CH-S Single Zone Control Hub

Installation / Operation Manual

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Table of Contents

Introduction

General Description

The CH-S Single Zone Control Hub is designed to function as a dual-zone standalone gas monitor and ventilation controller. The hub consists of a sensor (multiple or as a controller only), six control relays, and digital control circuitry. The unit monitors the signal from the sensor, compares the signal to preset values, and controls relay contacts based upon the comparison. These relay contacts then provide signals that control ventilation components such as exhaust fans, louvers, and dampers. A four-digit display and indicator LEDs are mounted on the front panel to provide a visual indication of the hub's operational condition. A linear proportional output is also included for communication with a building management system (BMS), direct digital controls system (DDCS), or variable-frequency drive (VFD).

Carbon monoxide and nitrogen dioxide sensors used in the hub and in the remote detectors operate on the electrochemical principle. A current is produced when the target gas reacts chemically with an electrode inside the sensor. This small current is converted to an analog voltage, amplified, and converted to a digital signal. Hydrogen sensors operate on the catalytic bead principle. When combustible gas contacts the catalytic bead, heat is released, causing the resistance to change. This variation in resistance is expressed as a voltage and converted to a digital signal. In both cases, the signal is proportional to the gas concentration present at the sensor and is shown on the display. After comparing the digital signal to preset values, the unit activates the appropriate LEDs and relays. The actual gas concentration is sampled and updated approximately every five seconds.

The control hub's circuitry consists of three or more printed circuit boards mounted inside a polycarbonate housing. The housing has a NEMA 3R rating and is supplied with conduit fittings so that the hub can mount directly to a standard four inch conduit box. Short lengths of 16 AWG wire, connected to the power and relay terminals inside the housing, extend through the conduit fittings. These wires are color-coded so that most installations will not require opening the front panel of the hub.

Space is available in the control hub housing for mounting two detector assemblies. This allows for local detection of two target gases. Additionally, remote sensors can be attached via a four-conductor shielded cable. Each hub supports up to a total of four sensors mounted either locally, remotely, or both.

Features and Benefits

- Comprehensive Monitoring
  - Detects CO, NO_2, and H_2
- Greater Coverage
  - Monitors up to 4 Sensors and 36,000 sq. ft.
- More Control
  - User-Adjustable Setpoints, Delays, Outputs, and Relays
  - Built-in Manual Fan Activation
- Enhanced Durability
  - Rainproof Water Resistance
  - Simple Service and Maintenance
- Simplified Installation
  - Preconfigured Wiring
  - Factory Calibration
  - Customized Programming
- Effortless Upgrade
  - Works with New and Existing Building Controls Systems

Technical Specifications

Product Specifications

Input Power (selected at time of order)	120 VAC, 50/60 Hz, 0.2 A 24 VAC, 50/60 Hz, 1.0 A
Installation Category	II (local level, over-voltage transients less than 500V)
Storage Temperature	-50°C to 120°C (-58°F to 248°F)
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Humidity	15% to 90% (non-condensing)
Ventilation Control Relays	125 VAC, 50/60 Hz, 5 A resistive, 250 VA inductive
Internal Alarm	106 dB @ 10 cm, 3.8 kHz piezoelectric element
Front Panel Indicators	Power (green LED) Alert 1 (red LED) Alert 2 (red LED) Alarm (red LED) Sensor 1 (yellow LED) Sensor 2 (yellow LED) Sensor 3 (yellow LED) Sensor 4 (yellow LED) Zone 1 (yellow LED) Zone 2 (yellow LED)
Display	4-digit numeric
Selectable Fan Settings	2-speed motor fans 2 individual fans
Alert Levels	8 field selectable choices
Delay Times	0 to 7 minutes, both entrance and exit
Dimensions	8.72” W x 10.50” H x 2.90” D (22 cm W x 27 cm H x 7 cm D)
Weight	4.5 lbs (2.04 kg)
Housing	Gray, NEMA 3R, polycarbonate plastic
Compliance	ANSI/ISA 92.00.01-2010 (R2015) [CO/NO_2 Only] EN 50270 FCC Part 15 Subpart B RoHS

Target Gas Specifications

This Systemair Control Hub and its remote detectors are available for monitoring carbon monoxide, nitrogen dioxide, and hydrogen as target gases. Regulatory agencies have determined the threshold concentrations at which the gases become dangerous. Systemair has designed detectors so that the measurement ranges for each target gas meet the agencies' requirements. Each target gas, for which Systemair currently produces a sensor, is listed below along with the relevant concentration specifications.

Performance	**CO**	**NO_2**	**H_2**
Range	0-200 PPM	0-10.0 PPM	0-100% LEL
Resolution	1 PPM	0.1 PPM	1% LEL
Calibration Point	100 PPM	5.0 PPM	50% LEL
Max Overload	2,000 PPM	200 PPM	N/A
T90 Response Time	< 30 seconds	< 50 seconds	< 20 seconds
Coverage Radius	50 ft.	50 ft.	40 ft.
Coverage Area	7,500 sq. ft.	7,500 sq. ft.	5,000 sq. ft.
Technology	Electrochemical	Electrochemical	Catalytic Bead
Lifespan			
Long Term Output Drift	< 5% per year	< 2% per month	< 5% per month
Expected Sensor Life	> 7 Years	> 5 Years	2 Years
Average Calibration Duration	2 Years	1 Year	N/A
Setpoints			
Low Alert (Switch Position 0-7)	20, 25, 30, 35, 40, 45, 50, 55 PPM	0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 PPM	2.5, 5, 7.5, 10, 20, 25, 30, 40% LEL
Relay 2	100 PPM	5.0 PPM	50% LEL

Description of Front Panel Indicators

The front panel indicators convey to the user the operational status of the control hub. The following table describes the function of each indicator. Please refer to the hub's front panel label for the indicator's location.

Front Panel Indicators

Indicator	Color	Description
Power	Green	Glows whenever power is on
Alert 1	Red	Blinks or flashes to indicate the condition of Zone 1
Alert 2	Red	Blinks or flashes to indicate the condition of Zone 2
Alarm	Red	Glows after remaining in High Alert for 15 minutes
Zone 1	Yellow	Glows whenever the active sensor is assigned to Zone 1
Zone 2	Yellow	Glows whenever the active sensor is assigned to Zone 2
Sensor 1	Yellow	Glows whenever Sensor 1 is active
Sensor 2	Yellow	Glows whenever Sensor 2 is active
Sensor 3	Yellow	Glows whenever Sensor 3 is active
Sensor 4	Yellow	Glows whenever Sensor 4 is active
4-digit Display	Red	Indicates the gas concentration or error code associated with the active sensor

Operation Safety Notice

Certain procedures and operations detailed in this manual require that specific precautions be taken prior to beginning the procedure or operation. When precautions are required, a notice will be printed in an appropriate location in the manual. The user is urged to read and understand all such notices.

Types of Notices

Three types of notices may be used in this manual to describe the severity of the situation encountered.

WARNING:	This notice indicates that conditions exist that could cause personal injury or loss of life.
CAUTION**:**	Conditions exist that could cause damage to the equipment or other property.
Note:	Special consideration should be given to the procedure or operation, otherwise an unexpected operational result could occur.

Quick Start Guide

Please read this entire manual before attempting to install and operate this control hub. This guide is only intended to provide the basic steps necessary for installation and operation. Each step will reference the portion of the manual where more complete information can be obtained.

Step 1 – Mounting

Determine the location for mounting your control hub(s). The location(s) may be indicated on the architectural drawing. Also, the owner or designer of the facility may be consulted. Mounting guidelines can be found on page 14 of this manual.

Step 2 – Input Wiring

WARNING

This hub may require the use of voltage levels high enough to cause fatal injuries. Proper procedures must be followed any time work is performed on this unit.

Only qualified personnel should attempt to install, maintain, or service this equipment.

Provide a dedicated circuit with the required operating voltage at each control hub mounting location. Follow all national and local wiring codes. The wiring should be at least 14 AWG. A conductor connected to earth ground should also be provided for 120 VAC models. The circuit must include a disconnect switch located within easy reach of the hub.

If the hub operates from a voltage other than 120 VAC, ensure that the step-down transformer provides the correct secondary voltage and has the necessary volt-amp rating. The power requirement for the hub is listed on the front panel label.

CAUTION

Operating this control hub with the incorrect voltage and power requirements can cause internal electrical components to overheat and fail. Operation with the wrong power requirement will void the manufacturer's warranty and the installer will be responsible for any damage that occurs.

Contact Systemair before connecting power to the hub if you are unsure of the correct power requirement.

Color-coded wires exiting the hub housing through the top, right conduit connector are provided for connecting the operating voltage to the hub. Therefore, it should not be necessary to open the cover on the hub when connecting the voltage supply. Connect the hot power conductor to the black wire, the neutral conductor to the white wire, and the ground conductor to the green wire (if present).

Refer to page 15 for further information.

Step 3 – Remote Detector Wiring

If remote detectors are a part of this control hub, the hub will supply the operating power to each detector. Use a four-conductor cable with color-coded conductors of at least 18 AWG to make the connection. Two of these conductors provide the positive voltage and reference common to the detector for power. The remaining two conductors carry the signal from the detector to the controller. These two signal conductors should be a shielded twisted pair (STP). See figure 10 on page 43 and figure 11 on page 44 for details. If possible, choose a cable with color-coded conductors that follow the suggested color scheme listed on the drawings.

CAUTION

It is very important that the power and signal connections between each detector and between the detectors and the Systemair controller be correct. If the connections are wired incorrectly, damage to both the detectors and the controller will occur.

Use a cable with color-coded conductors and make sure that the same conductor connects to the same terminal on each detector and the controller.

Do not apply power to the detector or controller unless you are sure that the connections are correct.

Multiple remote detectors, regardless of gas type, should be connected in a daisy chain pattern. All detectors share the same conductors back to the controller. Therefore, a four-conductor cable can be connected from detector to detector, or from detector to controller, as the situation dictates. In either case, ensure the communication wires are a twisted pair and shielded from the power conductors. Separate cables may be used as necessary. Follow the wiring diagrams on page 43 and 44 to determine the proper connections at the controller. On the detector farthest from the controller, enable the RS-485 termination resistor (SW3) to reduce signal reflections.

Step 4 – Relay Wiring

In most cases, wiring of the ventilation control relays can be completed without opening the front panel of the control hub. Color-coded wires connected to the internal relay terminals extend outside the housing through the conduit connector located at the top, left of the unit. Use only the necessary wires required for control of the ventilation components. Cover or seal the ends of any unused wires and place them safely inside the conduit or electrical box.

Determine the type and number of fans and/or make-up air units the hub will control. For proper installation, you must first determine how and when the fans/make-up air units will operate. Many installations have only one or two ventilation components designed to operate simultaneously. These components usually operate from the A1 terminals of the Low Alert relay. Other ventilation systems contain multiple components designed to operate in two stages. Connect the primary ventilation components to the A1 terminals of the Low Alert relay using the yellow wires and the secondary components to the A2 terminals of the High Alert relay using the brown wires. When using multiple zones, follow the same guidelines as above using the red wires for A1 and blue wires for A2 of Zone 2. Note that while the Low Alert and Alarm relay contacts are labeled NC, they will open when power is applied and close upon a rise in gas. This allows the hub to fail safely in the event of power loss or any error condition.

All relays are dry contacts. Do not exceed the specified voltage and power limits of the relays (see page 6). Most installations require motor starters or larger relays to provide the necessary power requirements for the ventilation components.

For more information concerning ventilation system operation, read page 17 of this manual.

Step 5 – External Alarms

Determine if the installation requires an external alarm. If so, provide the proper wiring and connect the wires to the required voltage source. Connect the wiring to the Alarm relay(s) using the gray wires for Zone 1 and purple wires for Zone 2.

Refer to page 18 for more information concerning the alarm feature.

Step 6 – Applying Power

Once you are sure that the wiring connections are correct, apply power to the control hub circuit. When power is first applied, the unit will display the firmware version for five seconds before entering normal operation. When the sensors are powered at the same time as the controller, the display will show dashes until the sensors exit their warm-up phase. The green Power LED will remain solid and the yellow LEDs will begin to alternate according to how many zones

and sensors are present. Upon sensors exiting warm-up, the dashes will be replaced by a numeric readout of the gas concentration or any errors present.

See page 18 for more information concerning the initial startup.

Step 7 – Self-Test Mode

This control hub is equipped with a self-test mode that can be activated any time after warm-up by pressing the “SELF TEST” button for approximately one second. This mode will test the display, indicator LEDs, relays, and buzzer for proper operation. Any ventilation components connected to these relay terminals will operate if their power supply is active. The ventilation component relays will remain on for 30 seconds to allow sufficient time for testing if problems occur. There is a 30 second period between each relay actuation. At the end of this test, the buzzer will sound for three seconds and the hub will resume normal operation as described in step 6.

Page 19 contains a more complete discussion of this self-test mode.

At this point, the control hub is now ready to monitor for the presence of the target gas(es) and control the ventilation system to efficiently remove the gas from the protected area.

Installation

Mounting the Hub

The ability of the control hub to sense the target gas and efficiently control the ventilation system depends greatly upon proper selection of the mounting location. This hub monitors the area around it by sampling the air that passes by the sensor. Since the sensor is mounted inside a housing, air must diffuse through the intake vents and pass by the sensor on its way out the exhaust vents. Therefore, the hub should be positioned where it can sample air that contains a target gas concentration representative of the average value in that area.

When determining the mounting location, give special consideration to the following guidelines.

- Use one sensor per target gas for each area to be covered.
- Always prioritize locations with the highest occupation density.
- If using remote detectors, do not locate any further than 4000 feet from the control unit.
- The types of gases each unit is designed to monitor have varying densities. For CO and NO_2, mount the unit at the average breathing height – approximately 5 to 7 feet from the floor. For H_2, mount the unit at or near the ceiling.
- Avoid mounting locations that would not be representative of the average gas value in that area. These include but are not limited to locations near doorways, fans, ventilation inlets and outlets, and areas with air velocities in excess of 3.3 ft/s (1 m/s).
- Avoid locations that would allow direct contact with water. Mounting the unit near outside garage doors may allow rain to hit the unit when the door is open.
- Avoid locations that are directly in the outlet air vents of heaters or air conditioners.
- Avoid mounting locations with normal ambient temperatures below -4°F (-20°C) or above 122°F (50°C).
- Do not allow exhaust from engines to flow directly on the unit. Each unit is designed to sense gas concentrations that are 300 to 1000 times less concentrated than the gas levels found in engine exhaust. Also, engine exhaust contains high levels of other components. These components can shorten the useful life of the sensor if they contact the sensor before being diluted by the room air volume.

- Avoid mounting locations where the unit may be hit by passing vehicles. If the unit must be mounted in these locations, provide a shielding cage around the unit for protection.
- Do not restrict the air flow to the unit housing.
- Do not mount the unit in a corner.
- Do not mount the unit near containers of chemicals such as gasoline, kerosene, alcohol, or other cleaning fluids. High level concentrations of these chemicals may be mistaken as the target gas by the sensor and cause false readings. Also, some welding gases may cause false readings.

The hub is attached in the mounting position in one of two ways.

- Attach the housing to a four inch conduit box using the conduit fittings supplied with the hub. If you use this method, make sure that the four inch box is securely attached with screws to a solid support base. Firmly tighten the threaded nuts on the conduit fittings inside the conduit box so they will not loosen over time.
- Attach the housing to a solid support base using screws through the holes in the mounting feet.

  Find a flat area at least eight inches wide by eleven inches tall and place the back of the housing flat against it. Using a pencil or other slender marking tool, mark the location of the four mounting holes using the housing as a template. Start the screws without the housing in place to avoid any possibility of damage to the housing or circuit boards. Remove the screws, place the housing in position, and install the mounting screws. Do not over-tighten the screws as this may crack the plastic housing.

Connecting the Power Supply

WARNING

This hub may require the use of voltage levels high enough to cause fatal injuries. Proper procedures must be followed any time work is performed on this unit.

Only qualified personnel should attempt to install, maintain, or service this equipment.

Systemair Control Hubs are designed to operate from either 120 VAC or 24 VAC. Selection of the operating voltage is made by the user at the time the hub is ordered. The correct voltage is listed on the front panel label.

While this hub does not require much power to operate, it is usually located near machines that do consume large amounts of power. When these large machines operate, they

cause large voltage spikes to appear on the AC wiring. These spikes can interfere with the proper operation of the hub. The easiest way to avoid much of this interference is by providing power to the hub through a dedicated circuit from the service panel. In some very noisy situations, a line filter can be connected in the power supply circuit just ahead of the wiring connections at the hub.

> Note
>
> Do not operate the hub on the same AC circuit as the ventilation components. Doing this will almost always cause improper hub operation.

Provide a dedicated circuit at the required operating voltage at each hub mounting location. Follow all national and local wiring codes. The wiring should be at least 14 AWG. A conductor connected to Earth ground should also be provided for 120 VAC models. The circuit must include a disconnect switch located within easy reach of the hub.

If the hub operates from a voltage other than 120 VAC, be sure that the step-down transformer provides the correct secondary voltage and has the necessary volt-amp rating. The power requirement for the hub is listed on the front panel label.

> CAUTION
>
> Operating this hub with the incorrect voltage and power requirement can cause internal electrical components to overheat and fail. Operation with the wrong power requirements will void the manufacturer's warranty, and the installer will be responsible for any damage that occurs.
>
> Contact Systemair before connecting power to the hub if you are unsure of the correct power requirement.

Color-coded wires exiting the hub housing through the top, right conduit connector are provided for connecting the operating voltage to the hub. Therefore, it should not be necessary to open the front cover of the hub when connecting the voltage supply.
Connect the hot power conductor to the black wire and the neutral conductor to the white wire. If using 120 VAC, also connect the ground conductor to the green wire.

If minor maintenance work needs to be performed on the hub, there is a power switch for the hub to the left of the incoming power wires on the printed circuit board. By default, this switch is in the "ON" position so that the front cover does not need to be opened during the initial installation.

Connecting the Remote Detectors

If remote detectors are a part of this control hub, the hub will supply the operating power to each detector. Use a four-conductor cable with color-coded conductors of at least 18 AWG to make the connection. Two of these conductors provide the positive voltage and reference common to the detector for power. The remaining two conductors carry the signal from the detector to the controller. These two signal conductors should be a shielded twisted pair (STP). See figure 10 on page 43 and figure 11 on page 44 for details. If possible, choose a cable with color-coded conductors that follow the suggested color scheme listed on the drawings.

CAUTION

It is very important that the power and signal connections between each detector and between the detectors and the Systemair controller be correct. If the connections are wired incorrectly, damage to both the detectors and the controller will occur.

Use a cable with color-coded conductors and make sure that the same conductor connects to the same terminal on each detector and the controller.

Do not apply power to the detector or controller unless you are sure that the connections are correct.

Multiple remote detectors, regardless of gas type, should be connected in a daisy chain pattern. All detectors share the same conductors back to the controller. Therefore, a four-conductor cable can be connected from detector to detector, or from detector to controller, as the situation dictates. In either case, ensure the communication wires are a twisted pair and shielded from the power conductors. Separate cables may be used as necessary. Follow the wiring diagrams on page 43 and 44 to determine the proper connections at the controller. On the detector farthest from the controller, enable the RS-485 termination resistor (SW3) to reduce signal reflections.

Connecting the Ventilation System

As an energy saving device, the main function of the Systemair Control Hub is to operate the ventilation system only when necessary. To accomplish this, the hub is equipped with three dry-contact control relays per zone with color-coded wires exiting the hub housing through the top, left conduit connector. The contacts of these relays can control various ventilation system configurations. Figures 2, 3, 4, and 5 on pages 21 and 22 give examples of the wiring for the most common systems. Coil control signals on relays for damper and make- up air units can also be connected across the hub’s relay contacts so that these

components actuate simultaneously with the exhaust fans. However, do not exceed the maximum ratings of the relays (see page 6). Note that while the Low Alert and Alarm relay contacts are labeled NC, they will open when power is applied and close upon a rise in gas. This allows the hub to fail safely in the event of power loss or any error condition.

Please give special attention to the note on each wiring diagram. Jumpers JP5 and JP10 must be in the proper configuration before power is applied or the ventilation system will not function correctly. The factory default position for JP5 and JP10 is the “50/100” position. Therefore, unless a two-speed motor starter is used, or a low-speed fan is to be off if a high-speed fan is on, the ventilation wiring can be connected without opening the hub front panel cover.

JP5 and JP10 are located on the bottom, left edge of the control board (see figure 9 on page 43). To change the setting to “2-SPEED”, lift the shunt off JP5 and/or JP10 and move it one pin towards the bottom. Then slide it back on the pins.

Connecting the External Alarm

The Systemair Control Hub comes standard with an internally mounted alarm. If the target gas concentration exceeds the Alarm threshold, this alarm will sound. There is also a set of external Alarm contacts that close at the same time. These external contacts, ALR COM and ALR NC, can be used to trigger an alarm element mounted at a remote location.

Figures 2, 3, 4, and 5 on pages 21 and 22 show typical alarm wiring.

Connecting the Voltage or Current Proportional Output

The Systemair Control Hubs include circuits that provide either a current loop or voltage proportional output for each gas sensor. Each output produces a linear response over the full scale range of the sensor. A detailed description of these outputs can be found starting on page 27.

Applying Power For the First Time

Once all the wiring connections are complete, the control hub is ready for power to be applied. When power is first applied, the unit will display the firmware version for five seconds before entering normal operation. When the sensors are powered at the same time as the controller, the display will show dashes until the sensors exit their warm-up phase. The green Power LED will remain solid and the yellow LEDs will glow to indicate the active sensor and zone being displayed. Upon sensors exiting warm-up, the dashes will be replaced by a numeric readout of the gas concentration or any errors present. In most cases, the gas concentration will be “0.0”. However, if the target gas is present in the monitored area, the display will indicate the actual concentration. After all sensors have exited warm-up and any errors are

resolved, the self-test feature can be activated by pressing the “SELF TEST” button for approximately one second. The hub will then enter the test mode.

Using the Self-Test Feature

The self-test feature on this hub provides a convenient way to test the major functions of the complete system. This feature can only be activated when all sensors are reporting valid gas concentrations. Activate the self-test by pressing the “SELF TEST” button for approximately one second.

The self-test performs the following events in sequence:

1. Tests each display digit by displaying “0” through “9”
2. Activates the Zone 1 Low Alert relay and indicator LED for 30 seconds
3. Waits for 30 seconds
4. Activates the Zone 1 High Alert relay and indicator LED for 30 seconds
5. Waits for 30 seconds
6. Activates the Zone 1 Alarm relay and indicator LED for 30 seconds
7. Waits for 30 seconds
8. Activates the Zone 2 Low Alert relay and indicator LED for 30 seconds
9. Waits for 30 seconds
10. Activates the Zone 2 High Alert relay and indicator LED for 30 seconds
11. Waits for 30 seconds
12. Activates the Zone 2 Alarm relay and indicator LED for 30 seconds
13. Waits for 30 seconds
14. Activates the internal alarm for 3 seconds
15. Resumes normal operation

Before using the self-test feature, Systemair recommends testing the ventilation system wiring for correct connections and operating the ventilation components manually. Make any wiring changes and replace any defective components. Any problems found during the self-test can then be identified much easier. Although the self-test feature tests much of the hub’s functions, it does not test the sensors’ response to the target gas. Page 30 gives suggestions and procedures for testing the sensors’ response.

Typical Installation Diagrams

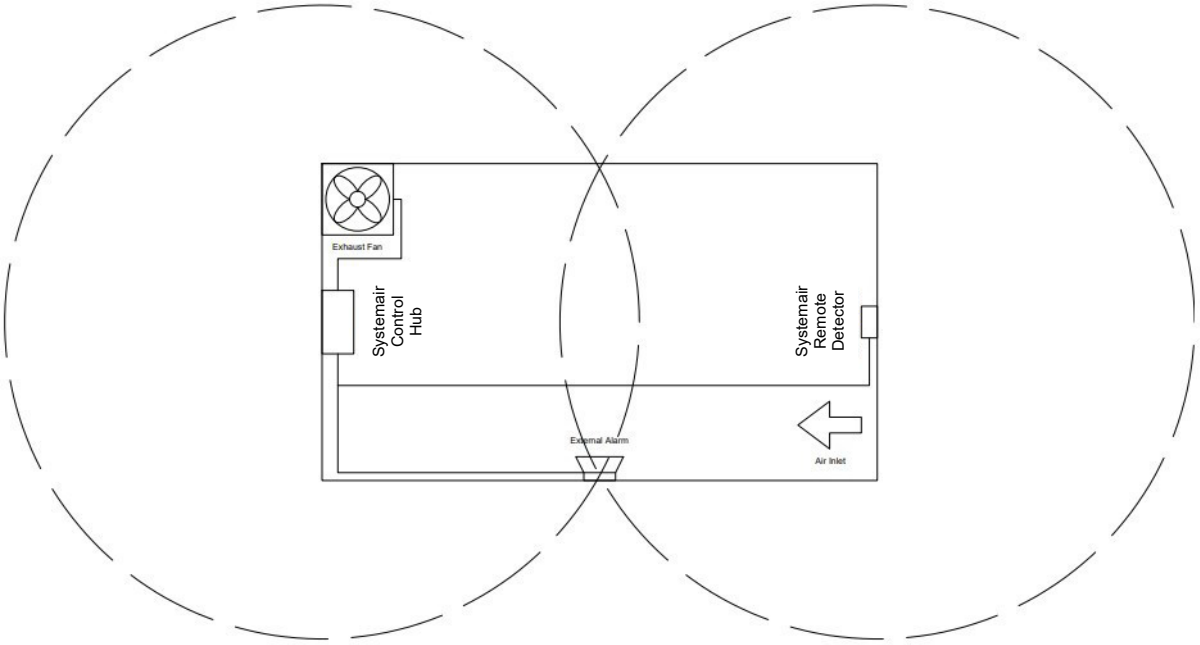


Figure 1: Wiring – Typical Layout

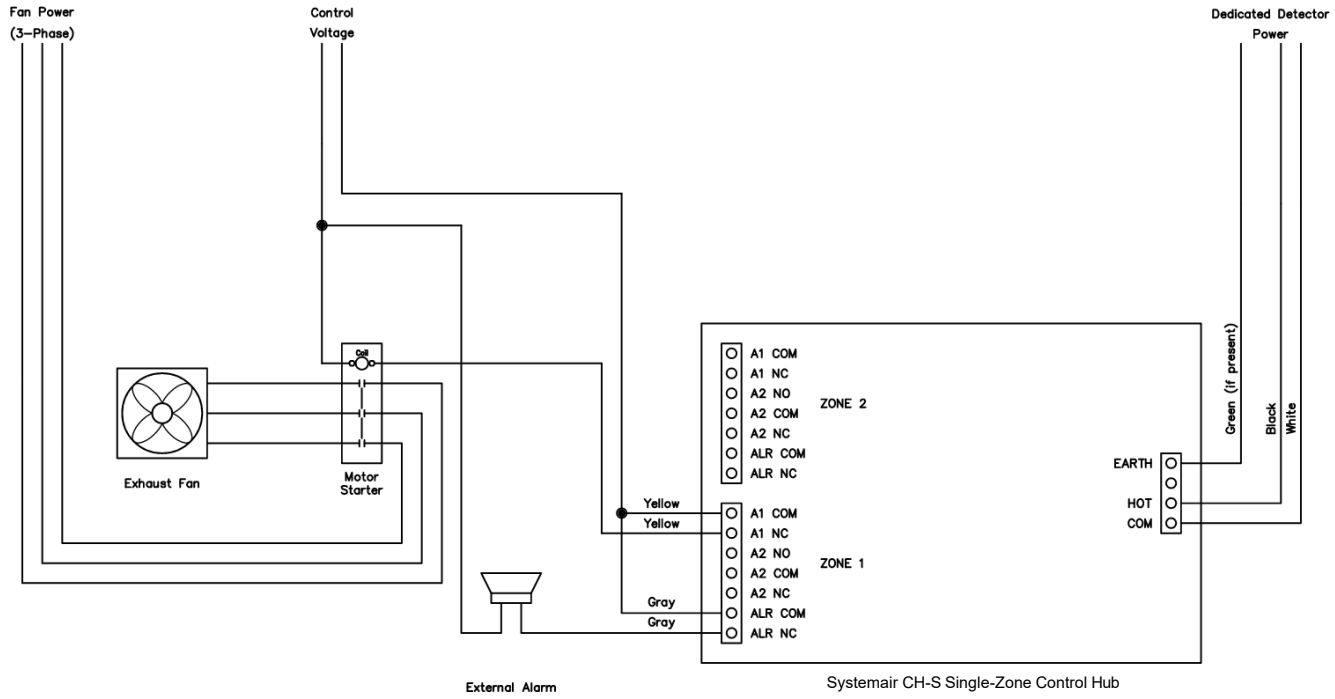


Figure 2: Wiring - Single Fan Ventilation System with One Zone

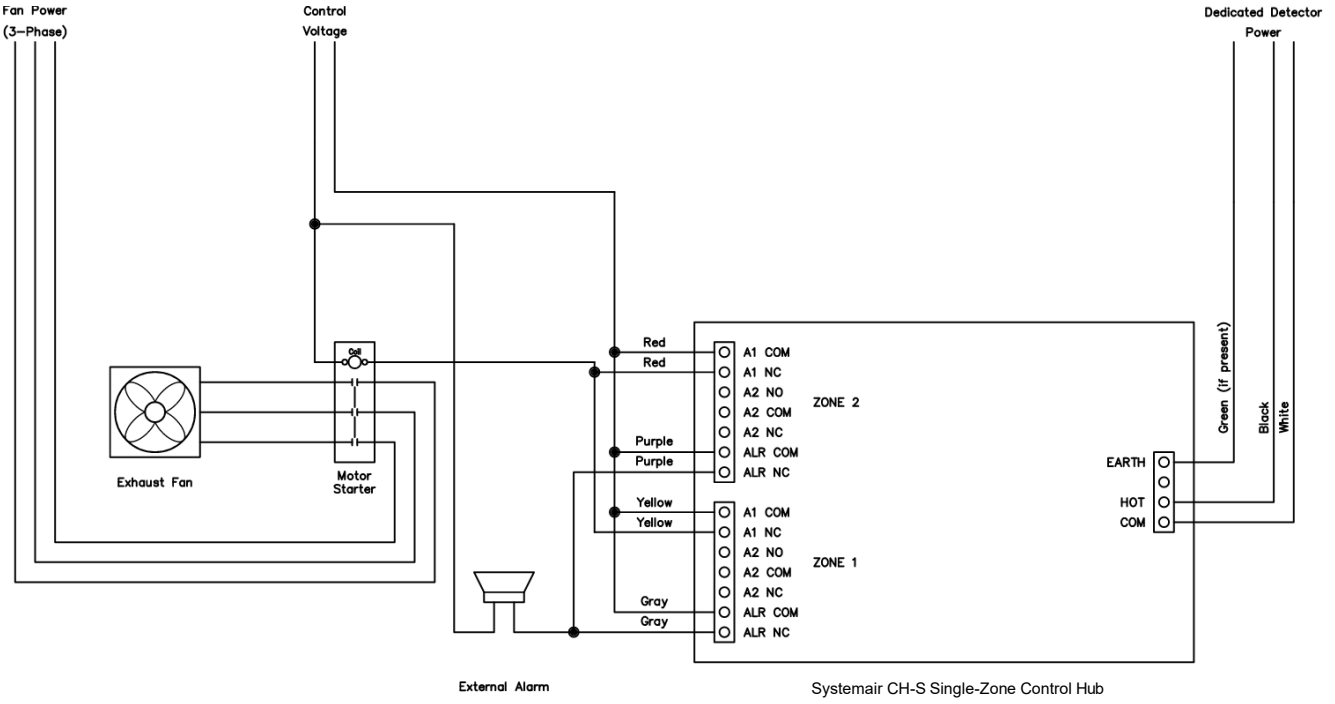


Figure 3: Wiring - Single Fan Ventilation System with Two Zones

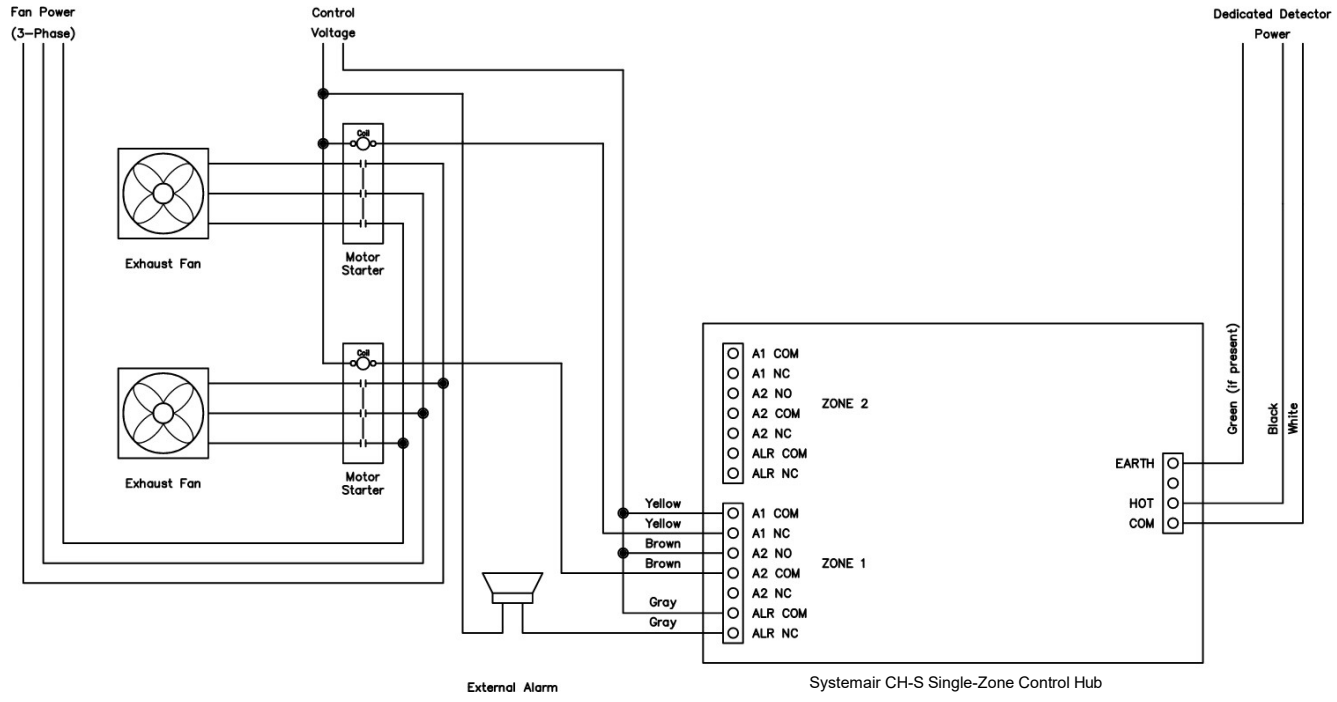


Figure 4: Wiring - Two Fan Ventilation System with One Zone

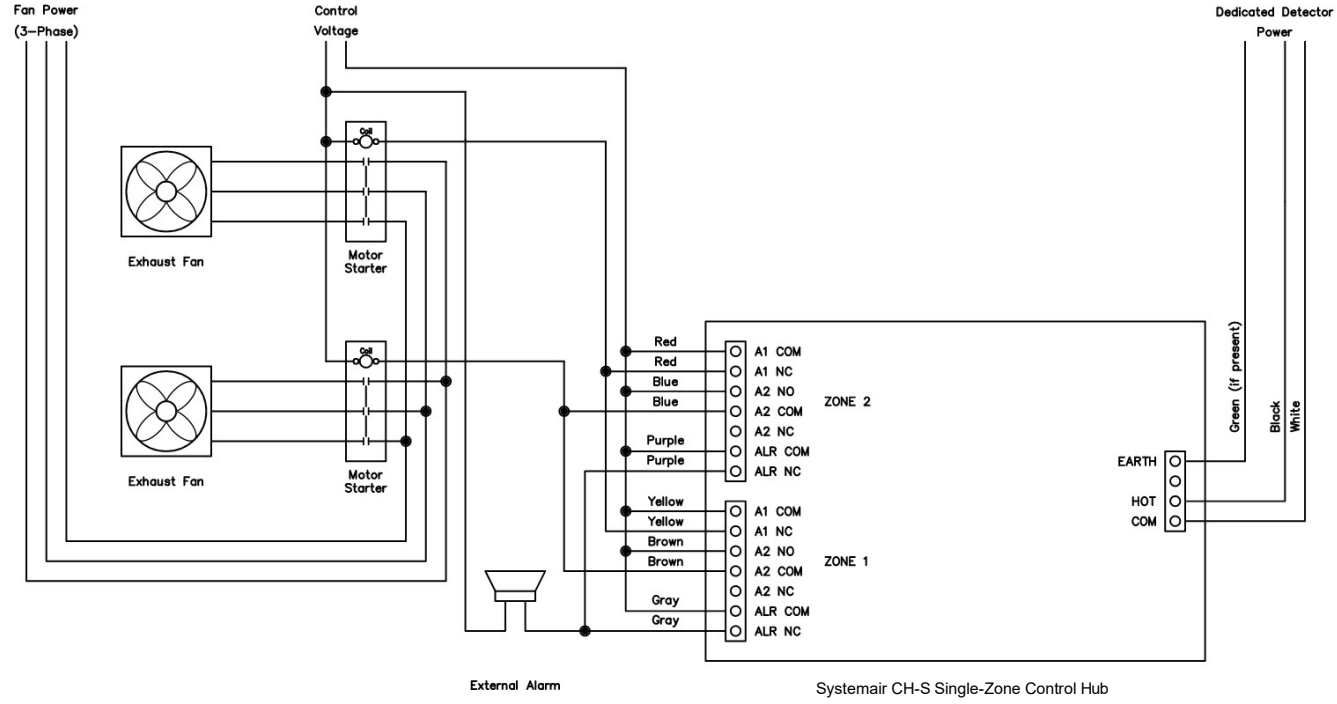


Figure 5: Wiring - Two Fan Ventilation System with Two Zones

Operation

How the Control Hub Senses the Target Gas

Ambient air surrounding the control hub housing diffuses inside the housing where it comes into contact with the sensor. Although the hub's circuitry dissipates very little power, a small amount of heat is produced inside the housing. This heat causes air to rise up through the bottom vents, past the sensor(s), and out the upper vents on either side of the unit. Any target gas present in this air causes a response from the sensor. If the hub is located properly, the sensor will respond to the average amount of the target gas present in the area. For help in properly locating the hub, please read the mounting guidelines on page 14. This hub monitors the actual concentration of the target gas exposed to the sensor. This actual value may be different than the time-weighted-average values displayed by many personal gas monitors. Please take this difference into account when comparing the response of the two units. A new target gas reading is taken and displayed every five seconds per sensor installed.

How the Control Hub Controls the Ventilation Equipment

Upon sensing target gas, the control hub has three threshold levels that it uses to control external ventilation and alarm equipment.

Low Alert

Once the concentration of target gas has exceeded the threshold set by the user, the delay countdown timer, also set by the user, begins. During this time, the appropriate LED will blink short-on-long-off. If the concentration is still above the threshold after this delay, the Low Alert relay will close and the corresponding LED on the front panel will flash slowly. Any equipment connected to the Low Alert relay will be energized at this time.

After the target gas concentration drops below the threshold, the delay countdown timer will initiate again. If the concentration is still below the threshold after this delay, the Low Alert relay will open and the corresponding LED on the front panel will stop blinking. Any equipment connected to the Low Alert relay will be de-energized at this time.

High Alert

If the target gas concentration continues to rise above a second, factory-set threshold, the High Alert relay will close and the corresponding LED on the front panel will flash quickly. The Low Alert relay will remain closed if the jumpers on JP5 and JP10 are set to the "50/100" position; otherwise, the Low Alert relay will open upon the High Alert relay closing. Should the

target gas concentration rise quicker than the Low Alert delay time, the High Alert condition will be activated immediately, regardless of how much time is left in the delay period. If the unit is set for “50/100” operation, both the Low Alert and High Alert relays will close simultaneously.

The High Alert relay will remain closed until the target gas concentration drops below the Low Alert threshold. The High Alert relay will then open and the unit will return to the Low Alert condition until the delay countdown timer expires.

Alarm

For toxic gases, the Alarm relay will close after remaining in High Alert for 15 minutes. For combustible gases, the Alarm relay will close if the target gas concentration continues to rise above the third, factory-set threshold. At this time, the Alarm LED will illuminate and the internal buzzer will sound, indicating the gas concentration could not be reduced. The internal buzzer may be silenced by pressing the “ALARM OFF” button on the front of the control hub. Once the concentration drops below the Alarm threshold, the Alarm relay will open and the hub will return to the High Alert condition.

Proportional Output

Each sensor is equipped with a proportional output that generates a 4-20 mA, 2-10 VDC, 1-5 VDC, or 0.2-1 VDC signal. This signal is proportional to the concentration of target gas present at the sensor and may be used for monitoring gas or for controlling a VFD. Not all systems will accept this signal directly and may need an intermediary controller. The zero offset may be disabled via the selection DIP switch if desired.

Manual Fan Activation

To manually activate the ventilation system, press the “MANUAL FAN 1” or “MANUAL FAN 2” button on the front keypad. These buttons will turn on any equipment connected to the Zone 1 and Zone 2 Low Alert relays respectively. Pressing the button a second time will deactivate the equipment. This feature only works when the target gas concentration is below the Low Alert threshold for the zone in question. If the target gas concentration is above the setpoint, the control hub will automatically activate any equipment and disable the manual fan activation buttons. The Low Alert cannot be turned off by the keypad buttons if activated automatically by the hub.

Factory Default Settings

Unless otherwise specified at the time of order, the following settings will be used to configure the control hub.

Setting	**Default**
Sensor 1	Active
Sensor 2	Active if Applicable
Sensor 3	Active if Applicable
Sensor 4	Active if Applicable
Zone 1	Active
Zone 1 Delay	3 Minutes
Zone 1 Alert	Switch Position 3
Zone 2	Inactive
Zone 2 Delay	3 Minutes
Zone 2 Alert	Switch Position 3
Fan 1	50/100
Fan 2	50/100
Proportional Output Signal	4-20 mA
High Alert Relay Operation	Normally Open

Each sensor ordered will be assigned a number 1 through 4 as applicable. Sensor addressing should not be changed unless adding or removing a sensor.

Color-coded relay contact wiring is provided for any active zones with the High Alert relay contacts set to close upon entering High Alert and open during a fail-safe condition.

Adjusting the Settings

Note
All changes made to the control board settings require a power cycle to take effect.

Sensor Address

The sensor address is set by SW1 on the top, right side of each sensor board using a binary counting system. Digit 0 is at the top of the board and 1 is at the bottom. See figure 12 on page 44 for proper settings. The address of the sensor board should match the desired address of the first sensor module present. If a second sensor module is enabled, it will take the address immediately following that of the DIP switch positions at SW1. In this way, the remote detector may use two addresses. Each detector comes preset from the factory with the correct address assigned, so these switches should not be touched except for in very specific cases. Please consult with the factory before reassigning sensor addresses.

Active Sensors

Each sensor can be made active or inactive by SW3 on the top, left of the control board. Flipping the corresponding switch to the “ON” position will make that sensor active while flipping the switch to the “OFF” position will make that sensor inactive. By default, all included sensors will be set as active while any that are not in use will be inactive. These switches should not need to be touched, but may be used to disable a sensor if being repaired or recalibrated.

Active Zones

Each sensor can be assigned to a zone on the control board by moving the corresponding switch on SW4. Sensors with the switch in the lower position will be assigned to Zone 1 while those with switches in the upper position will be assigned to Zone 2. To make a zone inactive, move all switches to the opposite zone.

Zone Delay

The Low Alert delay time can be adjusted individually for each zone using the rotary switches SW2 and SW9 on the bottom of the control board. Each of the eight positions has a number corresponding to the number of minutes for the delay. Setting the switch to position “0” will disable the delay timer for the associated zone.

Zone Alert

The Low Alert setpoint can be adjusted individually for each zone using the rotary switches SW1 and SW10 on the bottom of the control board. Each of the eight positions has a number representative of the threshold concentration of target gas. See the table on page 7 for the gas concentrations represented by each position. Numbers in bold represent the factory default setpoint. Note that the switch assigns threshold concentrations for all gases in the zone. Separate sensors of different types into different zones to adjust the threshold concentration by gas. The High Alert and Alarm setpoints cannot be adjusted.

High Alert Relay Operation

There are two sets of contacts for the High Alert relay in each zone. The main contact is labeled A2 NO and should be used in most scenarios. This sets the High Alert relay to close upon reaching the threshold concentration, thus activating any connected ventilation equipment. In fail-safe mode, this relay will open so as to prevent malfunctions with two-speed fan configurations. Moving the wire to A2 NC will cause any connected equipment to deactivate upon reaching High Alert and activate in fail-safe mode.

Fan Speed

The operation of the relays to accommodate different types of systems can be adjusted by JP5 and JP10 on the left side of the control board. Placing the jumpers on the top two pins will set the relays to operate for a 50/100 system while placing the jumpers on the bottom two pins will set the relays to operate for a two-speed system. Fan 1 controls Zone 1 and Fan 2 controls Zone 2, but in most cases, these jumpers will be set to identical positions. See figure 9 on page 43 for details.

Proportional Output

To adjust the output scale, set the switch above the sensor module to the desired output signal – 2-10 V, 1-5 V, 0.2-1 V, or 4-20 mA. Make sure that only one DIP switch is in the “ON” position. To disable the zero offset, move the Offset switch to the “OFF” position. This will remove the lower limit of the scale so that all scales start at 0 V or 0 mA. SW7 controls the scale for Sensor 1 while SW6 controls the scale for Sensor 2. Be sure to follow the instructions below to ensure proper functionality of the proportional output.

Using the Proportional Outputs

This Systemair Control Hub is supplied with a linear proportional output for each sensor that can be connected to a building management controller or variable-frequency drive. These outputs

can produce either a current or voltage signal that is proportional to the concentration of the target gas present at the sensor. By adjusting DIP switches, located on the sensor board, the user can select from 4-20 mA, 2-10 VDC, 1-5 VDC, and 0.2-1 VDC signals. By disabling the zero offset, the user can select from 0-20 mA, 0-10 VDC. 0-5 VDC, and 0-1 VDC. This signal is available at the terminal strips TS3 and TS4, located in the middle of the sensor board. See figure 13 on page 45 for the terminal strip locations and signal mode selection switches.

Unless otherwise specified, the control hub is shipped from the factory with both switches set in the 4-20 mA current loop mode. Ensure that power to the hub is off before attempting to change these settings. Outputs will change in real time and may cause damage to equipment that is not rated for certain signal types.

The output signal is connected using a two-conductor shielded cable. The resistance of the total cable length must be less than 250 Ω if the current loop mode is selected. For the voltage modes, the input impedance of the controller must be greater than 100 kΩ.

Ground the shield of the signal cable at the controller earth grounding point only to avoid noise conditions created by ground loops. Although the positive signal lead can be shorted to ground without causing damage, this condition should be avoided. Also, do not route the signal cable in conduit containing other wiring to avoid unwanted noise pickup.

The linear outputs produce a signal based on the full scale response of the sensor. See the graphs in figure 18 on page 49 of this manual.

As an example, a Systemair Carbon Monoxide Hub has a full scale output of 200 PPM CO. For the 4-20 mA output mode, 0 PPM CO would equal 4 mA while 200 PPM CO would equal 20 mA. Follow the instructions supplied with your controller to adjust the controller's input for the proper scaling of the signal. Consider a 0 mA or 0 VDC output as a failed sensor condition while the Offset switch is in the "ON" position.

Obtaining the Best Operation

Toxic and combustible control hubs are designed to control the ventilation system in response to a rising concentration of the target gas. No two installations will be exactly the same. Different ventilation components, the number of gas producing sources, air flow patterns inside the room, the total room volume, and the exact location of the hub(s) influence how effective the system is in controlling the target gas concentration. The ideal operation occurs at hub settings that cycle the most air without unnecessarily operating the ventilation system.

The hub has two variables that can be adjusted to obtain the best performance under the conditions it is operating – Low Alert threshold concentration and delay time. Each of these

are adjustable in eight steps using the corresponding rotary switches located on the control board. The threshold sets a desired maximum concentration while the delay assures that transient levels of gas do not cause the fans to operate for unnecessarily short periods of time. This delay for any target gas is adjustable from 0 to 7 minutes in eight steps of one minute each. The delay period occurs between the time the Low Alert level is exceeded and the fans activate, and between the time the target gas concentration drops below the Low Alert level and the fans turn off. While the delay is in progress, the appropriate alert indicator will blink short-on-long-off as the time proceeds toward zero.

The hub is shipped from the factory with the Low Alert concentration set at position 3 (see page 7) and the delay set at 3 minutes. These settings provide a good starting point and will be acceptable for most installations. If the target gas concentration appears to continue rising after the fans activate, fine tune the settings by reducing the Low Alert setpoint or the activation delay. If the fans operate too often and/or for short periods, increase the activation delay.

In some cases, you may find that a target gas source is too close to the hub. Consider other mounting locations for the hub, or move the gas source farther away.

Maintenance

Testing the Response to the Target Gas

Testing these control hubs requires that the target gas be applied to the sensor from a tank of air containing a known concentration of the target gas sufficient to activate the hub. While it is possible to activate the hub by running an engine (i.e., gasoline for CO, diesel for NO_2), this form of testing does not provide consistent results and may damage the hub. Care should be taken to prevent exhaust gases from directly contacting the hub.

CAUTION

Allowing the control hub to come in direct contact with undiluted exhaust gases will decrease the expected useful lifetime of the sensor. The high concentration of acids and other components in the exhaust gas will overload the activated carbon filter inside the sensor and will increase the effects of interfering gases on the accuracy of the sensor.

If the sensor becomes damaged, it must be replaced with a new sensor calibrated at the factory.

Using test gas applied from a tank has the advantage of speed as well as assurance that the hub is responding accurately to the target gas. However, the gas must be applied directly to the sensor if the response is to be close to the value present in the tank. The test gas can not be allowed to become diluted by the air in the room before it comes in contact with the sensor. This reduces the concentration to a level too low to give the desired result.

Test gas should be within the nominal full-scale range of the sensor. Check with your local environmental or chemical supply store for more information.

To test the sensor response using test gas from a tank, remove the two retaining screws and open the lid. Then apply gas to the sensor. The concentration on the display should reach 90% of the expected reading within 50 seconds. Allow approximately five minutes to ensure 100% response. If the response time is too slow or the concentration displayed is outside of acceptable tolerance, the sensor should be recalibrated or replaced.

To ensure proper response and accuracy, Systemair recommends testing toxic detectors once every six months and combustible detectors once every three months.

Replacing the Sensor

The sensor's useful lifetime depends greatly upon its operating conditions. Continuous operation around large or numerous gas sources may shorten the sensor's useful life. A recommended recalibration date is recorded on the front panel label.

Please refer to figure 16 in the appendix of this manual while removing and installing the sensor module.

To replace a sensor module, remove the two retaining screws and carefully open the cover. Unplug the sensor module and set it aside. Align the pins of the new sensor module with the headers of the sensor board. Gently press the module into the board until it is fully seated. Close the cover and firmly tighten the two cover retaining screws. Check for proper operation after the sensor has finished warming up. See "Applying Power for the First Time" on page 18 and "Using the Self-Test Feature" on page 19. Once operation is verified, the old sensor module may be discarded.

Recalibration

To perform field recalibration on a sensor, first obtain a test gas cylinder with the appropriate concentration. For toxic and hydrogen sensors, this concentration should be exactly 50% of the full-scale range of the sensor to be calibrated. A 0.3 LPM regulator, tubing, and gas cup will also be needed. Refer to figure 14 for details.

To enter calibration mode, simultaneously press and hold SW4 and SW5 for three seconds. Once LED2 and LED3 blink in an alternating pattern, select the sensor to be calibrated by pressing the corresponding button – SW4 or SW5. Once selected, the corresponding LED will remain solid. Next, verify that there is no target gas present; use a cylinder of zero air if necessary. Then press SW4 to set the zero value. The corresponding LED will blink continuously when the zero value is saved successfully. Begin applying target gas to the sensor. After the sensor output voltage has stabilized (approximately five minutes from initial application), press SW5 to set the span value. If the calibration was completed successfully, the blue LEDs will turn off and the control hub will exit calibration mode.

Calibration mode will automatically timeout after ten minutes of inactivity. To manually back out of calibration mode at any time, press and hold SW4 and SW5 for three seconds. A power cycle will also interrupt calibration and return the hub to normal operating mode upon restart. Calibration will only complete if both zero and span values are able to be saved. Partial calibrations are not possible. Refer to the blue Sensor 1 and Sensor 2 LEDs to determine the present stage of calibration mode.

Suggested Repair Parts

Below is a list of parts that may be replaced inside Systemair Control Hub and Remote Detector products. Please consult your local Systemair representative for pricing and availability.

Part Number	Description
494132	CO Sensor | Carbon Monoxide Sensor
494133	NO2 Sensor | Nitrogen Dioxide Sensor
494134	H2 Sensor | Hydrogen Sensor

Troubleshooting

Error Codes

The Systemair Control Hub is programmed to display error codes to indicate a problem condition with the unit.

Code	Description
9501	Transmit Timeout
9601	Failed Communication with Sensor 1
9602	Failed Communication with Sensor 2
9603	Failed Communication with Sensor 3
9604	Failed Communication with Sensor 4
9802	Cannot Run Self-Test
9995	Sensor End-of-Life Signal
9996	Sensor Not Installed
9997	Invalid Calibration Values
9998	No Active Zones
9999	No Active Sensors
rCAL	Calibration Expired

Transmit Timeout – 9501

A transmit timeout error occurs when the control board is not able to send a signal on the communication line. This error will rarely ever appear, but if it does, contact technical support.

Failed Sensor – 960x

This error code indicates that the control board cannot establish communication with one or more of the sensor modules. It will appear as 9601, 9602, 9603, or 9604, with the last digit indicating the troublesome connection. The error code will only be displayed when the sensor that is the source of the error is active. If multiple sensors are failing to communicate, multiple error codes will appear on the display. If other sensors are functioning properly, the unit will continue to measure the target gas concentration for those sensors.

The most common reason for this error code is improper wiring between the sensor board and control board. Another reason is that the sensor is addressed incorrectly, either matching the designation of another sensor or being set to an address set as inactive on the control board.

Cannot Run Self-Test – 9802

The self-test feature can only be run when all alerts are inactive and no other errors are present. If the control hub is measuring gas concentrations in excess of any active zone's Low Alert level, this error code will be displayed.

To clear the error code, allow the gas concentration to drop and the alert to clear. Then restart the self-test. Alternatively, restart the unit to clear the error code and verify no other errors are present before attempting the self-test.

End-of-Life – 9995

When a sensor reaches the expected end of its useful lifetime, this error code will be shown while the sensor is active. The signal is triggered by a clock in the sensor module. In the event that the unit loses power, the module will save the timestamp with an accuracy of one hour. Once power is restored, the clock will resume from the previous timestamp. While this error code is being displayed, any zones with expired sensors will be unmonitored and the unit will close the Low Alert and Alarm contacts to enable constant ventilation. The proportional output will also send a 0 mA or 0 V signal depending on the output settings.

When this error code appears, replace the sensor module.

Sensor Not Installed – 9996

If no sensor module is present on the sensor board, a 9996 error code will appear on the display.

Verify that there is a sensor module on the sensor board and that the pins are properly aligned with the headers. If not, remove the sensor module and reinsert it correctly. If the issue persists, check that the address of the sensor module is correct.

Invalid Calibration Values – 9997

When a sensor module does not have zero and span values saved in memory, this error will be shown. This is often due to damaged or corrupted memory.

Replace the sensor module to correct the error.

No Active Zones – 9998

This error will only appear if there is damage to the zone assignment circuit. It is not possible to achieve this error under normal operating conditions.

Replace the control board to correct the error.

No Active Sensors – 9999

If all sensors are set as inactive at SW3 on the control board, this error code will appear.

Setting at least one active sensor and ensuring proper connection of that sensor to the control board will remedy the error.

Calibration Expired – rCAL

Once the calibration duration timer on a sensor module expires, rCAL will be displayed.

Pressing the “ALARM OFF” button once will silence the alarm and indicate the gas concentration along with the recalibration message. Pressing and holding the “ALARM OFF” button for three seconds will clear the recalibration message for one month. This message may be cleared up to three times, after which the sensor module must be calibrated or replaced.

Checking and Replacing Fuses

The circuitry of all the control hubs are protected by time-lag TR5 fuses. They are UL rated at 250 VAC, and manufactured by Littelfuse, series 374.

There are seven fuses on the interface board. The main fuse is located in FH1 and protects the entire hub circuitry. This fuse has a rating of 2.0 Amps for 24 VAC units and 0.400 Amps for 120 VAC units.

Each pair of control relay contacts are protected by a TR5 time-lag fuse rated at 5.0 Amps. These fuses are located in FH2 through FH7, and can be found along the left edge of the interface board next to terminal strips TS2 and TS3.

Test these fuses by switching power off and removing them from their holders. Measure for a low value of resistance across the pins. Replace any fuse that does not have a resistance reading near 0 Ω. Always replace fuses with one having the same ratings and characteristics.

A single 1.0 Amp TR5 time-lag fuse protects the input circuitry of the sensor board at FH1. Test the fuse for resistance and replace if the reading is not near 0 Ω.

Common Installation/Operation Mistakes

Ventilation Components Connected without Control Voltage

Relays on this control hub are dry contacts. They do not supply any voltage. A typical mistake is to wire ventilation equipment directly to the relay contacts, expecting them to provide the
necessary power. Consider these relay contacts as a switch – allowing any voltage to pass through only when closed. Provide the required control voltage on a dedicated circuit to each relay as required. Be careful not to exceed the maximum power draw limits of the relays.

Ventilation Components Connected to the Wrong Relays

A common mistake is to control a single fan ventilation system using the A2 COM and A2 NO relay contacts. If connected this way, the fan will not activate until the target gas concentration exceeds High Alert level. Unless you intend that the ventilation system activate only above the High Alert level, operate this type of ventilation system using the A1 COM and A1 NC relay contacts. Place jumpers JP5 and JP10 in the “50/100” position so that the fan will continue to operate if the target gas concentration exceeds the High Alert level.

Ventilation Components Connected to the Wrong Zone

The control hub is equipped with two sets of relay contacts – one for each zone. If only one zone is in use and the ventilation equipment does not activate when expected, verify that the correct relay contacts are being used for the active zone. If not, you can move the connections to the other set of relay contacts or use the switch on the control board to swap to the other zone. If both zones are in use and the wrong ventilation equipment is activating, either swap the zones using SW4 on the control board or swap the wiring connections into the relay contacts.

Low Alert Level Set at Wrong Concentration

A common tendency is to set the Low Alert concentration at the lowest setting. A Low Alert setting that is too low can cause frequent cycling of the ventilation system. Set the Low Alert concentration to that which produces the most efficient ventilation system operation while protecting people in the monitored area. Setting the Low Alert concentration too high can create a situation in which the target gas concentration becomes dangerous. Again, adjust the setting to a level that produces the best overall operation. Be sure to check all applicable federal, state, and local guidelines as these may dictate the required concentration.

Delay Period Set Incorrectly

Using a long delay period can produce a situation in which a rapidly increasing gas level may rise to dangerous concentrations before the ventilation system activates. In the case of vehicle emissions detection, smoke from the engine exhaust could build up to a point where people in the area begin to experience irritation in their eyes and nose. Choose a delay setting that activates the fans and begins to clear the area before the gas rises to a dangerous concentration, or eye and nose irritation happens.

Setting the delay period too short will cause frequent operation of the ventilation system. The control hub may activate the fans after sensing a transient gas concentration. Once the fans activate, this transient level will drop quickly causing the hub to turn off the fans. In this case, the ventilation system operates frequently and wastes energy. Increase the delay setting until a compromise is reached that keeps the target gas level below that specified in the regulatory standards without operating the ventilation system too often.

Setting the Proportional Output Incorrectly

If a controller connected to the proportional output is expecting a certain output signal, the DIP switches on SW6 and SW7 of the sensor board must be configured to output that type of signal. A common mistake is setting multiple outputs as active simultaneously. This alters the output scale and changes disproportionately to the sensor's gas readings.

Control hub Mounted in an Unsatisfactory Location

For reliable operation, the control hub(s) must be mounted in the proper locations. Please read "Mounting the Hub" on page 14 for guidelines on choosing locations.

Common mistakes include mounting a hub too close to a garage door. When the door is open, rain may blow through the doorway and onto the hub housing. Another common mistake is to mount the hub in a location where it comes in direct contact with engine exhaust. The large amount of contaminates in engine exhaust can shorten the useful life of the sensor.

One more common mistake is to choose a mounting location that places the hub too near the outlet of air conditioners or heaters. Quick, drastic changes in ambient temperature can cause erratic shifts in the hub readings.

By following the mounting guidelines, many of the problems caused by improper mounting locations can be eliminated.

Limited 2 Year Warranty

Our goal at Systemair is to make products that constantly go above and beyond the requirements and expectations of our customers. One way to meet that goal is to make products that never fail or require service. When there is a problem with one of our products, it is our goal to handle the problem as quickly and efficiently as possible. You can solve many problems in the field, but if you cannot, and want to speak with a factory service technician, you can call 1–800–263–7081. You will be transferred to a technician specially trained to service that product.

Warranty Statement

Systemair MFG. Inc. warrants gas remote sensors, control hubs, and accessories for a period of two years from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, Systemair MFG. Inc. will repair or replace the affected product, at its own discretion, without charge. The company shall not be held responsible for any charges incurred with removal or replacement of allegedly defective equipment, nor for incidental or consequential damages. If any equipment has not been installed per Systemair instructions, this warranty is void. The cost to repair, replace, or service any component is not the responsibility of Systemair. Any service necessary must be paid in full prior to shipment or performance.

Warranty Claim Procedure

If service or repair of your Systemair product becomes necessary, begin the RMA (Return Merchandise Authorization) procedure by notifying Systemair NA, c/o Warranty Specialist, 10048 Industrial Blvd, Lenexa, KS 66215, or email warranty@systemair.net detailing the failure or defect and noting the specific model and serial number, including readily verifiable details that support its claim. Upon receipt by Systemair of your written concern, you will be notified of our receipt as to the review process to manage the specific claim. If deemed a manufacturing defect and Systemair determines that you are entitled to a warranty claim, a resolution will be provided and a RMA Number shall be issued for reference on all communications. If not deemed a manufacturing defect or you are not entitled to a warranty claim, then Systemair will inform you of the same and, if applicable, a quote for repairs. Freight to factory will be paid by you and return freight will be paid by Systemair (unless not deemed a manufacturing defect or you are not entitled to a warranty claim, in which case return freight will be paid by you). The warranty and any disputes hereunder shall be governed by and construed under the laws of the State of Kansas, without regard for the conflicts of laws provisions thereof.

Appendix

Model Numbers and Descriptions

Each Systemair Control Hub is given a model number that describes the type(s) of target gas(es) and the operating voltage. This model number appears on the front panel label.

Use the following list to completely identify a hub once you know the model number.

Control Hub Model Number and Description

Example:

CH-S	Dual	120
1	2	3

1. Product Line
   a) CH-S – Single Zone Control Hub
2. Type(s) of Gases Detected
   a) BLANK – Control Hub Only
   b) Dual – Dual Gas Detection
3. Input Voltage
   a) 24 – 24 VAC Input Voltage
   b) 120 – 120 VAC Input Voltage

For the example given above, the unit, powered by 120 VAC, would detect both Nitrogen Dioxide and Carbon Monoxide.

Complete Model Number List

Single Zone Control Hub with or without Local Sensors		
Voltage	**No Local Sensors**	**Two Local Sensors (CO and NO_2)**
24 VAC	CH-S 24	CH-S Dual 24
120 VAC	CH-S 120	CH-S Dual 120

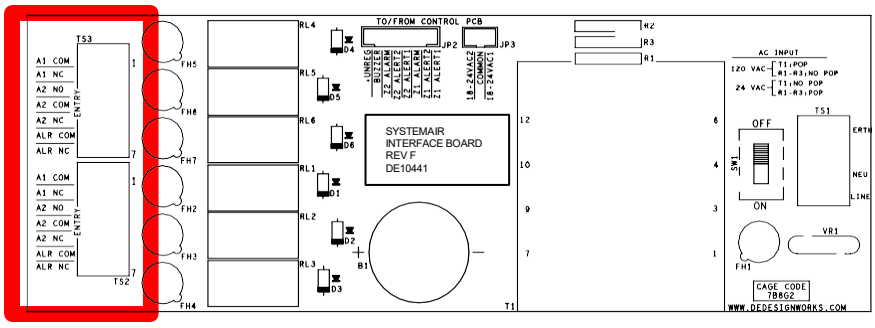
Remote Detectors			
CO	**NO_2**	**CO/NO_2**	**H_2**
RD CO	RD NO_2	RD Dual	RD H2

Note

The hub can only accommodate up to four sensors in any combination of local and remote mounting placement. Up to two sensor may be mounted locally. Therefore, if one sensor is mounted locally, only three can be mounted remotely; if two sensors are mounted locally, only two can be mounted remotely. CO/NO_2 dual-gas detectors count as two sensors.

Figures and Diagrams

Figure 6: Front Cover Layout



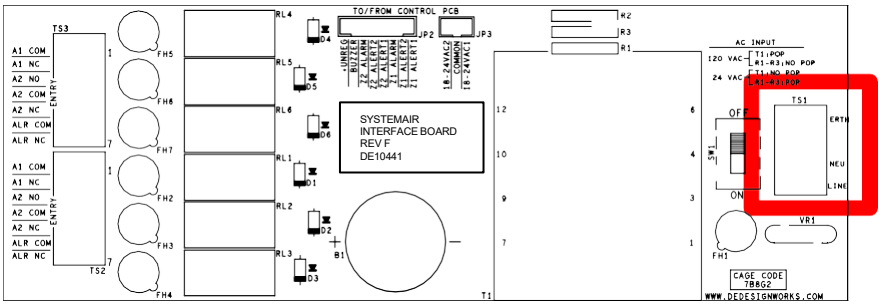
Red		A1 COM
Red		A1 NC
Blue		A2 NO
Blue		A2 COM
		A2 NC
Purple		ALR COM
Purple		ALR NC

Zone 2 (TS3)

Yellow		A1 COM
Yellow		A1 NC
Brown		A2 NO
Brown		A2 COM
		A2 NC
Gray		ALR COM
Gray		ALR NC

Zone 1 (TS2)

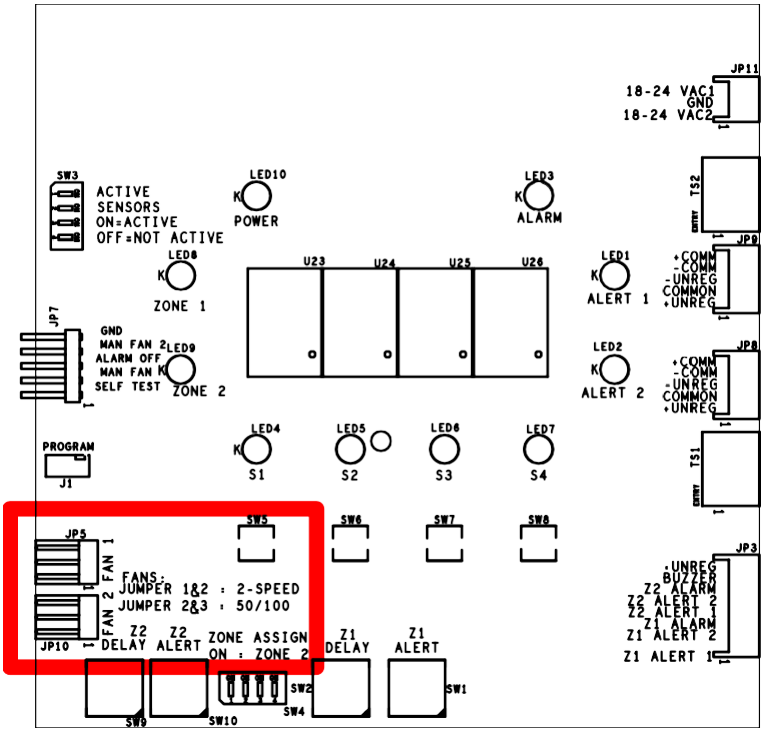
Figure 7: Relay Wiring Color Code

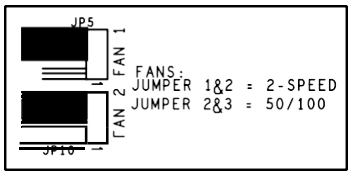


EARTH		Green (120 VAC Only)
HOT		Black
COM		White

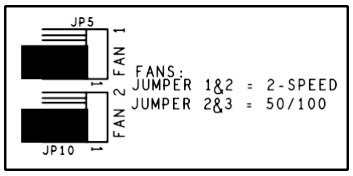
AC Input Wiring (TS1)

Figure 8: Input Power Connections



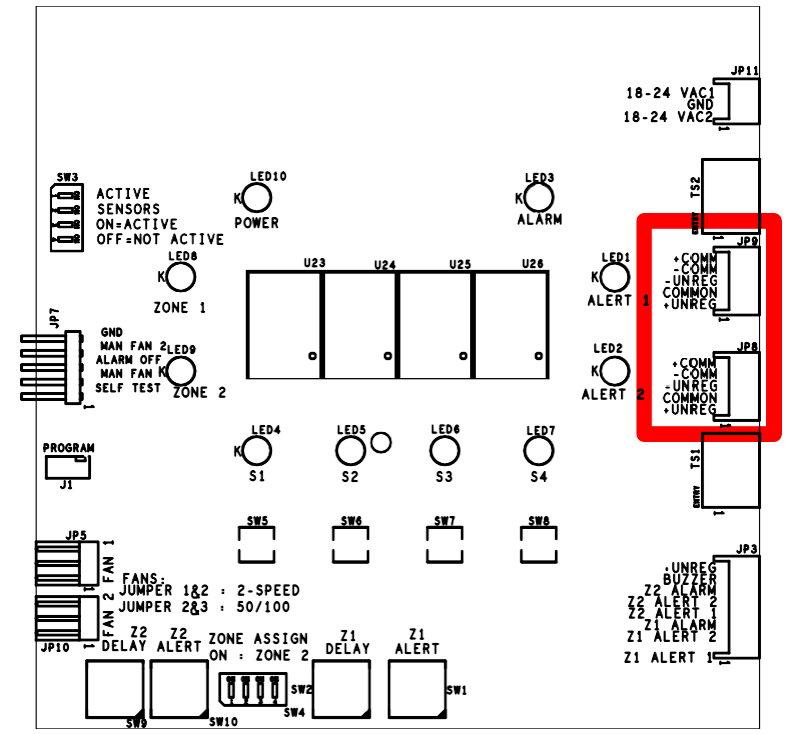


50/100 Configuration
(Factory Default)



2-SPEED Configuration

Figure 9: Fan Settings



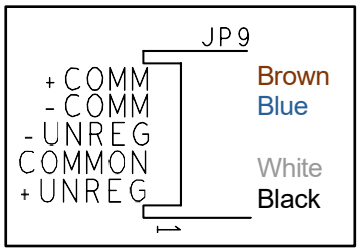


Figure 10: Sensor Wiring Color Code – Control Board

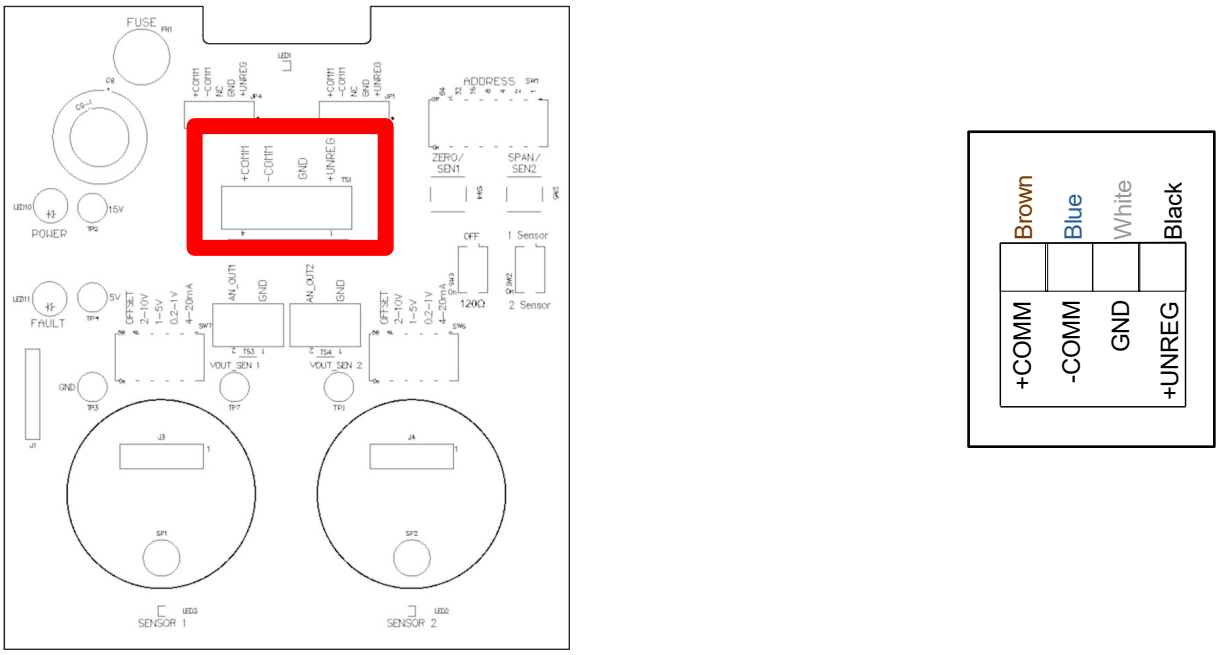


Figure 11: Sensor Wiring Color Code – Sensor Board

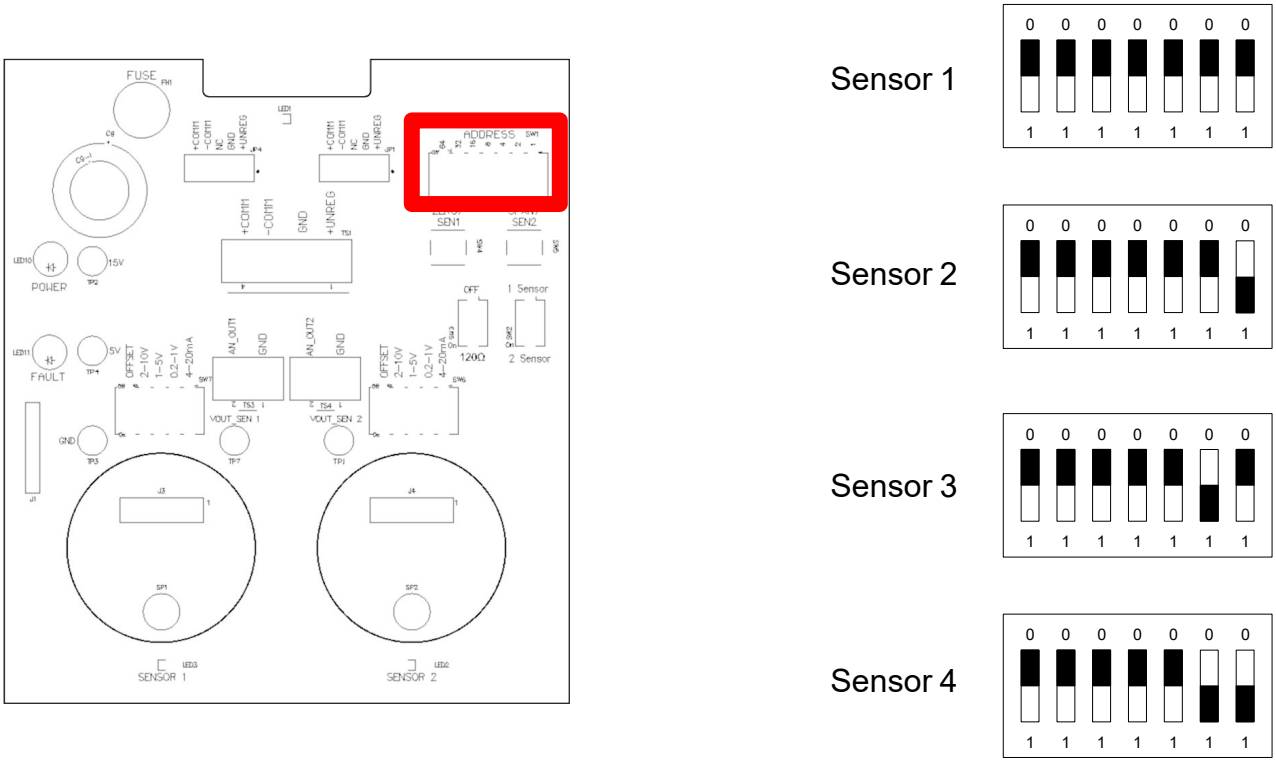
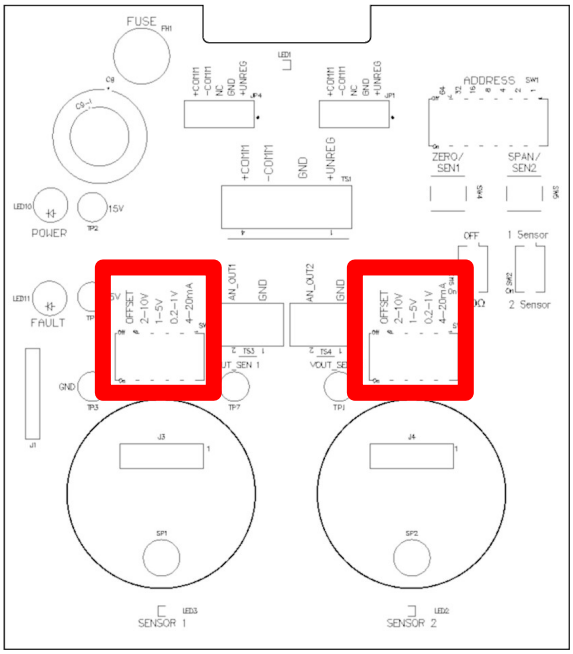
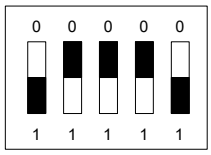


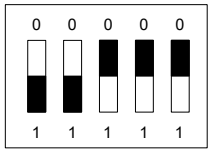
Figure 12: Sensor Board Assignment (Address of First Sensor on Board)



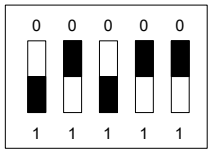
4-20 mA



2-10 VDC



1-5 VDC



0.2-1 VDC

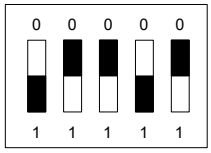
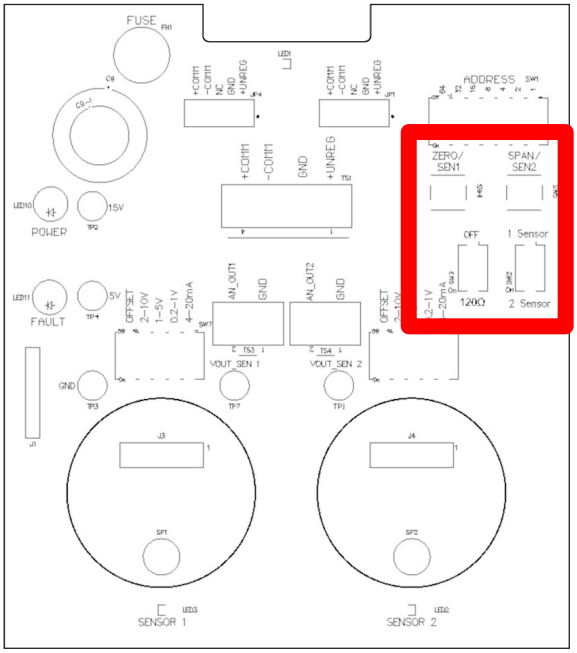


Figure 13: Proportional Output Settings



Set Zero Value/ Select Sensor 1

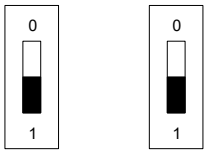
Set Span Value/ Select Sensor 2

Calibration Selection Buttons

OFF

1 SEN

End-of-Line Termination Resistor



Select # of Sensors per Board

120Ω

2 SEN

Figure 14: Sensor Board Auxiliary Settings

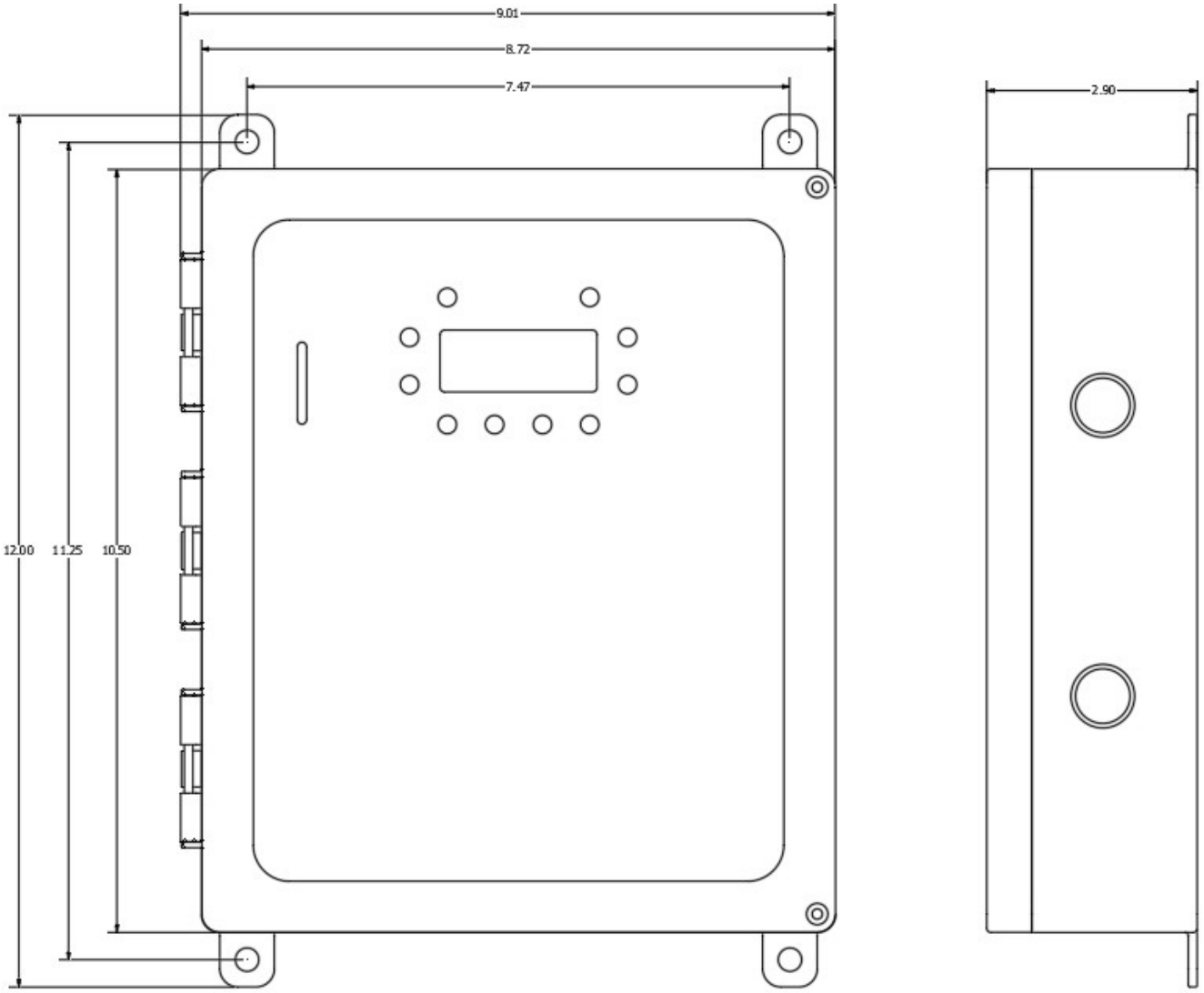


Figure 15: Dimensions (Inches – Not to Scale)

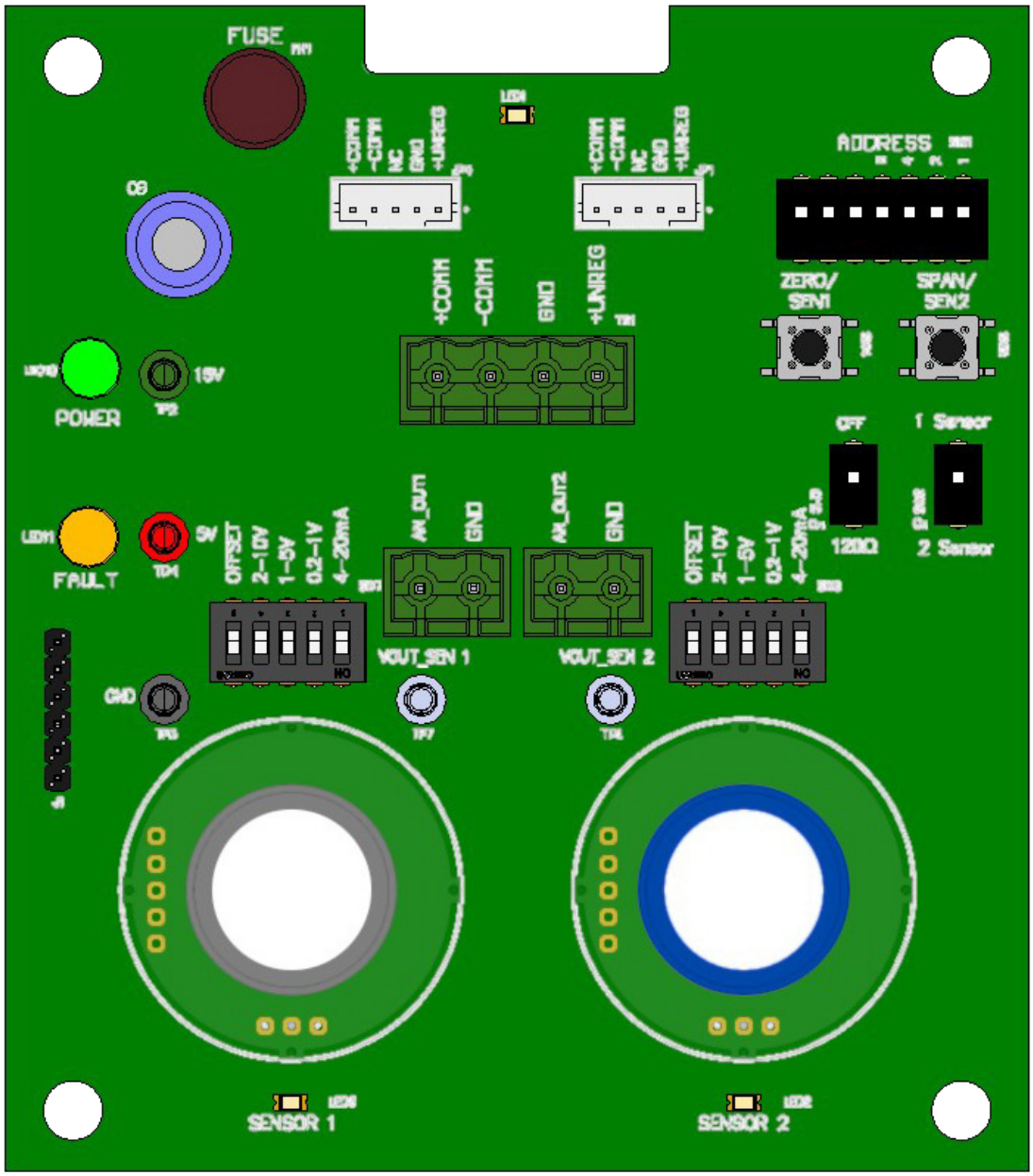


Figure 16: Sensor Board – Enlarged View

Gas	**CO**	**NO_2**	**H_2**
Name	Carbon Monoxide	Nitrogen Dioxide	Hydrogen
Relative Density	0.97	1.58	0.07
Recommended Detection Height	Medium	Medium	High
Hazard	Toxic	Toxic	Combustible
OSHA PEL	50 PPM	1 PPM	
NIOSH REL	35 PPM	1 PPM	
ACGIH TLV	25 PPM	3 PPM	
STEL	400 PPM	1 PPM	
C		5 PPM	
IDLH	1200 PPM	13 PPM	
LEL	12.5% V/V		4% V/V
Reactivity	No	Yes	No

Figure 17: Gas Information

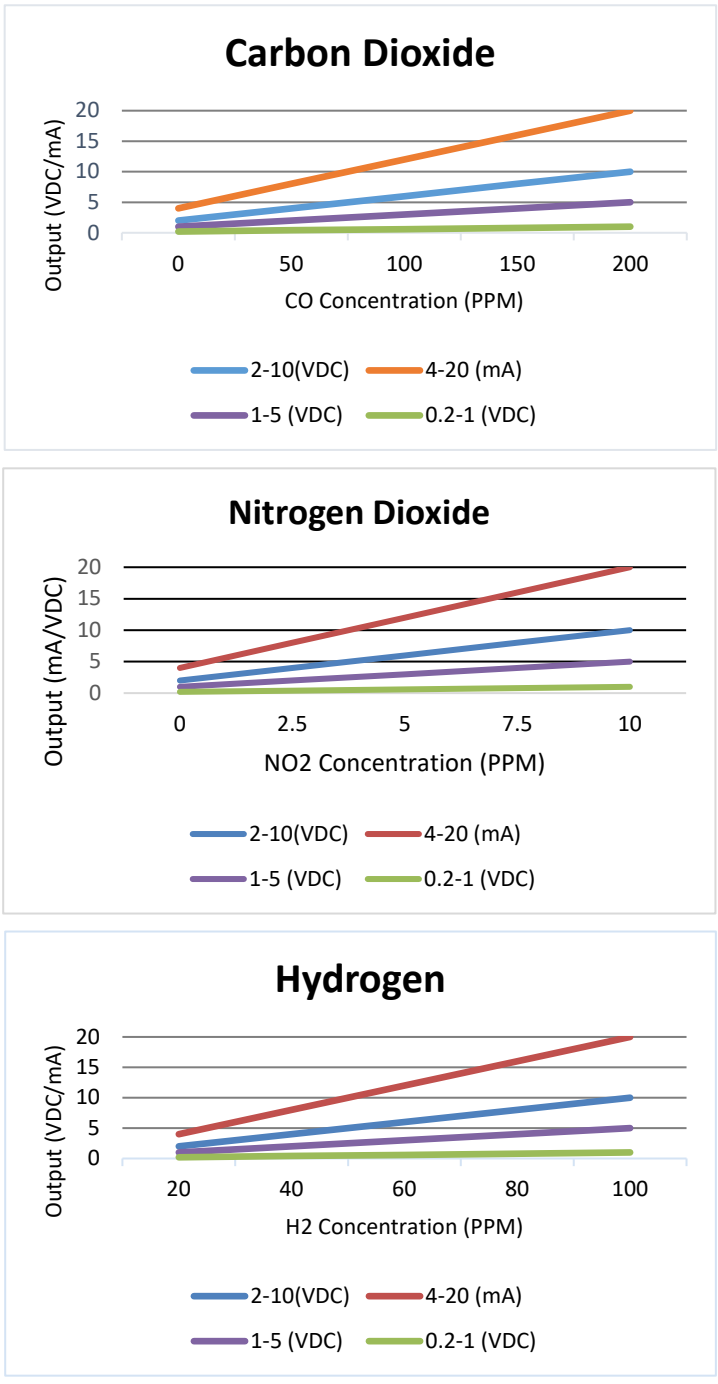


Figure 13: Proportional Output Scales (OFFSET ON)