GA-171 Gas Detector

Operation and Maintenance Manual

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GA-171
Gas Detector
Operation Manual

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I. OPERATION OF THE GA-171

A. Start Up and Installation

1. The GA-171 will accept any single phase A/C power in the range of 110 to 240 VAC at 50 to 60 Hz. When connecting A/C power to the instrument, it is imperative that the A/C source be well grounded. Insufficient A/C grounding will disrupt proper operation of the instrument.

2. **Sensor Monitor Communication:** Each monitor can be connected to one or two sensors. The sensors are 24VDC loop powered by the monitor and the sensors provide a 4-20mA signal to the monitor. See Figure 12.

3. **Initial Power Up:** Each time the GA-171 power is turned on the alarms will be inactive for five minutes. A countdown will be shown on the display. This allows for the sensor(s) to stabilize.

4. **Gas Density:** For measured gases that are heavier than air, the gas sensor should be mounted 12" to 24" (30 to 60 cm) from the floor (Example: Figure 1a–Chlorine & Sulfur Dioxide). For measured gases that are lighter than air, the gas sensor should be mounted 12" to 24" (30 to 60 cm) from the ceiling (Example: Figure 1b–Ammonia).

FIGURE 1a

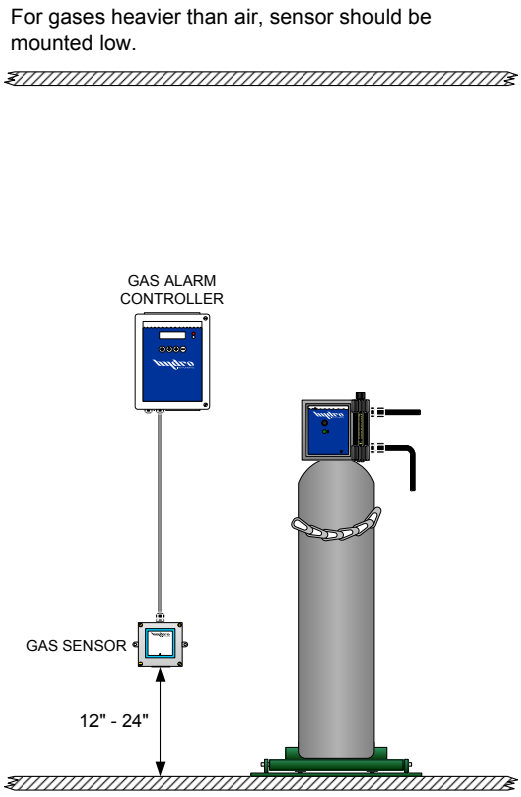
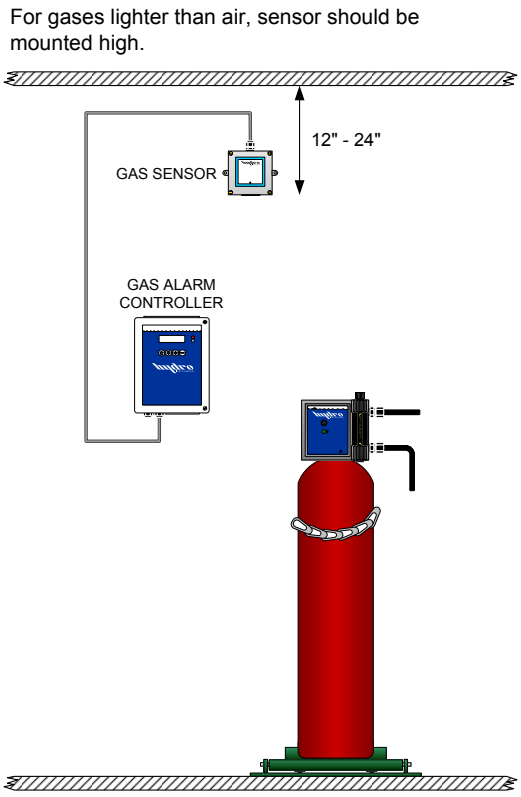


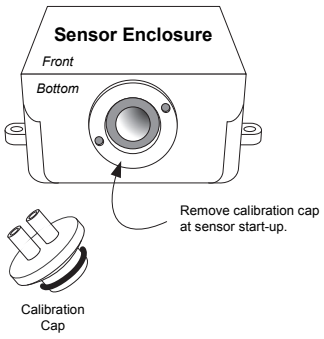
FIGURE 1b



5. **Sensor Protection:** The sensor should not be exposed directly to extreme temperatures and/or conditions. It is very important not to allow the sensor element to get wet from rain or any other source because water will cause premature failure of the sensors.

6. **Sensor Start Up:** The sensor calibration cap must be removed upon start up. Upon removing the sensor cap, be sure to store it for later use. See Figure 2. The cap is used to protect the sensor during shipment and storage and the two ports on it are to be used for calibration with test gas.

FIGURE 2



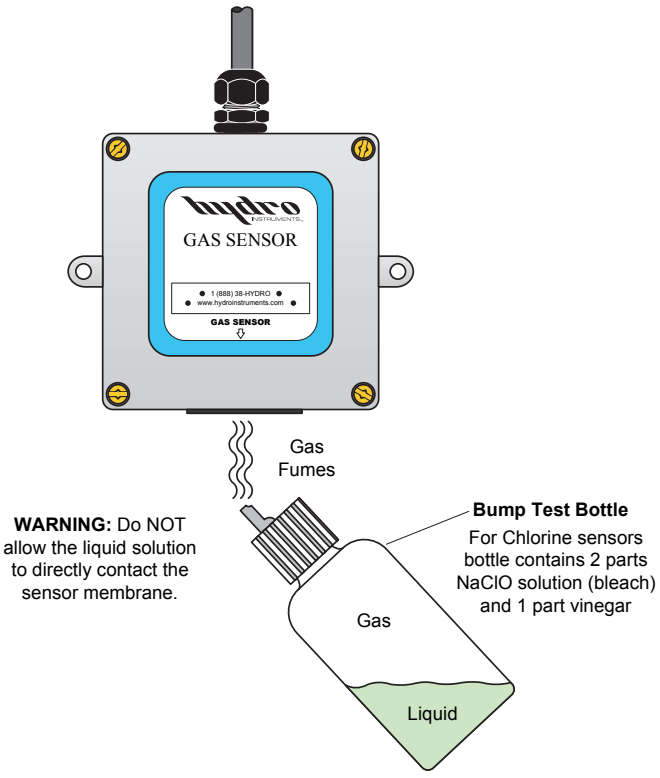
7. **Calibration:** The Model GA-171 Gas Detectors are factory calibrated and do not require any calibration at startup. With the use of the calibration cap, the span calibration can be carried out if required. Be sure to retain the sensor calibration cap for such calibrations. See Section II.B.7.

8. **Response Checks (Bump Testing):** To verify responsiveness, the gas sensors can be bump tested (exposed to a small amount of the target gas) in order to test the reaction of the sensor. A plastic squeeze bottle is provided with each gas detector for this purpose. See Figure 3. It is suggested that bump testing can be done at quarterly intervals, however required frequency is determined by environment, conditions, number of and severity of leaks. Proper bump testing (exposing the sensor to a modest amount of the fumes) will not substantially degrade the sensor or shorten sensor life. Depending on the environment, sensors can reliably last more than 5 years.

   WARNING: Do NOT allow the liquid solution to directly contact the sensor membrane.

9. **LED Indicators:** The red alarm indicator LED on the front panel will illuminate as long as an alarm condition is present.

FIGURE 3: Bump Testing (Chlorine Gas Example)



B. Alarms and Output Signals

1. **Acknowledgement of Alarms:** If an alarm condition occurs, the alarm (red) LED will illuminate and the relay will be activated. To acknowledge an alarm (and thereby de-activate [open] the relay contact output) press the ⊖ key.

   NOTE: Even after acknowledging the alarm the red LED will remain illuminated until the alarm condition has been removed.

2. **4-20 mA output channels:** Each sensor has a dedicated 4-20 mA output channel. See Figures 9 and 10. AO1+/AO1- is for sensor 1 and AO2+/AO2- is for sensor 2.

3. **Alarm Relay:** The GA-171 has one common alarm relay output. This is a normally open, non-powered relay. See Figures 9 and 10. NO1/CO1 are the pins for the relay. See suggested relay wiring diagram (Figure 11).

C. Operation Screens

This section explains the features of the standard operating screens of the GA-171.

NOTE: Navigate between the display screens below using the ⬆ and ⬇ keys. See Figure 4.

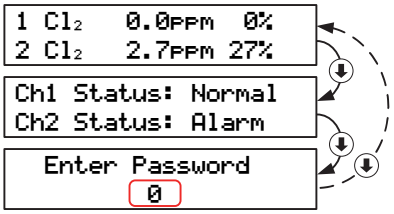
1. **Home Screen:** This screen displays the gas type and reading of the sensor(s).

2. **Status Screen:** This screen shows all present alarm conditions.

3. **Password Screen:** See Section II.A for instructions on this screen and the configuration section.

FIGURE 4

GA-171 Operation Mode Screens



Status messages

1. **Normal:** Indicates that the sensor reading is above 2 mA and below the alarm set point.
2. **Alarm:** Indicates that the sensor reading exceeds the alarm setting. (Meaning that if the alarm setting is at 2.0 PPM, then status will be "Alarm" if the reading is 2.0 PPM or higher.)
3. **Error:** Indicates that the sensor signal is below 2 mA and usually indicates that the sensor is either damaged or not connected.

II. CONFIGURATION OF PARAMETERS

Configuration of Sensor Parameters & Calibration of Sensors

Each GA-171 Gas Detector will be set up from the factory as per the ordering instructions. However, settings and sensors can be changed using the following procedure.

A. Entering Setup: All parameters are set in the password protected setup section.

1. Press the ⬇ key until the password screen is reached.
2. Use the ⊕ and ⊖ keys to set the password. The password is "171".
3. Press the ⬇ key.

B. Configuring Each Channel

See Figure 5. The selected channel will flash. Move between the channels with the ⬆ and ⬇ keys. When the desired channel is flashing, press the ⊕ key to enter setup for that channel. Setup for each channel is identical.

1. ALARM **MODE:** Each channel can be set to latching or non-latching. Selection is changed using the ⊕ and ⊖ keys. *NOTE: This refers to the ALARM condition. If an alarm state is reached while in the latching mode the user must still acknowledge the alarm by pressing the ⊖ key after the alarm condition has already been alleviated in order for the red LED and relay to be de-activated.*

   PRESS ⬇ TO GO TO THE NEXT PARAMETER

2. ALARM **DELAY:** This parameter allows for a delay in response to the alarm. The recommended setting is between 5 & 30 seconds. An alarm condition must be continuously present for the duration of a full delay time before the GA-171 will change to the ALARM state.
   NOTE: Increasing the delay time may help to avoid false alarms caused by transient effects.

   PRESS ⬇ TO BEGIN THE CALIBRATION

3. **ALARM LEVEL:** This is the sensor reading above which the alarm will be activated. The GA-171 will be factory set at the recommended alarm level. To adjust this parameter use the ⊕ and ⊖ keys.

   PRESS ⬇ TO GO TO THE NEXT PARAMETER

4. **ZERO CALIBRATION:** After the sensor is installed with the calibration cap removed the display should read 0.0 ppm if no target gas is present. If the reading is not 0.0 PPM on this screen, then use the ⊕ key to increase the reading or the ⊖ key to reduce the reading. Press and release the keys each time. Do not press and hold the keys. After adjusting, wait 10 seconds to confirm that the reading is stable before proceeding to the next step.

5. **SPAN CALIBRATION:** The gas detector system is factory calibrated and does not require calibration upon installation setup. Span calibration is rarely required and so this screen is hidden to avoid accidental miscalibration. However, it may be required or desired to perform span calibrations periodically over the life of the sensor. If calibration is to be carried out, then the appropriate span gas calibration kit must be purchased. See Figures 6, 7, and 8. The calibration cap must be installed on the sensor and connected as indicated in figures 6 and 7. Span gas must be allowed to flow at 500 cc/min for at least 1 or 2 minutes until the displayed reading stabilizes. The reading on this screen should be adjusted to match the ppm value of the span gas being used. Use the ⊕ key to increase the reading or the ⊖ key to reduce the reading. Press and release the keys each time. Do not press and hold the keys. After adjusting, wait 10 seconds to confirm that the reading is stable before proceeding to the next step.

6. **SPAN VALUE:** This parameter must be set to match the full scale of the sensor being used. (Example: If the sensor has a 0.0-10.0 PPM range, then this parameter must be set to 10.0 PPM. If this setting does not match the sensor range, then the GA-171 will not display the correct sensor reading.) Adjustment of this parameter is only required if the sensor type is being changed. Therefore, this screen has been hidden.

   PRESS ⬇ TO GO TO THE NEXT PARAMETER

7. **GAS TYPE:** This parameter adjusts the gas type to be displayed for this sensor. You can navigate through the list of gases using the ⊕ and ⊖ keys. Adjustment of this parameter is only required if the sensor type is being changed. Therefore, this screen has been hidden.
   NOTE: The gas type must match what the sensor was designed to detect.

   PRESS ⬇ TO GO TO THE NEXT PARAMETER

8. **FILTER TIME:** Instability or electrical noise can cause the sensor signal to fluctuate. These fluctuations can be smoothed out by increasing the filter time. The sensor signal will be averaged over this adjustable filter time. Adjustment of this parameter is rarely required. Therefore, this screen has been hidden.

9. **ANALOG OUT MODE:** This screen allows the analog output for AO1 or AO2 to be set to represent the reading of either Sensor #1 or Sensor #2. For example: Analog outputs (AO1 and AO2) can both be set to represent the reading of Sensor #1.

10. **4mA OUTPUT CALIBRATION:** This screen allows for calibration of the 4 mA output. This is factory calibrated and rarely required. Therefore, the screen has been hidden to avoid accidental miscalibration. While on this screen, the output signal should be 4 mA. Adjust the output using the ⊕ and ⊖ keys.

11. **20mA OUTPUT CALIBRATION:** This screen allows for calibration of the 20 mA output. This is factory calibrated and rarely required. Therefore, the screen has been hidden to avoid accidental miscalibration. While on this screen, the output signal should be 20 mA. Adjust the output using the ⊕ and ⊖ keys.

12. **RELAY MODE:** This screen allows the relays to be set to represent either Sensor #1 or Sensor #2. For example: Relay #1 (NO1/CO1) and Relay #2 (NO2/CO2) can both be set to represent Sensor #1.

FIGURE 5: GA-171 All Screens

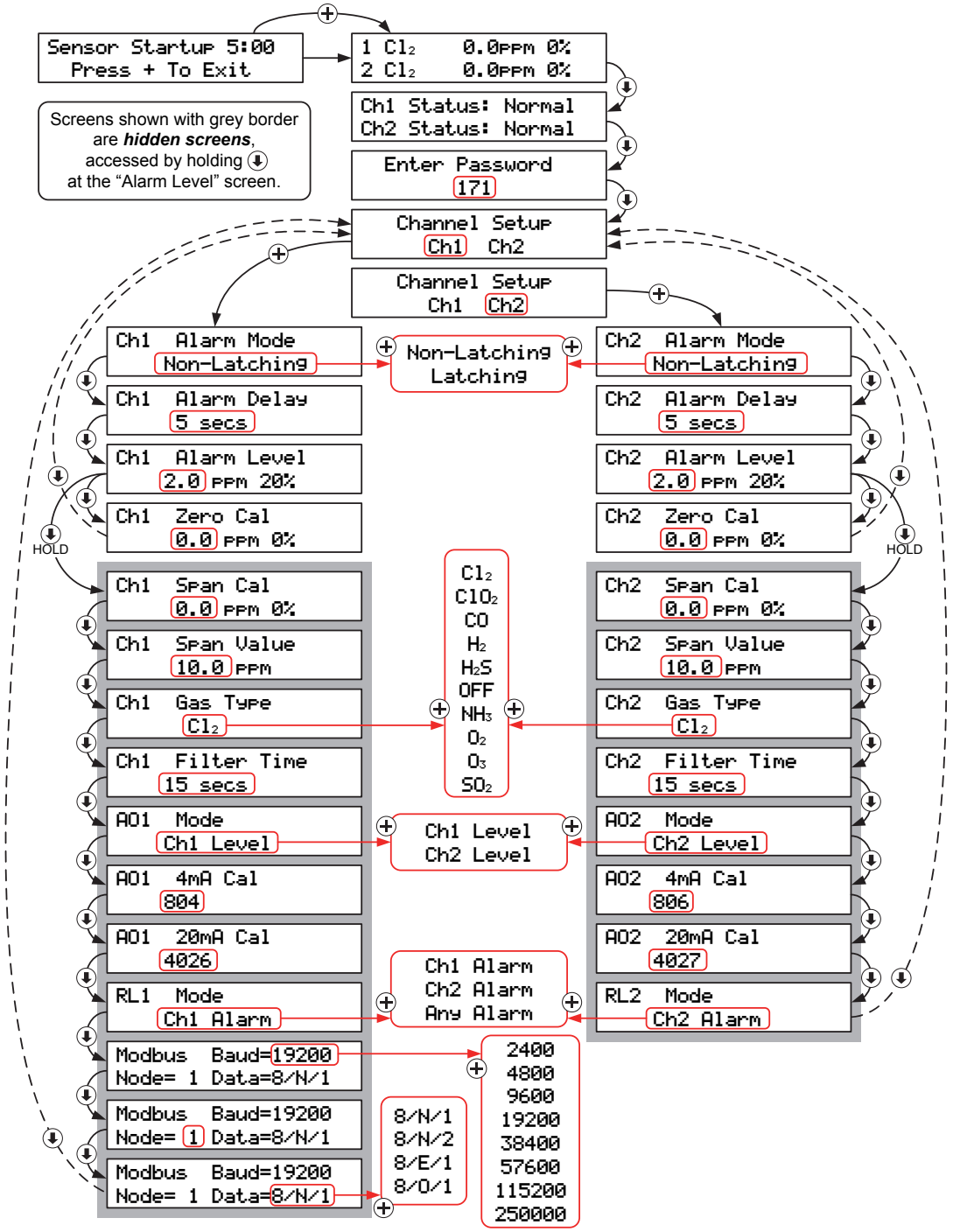


FIGURE 6: Calibration Cap

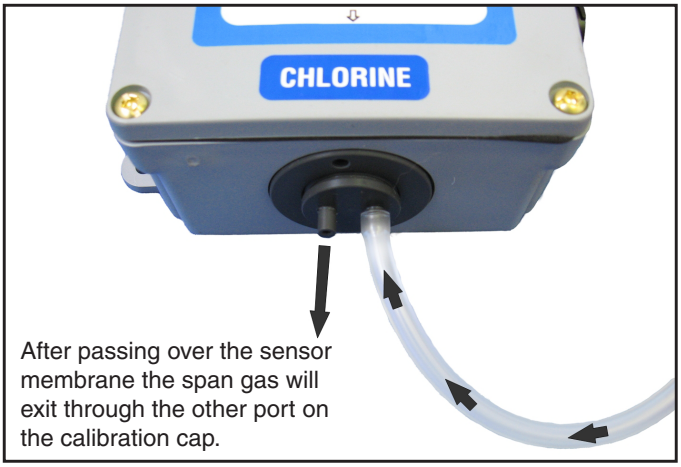


FIGURE 7: Sensor and Calibration Kit

Ordering Information

Product Number	Description
GA-CK-CL2-10	Calibration Kit – 10 PPM Chlorine Gas with Regulator
GA-CRS-CL2-10	Replacement Sensor – 0-10 PPM Chlorine

Note: *The sensor is shipped with the calibration cap already installed. After calibration the calibration cap should be removed for normal use. Do not dispose of the calibration cap as it will have to be reinstalled and used for any further sensor calibrations.*

III. TROUBLESHOOTING

A. Installation Check – Review each of the following points first.

1. **Sensor Installation:** Check the following points regarding the sensor installation.
   a. Sensor enclosure bolts must be securely fastened to protect against corrosion of the transmitter board etc.
   b. Sensor must be mounted at a height that is according to Figures 1a and 1b.
   c. Sensor must be mounted so that (rain) water cannot come into contact with the sensor element. Water coming into contact with the sensor element will damage the sensor and cause the need for sensor replacement. Generally, water damage will cause the sensor to have an above zero reading that will not return to zero.
   d. Ensure that the sensor calibration cap has been removed completely. See Figure 2.
2. **Monitor Installation:** Check the following points regarding monitor installation.
   a. Monitor should be installed at eye level in a location that is suitable for personnel to check the sensor status before entering the chemical storage room.
   b. Monitor should be mounted in a location that is protected from rain and it is recommended that it should not be mounted under direct sunlight.
   c. Monitor enclosure bolts must be securely fastened and wiring seal tights must be plugged if not used in order to protect against corrosion of the circuit boards etc.
   d. Ensure that the alarm relay output and/or 4-20mA outputs are wired according to Section I.C and Figures 9, 10, and 11.

B. Symptoms, Likely Causes, and Suggested Responses

Symptoms	Likely Causes	Suggested Responses*
Slightly off zero in air	Inaccurate zero calibration	Perform zero calibration
Unstable zero	Signal noise	Increase filter time
Zero & no response with Alarm Status: Normal	1. Calibration cap not removed 2. Wrong span calibration	1. Remove calibration cap 2. Correct span calibration
Zero & no response with Alarm Status: Error	1. Sensor disconnected 2. Sensor damaged	1. Check sensor wiring 2. Replace the sensor
High reading or reading that won't return to zero	Sensor damaged	Replace the sensor
4-20mA output inaccurate	1. Wrong calibration 2. Wrong AO settings 3. Damaged circuit board	1. Correct the calibration 2. Correct AO settings 3. Replace circuit board
Blank display	1. Lost A/C power 2. Power supply board failure 3. Damaged circuit board 4. Blown fuse	1. Check A/C Power 2. Check power supply board 3. Replace circuit board 4. Replace fuse

* See section III.C below for a more detailed explanation of the suggested responses.

C. Explanation of Responses

1. **Zero Calibration:** If the display is not reading 0.0 PPM in air, then adjust the zero calibration. Refer to Section II.B.6 and Figure 5.

2. **Filter Time:** If the displayed reading is not stable at zero and noise is causing it to oscillate from -0.2 to 0.2 PPM for example, then the filter time can be increased to eliminate this oscillation. Refer to Section II.B.10 and Figure 5.

3. **Calibration Cap:** The calibration cap is installed for protection of the sensor during shipping and storage, but must be removed upon installation. If the sensor cap is not removed, then there will be no response or a very slow response. Refer to Section I.A.5 and Figure 2.

4. **Span Calibration:** If the span calibration is performed incorrectly (usually accidentally done in air with zero target gas) then this will cause the readings to be inaccurate. Unless you intend to perform the span calibration and have a span gas calibration kit, do not touch the ⊕ and ⊖ keys if you enter the span calibration screen. See Section II.B.7 and Figures 6, 7, and 8.

5. **Sensor Wiring:** If the display is reading zero and giving an "Alarm Status: Error" message, then the sensor may not be connected to the monitor. Check the wiring at the circuit board in the monitor and inside the sensor enclosure. See Figures 9 and 10.

6. **Sensor Replacement:** Repeated or excessive exposure to the target gas will eventually cause failure of the sensor. If water is allowed to contact the sensor element this will also eventually cause failure of the sensor. Under normal circumstances a sensor life is typically 2 years or more. However, lightning, other power surges, chemical leaks, and contact with water can all cause sensor failure. Replacement sensors are easily installed with the quick disconnect fitting.

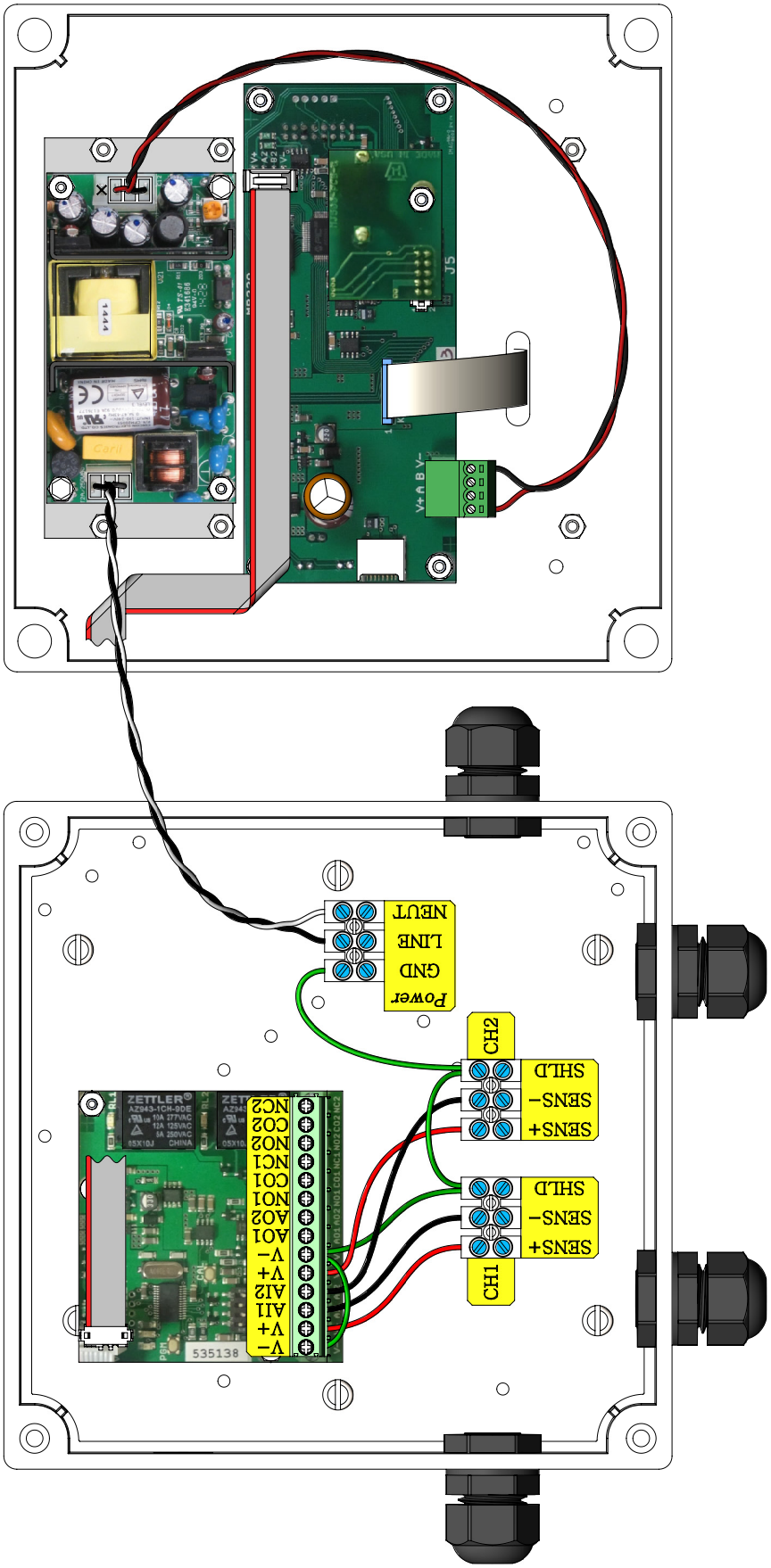
7. **4-20 mA Output Calibration:** It is possible that somebody could enter the 4-20mA output calibration screens and change the values without understanding their meaning. This will cause the output 4-20mA signals to be inaccurate. Refer to sections II.B.8 and II.B.9.

8. **Damaged Circuit Board:** The circuit boards can be damaged if high voltage is connected to the wrong terminals, by lightning, other power surges, or by corrosion. If you believe that the circuit board is damaged, then contact the factory and your local sales representative. Refer to Figures 9 and 10.

9. **Damaged Power Supply Board:** Refer to Figures 9 and 10. The power supply board accepts AC power (110 - 240 V at 50-60 Hz) and provides 24 VDC power to the main circuit board. If the main circuit board does not have power, then check the DC voltage on the output pins of the power supply board. If it has A/C power coming in, but is not putting out 24 VDC, then it either has a blown fuse or is damaged and requires replacement.

10. **Blown Fuse:** If the power supply board is not putting out 24 VDC, then always check to see if the fuse is blown and replace if necessary.

FIGURE 8: GA-171 Controller Electronics



Date: August 2016
Dwg. No.: GA-171-CONTROLLER

GA-171 CONTROLLER

An external alarm light with combination audible horn is an electronic device designed to alert operators and other personnel both visually and audibly to a specific danger.

Most commonly an external alarm light and horn is used with a gas leak detector to warn of gas leaks before entering a structure or room.

Features

- Single compact unit
- Wall mounting
- Rotating strobe light with red lens
- 90 dB Audible horn
- Weather resistant

Available Models

- GA-AL-110 (110VAC)
- GA-AL-220 (220VAC)

The external alarm light & horn is an optional accessory for use with all Hydro Instruments gas leak detection equipment. The alarm light connects to a relay inside the gas detector monitor. This can be a sensor specific relay or a common relay.

Alarm Light Wiring—Normally Open Relay Circuit

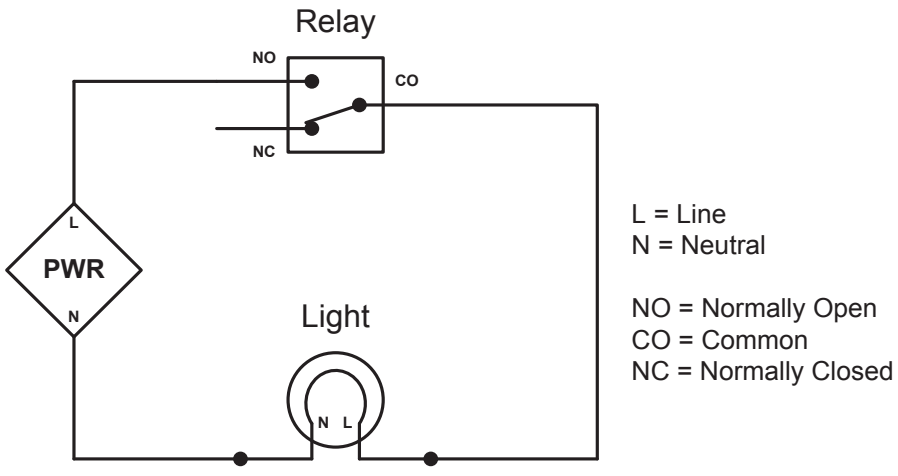
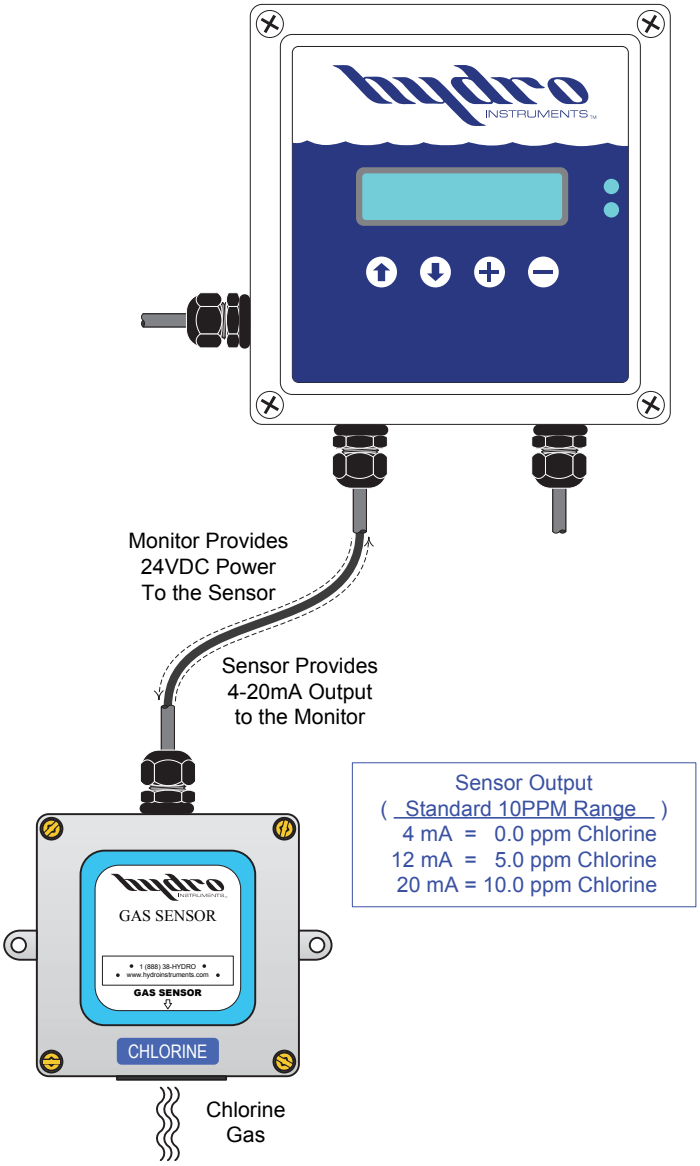


FIGURE 10



Sensor Output
(Standard 10PPM Range)
4 mA = 0.0 ppm Chlorine
12 mA = 5.0 ppm Chlorine
20 mA = 10.0 ppm Chlorine