

# Installation Guidelines

## For NTM Hydrogen Alarm Systems

(NTM Hydrogen Alarm System, NTM Hydrogen Alarm System Plus, NTM Hydrogen Alarm System-R, & NTM Hydrogen Alarm System-R Plus)



Installation and use of the NTM Hydrogen Alarm Systems are simple. These guidelines will instruct the user on the correct installation of the hydrogen alarm system and setup of the relays at the two threshold settings. The alarm system comes ready to use with the power supply wired to the board and pre-set for use with one or two NTM SenseH<sub>2</sub><sup>®</sup> or NTM SenseH<sub>2</sub>-R<sup>™</sup> hydrogen sensors.

### System specifications:

	Min	Max	Units
<b>Power</b>			
Input voltage (AC)	90	264	VAC
Input voltage (DC)	10.0	57.6	VDC
<b>Relays</b>			
Max Switching Voltage	—	277	VAC
Max Switching Voltage	—	28	VDC
Rated Current (@ Max Voltage)	—	10	A
<b>Environmental Conditions (for sensor module):</b>			
Ambient temperature	-20	80	°C
Relative humidity	5	95	%R.H.
<b>Dimensions:</b>			
Display	5.25"W x 4.75"H x 1.4"D		
Sensor Module	2.9"W x 2.75"H x 1.0"D		
Connector	25' L		

## Alarm system layout:

- ❑ A: Jumpers to enable/disable Sensor 1/Sensor 2

**Factory Default:** Sensor 2 disabled

- ❑ B: Jumpers to select input signal (0-5V/4-20mA)

**Factory Default:** 0-5VDC

- ❑ C: SPDT Relay for Warning Condition (1% H<sub>2</sub>)

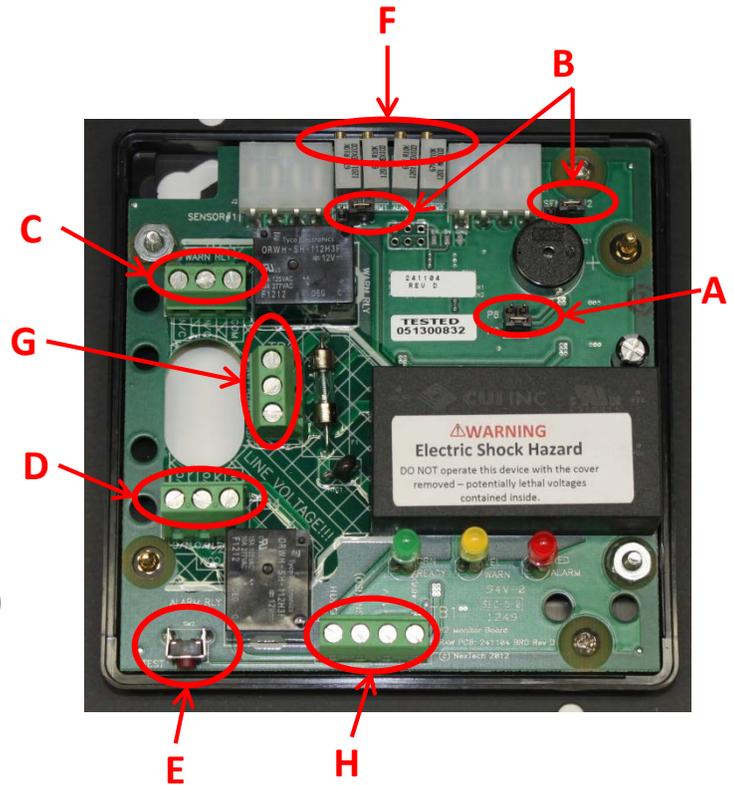
- ❑ D: SPDT Relay for Alarm Condition (2% H<sub>2</sub>)

- ❑ E: Test System Push Button

- ❑ F: Calibration Potentiometers

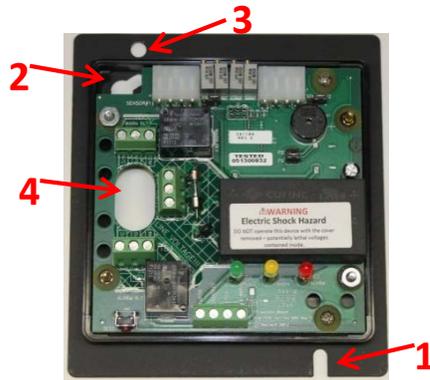
- ❑ G: Power input (AC Power)

- ❑ H: Power input (DC Power)



## Installation of the alarm system:

- The alarm system is designed for mounting on either a junction box or directly to a wall.
- Junction box installation (4-11/16" junction box, not provided):
  - Remove the front cover of the alarm system by pulling straight off.
  - Mount alarm system to junction box using slots 1 & 2.
  - Note: A wire feedthrough (4) is provided to route wires for power and relays into junction box.
- Wall mounting
  - Using an appropriate fastener, mount alarm system to wall using slot 1 and hole 3.
  - Note: Feedthroughs are provided at the bottom and left side of the box for a power cord and relay wiring, respectively.



## Powering the alarm system:

- The alarm system can be powered by either AC or DC voltage.
- Input power to the alarm system also provides power to the sensor(s) connected to the alarm system.
- Powering with AC Power
  - The alarm system can be powered by 90-264VAC (an onboard transformer steps the voltage down to 12VDC).
  - Connect AC power to terminal block G (see page 1).
  - Note: Earth ground needs to be connected to terminal block as it is connected to the drain in the shielded cable connected to each sensor module.
- Powering with DC Power
  - The alarm system can be powered by 12-48VDC  $\pm 20\%$ .
  - Connect DC power to terminal block H (see page 1).
  - Two different DC power input terminals are provided. One for a nominal 12VDC input ( $\pm 20\%$ ) and one for 14-48VDC (-2%/+20%).
    - Nominal 12VDC supply: Connect to "+12V" and "GND(ISO)" on the terminal block.
    - 14-48VDC supplies: Connect to "14-48VDC" and "GND(ISO)" on the terminal block.
  - Note: Earth ground needs to be connected to terminal block ("EARTH") as it is connected to the drain in the shielded cable connected to each sensor module.

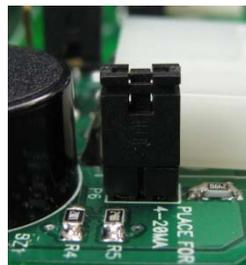
## Alarm system power consumption:

The nominal power consumption requirements for various alarm system configurations are shown below:

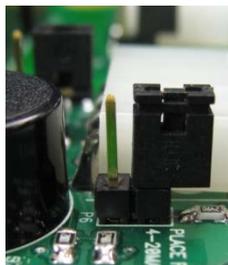
Input Voltage	1 Sensor Connected	2 Sensors Connected
12 VDC	0.154 A	0.302 A
24 VDC	0.090 A	0.167 A
48 VDC	0.052 A	0.090 A
120 VAC	0.035A	0.062A

## For use with more than one hydrogen sensor:

- Remove the front cover of the alarm system by pulling straight off.
- Locate item A, jumpers to enable/disable sensors
- Remove the jumper across P9 to enable SENSOR 2 (default disabled)
- Replace the front covering of the alarm box.



Sensor Disabled  
or  
40mA Signal Output



Sensor Enabled  
or  
Voltage Signal Output

## For use with a sensor module equipped with a 4-20 mA adapter:

NTM Sensors' hydrogen sensors come standard with a 0-5VDC analog output. For installations that require long cable lengths (>100 ft), NTM Sensors recommends purchasing the optional 4-20 mA adapter to convert the output to a 4-20 mA signal to prevent signal loss. When a 4-20 mA adapter is used, the alarm system must be configured to accept that as an input.

- Remove the front cover of the alarm system by pulling straight off.
- Locate Item B, the signal output select jumpers (P5 for Sensor 1 and P6 for Sensor 2).
- Install the jumper across the two pins to enable the current output mode (see photo above).
- Replace the front covering of the alarm box.

## Using the Mechanical Relays:

The alarm system comes with two independent relays. The “Warning” relay is powered when the hydrogen level reaches 1% and the “Alarm” relay is powered when the hydrogen level reaches 2%. Both relays are SPDT relays so they can be wired to either a normally open (“N/O”) or a normally closed (“N/C”) contact depending on the desired operation of the system.

- Locate items C and D, and determine to which relay you want to connect.  
Use relay C for the warning condition (1% H<sub>2</sub>) and relay D for the alarm condition (2% H<sub>2</sub>).
- Wire the relay as a switch for the equipment, or indicator, you want to control. Take note of the electrical ratings for the relay outlined in this document. If you need to switch a piece of equipment which requires more power than the relay is rated to, then you can wire the provided relay to control a separate high power relay.
- Replace the front covering of the alarm box.

## Testing the alarm system:

The functionality of the alarm system can be tested using the “Push and hold to test” button located on the bottom of the alarm system display.

- Before testing the setup, the alarm system should be installed with sensors connected and powered.
- Push the recessed “Push and hold to test” button. While the button is pressed the LEDs, relays and buzzer for the Warning and Alarm conditions will be activated. While the button is pressed, confirm the alarm states of any equipment connected to the alarm system.
- Note: this test does not test the operation of the gas sensor(s) connected to the system. It is only a test for the alarm electronics and equipment connected to the relay contacts.

Condition	LEDs		Relay Closure	Audible Alarm	Troubleshooting
Start Up (10 min duration)	Green LED flashes	  	None	None	
Normal Operation	Green LED ON	  	None	None	
Hydrogen Warning (1% H <sub>2</sub> )	Yellow LED ON	  	Warning Relay energized	None	
Hydrogen Alarm (2% H <sub>2</sub> )	Yellow & Red LED ON	  	Warning & Alarm Relay energized	Audible alarm	
Lost communication with sensor device	Yellow LED flashes (1Hz)	  	None	None	Make sure sensors are connected and powered (LED on back of sensor module should be flashing)
Power supply out of range	Red LED flashes (1Hz)	  	None	None	If using DC voltage supply, confirm that you are connected to the correct terminal for your supply voltage
Refrigerant leak detected	Green, Yellow, & Red flash (1Hz)	  	None	Audible chirp (1Hz)	Refrigerant leak should be repaired and a new sensor will need to be installed.

## Calibrating The NTM Hydrogen Alarm Systems :

The NTM Hydrogen Alarm Systems are calibrated before shipment. Calibration points are factory set to 2% $H_2$  for each channel's 'Alarm' threshold and 1% $H_2$  for each 'Warning' threshold. It is recommended that the calibration be checked on the NTM Alarm Systems at least once per year.



Calibration Potentiometers  
(Left to right: Warning1, Alarm1, Alarm2, Warning2)

### Calibrating the Warning and Alarm Thresholds:

1. Turn all 4 calibration potentiometers a few turns (clockwise) to clear previous calibration points.

#### CALIBRATE THE WARNING STATE:

2. Connect the calibration fixture to the 1%  $H_2$ /air gas cylinder.
3. Secure the test fixture to the sensor module connected to 'Sensor 1' by pressing the flexible tubing completely over the inlet to the sensor head.
4. Turn on the gas flow by loosening the valve on the cylinder regulator until gas begins to flow. Please note that the valve on the regulator does not have to be opened all the way. Let the gas flow onto sensor for ~30 seconds to ensure the air in the tubing has been purged.
5. Continue gas flow during the following adjustment. Adjust the 'Warning' potentiometer for 'Sensor 1' using the following procedure:
  - 5.1 Turn the potentiometer clockwise until the yellow warning LED is lit. If the yellow LED is already lit then go to step 5.2.
  - 5.2 Turn the potentiometer clockwise slowly until the yellow LED turns off.
  - 5.3 Finally, turn the potentiometer counter-clockwise *slowly* until the yellow LED turns on. Turn off the gas and the calibration is set for this threshold.

#### CALIBRATE THE ALARM STATE:

6. Repeat Steps 2-5 above using the 2% $H_2$ /air cylinder and the 'Alarm' potentiometer for 'Sensor 1'. The 'Alarm' threshold is connected to the red LED and the audible alarm which will both activate during calibration.

#### TO CALIBRATE SENSOR 2 (IF INSTALLED):

7. Repeat Steps 2-6 above for 'Sensor 2'.

**WARNING:** NTM Hydrogen Alarm Systems are not a standalone safety device and does not provide protection from hydrogen explosion. The relay contacts are intended to be connected to a safety system, enabling audible alarms, system shutdown, ventilation, or other measures to ensure safe handling and use of hydrogen gas.

## Sensor Guidelines:

Hydrogen sensors are calibrated for operation in air. Tampering with the sensor or operation in other gas environments can lead to inaccurate readings and possible permanent damage if operating in a reducing atmosphere or 100% hydrogen. The hydrogen sensor is silicone resistant but uncured silicone compounds, extended exposure to silicone off gassing, or high concentrations of refrigerant gasses related to a leak can give inaccurate readings in the NTM SenseH<sub>2</sub><sup>™</sup> sensor. The NTM SenseH<sub>2</sub>-R<sup>™</sup> sensor is tolerant to refrigerant gases and isn't negatively affected by refrigerant gas leaks.

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