

# HY-ALERTA

HYDROGEN SPECIFIC LEAK DETECTION

HY-ALERTA™ 500 Handheld Hydrogen Leak Detector



## OPERATING MANUAL



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## MISSION STATEMENT

- ⊙ To become the leading provider of hydrogen specific safety monitoring and in-line process measurement systems where hydrogen gas is produced, used, consumed, stored and transported.
- ⊙ We are committed to providing cost-effective solutions as new installations and replacements for existing hydrogen gas analyzers to OEM customers and through our global distribution network.
- ⊙ Our products will achieve worldwide recognition in industrial safety and process applications based on superior products, while maintaining excellent relationships with and ensuring unsurpassed value to our business partners around the globe.

## CONTENTS

1.	Description .....	5
2.	Specifications .....	5
3.	Operation.....	7
3.1	Startup .....	7
3.2	Shutdown.....	7
3.3	Battery Level.....	7
3.4	Normal Operation .....	7
3.5	Controller LCD Error Status.....	10
3.6	Reset Operation .....	10
3.7	Zero Operation .....	10
3.8	Configuration Menu .....	10
3.8.1	Information Disp .....	12
3.8.2	Reset Sensor.....	12
3.8.3	Zero Sensor.....	12
3.8.4	Field Calibrate .....	12
4.	Calibration .....	12
4.1	Calibration Interval.....	12
4.2	Gases .....	12
4.3	Gas Connection .....	12
4.4	Numerical Changes .....	13
4.5	Verify Sensor .....	13
5.	Hydrogen Sensing Considerations .....	15
6.	Maintenance.....	15
6.1	Battery Charging.....	15
6.2	Cleaning .....	16
7.	Troubleshooting.....	16
8.	Appendix .....	17
8.1	European Declaration of Conformity.....	17
8.2	Revision Overview .....	18

## IMPORTANT NOTICES

Read and understand this operating manual before installing or using the unit.



Only use cables, battery pack, battery charger, and AC/DC power supply from H2scan with this unit.

If this equipment is used in a manner not specified by H2scan, the protection provided by this equipment may be impaired.



Hydrogen is flammable at 4% in air. Take indications seriously and be prepared to take action. In the event of detection of 4% or higher of a hydrogen gas concentration there is a high probability of a hazard to safety. Inform local emergency response personnel immediately.

## LIMITATION OF LIABILITY

In the event of a defect in a product, h2scan shall not be responsible for any direct, indirect, incidental or consequential damages resulting therefrom, including, but not limited to, loss of revenue and/or profit.

## LIMITED WARRANTY

H2scan Limited Warranty: Each hydrogen instrument ("Product") will conform, as to all substantial operational features, to the Product specifications set forth this Manual and will be free of defects which substantially affect such Product's performance for twelve (12) months from the ship date for such Product.

Must Provide Notice of Defect: If you believe a Product that you believe is defective, you must notify H2scan in writing, within ten (10) days of receipt of such Product, of your claim regarding any such defect.

Return Product to H2scan for Repair, Replacement or Credit: If the Product is found defective by H2scan, H2scan's sole obligation under this warranty is to either (i) repair the Product, (ii) replace the Product, or (iii) issue a credit for the purchase price for such Product, the particular remedy to be determined [by H2scan] on a case-by-case basis.

Voided Warranty: H2scan's 12 Month Limited Warranty is void for any of the following:



- The unit is opened and the manufacturing seal is broken
- Unauthorized repair work performed at the customer's location or carried out by anyone other than H2scan's factory trained technicians
- Equipment or parts that have been tampered with, misused, neglected, mishandled, improperly adjusted, or modified in any way without the written consent of H2scan.
- Equipment or parts that have been damaged due to shipping, misuse, accidents, mishandling, neglect, or problems with electrical power sources.
- Repair work performed during the warranty period does not prolong the warranty period past the original period.
- System operation in incorrect or inappropriate environments.
- Usage that is not in accordance with system guidelines or an operator's failure to follow manual instructions.

Limitation of Warranty: THE ABOVE IS A LIMITED WARRANTY AS IT IS THE ONLY WARRANTY MADE BY H2SCAN. H2SCAN MAKES NO OTHER WARRANTY EXPRESS OR IMPLIED AND EXPRESSLY EXCLUDES ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. YOUR SOLE REMEDY HEREUNDER IS REPAIR OR REPLACEMENT OF THE PRODUCT OR A CREDIT FOR THE PURCHASE PRICE FOR SUCH PRODUCT, THE PARTICULAR REMEDY TO BE DETERMINED BY H2SCAN ON A CASE-BY-CASE BASIS. H2SCAN SHALL HAVE NO LIABILITY WITH RESPECT TO ITS OBLIGATIONS UNDER THIS AGREEMENT FOR CONSEQUENTIAL, EXEMPLARY, OR INCIDENTAL DAMAGES EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE STATED EXPRESS WARRANTY IS IN LIEU OF ALL LIABILITIES OR OBLIGATIONS OF H2SCAN FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE DELIVERY, USE OR PERFORMANCE OF THE PRODUCTS.

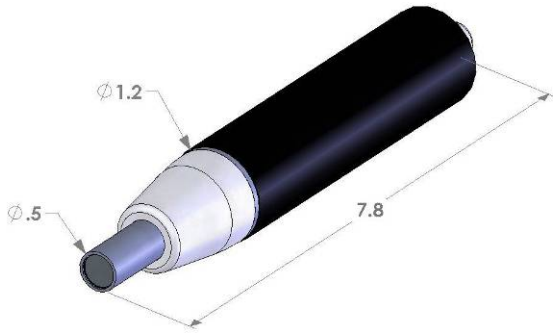
**1. Description**

H2scan believes that protecting lives means being able to locate and find hydrogen leak as quickly as possible. With two sensing elements on the same semiconductor die, the HY-ALERTA™ 500 can detect hydrogen leaks as low as 15 ppm and will not saturate or be destroyed when detecting concentrations of hydrogen up to 100%. The flexible cable allows the sensor probe access to virtually all potential leak sources.

**2. Specifications**

<b>Sensitivity Range:</b>	0.0015% (15 ppm) to 100% hydrogen by volume in air.
<b>Response Time:</b>	Indication of hydrogen within seconds. Stabilization to final value depends on concentration.
<b>Ambient Temperatures:</b>	Operating: 0°C to +40 °C Storage: -20°C to +45 °C
<b>Relative Humidity:</b>	<b>0-95% non-condensing</b>
<b>Power:</b>	Internal rechargeable Lithium Ion battery yields over 10 hours of operation and is recharged in 4 hours with included charger. Battery charger input: 100-240VAC, 50-60Hz, 0.6A.
<b>Environmental:</b>	Indoor/Outdoor Use Altitude up to 2000 meters Pollution degree 2 environment
<b>Ingress Protection:</b>	IP64 capable
<b>Calibration Period:</b>	Recommended user Verification/Calibration on a 12 month basis.
<b>Weight:</b>	975 g (2.15 lb.) unit and carrying pouch 2.2 kg (5 lb.) shipping weight (unit with accessories)
<b>Product Life Expectancy:</b>	10 years
<b>Certifications:</b>	  <b>US LISTED</b>

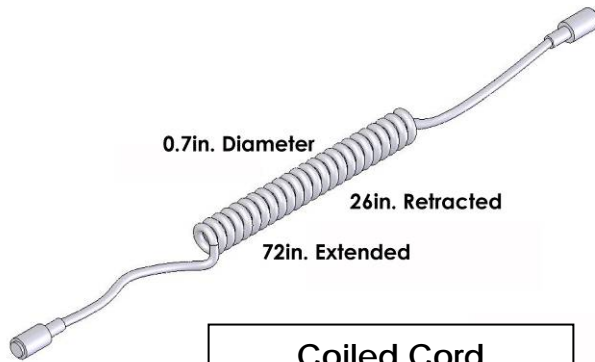




Probe



Controller



Coiled Cord



Controller Carry Pouch



Battery Charger with Regional Plugs

### 3. Operation

#### 3.1 Startup

Before power-up, charge the controller for 4 hours to fully charge the battery for operation. To power-up the HY-ALERTA™ 500, press and hold the **ON/OFF** button until the Controller LCD display indicates an operational message.

**WARNING: ONLY POWER-UP THE INSTRUMENT IN A HYDROGEN-FREE ENVIRONMENT.**

After power is on, the instrument automatically enters an Initialization Mode that lasts approximately ten minutes. During this time the LCD displays a countdown to completion and the lighted indicator closest to the Probe Tip is amber until the following operations complete:

- Heat the Wide Range Sensor® to operating temperature.
- Perform system self-test.
- Zero the sensor reading.

Upon successful completion the instrument automatically switches to Normal Operation. If an error is detected the instrument will display an Error Status (see *Section 7*).

#### 3.2 Shutdown

To power-down the HY-ALERTA™ 500, press and hold the **ON/OFF** button for approximately two seconds until the Controller LCD display turns off.

#### 3.3 Battery Level

After power-on the **BATTERY LED** indicates the current battery level (*times may vary as battery ages*):

- Green – more than one hour of operation remaining
- Amber – approximately 15 to 60 minutes of operation remaining
- Red – less than approximately 15 minutes of operation remaining

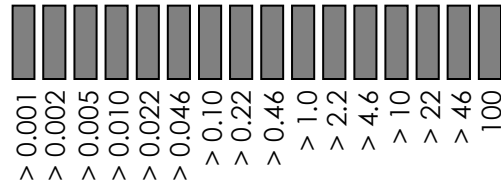
A fully charged battery should last a maximum time of 10 to 15 hours, depending on use. The battery LED will be green until there is less than 1 hour of battery time left. The battery LED will be amber to represent 15 to 60 minutes of battery time remaining. A red battery LED represents approximately 15 minutes of battery time remaining, indicating the need for a recharging session.

There is a small load on the battery when the unit is powered off. This load will discharge the battery of the unit in it's powered off state in about 6 months. Customers that do not use the device frequently should charge the battery and perform a bump test with hydrogen gas every one to three months to keep the battery charged and ready for use.

#### 3.4 Normal Operation

During Normal Operation the instrument is detecting and reporting hydrogen concentration near the Probe Tip Sensor. Hydrogen readings are displayed on the Controller LCD and the Probe Tip LED bar graph array. Note that due to the extreme sensitivity of the sensor, it may take more than one minute to return to a near zero (less than 0.001%) reading after exposure to hydrogen. If the instrument doesn't return to an indication of less than 0.001% after 5 minutes in a hydrogen-free environment, then invoke the Reset operation (See *Section 3.6*).

The upper line of the Controller LCD indicates a numerical value or range for the percent hydrogen concentration or peak hydrogen value. The lower line is used to display the hydrogen meter, a logarithmic bar graph ranging from 0.001% (10 ppm) to 100% hydrogen by volume. An open box on the bar indicates the last peak value obtained and filled boxes indicate current value. The following figure describes how to interpret the hydrogen meter:



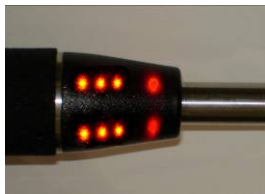
The Probe Tip LED Indicator can be used to show an increase or decrease in hydrogen concentration. Leak detection is accomplished by watching the Probe Tip LED and moving the sensor around a potential hydrogen leak.

- |                            |                      |
|----------------------------|----------------------|
| Solid Green:               | H2 level below 15ppm |
| Pulsing Green:             | Decreasing H2 level  |
| Pulsing Red:               | Increasing H2 level  |
| Solid Amber:               | Very steady H2 level |
| Alternating Red and Green: | Steady H2 level      |

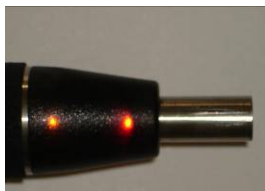
The color of the Probe Tip LED indicates:



- Green** – Unit ready  
 < 0.001% hydrogen by volume  
 < 10 ppm



- Red** – New peak hydrogen concentration detected



- Amber** – System startup  
 – Hydrogen detected  
 – Less than most recent peak hydrogen concentration

The number of yellow LEDs powered on in the Probe LED bar graph array indicates detected hydrogen concentrations. These concentration ranges are noted below:

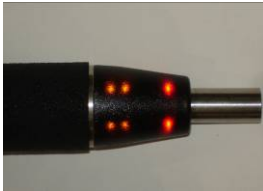
**0 Yellow LEDs:** < 0.001% hydrogen



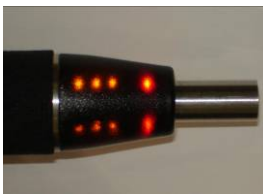
**1 Yellow LED:**  
> 0.01% hydrogen  
> 100 ppm



Green Probe Tip LED  
No hydrogen detected  
Sensor is ready



**2 Yellow LEDs:**  
> 0.1% hydrogen  
> 1000 ppm



**3 Yellow LEDs:**  
> 1% hydrogen  
> 10,000 ppm



Red Probe Tip LED  
4 Yellow LEDs in the LED Array  
Peak Hydrogen Detected  
New Peak over 10%



**4 Yellow LEDs:**  
> 10% hydrogen  
> 100,000 ppm

KEYPAD use to alter the display or initiate special functions:

- Pressing ▲ (up arrow button) will display the peak hydrogen reading.
- Pressing ▼ (down arrow button) will display the current percent hydrogen concentration.
- Pressing ► (right arrow button) will clear the peak hydrogen value.

Pressing and holding the ENTER button will invoke the Configuration Menu

- Pressing and holding ◀ (left arrow button then Enter) will invoke the Zero Operation (see manual Section 3.7).
- Pressing and holding ◀▶ (left and right arrow buttons then Enter) will invoke the Reset Operation (see manual Section 3.6).

### 3.5 Controller LCD Error Status

Controller LCD displays *Sensor Error* – Unit has detected a failure to communicate with the Probe.  
Controller LCD displays *broken* – Unit has detected a unit internal failure.  
See *Section 7* for troubleshooting.

### 3.6 Reset Operation

The Reset Operation is used to speed recovery from hydrogen exposure. This operation can be invoked from the keypad during Normal Operation by Pressing and holding ◀▶ (left and right arrow buttons simultaneously) or from the Configuration Menu (see *Section 3.8*). Once invoked the user is asked to confirm the operation by pressing the ENTER key, pressing any other key will abort the operation.

**WARNING: THE INSTRUMENT MUST BE IN A HYDROGEN FREE ENVIRONMENT WITH THE LCD INDICATING LESS THAN 0.1% HYDROGEN BEFORE INVOKING THE RESET OPERATION.**

During Reset the LCD indicates a count down to completion and the Probe tip LED will be yellow.

### 3.7 Zero Operation

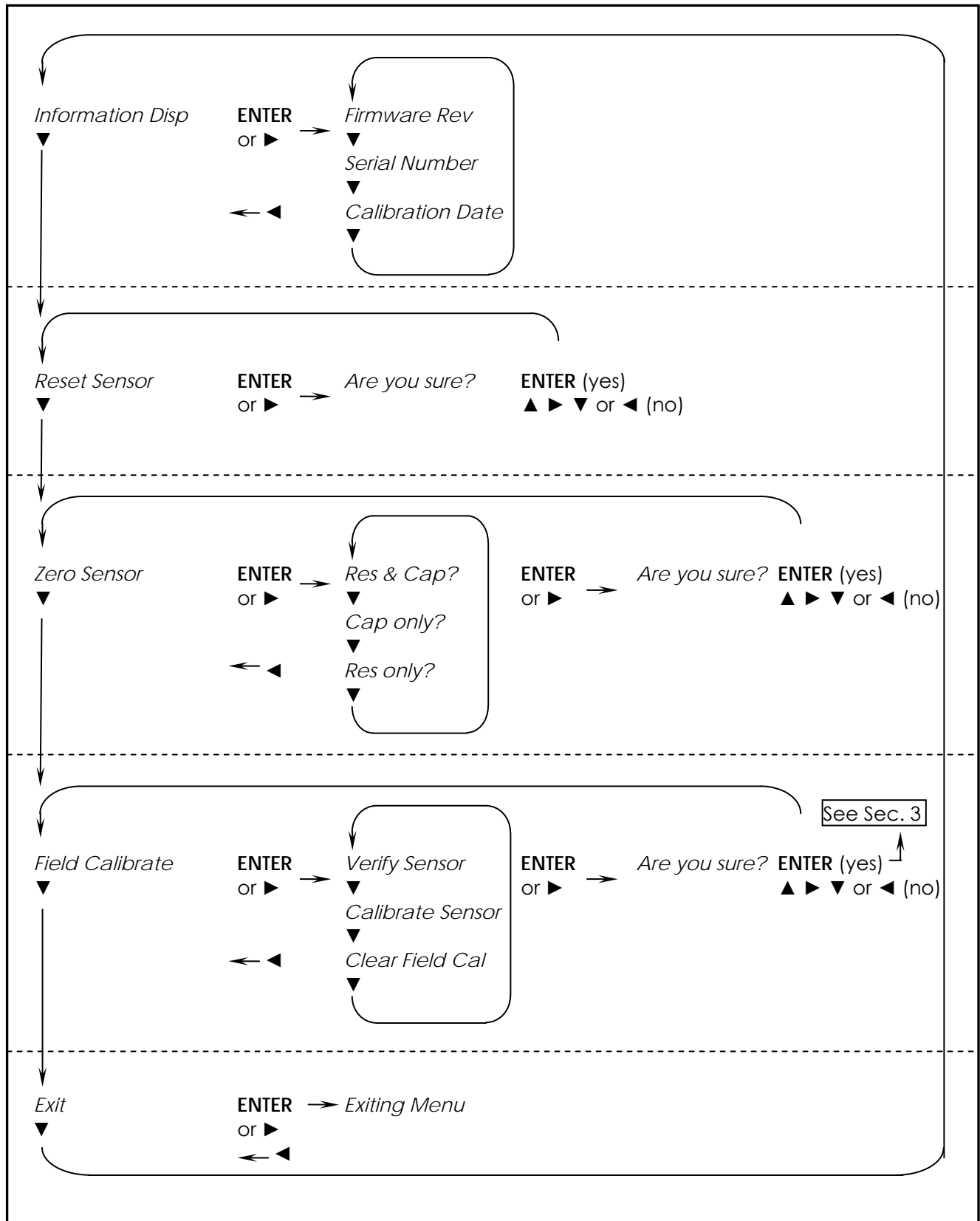
The Zero Operation is used to zero the hydrogen reading if the instrument is reporting low levels (0.001% to 0.01%) of hydrogen when no hydrogen is present. This operation can be invoked from the keypad during Normal Operation by pressing and holding ◀ (left arrow button) or from the Configuration Menu (see *Section 3.8*). Once invoked the user is asked to confirm the operation by pressing the ENTER key, pressing any other key will abort the operation.

**WARNING: THE INSTRUMENT MUST BE IN A HYDROGEN FREE ENVIRONMENT WITH THE LCD INDICATING LESS THAN 0.1% HYDROGEN BEFORE INVOKING THE ZERO OPERATION.**

### 3.8 Configuration Menu

The Configuration Menu is used to display and modify instrument settings and can be entered by pressing and holding the ENTER button. The configuration parameters are summarized below with details in the following sections. The keypad is used to navigate the menu as shown in the following table.

Key	Navigation	Editing Values	Query Answer
ENTER	Enter submenu	Select Value	Yes
▲	Previous Menu	Increase Value	No
▼	Next Menu	Decrease Value	No
▶	Enter Submenu	Move Cursor Right	No
◀	Exit Submenu (Back)	Move Cursor Left	No
◀▶	Exit Configuration	Undo Changes	No



Configuration Menu Navigation

### 3.8.1 Information Disp

The Information Display menu allows the user to view useful information about the instrument including firmware revisions, serial number, and calibration date.

- **Firmware Rev:** Displays the sensor pod and controller firmware. The left most number preceded by an 'S' is the Probe firmware revision. The right most number preceded by a 'C' is the Controller firmware revision. For example: *S1.23 C2.34* for Probe firmware version 1.23 and Controller firmware version 2.34
- **Serial Number:** Displays the product serial number. For example: *50123*
- **Calibration Date:** Displays the date of last factory calibration, MM/DD/YY. For example: *5/8/06* for 8 May 2006.

### 3.8.2 Reset Sensor

The Reset Sensor menu is used to invoke the Reset Operation as described in *Section 3.6*.

### 3.8.3 Zero Sensor

The Zero Sensor menu is used to invoke the Zero Operation as described in *Section 3.7*.

### 3.8.4 Field Calibrate

The Field Calibrate menu shows the date of the last field calibration and allows the user to invoke the Verify, Calibrate, and Clear functions.

- **Verify Sensor:** press ENTER to invoke the Verify function (refer to *Section 4.5*)
- **Calibrate Sensor:** This function is not supported at this time. Please refer to section 4.1 for calibration.
- **Clear Field Cal:** This function is not supported at this time. Please refer to section 4.1 for calibration.

## 4. Calibration

### 4.1 Calibration Interval

H2scan recommends that the Verification/Calibration be carried out every 12 months. The user has two choices for doing that:

- Contact H2scan to make arrangements for a comprehensive Factory Calibration by H2scan's factory trained technicians; optional NIST traceable certificate available.
- Carry out a Field Verification (refer to *Section 4.5*). Customer-specific Field Verification Kits for the HY-ALERTA™ 500 are available from H2scan.
- If the Field Verification fails the unit must be returned to the factory for calibration.

### 4.2 Gases

Verification requires the availability of the following certified gases:

- 2.00% hydrogen by volume in air (20,000 ppm)
- 0.10% hydrogen by volume in air (1000 ppm)
- zero grade, hydrogen-free air; as a substitute, ambient air can be used instead of certified, zero grade air if the user has high confidence that it is a hydrogen-free environment

### 4.3 Gas Connection

Gases are applied to the unit through the use of the Calibration Cup Assy. (P/N 50000009) available from manufacturer.

## 4.4 Numerical Changes

In the following sections when queried to change a numeric value the ▲ (up arrow) and ▼ (down arrow) keys are used to increment/decrement the value based on the selected digit. If the ones digit is selected the value will increment/decrement by one (9 increments to 10, 10 decrements to 9). The ◀ (left arrow) and ▶ (right arrow) keys are used to select another digit. To change a value of 0 to 100 first select the hundreds digit then press the ▲ up arrow. Pressing ◀▶ (the left and right arrows simultaneously) will clear any changes made and restore the previous value. Once the correct value is displayed press the **ENTER** key to save it.

## 4.5 Verify Sensor

The Verify function allows the user to check the instrument's calibration. If Verify is successful, then the user is asked to enter the new verification date. If Verify fails, the field calibration values are erased, restoring the last factory calibration. Details on the Verify function can be found in *Section 3.8.4*. Below are the steps to carry out the Verify Test:

Step	Display	User response
1	<i>Hydrogen &lt;0.001%H2</i>	Press <b>ENTER</b>
2	<i>Information Disp</i>	Press ▼
3	<i>Reset Sensor</i>	Press ▼
4	<i>Zero Sensor</i>	Press ▼
5	<i>Field Calibrate XX/XX/XX</i>	Press <b>ENTER</b> or ▶
6	<i>Verify Sensor</i>	Press <b>ENTER</b>
7	<i>Verify Sensor Are you sure?</i>	Press <b>ENTER</b> to Verify sensor, any other key to exit.
8	<i>Verify Sensor In Progress</i>	Verify Test begins.
9	<i>Apply 0.000%H2 Are you sure?</i>	With the Calibration Cup that accompanies the HY-ALERTA™ 500, apply hydrogen-free, ultra-zero air to the Probe sensor. The Probe Tip LED will remain Green. Press <b>ENTER</b> .
10	<i>Apply 0.000%H2 In Progress</i>	0% Verify Test starts.
11	<i>Apply 0.000%H2 Settle</i>	Checking sensor temperature.
12	<i>Apply 0.000%H2 Wait xxxx</i>	Wait for sensor reading to stabilize until <b>xxxx = 0</b> .
13	<i>Apply 0.000%H2 Finding Average</i>	Measuring sensor response to test gas.

14	<i>Apply 0.100%H2 Are you sure?</i>	With the Calibration Cup, apply 0.1% hydrogen (balance air) to the Probe sensor. The Probe Tip LED will change from Green to Red. One (or two) yellow LEDs in the LED Bar Graph Array will turn on. Press <b>ENTER</b> .
15	<i>Apply 0.100%H2 In Progress</i>	0.1% Verify Test starts.
16	<i>Apply 0.100%H2 Settle</i>	Checking sensor temperature.
17	<i>Apply 0.100%H2 Wait xxxx</i>	Wait for sensor reading to stabilize until <b>xxxx = 0</b> .
18	<i>Apply 0.100%H2 Finding Average</i>	Measuring sensor response to test gas.
19	<i>N/A</i>	Visually verify that 1-2 yellow LED's are lit up in the probe tip. If not the unit needs factory calibration
20	<i>Apply 2.000%H2 Are you sure?</i>	With the Calibration Cup, apply 2.0% hydrogen (balance air) to the Probe sensor. The Probe Tip LED will remain Red. Three yellow LEDs in the LED Bar Graph Array will turn on. Press <b>ENTER</b> .
21	<i>Apply 2.000%H2 In Progress</i>	2.0% Verify Test starts.
22	<i>Apply 2.000%H2 Settle</i>	Checking sensor temperature.
23	<i>Apply 2.000%H2 Wait xxxx</i>	Wait for sensor reading to stabilize until <b>xxxx = 0</b> .
24	<i>Apply 2.000%H2 Finding Average</i>	Measuring sensor response to test gas.
25	<i>Enter Date: 1.0000 M</i>	Enter the current month (1-12) using the ▲ (up arrow) and ▼ (down arrow) keys.
26	<i>Enter Date: 1.0000 D</i>	Enter the current day (1-31) using the ▲ (up arrow) and ▼ (down arrow) keys.
27	<i>Enter Date: 6.0000 Y</i>	Enter the current year (7=2007, 12=2012, etc.) using the ▲ (up arrow) and ▼ (down arrow) keys.
28	<i>Verify Sensor Passed</i>	Verify is complete, press any key.

- 1) If the unit passes Verification, Calibration is not required at this time. The Verify Test stops here.
- 2) If the unit fails Verification, H2scan recommends that the unit be returned to the factory (see section 4.1)

## 5. Hydrogen Sensing Considerations

From any given source, hydrogen gas disperses rapidly and generally upward due to the very low density of hydrogen compared to air. Understanding this behavior allows the operator to more effectively search for hydrogen leaks.

If the sensor element is near (and above) the leak, the concentration will likely be higher but the leak may be difficult to locate. As hydrogen dissipates (generally above the leak) the concentration decreases. Generally, greater distances will increase the chance of intercepting the leak stream, but if the sensor is too far away, the response may be too weak to detect.

When drafts or air currents are present, hydrogen will tend to be dispersed. Testing for hydrogen leaks downwind of the leak area may increase the chance of detecting the leak.

If hydrogen is rising in an enclosed building (where there may be a layer of hot air near the ceiling) the hot air near the ceiling may have a lower density and act to retard the hydrogen from continuing to rise as rapidly as it did in lower layers of air. Thus, sensing hydrogen near ceiling areas with high temperatures present may not be as effective.

Low temperatures can also affect the behavior of hydrogen. Hydrogen stored in a liquid state is at an extremely low temperature. The low temperature of any escaping hydrogen will be of a higher than normal density and may initially move downward. As the hydrogen warms, it will begin to rise upward. When checking for a leak in areas where liquid hydrogen is stored, check both above and below the area of concern.

## 6. Maintenance

### 6.1 Battery Charging

To recharge the unit's battery:

- 1) Ensure the unit is powered OFF.
- 2) Disconnect the Coiled Cord from the Controller.
- 3) Connect the Battery Charger to the Controller.
- 4) Using the appropriate A/C plug adapter for the region of use, plug the Battery Charger into the A/C supply.
- 5) The Battery Charger indicator light will illuminate according to charge status as follows:
  - OFF: No Battery
  - FLASHING GREEN: Fast charging
  - STEADY GREEN: Fully charged
  - STEADY AMBER: Standby
  - FLASHING RED: Error

**WARNING: COMPLETE CHARGING MAY TAKE UP TO 4 HOURS FOR A FULLY DISCHARGED BATTERY.**

## 6.2 Cleaning

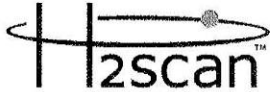
If the unit becomes soiled, clean the unit with a lint-free cloth. Use special care when cleaning the handheld probe assembly. Small debris or other material may collect over the sensor tip. Clean the tip with a gentle wiping with a clean lint-free cloth or paper.

## 7. Troubleshooting

Symptom	Action
Controller LCD indicates <i>Sensor Error</i> after power on	Turn off the instrument and verify that the Probe is properly connected to the Controller.
Controller LCD indicates <i>broken</i>	Turn off the instrument and verify that the Probe is properly connected to the Controller and that there isn't any damage to the unit.
BATTERY LED is red	Charge the battery completely; see <i>Section 6.1</i> .

8. Appendix

## 8.1 European Declaration of Conformity



## *European Declaration of Conformity*

Application of Council Directive: 2004/108/EC

**Standards to Which  
Conformity is Declared:** EN61326:1998  
EN55011 Class B Group I  
EN61000-4-2  
EN61000-4-3

Standards comply with  
requirements of the  
European Directives.

**Manufacturer's Name:** H2scan Corporation

**Manufacturer's Address:** 28486 Westinghouse Place, Suite 100  
Valencia, CA 91355  
(661) 775 - 9575

**Equipment Description:** Handheld Hydrogen Leak Detector

**Equipment Class:** Laboratory, Measurement, and Process  
Control Equipment: Portable Environment

**Model Number:** 500

The tests were carried out by the test laboratories of DNB Engineering and/or in accredited testing laboratories. Test reports may be inspected on demand.

*We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).*

Date of Issue: 31 May, 2007  
Place of Issue: Valencia, CA

Signature:   
Full Name: Dennis Wayne Reid  
Position: Chief Executive Officer

Signature:   
Full Name: Todd E. Wilke  
Position: Chief Technical Officer

Annexes are part of this declaration. This declaration certifies conformance with the above mentioned Directives.  
Affirmation of attributes in a legal sense is not included. Security declarations given in the product documentation have to be considered.

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## 8.2 Revision Overview

Revision	Comments	ECO Number
R5	<ul style="list-style-type: none"><li>• Further details to section 3.3 Battery Level</li><li>• Added section 8.2 Revision Overview to Appendix</li></ul>	08-034
R6	<ul style="list-style-type: none"><li>• Battery charge statement added to Section 3.1 Startup</li><li>• Add CE documentation, logo</li><li>• Add UL to certification</li><li>• Add warnings to important notices section</li></ul>	09-005
R7	<ul style="list-style-type: none"><li>• Make changes to the manual based on the probe LED function</li><li>• Removed Field Calibration from manual</li></ul>	09-036

QUESTIONS?

PLEASE CONTACT US AT:



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Website: <http://www.h2scan.com>

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