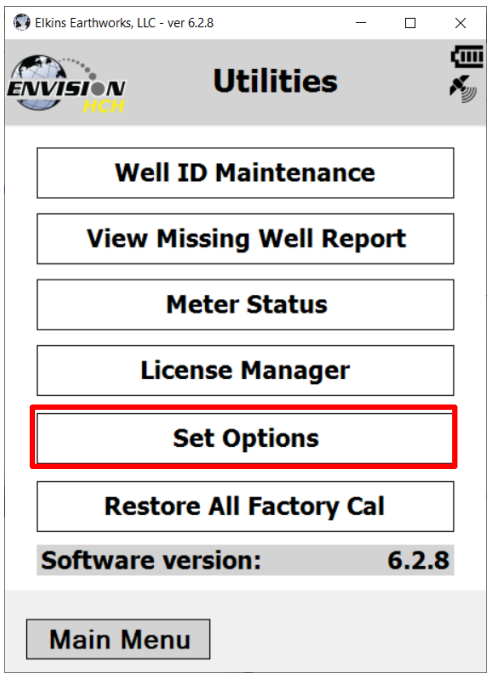




3. Once the license key is entered click “Activate Options”.

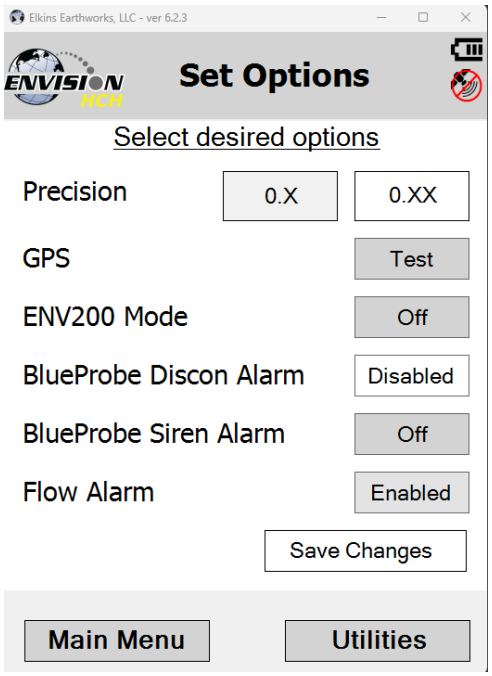
4.9.5 Set Options

The purpose of the set options screen is to allow the user to determine specific data reporting parameters.



Click “Set Options” on the “Utilities” page.

Below show all available options. See below for an explanation of each option.



Precision: Clicking 0.X will display and store measurements with one decimal place. Clicking 0.XX will display and store measurements with two decimal places.

GPS: This allows the user to test the GPS (usually built-in to the tablet)

ENV200 Mode: This option is only enabled when connected to an ENVHCH model of the Envison. When enabled this will make the ENVHCH measure and store only the gases of the ENV200.

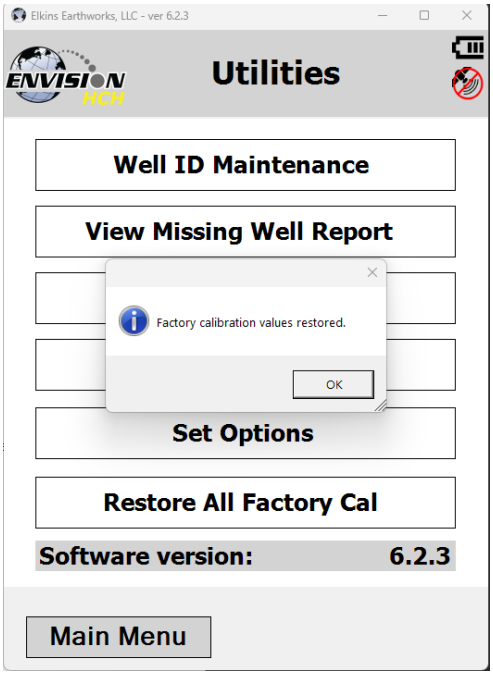
BlueProbe Disconnect Alarm: This option is only available when a BlueProbe Temperature Sensor is Connected to the tablet via Bluetooth. When enabled, if the Bluetooth connection between the tablet and the BlueProbe is lost, the BlueProbe will sound an alarm.

BlueProbe Siren Alarm: If the BlueProbe is ever misplaced, and still connected to the tablet via Bluetooth, enabling this feature sounds an alarm so it can be located.

Flow Alarm: This option enables and disables the alarm indicating low gas sample flow.

4.9.6 Restore All Factory Cal

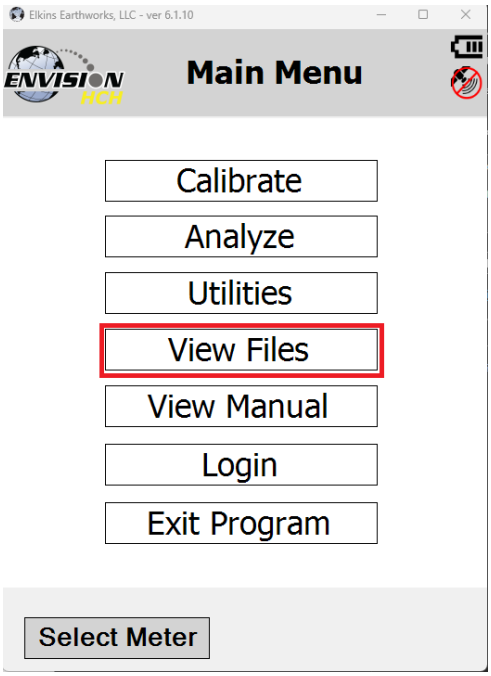
Tapping "Restore all Factory Cal" will set all field calibration offsets to zero and restore the calibration values from the last factory service.

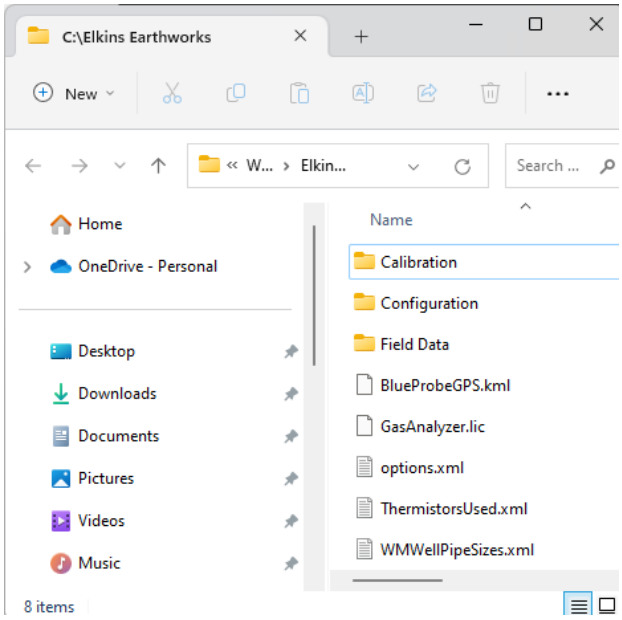


If a sensor has drifted significantly, a message indicating such may appear when the restore all factory cal button is pressed. If restoring factory calibration would adversely affect the ability of the user to calibrate the unit, the user will be notified and allowed to cancel the operation.

4.10 View Files

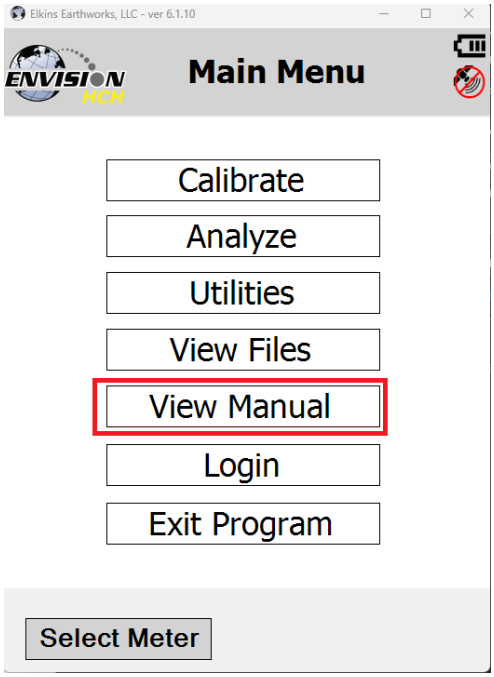
Return to the Elkins Gas Analyzer Main Menu and then click on “View Files”. A file explorer window will open to the directories used by the gas analyzer. The user can then locate the files that contain historical data from past monitoring events.

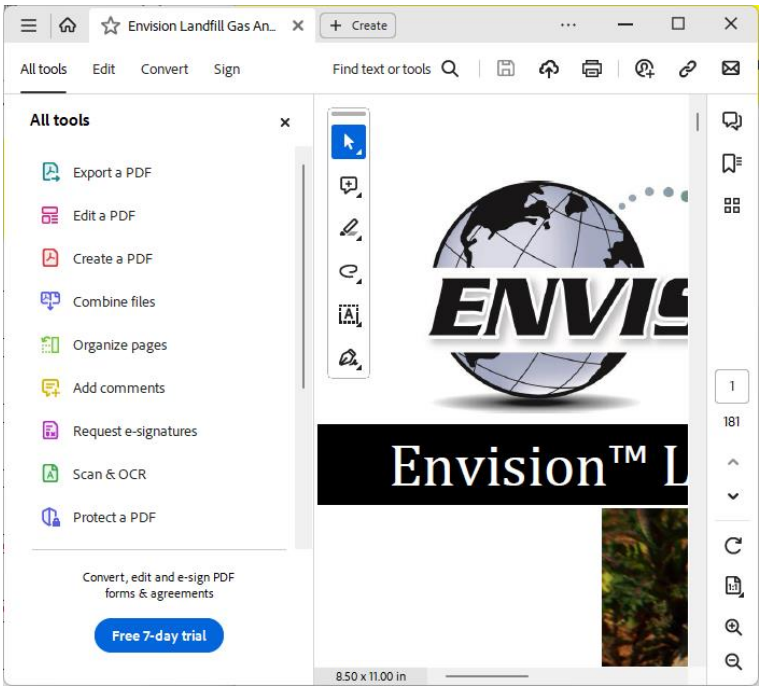




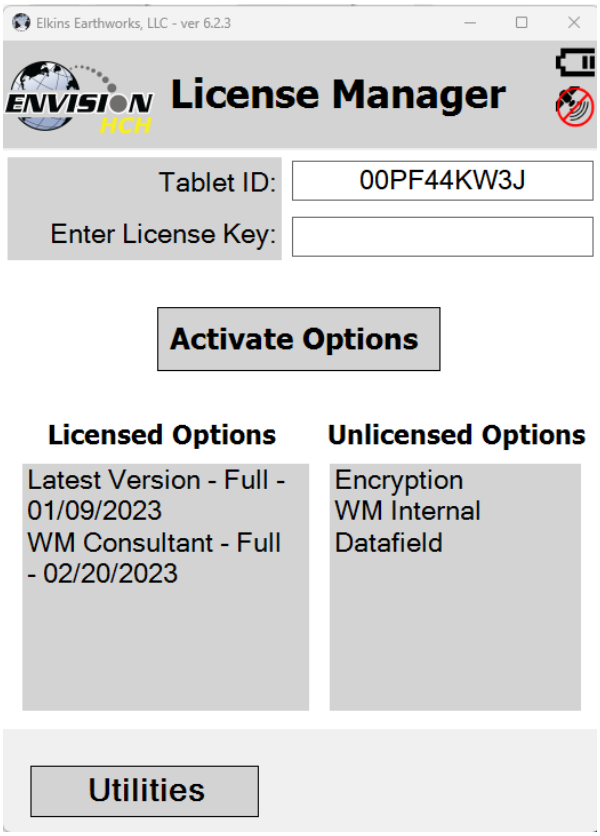
4.11 O&M Manual

Return to the Main Menu, and then click on “View Manual”. The O&M manual button will take the user directly to an HTML or PDF version of the O&M manual. The blue texts are hyperlinks to the relevant sections of the manual. Tapping on the blue text will take the user directly to that section of the manual.





4.12 Software Options



The License Manager screen shows all of the software options available for purchase from Elkins Earthworks.

1. **Base Package:** This refers to the v3.03 software version. Envisions that have software versions less than v3.03 may be upgraded to v3.03 for free.
2. **Latest Version:** All new Envisions come standard with the latest version software.
3. **Encryption:** The encryption option provides features that ensure data integrity during and after monitoring operations.
    a. GPS coordinates of user are logged and recorded when the reading was taken.
    b. All field data is encrypted and unable to be modified by anyone other than the data processor. Free desktop software is provided with this option to allow for decryption and distance to well analysis utilizing Microsoft Excel.
4. **WM Internal:** When this option is enabled only Waste Management sites are displayed for selection. The gas analyzer operation is modified as follows:
    a. ID sets and field data files are encrypted using a Waste Management proprietary algorithm and are used for downloading and uploading to the Waste Management database via Ecotec's LSGAM desktop software.

   b. New prompts for well and site Questions which come from the Waste Management database.
   c. Technician name selection is done via LSGAM.
   d. Additions and changes to well configuration, location, and barcodes are not allowed.

5. **WM Consultant:** This option gives access to features from both item 2 (Latest Version) and item 4 (WM Internal). This allows the user to access both the traditional and the new Waste Management modes based on the type of ID set that is loaded.

   For further information regarding the Waste Management option, please refer to the following documents/files:

   a. ENV Quick Start Guide V4-Mesa2.pdf
   b. WM Envision ENV-Mesa2 Guide V2 – Calibration.pptx
   c. WM Envision ENV-Mesa2 Guide V2 - Well Read.pptx
   d. Envision Calibration.mp4
   e. Envision Well Read.mp4

5 The Envision® Gas Analyzer Configuration Editor Software

The Configuration Editor has been upgraded to the Universal Configuration Editor. Instead of being able to create and modify ID sets only for the Envision®, it is now able to do the same for both ProSEM and Liquid Levels software. Therefore, the Universal Configuration Editor manual is now contained in a new document. Please see the Elkins Earthworks website Download Center section to get a copy after it has been released.

6 Errors and Troubleshooting

6.1 Envision® Error Conditions:

Error conditions from meter are presented by a blinking red "!" next to the connect icon in the header of each screen. The description of the error will appear in the "Meter Status" screen under error conditions. The following are error conditions that may be displayed:

1) **"Error 1-Battery Gauge"**
   a. *Explanation* - The battery gauge is displaying erroneous battery data, as a result of a charging chip failure. This will affect battery cut-offs and accurate monitoring.
   b. *Solution* – Call technical support at Elkins Earthworks® 330-725-7766.
2) **"Error 2-Charging**
   a. *Explanation*- The charging chip is not shutting off the charging process.
   b. *Solution* - Call technical support at Elkins Earthworks® 330-725-7766.
3) **"Error 3-Charging"**
   a. *Explanation* **-** The Envision® is charging too slowly.
   b. *Solution* - Call technical support at Elkins Earthworks® 330-725-7766.
4) **"Error 4-Sensor"**
   a. *Explanation*- The pump, manifold pressure sensor, or either of the two IR sensors have stopped operating correctly and are not drawing any current.
   b. *Solution* – Power down Envision® unit and reconnect to the tablet computer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
5) **"Error 5-Over Current"**-
   a. *Explanation*- Excessive current draw. Any number of parts may have failed due to a short or component failure.
   b. *Solution* – Power down Envision® unit and reconnect to the tablet computer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
6) **"Error 6-Pressure Sensor"**
   a. *Explanation*- One of the pressure sensors is reading out of spec, likely due to an overpressure situation (blown sensor)
   b. *Solution* – Try restoring the factory calibration on the pressure sensor calibration screen. If this does not solve the problem, then power down Envision® unit and reconnect to the tablet computer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
7) **"Error 7-Low Flow"**
   a. *Explanation*- Low flow condition

b. *Solution* – Check that the sample train hoses are not pinched. Check inline filters and make sure that they are clear and free from debris and liquids. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.

8) **"Error 8-Oxygen Sensor"**
   a. *Explanation*- Oxygen sensor is out of spec. Potentially bad sensor.
   b. *Solution* – Restore factory calibration on O_2 sensor and recalibrate. If recalibration does not solve the error, then power down Envision® unit and reconnect to the tablet computer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
9) **"Low pump voltage"**
   a. *Explanation*-Pump or supporting circuits is bad.
   b. *Solution* –Call technical support at Elkins Earthworks® 330-725-7766.
10) **"Low Flow Rate"**
   a. *Explanation*- Low Flow from clogged or pinched sample train.
   b. *Solution* – Check that the sample train hoses are not pinched. Check inline filters and make sure that they are clear and free from debris and liquids. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
11) **"Over Pressure"**
   a. *Explanation*- Pressure applied to pressure sensors are higher than sensors a specified for.
   b. *Solution* – Disconnect hoses from measurement location and recalibrate sensors. Verify that the pressure on the sample point is within the tolerance of the Envision® gas analyzer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
12) **"Battery low. Plug in charger"**
   a. *Explanation*- Pressure Low battery on Envision unit.
   b. *Solution* – Plug meter in to charge. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.
13) "Battery level is critically low"
   a. *Explanation*- Battery level is low.
   b. *Solution* – Charge Envision® gas analyzer. If the unit does not charge, then call technical support at Elkins Earthworks® 330-725-7766.
14) **"Over temperature. Cool unit"**
   a. *Explanation*- Measurement Unit over temperature.
   b. *Solution* – Move the Envision® unit into a cooler environment. If the error does not clear, then call technical support at Elkins Earthworks® 330-725-7766.

6.2 Additional Error Messages

Listed below are additional error messages that may show up during operations:

1) "Unable to connect to selected meter"
   a. *Explanation*- Connection attempt failed during meter selection
   b. *Solution* – Make sure that the Envision® unit is on and the Bluetooth light is blinking before tapping search on the tablet computer. Also, verify that the tablet's Bluetooth is turned on. If this does not solve the problem then power down Envision® unit, close and restart the Elkins Gas Analyzer software and try again to connect to the Envision®. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.

2) "The Bluetooth connection to the meter has been lost"
    a. *Explanation*- Bluetooth connection has been disrupted either due to interference or user has walked out of range from the Envision® gas analyzer.
    b. *Solution* – Walk back within range of the Envision® gas meter and let the Bluetooth attempt to reconnect. If this does not solve the problem then power down Envision® unit, return the Elkins Gas Analyzer software to the "Select Meter" screen on the tablet. Reboot the Envision® unit and try to connect to the Envision® gas analyzer. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766.

3) "Unable to initialize scanner device"
    a. *Explanation*- The scanner function is not active on the tablet computer.
    b. *Solution* – Verify that the tablet unit has a barcode reader. If not the barcode feature will not be active. If the tablet has a barcode reader, then the user needs to verify that the correct driver is installed and the application is active. Call technical support at Elkins Earthworks® 330-725-7766 for help in verifying drivers.

4) "GPS data not valid"
    a. *Explanation*- the GPS has not yet connected with the satellites.
    b. *Solution* – Allow the tablet unit at least four minutes outside to connect to the satellites. If this does not correct the problem, call technical support at Elkins Earthworks® 330-725-7766 for help.

5) "Failed to find GPS/barcode match"
    a. *Explanation*- the GPS coordinates at the current location are not within 30 feet of the GPS coordinates of any well in the ID set.
    b. *Solution* – Wait one minute at the location and press the GPS button again. If this does not correct the problem, make sure that the current well has been previously marked by GPS. If it has not been marked, press the "Mark" and "GPS" buttons to mark the well. If this doesn't fix the problem, call technical support at Elkins Earthworks® 330-725-7766 for help.

7 Envision® Maintenance

It is imperative to follow all recommended maintenance procedures to ensure that the HCH Envision® gas analyzer continues to measure gas concentrations as accurately as possible.

7.1 Factory Maintenance

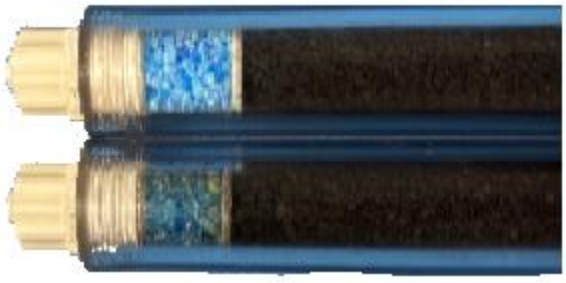
The HCH Envision® gas analyzer should be returned to the factory at a minimum once per year for inspection and factory calibration.

The HCH Envision® gas analyzer includes internal water trap filters on each of the three input ports. Use of an external water trap is recommended. When an instrument is exposed to sample gas with excessive water, the instrument should be protected by these internal water traps. The instrument should be allowed to dry out before use. If the unit does not recover, the unit should be sent in for repair.

7.2 Field Maintenance

The Envision® gas monitor has an internal H_2S filter and indicator. This filter/indicator is a consumable part of the HCH Envision® gas analyzer. Over time these filters may clog or H_2S may start to break through. and may need to be changed. To change the filters, locate the acrylic door on the back of the HCH Envision® gas analyzer. How often these filters need replaced depends on the conditions of the landfills being monitored, it can vary anywhere from weeks to months.

The indicator portion of the filter/indicator will turn to brown/black when the H_2S filter part is compromised. The acrylic back door allows the user to check the filter without opening the cover. This filter should be checked daily before using the meter. Shown below is a new filter/indicator (top) and a used/spent filter/indicator (bottom). The indicator should be checked daily through the rear filter door.



1. Remove the acrylic filter door by loosening the screws and lifting the door from the enclosure.

Warning: do not remove the filter door in dusty or wet atmospheres as the internal components can get damaged.

2. The user may now remove and replace the filter by turning the Luer filter fittings. Make sure that the filter is in the correct orientation and the seal is still in place before re-attaching the filter door. Replacement Luer filters may be purchased from Elkins Earthworks®.

Warning: Incorrectly installed filters can cause inaccurate H_2S and CO readings, as well as release harmful gases into the Envision's case as well as the atmosphere.

8 Envision Warranty

Elkins Earthworks®, LLC warrants its products to be free from defects in workmanship. This warranty shall be fulfilled by Elkins Earthworks® repairing or replacing its products, as necessary, to cure any such defect, which is reported to Elkins Earthworks® within 12 months of the ship date. All warranty work will be done at Elkins Earthworks® location.

(a) This warranty shall not apply to products which have been abused, altered, misused in application, improperly maintained or repaired.

(b) This warranty does not apply to components designed to be consumed or destroyed in normal operation.

(c) No product or part shall be returned to Elkins Earthworks without its prior consent. Any products which Elkins Earthworks consents to have returned shall be shipped to Elkins Earthworks factory with a completed RMA form at the customers expense. Elkins Earthworks shall only be responsible for payment of return ground shipment to customer location. Elkins Earthworks shall not be obligated to provide a “loaner” Envision® gas analyzer while performing warranty repairs. A rental unit may be obtained during the repair period if one is available from the rental department.

(d) In the event the **BUYER** delays shipment, the warranty period commences on the date Elkins Earthworks® is prepared to make shipment.

(e) **BUYER** shall give Elkins Earthworks® written notice of the defect promptly after discovery.

(f) This warranty is exclusive and is expressly in lieu of any other express or implied warranties.

9 Operating Notes

1. After greater than 1% H_2 is applied to the second path, it can take a while for the CO sensor to return to zero. The HCH Envision® should be purged in ambient air until the CO sensor reading is below 20 PPM.
2. It is recommended that the user calibrate the CO and/or H_2S sensor after a high level CO and/or H_2S Gas has been applied. A high level gas is within 20% of the target gas concentration. In the case of CO and H_2S, that would be around 1600 PPM. Purging should be performed after making these readings as well.
3. Allow for extra settling time for the H_2S and CO sensor if there is a significant amount of H_2. The additional settling time required should not be more than 90 seconds.
4. When H_2 is at or above 2%, the range of the CO sensor reading is reduced and accuracy may be decreased.
5. If the CO sensor is exposed to medium high levels of H_2 over its lifetime, the sensor will have a shortened lifetime.
6. Electrochemical sensors require at least a minimal amount of Oxygen in order to operate (a few thousand PPM). If the unit is operated without the presence of Oxygen for too long, the unit should be purged in ambient air. Most wells should have sufficient O_2 to maintain operation of the sensors indefinitely.
7. High levels of CH_4 and CO_2 can increase error of the H_2 sensor.
8. The HCH Envision® includes safety measures to avoid exposing the CO and H_2S sensors to high levels of H_2. Though these sensors may recover from higher levels, it can take hours (or days) and may shorten the lifespan of the sensors. Do not bypass these safety measures. Always run sample path one for at least 20 seconds to allow the H_2 high sensor to determine whether it is safe to switch to sample path two.
9. The cross sensitivity of the CO sensor to H_2 can shift over time. During a field calibration, the Gas Analyzer will check to make sure that this shift will not affect the accuracy of the instrument. If an instrument is showing significant response from the CO sensor to H2, the user should run a field calibration at a low value of H_2 (usually 1%).
10. The HCH Envision® has internal water traps on all input ports. Please use an external water trap whenever sampling. If an external filter is not used and the unit is exposed to a significant amount of water, the unit should be sent to Elkins Earthworks for repair.
11. If O_2 levels change drastically between path 1 and path 2 measurements, that indicates that the rear carbon filter needs changed. The rear carbon filter must not be bypassed, the CO sensor relies on this filter to ensure accurate measurements.

10 HCH Envision® Gas Analyzer Specifications

Envision® HCH Technical Specifications				
Gas Sensors				
Gas Type	Range	Typical Accuracy	Resolution	t90 (seconds)
CH4	0-100%	± 2% abs	0.1%	<30
CO2	0-100%	± 2% abs	0.1%	<30
O2	0-2%	± 0.1% abs	0.1%	<30
	2%-25%	± 5% relative	0.1%	<30
H2	0-1%	± 0.1% abs	0.1%	<30
	1%-100%	± 2% abs[1]	0.1%	<30
CO	0-2000 PPM	± 40 PPM abs[4,5]	1 PPM	<45
H2S	0-2000 PPM	± 40 PPM abs[2,4,5]	1 PPM	<45
Pressure Sensors				
Pressure Type	Low Range	Low Range Accuracy	High Range	High Range Accuracy
Static	-5 to +5 (" H2O)	±0.14"H2O	-130 to +130 ("H2O)	±2% of reading
Differential	-5 to +5 (" H2O)	±0.14"H2O	-130 to +130 ("H2O)	±0.6"H2O
Available	NA	NA	-130 to +130 ("H2O)	±2% of reading
Barometric	NA	NA	22 to 31 ("Hg)	±0.24"Hg (±8 mBar)
Operating Temperature		**Wired Thermistor**		
Range		Range	Accuracy	
+14 to +122°F (-10 to +50°C)		-22 to +212°F (-30 to +100°C)	±1.0°F (±0.6°C)	
Battery				
Discharge Time @ > 50°F	Discharge Time @ 32°F	Discharge Time @ 14°F	Charge Time	Lifetime	Construction
> 10 hours	8 hours	5 hours	4 hours from complete discharge	up to 1000 full charge cycles	NiMH (no memory)
Sample Pump				
		Minimum Vacuum Pull	Minimum Flow Rate	
		-138 ("H2O)	260 cc/min	

Notes

1. When measurements are taken with H2 concentrations higher that 10,000 PPM, the CO and H2S sensors will be disabled. High level H2 measurements will not damage CO and H2S sensors as long as software warnings and procedures are followed.
2. The H2S and CO sensors can only be used with gas mixes with H2 concentrations less than 10,000 PPM. Software will prevent readings that could damage the sensor.
3. To achieve specified accuracies, the meter should have a valid calibration certificate and proper field calibration procedures should be followed.
4. Sensor life is dependent on gas concentrations that are measured.
5. It is recommended to follow all software instructions, failure to do so may cause permanent damage to sensors.

11 Contact Information – Service and Sales

North America

150 Smokerise Drive
Wadsworth, Ohio 44281
Phone: 330-725-7766
Email: sales@elkinsearthworks.com

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Elkins Earthworks, LLC

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