# GA-170 Gas Detector

## Operation and Maintenance Manual

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GA-170A Rev. 6/4/10

# GA-170 Gas Detector
# Operation Manual

## Outline

# I. CONFIGURATION OF PARAMETERS

## Configuration of Sensor Parameters & Calibration of Sensors

Each GA-170 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 number ("170" is the password).
3. Press the ⬇ key to move to "OK".
4. Press the ⊕ or ⊖ key to move into the setup section.

### B. Set Units and Battery Selections

1. **UNITS:** Use the ⊕ and ⊖ keys to switch between PPM and %. Use the ⬇ key to move to Battery Selection.
2. **BATTERY:** Use the ⊕ and ⊖ keys to switch between yes and no for battery backup.

### C. Configure Each Channel

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. **GAS TYPE:** This parameter adjusts the gas type to be displayed for this sensor. You can toggle through a list of gases with the ⊕ and ⊖ keys. *NOTE: The only reason to change this setting is if the gas sensor type has been changed.*

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

2. **DECIMAL POINT:** This parameter sets the decimal point for the display of the sensor reading on the monitor. *NOTE: If the accuracy of the sensor in use is 0.1 PPM then this parameter should not be set to more than one decimal point (i.e. it should be set to 0.0).*

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

3. **FULL SCALE:** This parameter should be set to match the sensor in use. (i.e., if the sensor is a 0-10 PPM range sensor then this parameter must be set to 10 PPM. If it does not match the sensor then it will not display properly.)

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

**DO NOT TOUCH THE ⊕ or ⊖ keys on the next two parameters if you are not performing an actual calibration!**

4. **ZERO Calibration:** This is for electrical calibration of the monitor or gas calibration of the sensor input. The GA-170 will be factory calibrated and does not need to be adjusted unless there is a need for recalibration. If you do not touch the ⊕ or ⊖ keys it will save the current value and you can go on to the next step. However,
   a. If you want to recalibrate the monitor input electronically, then you should enter a calibrated 4.000 mA current signal (as per Appendix B) and press the ⊕ and ⊖ keys until the display reads 0 (zero).
   b. If you want to recalibrate the zero input of the gas sensor, then you should press the ⊕ and ⊖ keys until the display reads 0 (zero).

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

5. **SPAN Calibration:** This is for electrical calibration of the monitor or gas calibration of the sensor. The GA-170 will be factory calibrated and should not need to be adjusted. If you do not touch the ⊕ or ⊖ keys the GA-170 will save the current value and you can go to the next step. However,
   a. If you want to recalibrate the monitor input electronically, then you should enter a calibrated current signal (as per Appendix B) and press the ⊕ and ⊖ keys until the display indicates the desired span value for the sensor in use (i.e. for a 12 mA input on a 10 PPM sensor unit the display should indicate 5 PPM).
   b. If you want to recalibrate the gas sensor with a test gas, then you should connect and flow the test gas across the sensor (as per span calibration instructions in Appendix A). Wait for 1 to 2 minutes until the display reading has stabilized. Then press the ⊕ and ⊖ keys until the display indicates the known concentration of the test gas (i.e. if you are using a 5 PPM test gas on a 10 PPM sensor then you should adjust the display value with the ⊕ and ⊖ keys until the display reads 5 PPM).

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

6. **LOW SETPOINT:** This parameter corresponds to the DANGER level for Sensor #1. It is intended to represent a noticeable, but not yet critical level for the detected gas. (See Appendix C for Alarm condition explanation.) The GA-170 will be factory set at recommended alarm levels. To adjust this parameter press the ⊕ and ⊖ keys.

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

7. **HIGH SETPOINT:** This parameter corresponds to the ALARM level for Sensor #1. It is intended to represent the critical level for the detected gas. (See Appendix C for Alarm condition explanation.) The GA-170 will be factory set at recommended alarm levels. To adjust this parameter press the ⊕ and ⊖ keys.

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

8. **ALARM DELAY:** This parameter allows for a delay in response for both the low and high alarms (Danger & Alarm). The recommended setting is between 5 & 30 seconds. During this delay time the GA-170 will not respond to any detected gas level. However, if an alarm detection level remains present after this delay time, then the alarms will activate immediately.

   *NOTE: Increasing the delay time may help to avoid false alarms caused by transient effects. (See Appendix C)*

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

### D. Alarm Type

The channel can be set to Latching or Non-Latching and Failsafe or Non-Failsafe. Selection is changed by using the ⊕ and ⊖ keys. The default setting is Non-Latching and Non-Failsafe.

*NOTE: This refers only to the "ALARM" level (High Level Alarm). The "DANGER" level (Low Level Alarm) is always Non-Latching and Non-Failsafe.*

*PRESS ⬇ TO GO TO THE NEXT PARAMETER*

# II. Operation of the GA-170

## A. Start Up and Installation Considerations

1. **Initial Power Up:** Each time the GA-170 power is turned on Alarms will be disabled for five minutes. (A countdown will be shown on the display.) This allows for the sensor/transmitter electronics to stabilize.

2. **Battery Backup:** Whether or not the battery is used must be properly set in the configuration section. See Section I.B.2. Also, ensure that the battery is connected to the circuit board. *(See Drawings 1 and 2.)* Upon initial power up the battery may require up to 24 hours to complete charging. Also, during shipping the battery is disconnected and removed from the enclosure. Ensure that the battery is properly installed and connected to the proper terminals. Reversed connection of the + and – leads will damage the circuit board.

3. **Gas Density:** For measured gases that are heavier than air, the GA-170 gas sensor should be mounted 12" to 24" from the floor (e.g. Chlorine & Sulfur Dioxide). For measured gases that are lighter than air, the GA-170 sensor should be mounted 12" to 24" from the ceiling.

4. **Sensor Protection:** The sensor should not be exposed directly to extreme temperature conditions and it should be protected with a rain shield if mounted outside. If water or debris builds up on the sensor performance will in general be compromised.

5. **Sensor Start Up:** The large sensor cap must be removed upon start up. 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 samples.

6. **Weekly Checks:** It is recommended that the GA-170 Gas Alarm be exposed to a small amount of the measured gas each week in order to test the reaction of the sensor.

7. **Calibration:** It is recommended that calibration be carried out in approximately six (6) month intervals. Be sure to retain the sensor cap for these periodic calibrations.

8. **LED Indicators:** The DANGER and ALARM indicator LEDs on the front panel of the monitor will illuminate and flash as long as an alarm condition is present.

   *NOTE: EVEN IF THE ALARM HAS BEEN ACKNOWLEDGED.*

## B. Operation Mode Overview

This section explains the features of the standard operating mode of the GA-170.

*NOTE: Move between the display screens below using the ⬆ and ⬇ arrows. Also, if the display is left in any screen other than the first, it will automatically switch back to the first screen after 3 minutes.*

1. **Standard Display Screens:** These screens display the gas type and reading of the sensors. They also display an icon for indication of A/C Power and one for Battery Power on the right side of the screen. These icons will blink if that power source is lost. For units with one or two sensors there is only one display screen.

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

2. **TEST Operation Screen:** From this screen the audible alarm can be tested by pressing the ⊕ key and all relays can be tested simultaneously by pressing the ⊖ key.

   *NOTE: The ⊖ key must be pressed to turn off the audible alarm.*

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

3. **STATUS Display Screens:** These screens indicate all present alarm conditions.

   *PRESS ⬇ TO GO TO THE NEXT PARAMETER*

4. **Password Screen:** See Section I.A for instructions relating to this screen and the configuration section.

## C. Acknowledgement of Alarms

If a sensor alarm condition occurs, the audible alarm will sound until the alarm is acknowledged or until the condition is alleviated.

*NOTE: After acknowledgement, the alarm relays will remain activated until the alarm condition is alleviated. (i.e. until the measured gas level falls below the danger level for several seconds.)*

**How to Acknowledge Alarms:**

1. Acknowledgement can always be done by pressing the ⊖ key on the monitor.

2. Acknowledgement can be done with a remote relay input. Use the normally open RA+ and RA– inputs connectors. Closure of this input will acknowledge the alarm.

# APPENDIX A

## Span Calibration Procedure with Test Gas

**Required Equipment**

1. The test gas should have a concentration of between 25% and 75% of the sensor span amount of the desired gas in a neutral buffer (typically Nitrogen would be the buffer gas).

2. Obtain and connect a regulating system to meter the test gas flow at a controlled rate of 500 cc/min.

**Procedure:** Refer to Section I.C.5.

1. Connect the test gas flow tubing to one port of the Hydro Model GA-170 gas sensor cap. The ports allow for insertion into flexible plastic tubing and must be inserted with a tight seal for accurate results. Be sure that both port caps are removed.
2. Turn on the test gas flow at 500 cc/min and allow it to flow for approximately 1 to 2 minutes, until the reading on the monitor stabilizes.
3. When the reading has stabilized and while the gas is still flowing across the sensor, adjust the display reading with the ⊕ and ⊖ keys until the correct value is indicated on the monitor. (Example: for a test gas of 5 PPM the reading may stabilize at 4.8 PPM, you would then press the ⊕ key (do not hold down the key) until the display indicates 5 PPM.)

**Alternate Calibration Procedure**

The above method adjusts the zero and span settings inside the monitor electronics. The sensor/transmitter is also set up to allow zero and span settings to be adjusted. This other method involves adjusting potentiometers on the transmitter board inside the sensor housing. Hydro Instruments recommends that the above procedure be used instead, but if it is desired or necessary to calibrate at the sensor/transmitter, then please contact the factory for further information.

# APPENDIX B

## Electrical Calibration Connections

*NOTE: This section relates to electrical calibration of the sensor inputs on the monitor of the GA-170 Gas Detector. This section does not relate to calibration of the sensors.*

**Required Equipment**

1. An accurate current signal generator to provide a calibrated 4-20 mA signal.

**Procedure:** Refer to Sections I.C.4 and I.C.5.

1. Disconnect the sensor from the monitor connections SNX and 24V for the channel to be calibrated.

2. Connect the positive lead of the current source to the SNX input of the channel to be calibrated. Connect the negative lead of the current source to the GND (Signal Ground input).

3. Set the current source to 4 mA and adjust the monitor display with the ⊕ and ⊖ keys until zero is indicated on the display. Depress and release the keys. Do not hold down.

4. Set the current source to 12 mA and adjust the monitor display with the ⊕ and ⊖ keys until the sensor span value of 50% is indicated on the display (i.e. for a 0-10 PPM sensor the display should indicate 5 PPM, 50%).

   *NOTE: The current source can also be set to any other value between 4 mA & 20 mA and the display can be set accordingly. The GA-170 will then linearly interpolate a straight line between the zero point and this second calibration point to obtain the Current/Concentration curve.*

NOTES: Channel connection terminals.

1. GND: Signal Ground
2. 24V: 24 Volt Power Supply for sensors only (100 mA maximum current)
3. SNX: 4-20 mA input signal from each sensor/transmitter (237 Ohms to GND)

# APPENDIX C

## Alarm Explanation

**Rising and Falling Alarms**

**Rising:** If the Danger (Low Level Alarm) is set to a lower value than the Alarm (High Level Alarm), then the GA-170 will automatically configure the channel as a Rising Alarm (i.e., if the sensor reading is higher than the Danger or Alarm settings, then the GA-170 will activate alarm conditions).

**Falling:** If the Danger (Low Level Alarm) is set to a higher value than the Alarm (High Level Alarm), then the GA-170 will automatically configure the channel as a Falling Alarm (i.e., if the sensor reading is lower than the Danger or Alarm settings, then the GA-170 will activate alarm conditions).

**Failsafe Alarms:** If a sensor channel is set to Failsafe, then the corresponding High Level alarm relay will normally be energized. This will cause to reverse the NC/NO connections. Therefore, the NC connections will be OPEN unless an alarm condition is present or power is lost.

**ALARM REFERENCE CHART (For one or two sensor units)**

O – Inactive
X – Active

| | Alarm Relay | | | | | |
|---|---|---|---|---|---|---|
| **Condition** | **1** | **2** | **3** | **4** | **5** | **6** |
| Lost A/C Power | O | O | O | O | X | O |
| Lost Battery Power | O | O | O | O | X | O |
| Lost Sensor 4-20mA | O | O | O | O | O | X |
| Low Level Alarm Sensor #1 | X | O | O | O | O | O |
| High Level Alarm Sensor #1 | O | X | O | O | O | O |
| Low Level Alarm Sensor #2 | O | O | X | O | O | O |
| High Level Alarm Sensor #2 | O | O | O | X | O | O |

**ALARM REFERENCE CHART: (For three or four sensor units)**

O – Inactive
X – Active

| Condition | Alarm Relay | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Lost A/C Power | O | O | O | O | X | O |
| Lost Battery Power | O | O | O | O | X | O |
| Lost Sensor 4-20mA | O | O | O | O | O | X |
| High Level Alarm Sensor #1 | X | O | O | O | O | O |
| High Level Alarm Sensor #2 | O | X | O | O | O | O |
| High Level Alarm Sensor #3 | O | O | X | O | O | O |
| High Level Alarm Sensor #4 | O | O | O | X | O | O |

## Avoiding False Alarms

The GA-170 Gas Alarm is intended to indicate the presence of (or lack of) certain gases in the measured air space. Generally this means on a relatively permanent basis. Transient effects such as EMI or RFI spikes or very temporary and/or low-level detected gas concentrations can cause the GA-170 Alarms to activate, but may not indicate true alarm conditions.

To avoid or reduce such false alarms, consider taking the following steps.

1. Increase the delay time in the setup (Section I.C.8). If a transient effect causes the signal to rise above the Alarm set points for less than this time span, then no alarm will register.
2. Increase the Danger & Alarm set points (Sections I.C.6 and I.C.7). The lower these alarms are set, the more likely it is that insignificant effects/measurements will cause alarms.

# APPENDIX D

## Battery Backup Field Installation Instructions

1. Disconnect the A/C Power before beginning this procedure.
2. The battery has Velcro strips attached. Remove the clear surface protection tape and place the battery into the bottom of the enclosure with the single strip against the rear of the box.
3. Pay careful attention to which lead is – and which is + on the battery. The leads are marked on the battery. If you switch the leads to the circuit board you will damage the device. Connect the + of the battery to BAT+ and the – of the battery to BAT–.
4. Battery is now installed.
5. See configuration Section I.B.2 of the manual to follow the procedure to activate the battery backup using the keypad and display.
6. The unit will keep battery charged and ready for use. The battery will require approximately 12 hours to be fully charged.

   *NOTE: When the battery level falls below ~8.5 Volts it is automatically disconnected from the circuit board. After this has occurred, the unit can only be powered up by restoring A/C power.*

# APPENDIX E

## RS-232 Digital Output

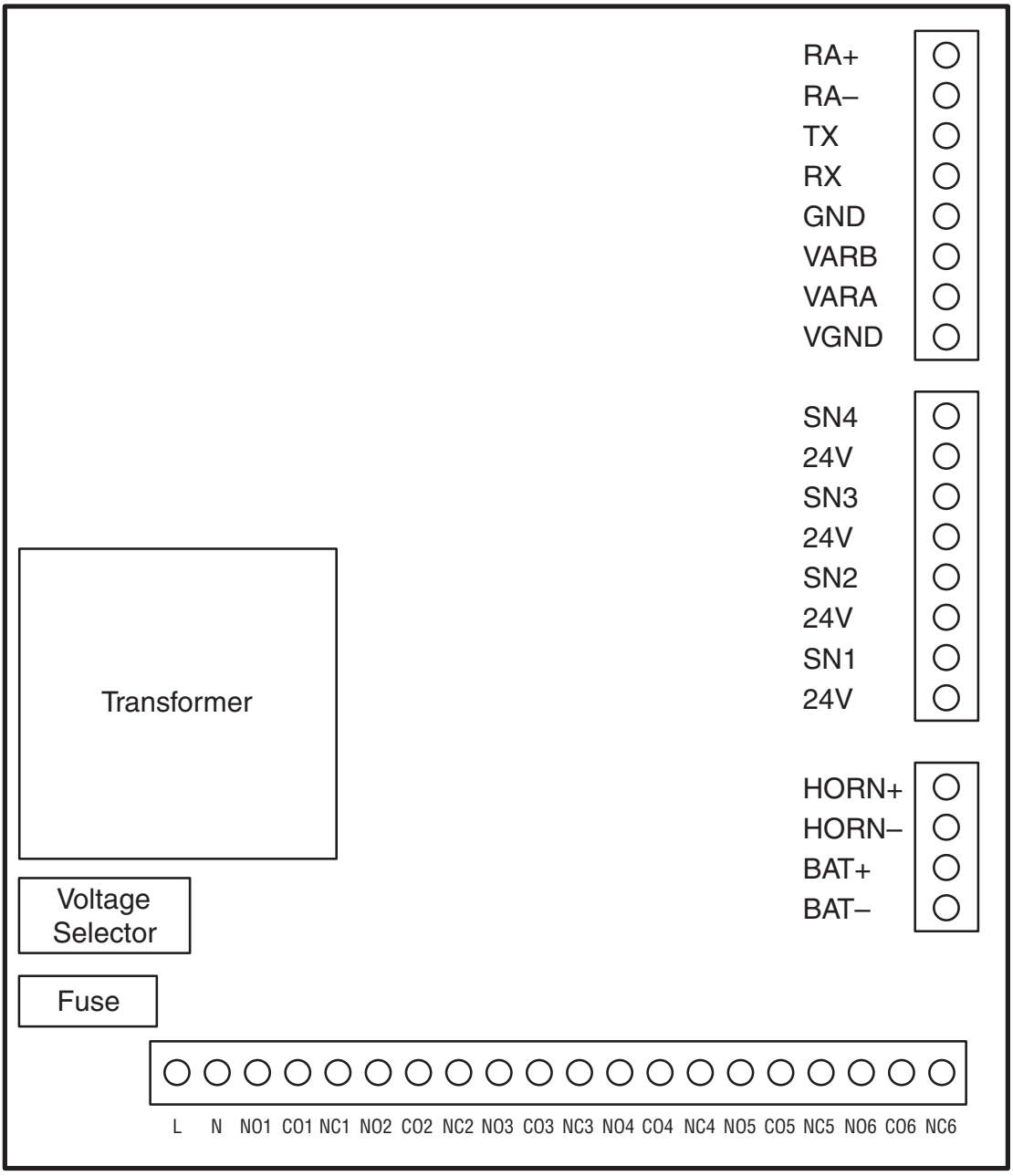
This will allow the GA-170 to be monitored by a computer.

1. Use a standard "COM" cable with a DB9 connector and make the following connections:

| **DB9 Connector** | **GA-170 Connections** |
|---|---|
| 2 | TX |
| 3 | RX |
| 5 | GND |

2. Run the Windows program "Hyperterminal" or any other terminal program. Set the COM communications as follows:

| | |
|---|---|
| Flow Control: | none |
| Baud: | 19,200 |
| Format: | 8 data bits, 1 start bit, 1 stop bit, no parity |

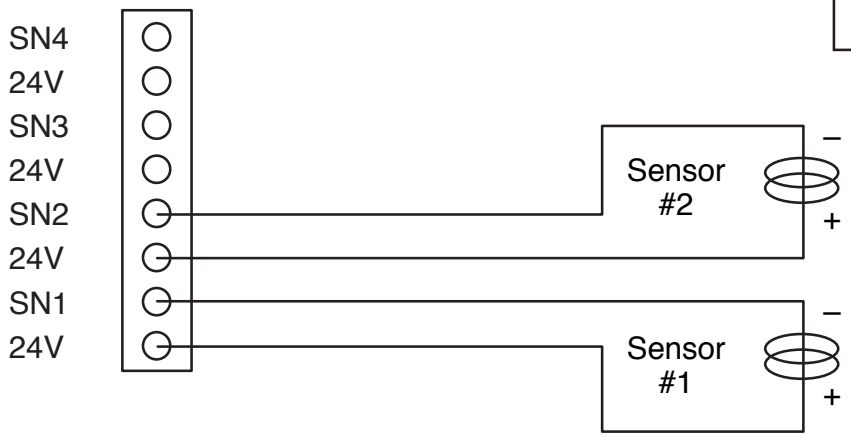



**GAS DETECTOR (GA-170) CIRCUIT BOARD**

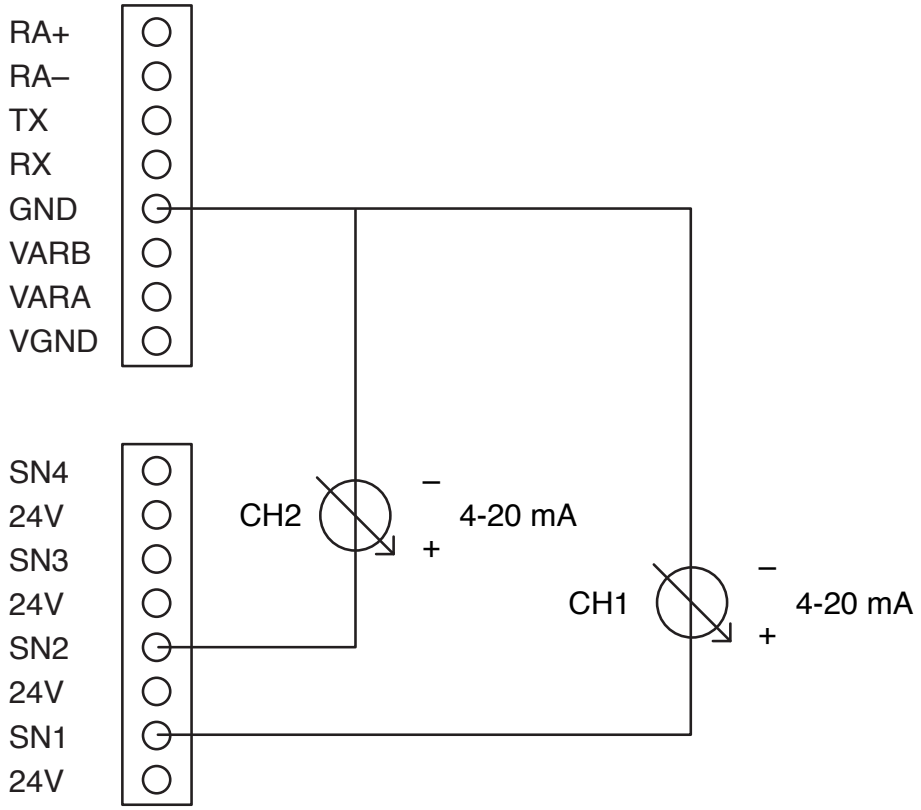
Date: October 2005
Scale: Not to scale
Dwg. No.: GA170CB

## 1. SENSOR WIRING

**Notes:**
SNX – Input (237 Ohms)
24V – 24V Source
GND – Signal Ground




## 2. CURRENT SOURCE CALIBRATION




**GAS DETECTOR (GA-170)**
**WIRING CONNECTIONS**

Date: August 2007
Scale: Not to scale
Dwg. No.: GA170WC

## 3. ALARM RELAY WIRING

The illustration at right depicts the basic wiring diagram of how to wire a Hydro Instruments Gas Alarm relay to a device requiring a 120v or 240v power source.

The Gas Alarm relays are not a powered relay. To power a component attached to the Gas Alarms relay you must provide an external power source. Typically this is done by connecting one lead of the power source to the component and the other to the CO (common) terminal of the relay. Complete the circuit by connecting either the NO (normally open) or NC (normally closed) terminal to the device depending on how you want your device to operate.

Either the line or neutral leg of the AC power can be wired through the relay.

**Example**