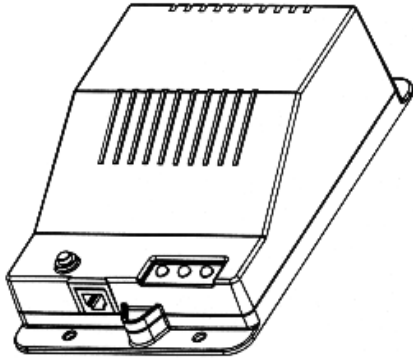




STORAGE BATTERY SYSTEMS, INC.

HGDI-DR Hydrogen Gas Detector



Installation/Operation Instructions & FAQ's

Installation:

Hydrogen gas is only 7% the density of air, and rises. Your hydrogen gas detector should be installed at the highest, draft-free location in the battery room or compartment where hydrogen gas would accumulate.

Remove the cover from the detector box carefully not to break the hinge connection at the top of the box.

Attach the detector to the wall, ceiling, or optional junction box using the mounting holes at the top and bottom of the detector box.

For hard wiring using conduit, the detector box will fit the following junction boxes: Appleton 25075, Bowers 702 SPL, Raco 951, or Steel City 2G-1/2&3/4.

The detector has a terminal block for connection to a single-phase ac power source and two internal relays. The relays can be used to switch a remote exhaust fan and/or alarm on and off.

For 120 volts ac power, use an 18 gage SJT 3-conductor PVC jacketed cable (Belden 19348, equivalent or better). For relay wires, use 14 gage wire (Belden 9989, equivalent or better). The detector's relay dry

contacts are rated at 10A / 250VAC, sufficient for most 1/3 HP exhaust fans. For higher current requirements, add external relays.

Ensure that your installation complies completely with all relevant local, state, federal, and OSHA safety and health regulations.

An optional 2 inch (5 cm.) square remote box with duplicate LEDs, test button, and alarm (buzzer), can be placed anywhere. This remote box connects to the detector box via a standard style 6-connector, 6-contact telephone-type modular cable.

Operation:

Keep the detector on at all times. If the green LED is lit, power is on.

When power is first turned on, approximately 10 minutes will elapse before the detector will start to function. This delay is to prevent false activation of the internal relay and alarm.

If the unit has been stored un-energized for more than 1 week, the sensor will require 7 days or more to stabilize. During this period the sensor will be overly sensitive to hydrogen gas. This may activate the internal relay at a slightly lower concentration level, but normally should not reach the point of activating the internal alarm.

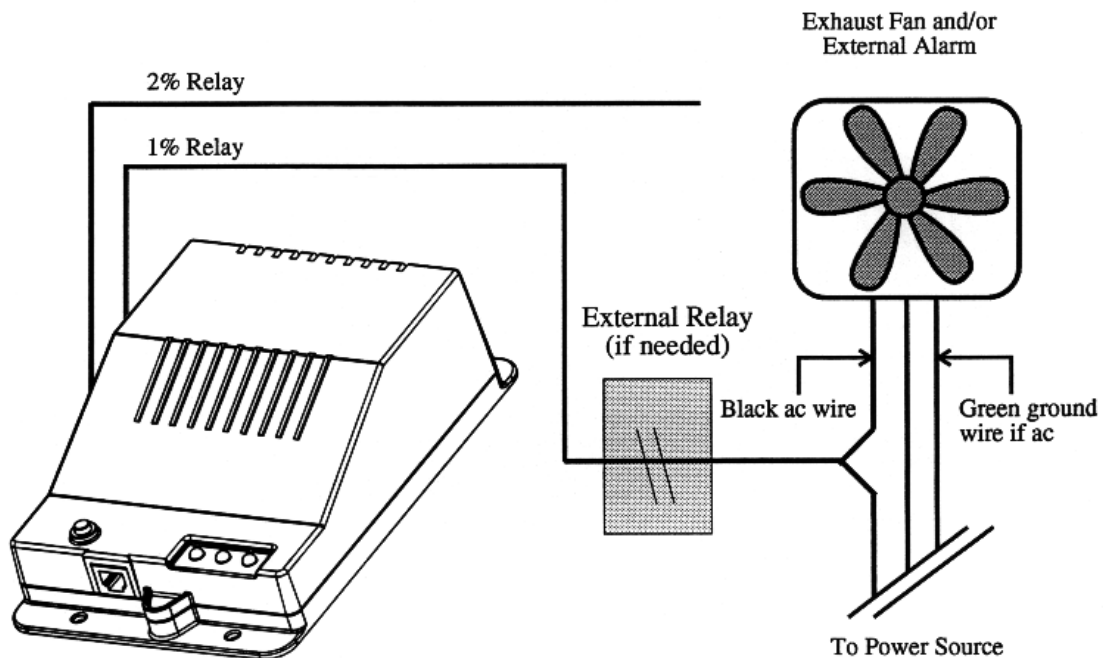
If the concentration of hydrogen gas in the air surrounding the sensor reaches 1% by volume, the yellow LED will light and the 1% internal relay will close. A 4 second delay prevents false activation.

Should the concentration reach 2%, the red LED will flash, the internal 80 db warning alarm will sound, and the 2% internal relay will close. The 1% relay will remain closed & the yellow LED on.

When the concentration decreases below 2%, the red LED will turn off, the internal alarm will stop, and the 2% relay will open. When the concentration falls below 1%, the 1% relay will open and the Yellow LED will turn off.

The sensor is calibrated at room temperature and humidity at sea level. It is slightly more sensitive at higher temperature, humidity or altitude. In these situations, the detector may activate at a slightly lower gas

concentration. This, however, should not noticeably affect its operation or require any adjustment.



1. The detector has two internal, normally-open Form A relays. If the sensor detects a 1% concentration of hydrogen gas in the air, the first relay closes and can be used to turn on an exhaust fan. If the sensor detects a 2% concentration of hydrogen gas in the air, the second relay closes and could be used to turn on an alarm in another area.
2. Connect the wires from the relays in "series" with the live wire (black) of the ac input line to the exhaust fan and/or alarm.
3. The detector's internal relays are rated at:
 - 10 amps at 250 volts ac
 - 10 amps at 30 volts dc
 - 1/3 horsepower at 125 volts ac
 - 1/3 horsepower at 250 volts ac
4. For currents higher than these relay ratings, add an external relay (shaded item in the sketch above).

Note: The sensor detects several other combustible gases in addition to hydrogen. Its sensitivity to these other gases, however, is much lower

than its sensitivity to hydrogen. Although additive, the presence of other gases is unlikely to falsely activate the detector.

Calibration:

This detector has been calibrated at the factory for hydrogen gas and should not be adjusted in the field. **DO NOT ATTEMPT TO FIELD CALIBRATE THIS UNIT.**

Testing (after the ac power is on for 10 minutes):

A "push-to-test" button is located on the unit's front. Push and hold this button for approximately 10 seconds to test the unit's electronic circuitry. The caution and warning LEDs will light in sequence; the relays will activate whatever is connected to them and the internal warning alarm will sound.

Note: The "push-to-test" button does NOT test the sensor itself.

Unless the detector becomes overly sensitive, recalibration or replacement of the sensor board should not be necessary for several years. For safety reasons replace the sensor board every five years.

Warning:

This detector is added protection, not a substitute, for prudent safety measures where hydrogen gas is present. For large or highly sensitive areas, use two or more detectors.

Frequently asked questions:

What regulations apply to battery charging areas?

OSHA Regulations (Standards - 29 CFR), National Electrical Code (National Fire Protection Association Standard NFPA 70), and associated directives, interpretations and compliance letters apply. For the latest information, see the web sites of OSHA (osha.gov) and NFPA (nfpa.org). Other regulations, state and local, may also apply.

What do these regulations require?

To the best of our knowledge at the time of this posting, existing regulations require that:

- A. Provisions be made for sufficient diffusion and ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures.
- B. Adequate ventilation means providing natural or mechanical dilution sufficient to limit the accumulation of hydrogen gas in air at the charging site to levels below the lower explosive limit of 4.1%.
- C. A typical exhaust fan can meet this requirement if it is used in such manner that the concentration of hydrogen gas in the fan's ambient air never exceeds the lower explosive limit.

What can cause a hydrogen gas explosion?

Hydrogen gas, 4.1% or more mixed with air, can be ignited by a flame, spark, or static electricity.

Can the detector itself cause an explosion?

Not if you make tight wire connections to the detector. The only moving parts are in the internal relays, and the relays are hermetically sealed.

Can you see or smell hydrogen?

Hydrogen is a colorless, odorless gas. Human senses cannot detect it.

What causes the odor in a battery room?

The odor in a battery room often is caused by a small amount of sulfuric acid vapor escaping into the air during finish charge. It is not caused by hydrogen, which is odorless.

When is hydrogen produced during battery charging?

When lead acid batteries, on charge, reach approximately 2.38 volts per cell (80 % of their full charge capacity), they begin to gas. At that

point, electrical energy in excess of what is needed for the chemical reaction, decomposes the water of the electrolyte into oxygen at the positive plates and hydrogen at the negative plates. Even after the charger turns off, the cells continue to produce oxygen and hydrogen until the reaction in the battery stabilizes.

Fully charged, lead acid batteries on float charge continually emit oxygen and hydrogen, although at a lower rate than batteries being recharged.

How much hydrogen do flooded batteries emit?

The amount of hydrogen gas emitted during gassing depends upon the:

- A. Charger output current.
- B. Number of cells.
- C. Condition of the battery.

Where does hydrogen gas accumulate?

Hydrogen exits flooded batteries through the vent plugs. The concentration at the vent plugs is very explosive. As hydrogen dissipates in the air, it rises and can accumulate in explosive concentrations in the highest, draft-free areas of the room. The main purpose of the hydrogen detector is to prevent this.

Do VRLA (sealed) lead-acid batteries emit hydrogen?

VRLA (valve regulated lead acid) sealed batteries use a recombination technique to prevent water loss in the form of oxygen and hydrogen gas. They often require special chargers with specific charge profiles for the brand and type of battery.

Although VRLA batteries normally do not emit gases, they can under certain circumstances. They have pressure relief valves to control their internal pressure. If the pressure builds too high due to high ambient temperature, overcharge, mechanical failure or other causes, they can emit hydrogen gas in explosive concentrations. The potential danger is greatest with stationary VRLA batteries kept in small enclosures with limited ventilation.

Will the detector work in a non-oxygen environment?

No. The sensor requires an oxygen environment.

Does the detector detect or react to other gasses?

The sensor detects several other combustible gases in addition to hydrogen -- ethanol, isobutane, methane, propane. Its sensitivity to these other gasses, however, is much lower than its sensitivity to hydrogen. This should not noticeably affect its operation.

What is the detector operating temperature?

The detector operating temperature is 14 to 104 degrees F, (-10 to 40 degrees C).

What is the response time?

When power is first applied, or after a power interruption, approximately 10 minutes will elapse before the detector starts to function. This delay is to prevent false activation. After this delay, response time to hydrogen for the first (1%) relay is about 4 seconds; response time for the second (2%) relay and/or alarm is 3 seconds later (total: about 7 seconds).

Does the detector have a built-in warning alarm?

The detector has a built-in 80 db warning alarm that activates at a 2% concentration of hydrogen.

Where should I place the detector?

Install the detector at the highest, draft-free location in the battery compartment or room where hydrogen gas might accumulate.

How do I install the detector?

The detector is designed to attach directly to a wall or ceiling, or to a conduit box, using four screws. You will need to run power and relay wires to the detector, plus a modular cable to the optional remote, if used.

How is the detector powered?

Normal power is 115 volts 50/60 hertz ac. If specified at time of order, the detector can be customized for 220 volts 50/60 hertz ac, or for 12, 24, 36 or 48 volts dc.

How much power does the detector consume?

The detector consumes 80 ma, 170 ma if the buzzer is sounding.

How large an exhaust fan can the detector control?

The internal relay dry-contacts are rated at 10 amps / 250 vac, sufficient for most 1/3 HP fans. For higher current requirements, add an external relay.

How many detectors do I need?

Similar to smoke detectors, hydrogen detectors sense hydrogen only at the sensor, not at a distance. How many detectors you need depends upon where hydrogen might accumulate near your ceiling. Factors affecting this are:

- A. Room size.
- B. Type of ceiling -- flat, pitched, compartmented, etc.
- C. Natural air flow patterns.

If unsure, add one or more detectors to be safe.

Can one detector control more than one sensor?

No. The detector can operate only one sensor.

How can I be sure the detector is working?

Each detector has a test button. Push and hold the test button for ten seconds. The LED's will light in sequence, the relay(s) will close to operate whatever is connected, and the warning buzzer will sound. This test can also be run from the optional remote, if used. This procedure will test the detector's electronics, but not the sensor itself.

There is no way accurately to test the sensor in the field. If you have hydrogen in a tank, you can fill a balloon with hydrogen and release it at the sensor to see the reaction. *Do not use hydrogen sulfide - it can damage the sensor.* For a more accurate test, you can purchase test gas from a gas supplier and flood the sensor with it, but these concentrations are very small and may not give a correct result.

Fortunately, when the sensor fails, often due to contamination, it normally becomes more sensitive, falsely activating the relay and/or alarm.

How long will the sensor last?

Normal sensor life is over 5 years. For safety reasons, we suggest you replace it every 5 years.

How can I replace the sensor?

To replace the sensor, remove the cover of the detector. Pull out the old sensor board and insert the new board. Replace the cover. Run the push-to-test-button procedure. For replacement sensor, please contact Storage Battery Systems Inc.

What is the warranty?

Hydrogen gas detectors are warranted to be free of defects in workmanship and material for a period of two years from the date of purchase.