BRASCH
ENVIRONMENTAL TECHNOLOGIES

Gen 2 Remote Transmitters

Installation / Operation Manual

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Introduction

General Description

The Brasch Environmental Technologies Generation 2 Remote Transmitter is designed to function as a gas sensor and signal transmitter. The transmitter consists of one or two sensors and digital control circuitry. A linear proportional output circuit is able to provide analog signals to a customer-supplied building management controller or a variable-frequency drive. An RS-485 circuit is able to provide two-way digital communication using Modbus RTU. A microprocessor monitors the signal from the sensor(s) and transmits that signal to the output as either an analog or digital signal.

Carbon monoxide, nitrogen dioxide, and oxygen sensors used in the transmitter 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. Methane, propane, and 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.

The transmitter's circuitry consists of a printed circuit board and sensor module(s) mounted inside a polycarbonate housing. The housing has a NEMA 3R rating. Vents are located on the bottom and side of the housing to allow the sensor(s) access to ambient air.

Features and Benefits

- Comprehensive Monitoring
  - Detects CO, NO_2, CH_4, C_3H_8, H_2, and O_2
- Greater Coverage
  - Monitors up to 9,000 sq. ft.
- Enhanced Durability
  - Rainproof Water Resistance
  - Simple Service and Maintenance
- Simplified Installation
  - Factory Calibration
  - Customized Programming
- Versatile Communication
  - Analog Output via User-Selectable Current or Voltage Loop
  - Digital Output via Modbus RTU Communication Protocol
- Effortless Upgrade
  - Works with GSE Generation 2, GDCP-Touch, and most BMS/DDCS/VFDs
  - Fully Backwards Compatible with TRNS Generation 1

Technical Specifications

Product Specifications

Input Power	24 VAC/VDC, 50/60 Hz, 0.35 A
Power Consumption	4.8 VA (Toxic/Oxygen) 6.8 VA (Combustible) 8.5 VA (Dual CO/NO_2)
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	None
Internal Alarm	None
Analog Outputs	4-20 mA, 0.2-1 VDC, 1-5 VDC, or 2-10 VDC with zero offset enable/disable
Digital Output	Modbus RTU
Front Panel Indicators	Power (green LED) Fault (yellow LED)
Dimensions	4.98” W x 4.98” H x 2.18” D (12.6 cm W x 12.6 cm H x 5.5 cm D)
Weight	1 lbs (0.5 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

Model Designation

XX=	CM	ND	NCM	ME	PR	HY	OX
Formula	CO	NO_2	CO + NO_2	CH_4	C_3H_8	H_2	O_2
Name	Carbon Monoxide	Nitrogen Dioxide	Carbon Monoxide & Nitrogen Dioxide	Methane	Propane	Hydrogen	Oxygen

Target Gas Specifications

This Brasch Remote Transmitter is available for monitoring carbon monoxide, nitrogen dioxide, methane, propane, hydrogen, and oxygen as target gases. Regulatory agencies have determined the threshold concentrations at which the gases become dangerous. Brasch Environmental Technologies, LLC has designed their transmitters so that the measurement ranges for each target gas meet the agencies' requirements. Each target gas, for which Brasch currently produces a transmitter, is listed below along with the relevant concentration specifications.

Performance	**CO**	**NO_2**	**CH_4**	**C_3H_8**	**H_2**	**O_2**
Range	0-200 PPM	0-10.0 PPM	0-100% LEL	0-100% LEL	0-100% LEL	0-25% V/V
Resolution	1 PPM	0.1 PPM	1% LEL	1% LEL	1% LEL	0.1% V/V
Calibration Point	100 PPM	5.0 PPM	50% LEL	50% LEL	50% LEL	20.9% V/V
Max Overload	2,000 PPM	200 PPM	N/A	N/A	N/A	30% V/V
T90 Response Time	< 30 seconds	< 50 seconds	< 20 seconds	< 20 seconds	< 20 seconds	< 10 seconds
Coverage Radius	50 ft.	50 ft.	40 ft.	40 ft.	40 ft.	30 ft.
Coverage Area	7,500 sq. ft.	7,500 sq. ft.	5,000 sq. ft.	5,000 sq. ft.	5,000 sq. ft.	3,000 sq. ft.
Technology	Electrochemical	Electrochemical	Catalytic Bead	Catalytic Bead	Catalytic Bead	Electrochemical
Lifespan						
Long Term Output Drift	< 5% per year	< 2% per month	< 5% per month	< 5% per month	< 5% per month	< 1% per year
Expected Sensor Life	> 7 Years	> 5 Years	2 Years	2 Years	2 Years	> 5 Years
Average Calibration Duration	2 Years	1 Year	N/A	N/A	N/A	2 Years

Description of Front Panel Indicators

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

Front Panel Indicators

Indicator	Color	Description
Power	Green	Glows whenever power is on
Fault	Yellow	Glows when expected end-of-life is reached

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 remote transmitter. 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 transmitter(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 12 of this manual.

Step 2 – Power Wiring

WARNING

This transmitter 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 at the required 24 VAC or 24 VDC at each transmitter mounting location. Follow all national and local wiring codes. The wiring should be at least 18 AWG. The circuit must include a disconnect switch located within easy reach of the transmitter or controller.

CAUTION

Operating this transmitter 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 Brasch Environmental Technologies, LLC before connecting power to the transmitter if you are unsure of the correct power requirement.

Step 3 – Communication Wiring

The transmitter conveys its sensor signal over two wires. Use a two-conductor shielded twisted pair (STP) cable of at least 24 AWG for each transmitter in the system.

> Note
>
> Ensure that the signal connections between each transmitter and between the transmitters and any controllers are correct. If the connections are wired incorrectly, the transmitters will be unable to communicate.
>
> Use a cable with color-coded conductors and make sure that the same conductor connects to the same terminal on each transmitter and the controller.

Multiple remote transmitters, regardless of gas type, should be connected in a daisy chain pattern. All transmitters share the same conductors back to the controller. Ensure the communication wires are a twisted pair and shielded from the power conductors. A single cable may be used for both power and communication provided it has the proper internal and external shielding. On the transmitter farthest from the controller, enable the RS-485 termination resistor (SW3) to reduce signal reflections.

See figures 1 and 2 on page 18 for wiring diagrams.

Step 4 – Analog Output Wiring

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.

Step 5 – Applying Power

Once you are sure that the wiring connections are correct, apply power to the transmitter circuit. When power is first applied, the green power indicator will glow, indicating the transmitter is active. The unit will begin a 90-second warm-up before taking any gas measurements and providing meaningful outputs.

See page 17 for more information concerning the initial startup.

At this point, the transmitter is now ready to monitor for the presence of the target gas.

Installation

Mounting the Transmitter

The ability of the transmitter to sense the target gas depends greatly upon proper selection of the mounting location. This transmitter 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 vent and pass by the sensor on its way out the exhaust vent. Therefore, the transmitter 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.
- The types of gases each unit is designed to monitor have varying densities. For CO, NO_2, and O_2, mount the unit at the average breathing height – approximately 5 to 7 feet from the floor. For CH_4 and H_2, mount the unit at or near the ceiling. For C_3H_8, mount the unit 12 to 18 inches above the floor.
- 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 transmitter is attached in the mounting position in one of three ways.

- Attach the housing to conduit using appropriate conduit fittings. If you use this method, make sure that the conduit is securely attached to a solid support. Firmly tighten the threaded nuts on the conduit fittings inside the transmitter housing so they will not loosen over time.
- Attach the housing to a four inch square conduit box using the ½ inch fitting provided with the transmitter. Make sure that the conduit box is firmly fastened to the mounting surface with screws. Securely tighten the fitting nut on the inside of the conduit box so it will not loosen over time.
- Attach the housing to a solid support base using screws through the mounting feet.

  Find a flat area at least six inches high by six inches long 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 transmitter 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.

While this transmitter 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 transmitter. The easiest way to avoid much of this interference is by providing power to the transmitter 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 transmitter.

Note

Do not operate the transmitter on the same AC circuit with the ventilation components. Doing this will almost always cause improper transmitter operation.

Provide a dedicated circuit at the required 24 VAC or 24 VDC at each transmitter mounting location. Follow all national and local wiring codes. The wiring should be at least 18 AWG. The circuit must include a disconnect switch located within easy reach of the transmitter or controller.

Be sure that the step-down transformer provides 24 VAC and has the necessary VA rating. The power requirements for each transmitter are listed on the label on the back of the unit.

CAUTION

Operating this transmitter 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 Brasch Environmental Technologies, LLC before connecting power to the transmitter if you are unsure of the correct power requirement.

Connecting to a GSE Generation 2 Standalone Detector

If connecting the remote transmitter(s) to a Brasch GSE Generation 2 Standalone Detector, the detector will supply the operating power to each transmitter. 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 transmitter for power. The remaining two conductors carry the signal from the transmitter to the controller. These two signal conductors should be a shielded twisted pair (STP). See figure 3 on page 19 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 transmitter and between the transmitters and the Brasch controller be correct. If the connections are wired incorrectly, damage to both the transmitters 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 transmitter and the controller.

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

Multiple remote transmitters, regardless of gas type, should be connected in a daisy chain pattern. All transmitters share the same conductors back to the controller. Therefore, a four-conductor cable can be connected from transmitter to transmitter, or from transmitter 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 diagram on page 19 to determine the proper connections at the controller. On the transmitter farthest from the controller, enable the RS-485 termination resistor (SW3) to reduce signal reflections.

Connecting to a GDCP-Touch Multi-Zone Control Panel

If connecting the remote transmitter(s) to a Brasch GDCP-Touch Multi-Zone Control Panel, the same power supply may be used to power both the control panel and the transmitter(s). 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 transmitter for power. The remaining two conductors carry the signal from the transmitter to the controller. These two signal conductors should be a shielded twisted pair (STP). See figure 3 on page 19

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 transmitter and between the transmitters and the Brasch controller be correct. If the connections are wired incorrectly, damage to both the transmitters 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 transmitter and the controller.

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

Multiple remote transmitters, regardless of gas type, should be connected in a daisy chain pattern. All transmitters share the same conductors back to the controller. Therefore, a four-conductor cable can be connected from transmitter to transmitter, or from transmitter 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 diagram on page 19 to determine the proper connections at the controller. On the transmitter farthest from the controller, enable the RS-485 termination resistor (SW3) to reduce signal reflections.

Connecting the Voltage or Current 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. A detailed description of these outputs can be found starting on page 21.

See figure 1 on page 18 for a wiring diagram.

Connecting the Modbus Output

Brasch Gas Transmitters also include a circuit that provides digital communication via Modbus RTU protocol. This output allows a client device to read the firmware version, gas sensor type, gas sensor value, and any error codes associated with the transmitter. Use a two-conductor shielded twisted pair (STP) cable of at least 24 AWG for each transmitter in the system.

See figure 2 on page 18 for a wiring diagram. A more complete description, including instructions on setting up the client, is available in the dedicated Modbus Setup Guide.

Applying Power For the First Time

Once you are sure that the wiring connections are correct, apply power to the transmitter circuit. When power is first applied, the green power indicator will glow, indicating the transmitter is active. The unit will begin a 90-second warm-up to allow the sensor time to stabilize. Once the warm-up sequence is complete, the transmitter will begin taking gas measurements and providing both analog and digital outputs to any connected devices. If the remote transmitter is connected to a Brasch controller, the display will show dashes during the warm-up phase, after which the actual gas concentration will appear.

At this point, the transmitter is now ready to monitor for the presence of the target gas.

Installation Diagrams

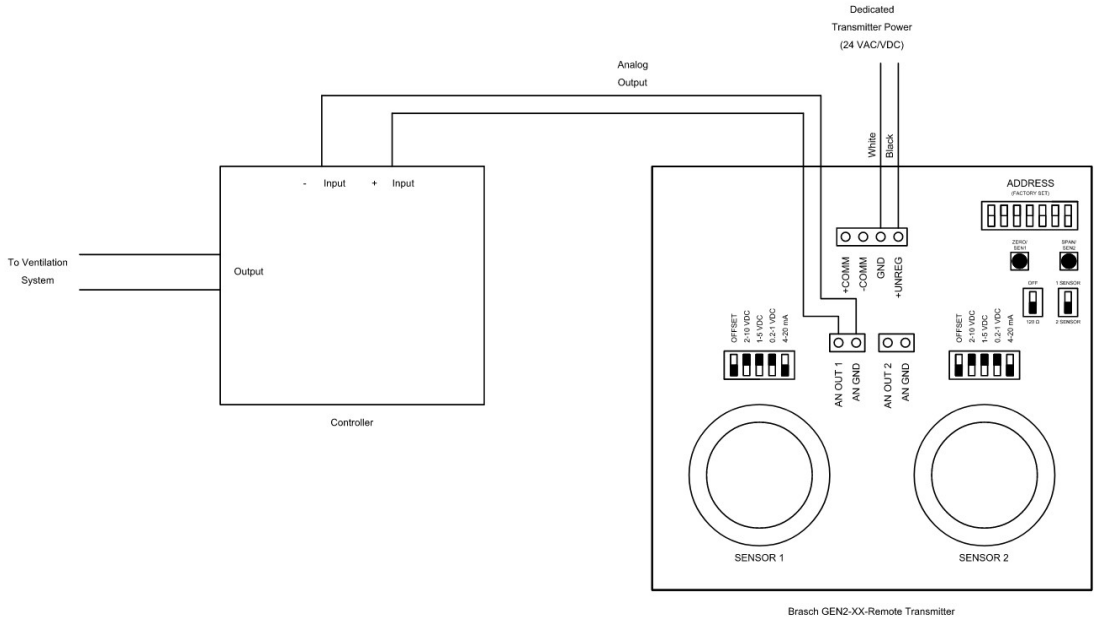


Figure 1: Wiring – Analog Output Configuration

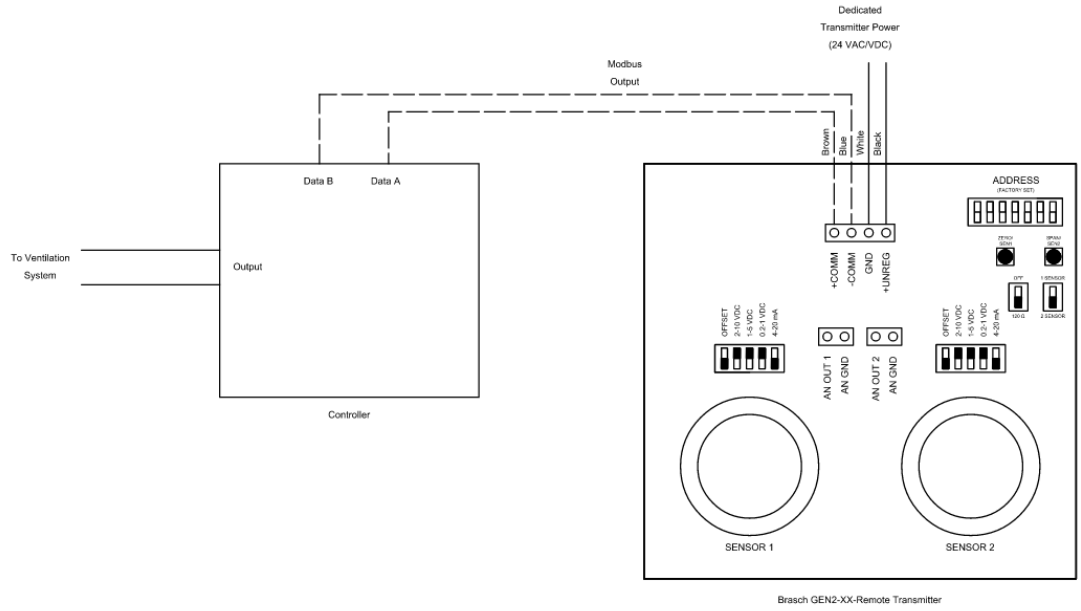


Figure 2: Wiring – Digital Output Configuration

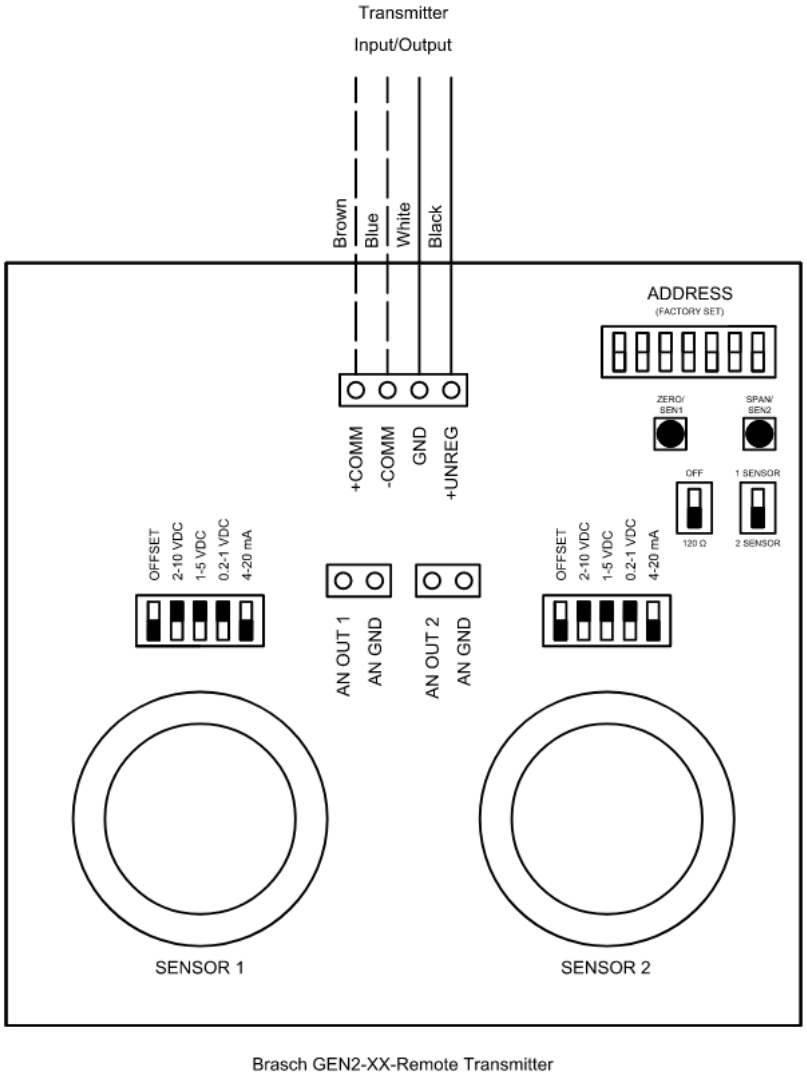


Figure 3: Wiring – Remote Transmitter to GSE Generation 2/GDCP-Touch

Operation

How the Transmitter Senses the Target Gas

Ambient air surrounding the transmitter housing diffuses inside the housing where it comes into contact with the sensor. Although the transmitter'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 vent, past the sensor, and out the upper vent. Any target gas present in this air causes a response from the sensor. If the transmitter 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 transmitter, please read the mounting guidelines on page 12. This transmitter 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.

Factory Default Settings

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

Setting	**Default**
Sensor 2	Active if Applicable
RS-485 Termination	Off
Analog Proportional Output Signal	4-20 mA
Zero Offset	Enabled

Each sensor ordered will be addressed 1 through 128 as applicable. Sensor addressing should not be changed unless adding or removing a sensor. Consult Brasch technical support before altering the sensor addresses.

Adjusting the Settings

Note
Any settings changes will take effect immediately. Incorrect settings may cause improper operation. Always verify that the settings change had the desired 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 6 on page 32 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 transmitter may use two addresses. Each transmitter 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.

Sensor 2 Enable

If more than one sensor module is present, SW2 should be in the “2 Sensor” position. If only one sensor module is present, SW2 should be in the “1 Sensor” position. See figure 9 on page 34 for details. Enabling the second sensor module also claims an additional address value. This address is the value set at SW1 plus one. Each transmitter comes preset from the factory with the correct number of sensor modules enabled, so this switch should not be touched except for in very specific cases. Please consult with the factory before enabling or disabling Sensor 2.

RS-485 Termination

In following with the RS-485 protocol, a 120 Ω termination resistor should be installed at the beginning and end of each communication bus. Moving SW3 to the “ON” position will enable the built-in 120 Ω termination resistor between the positive and negative communication lines. See figure 9 on page 34 for details. This switch comes preset in the “OFF” position from the factory, so it will need to be enabled in the field after the daisy chain has been established.

Adjusting the 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 Analog Proportional Output

This Brasch Remote Transmitter 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 8 on page 34 for the terminal strip locations and signal mode selection switches.

Unless otherwise specified, the transmitter is shipped from the factory with both switches set in the 4-20 mA current loop mode. Ensure that power to the transmitter 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 13 on page 38 of this manual.

As an example, a Brasch Carbon Monoxide Transmitter 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 transmitters are designed to monitor for a rising concentration of the target gas. Oxygen transmitters are designed to monitor for a falling concentration of oxygen. 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 transmitter(s) influence how effective the system is in sensing the target gas concentration.

With most installations, the only variable that can be changed is the location of the transmitter. In some cases, you may find that a target gas source is too close to the transmitter. Consider other mounting locations for the transmitter or move the gas source farther away.

Maintenance

Testing the Response to the Target Gas

Testing these transmitters requires that the target gas be applied to the sensor from a tank of air containing a known concentration of the target gas. While it is possible to test sensors 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 sensors.

CAUTION
Allowing the transmitter 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 transmitter 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 cannot 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 registered at the outputs 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, Brasch Environmental Technologies recommends testing oxygen and toxic transmitters once every six months and combustible transmitters 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 11 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 17. 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. For methane and propane sensors, use 50% LEL methane. For oxygen, use an inert gas (e.g., nitrogen or argon) and zero air. A 0.3 LPM regulator, tubing, and gas cup will also be needed. Refer to figure 9 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 transmitter 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 transmitter 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 Brasch Remote Transmitter products. Please consult your local Brasch representative for pricing and availability.

Part Number	Description
GEN2-PCB	Sensor Board
GEN2-F1A	1 A, 250 VAC Sensor Board Fuse
MOD-CM	Carbon Monoxide Sensor Module
MOD-ND	Nitrogen Dioxide Sensor Module
MOD-ME	Methane Sensor Module
MOD-PR	Propane Sensor Module
MOD-HY	Hydrogen Sensor Module
MOD-OX	Oxygen Sensor Module

Troubleshooting

Fault

The yellow LED on the front panel will glow to indicate a fault condition with a sensor. This is activated upon a sensor reaching the expected end of its useful lifetime.

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 fault is being displayed, the area covered by the sensor will be unmonitored. The proportional output will also send a 0 mA or 0 VDC signal depending on the output settings.

When this fault appears, replace the sensor module.

Checking and Replacing Fuses

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

There is one TR5 time-lag fuse protecting the input circuitry of the transmitter. The fuse located at FH1 is rated at 1.0 Amp. Test the fuse for resistance and replace if the reading is not near 0 Ω. Always replace fuses with one having the same rating and characteristics.

Common Installation/Operation Mistakes

Proportional Output Connected Incorrectly

The proportional output is polarity sensitive with terminals marked AN OUT and GND. When connected to another device, these terminals must correspond. Reversing these connections will result in inaccurate readings or no readings at all.

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 transmitter 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.

Using Improper Resistance/Impedance

If using the 4-20 mA current loop mode, the resistance of the cable connecting the output to the controller must be less than 250 Ω. If using one of the voltage modes, the input impedance of the controller must be greater than 100 kΩ. If these requirements are not adhered to, the proportional output will not accurately reflect the concentration of gas measured by the sensor.

Using Unshielded and/or Non-Twisted Cable for Communication

The communication lines are a differential pair and must be twisted to prevent self-inflicted interference. Furthermore, the communication lines must be shielded from any outside source, including other conductors carrying transmitter power in the same conduit. If the communication lines are not wired with a shielded twisted pair cable, communication loss may occur.

Transmitter Mounted in an Unsatisfactory Location

For reliable operation, the transmitter(s) must be mounted in the proper locations. Please read “Mounting the Transmitter” on page 12 for guidelines on choosing locations.

Common mistakes include mounting a transmitter too close to a garage door. When the door is open, rain may blow through the doorway and onto the transmitter housing. Another common mistake is to mount the transmitter 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 transmitter too near the outlet of air conditioners or heaters. Quick, drastic changes in ambient temperature can cause erratic shifts in the transmitter readings.

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

Limited Warranty

Warranty Statement

Brasch Environmental Technologies, LLC warrants gas transmitters, gas detectors, control panels, 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, Brasch Environmental Technologies 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 Brasch instructions, this warranty is void. The cost to repair, replace, or service any component is not the responsibility of Brasch. Any replacement parts or service necessary must be paid in full prior to shipment or performance.

Service and Repair Procedures

Our goal at Brasch Environmental Technologies is to produce products that constantly exceed the requirements and expectations of our customers. One of the ways of meeting that goal is to produce products that never fail or require service. However, when we are notified of a problem with one of our products, it is our intention to address the problem as quickly and efficiently as possible.

Many problems that appear at first to be associated with the product can be solved without returning the product. If you experience a problem and would like to discuss it with a factory service technician, you may call the number listed on the product label. You will be transferred to a technician specially trained to service that product. This technician will help you determine the most efficient way of solving the problem.

If service or repair of your Brasch product becomes necessary, an authorization request for returning the product to the Brasch factory must be obtained from our sales office. If you are an end user, please contact your Brasch distributor to initiate this request. The distributor, after obtaining a description of the problem, will contact the factory and request a Return Goods Tag (RGT) number. This number must be placed in a conspicuous location on the outside of the shipping package. Without this RGT number, Brasch will not accept the shipment. A brief description of the reason for returning the product should be included in the package. Without this description, repair may take longer than necessary.

You may, at the time you request service, request an estimate on the time it will take for repair. The Brasch representative will give you an estimate based upon the information you provide. Although Brasch Environmental Technologies, LLC will repair and return your product in as short a time as possible, Brasch cannot be held responsible for meeting repair estimates.

Appendix

Model Numbers and Descriptions

Each Brasch Remote Transmitter is given a model number that describes the type of target gas. This model number appears on the label on the front panel.

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

Transmitter Model Number and Description

Example:	GEN2	-NCM	-Remote
	1	2	3

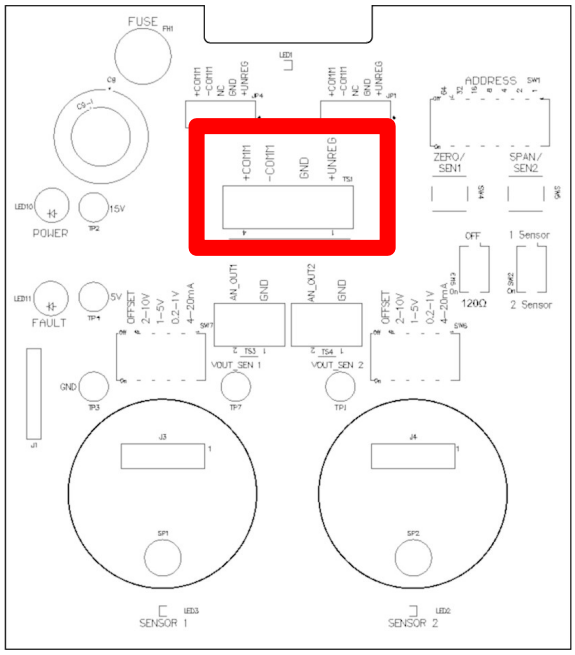
1. Product Line
   a) GEN2 – Generation 2
2. Type(s) of Gases Detected
   a) -CM – Carbon Monoxide
   b) -ND – Nitrogen Dioxide
   c) -NCM – Nitrogen Dioxide and Carbon Monoxide
   d) -OX – Oxygen
   e) -ME – Methane
   f) -PR – Propane
   g) -HY – Hydrogen
3. Remote
   a) -Remote – Universal Remote Transmitter

Complete Model Number List

CO	**NO_2**	**CO/NO_2**	**CH_4**	**C_3H_8**	**H_2**	**O_2**
GEN2-CM-Remote	GEN2-ND-Remote	GEN2-NCM-Remote	GEN2-ME-Remote	GEN2-PR-Remote	GEN2-HY-Remote	GEN2-OX-Remote

Figures and Diagrams

Figure 4: Front Cover Layout



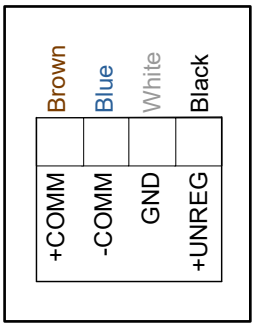
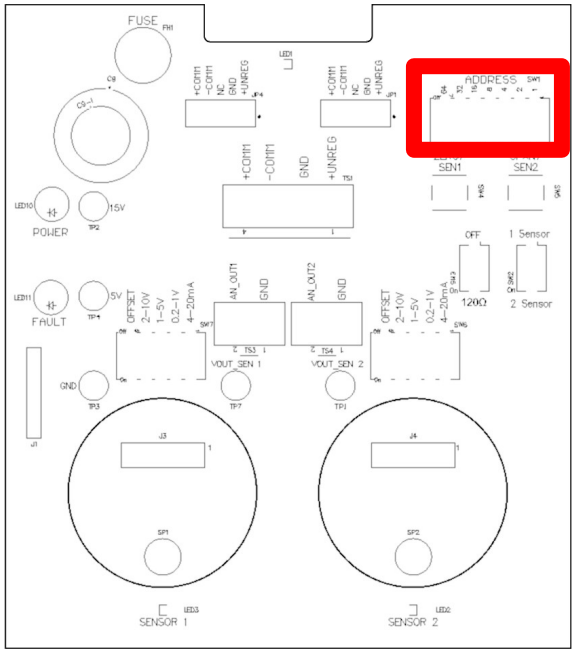


Figure 5: Transmitter Wiring (Brasch Color Code)



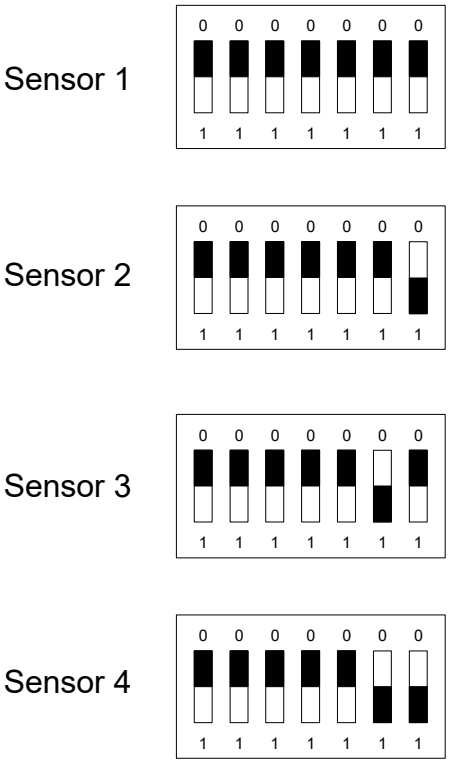


Figure 6: Addressing (Address of First Sensor on Board)

Transmitter Address	Switch Position	Transmitter Address	Switch Position	Transmitter Address	Switch Position	Transmitter Address	Switch Position
1	0000000	33	0100000	65	1000000	97	1100000
2	0000001	34	0100001	66	1000001	98	1100001
3	0000010	35	0100010	67	1000010	99	1100010
4	0000011	36	0100011	68	1000011	100	1100011
5	0000100	37	0100100	69	1000100	101	1100100
6	0000101	38	0100101	70	1000101	102	1100101
7	0000110	39	0100110	71	1000110	103	1100110
8	0000111	40	0100111	72	1000111	104	1100111
9	0001000	41	0101000	73	1001000	105	1101000
10	0001001	42	0101001	74	1001001	106	1101001
11	0001010	43	0101010	75	1001010	107	1101010
12	0001011	44	0101011	76	1001011	108	1101011
13	0001100	45	0101100	77	1001100	109	1101100
14	0001101	46	0101101	78	1001101	110	1101101
15	0001110	47	0101110	79	1001110	111	1101110
16	0001111	48	0101111	80	1001111	112	1101111
17	0010000	49	0110000	81	1010000	113	1110000
18	0010001	50	0110001	82	1010001	114	1110001
19	0010010	51	0110010	83	1010010	115	1110010
20	0010011	52	0110011	84	1010011	116	1110011
21	0010100	53	0110100	85	1010100	117	1110100
22	0010101	54	0110101	86	1010101	118	1110101
23	0010110	55	0110110	87	1010110	119	1110110
24	0010111	56	0110111	88	1010111	120	1110111
25	0011000	57	0111000	89	1011000	121	1111000
26	0011001	58	0111001	90	1011001	122	1111001
27	0011010	59	0111010	91	1011010	123	1111010
28	0011011	60	0111011	92	1011011	124	1111011
29	0011100	61	0111100	93	1011100	125	1111100
30	0011101	62	0111101	94	1011101	126	1111101
31	0011110	63	0111110	95	1011110	127	1111110
32	0011111	64	0111111	96	1011111	128	1111111

Figure 7: Transmitter Addresses and Switch Positions

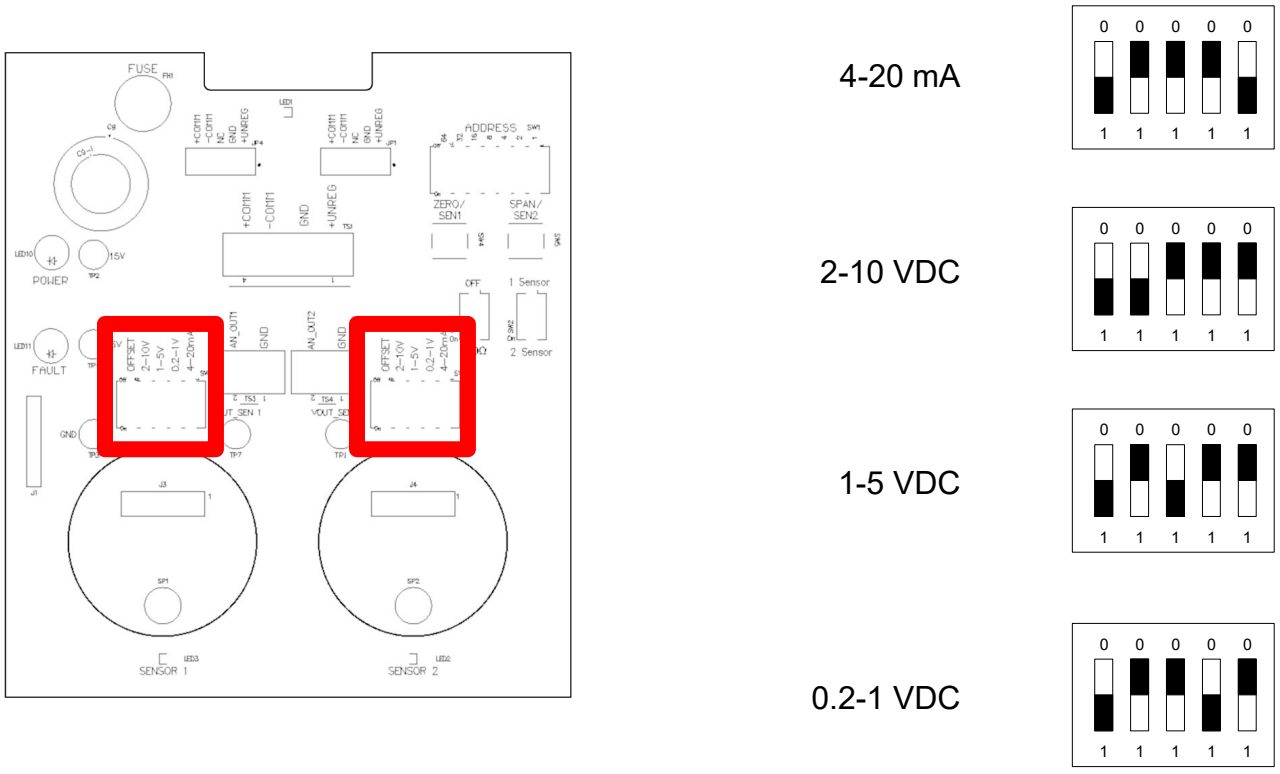


Figure 8: Proportional Output Settings

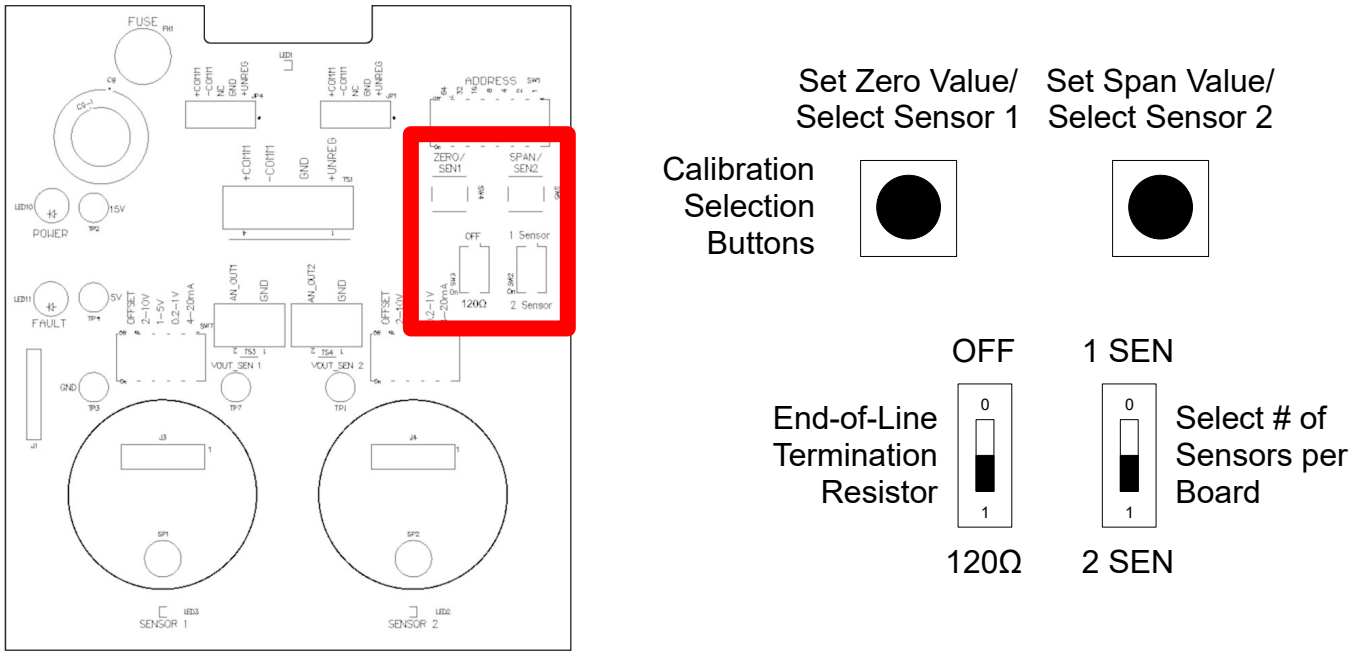


Figure 9: Sensor Board Auxiliary Settings

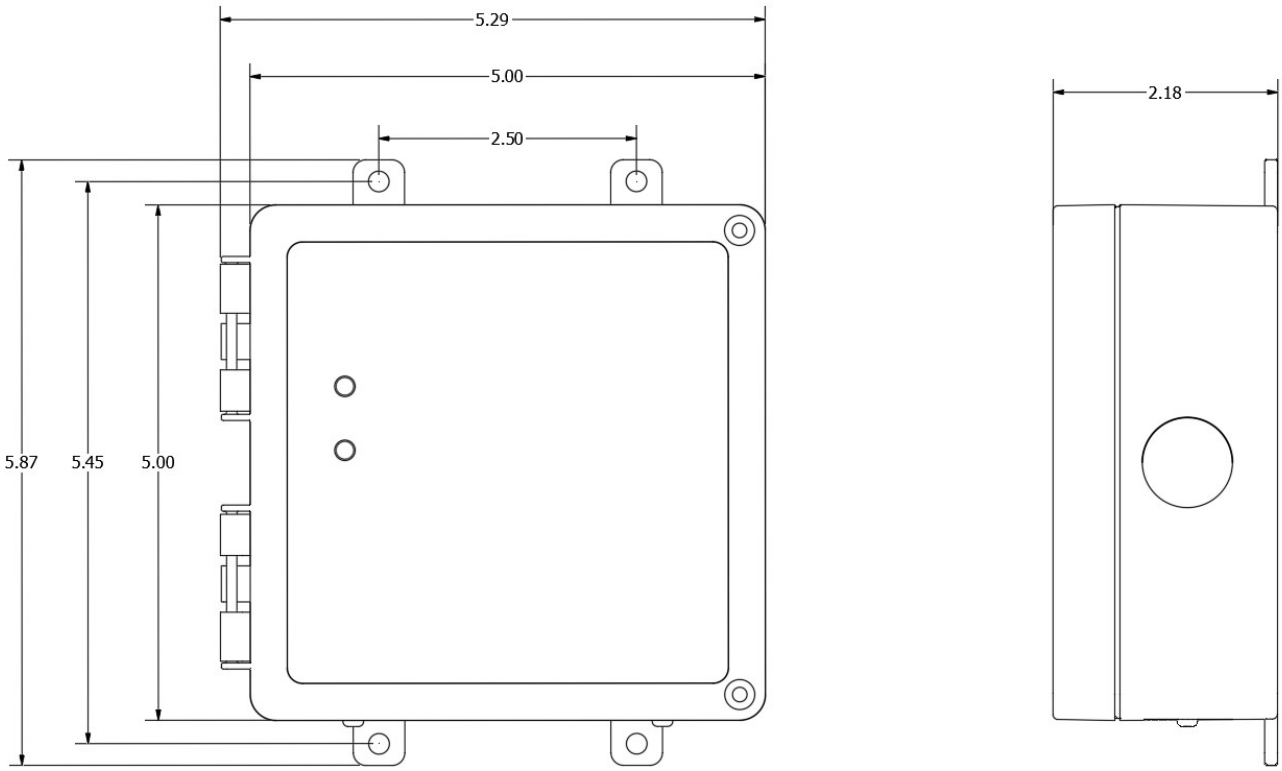


Figure 10: Dimensions (Inches – Not to Scale)

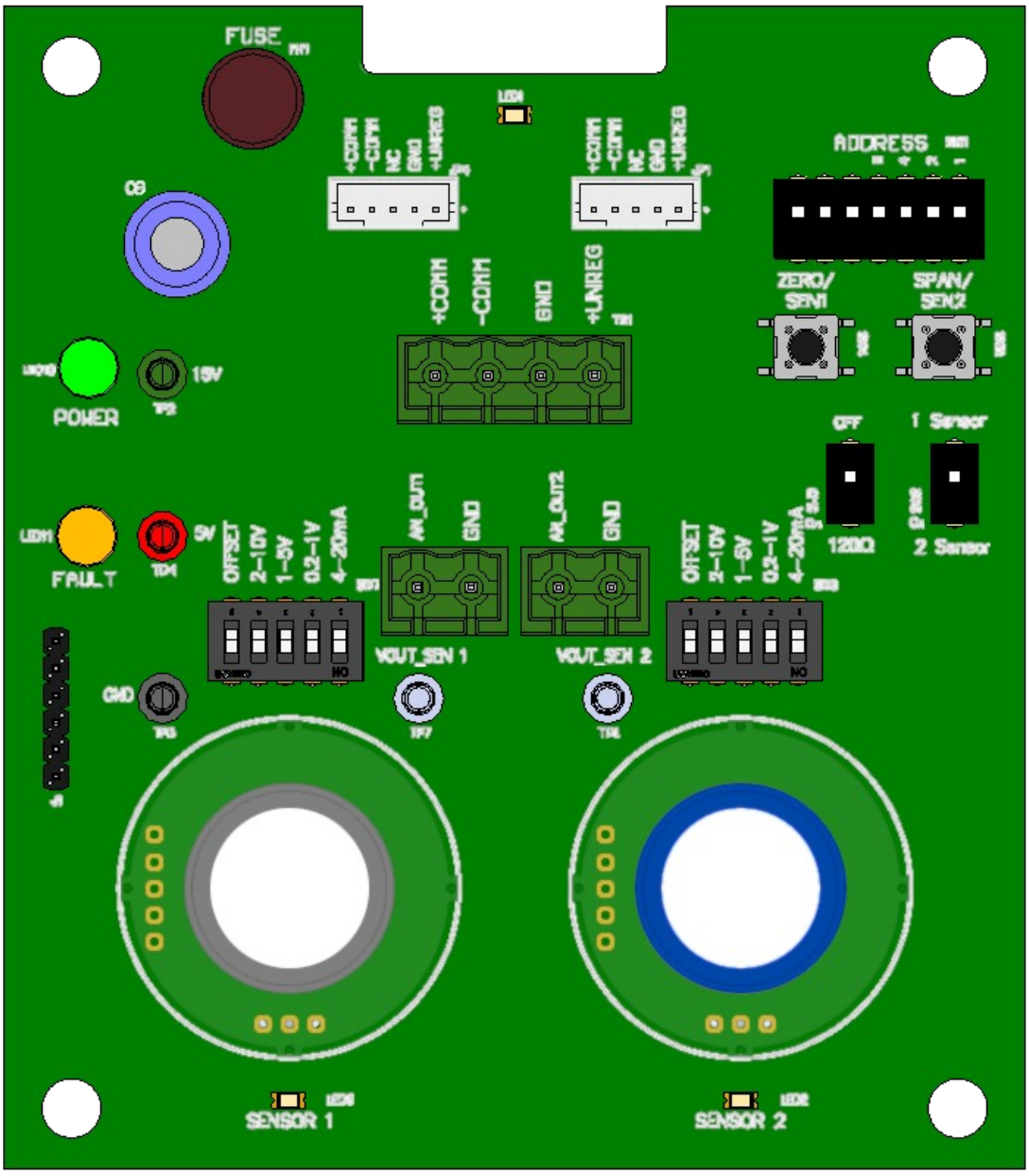


Figure 11: Sensor Board – Enlarged View

Gas	**CO**	**NO_2**	**CH_4**	**C_3H_8**	**H_2**	**O_2**
Name	Carbon Monoxide	Nitrogen Dioxide	Methane	Propane	Hydrogen	Oxygen
Relative Density	0.97	1.58	0.55	1.52	0.07	1.11
Recommended Detection Height	Medium	Medium	High	Low	High	Medium
Hazard	Toxic	Toxic	Combustible	Combustible	Combustible	Asphyxiant
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		5% V/V	2.1% V/V	4% V/V	
Reactivity	No	Yes	No	No	No	No

Figure 12: Gas Information

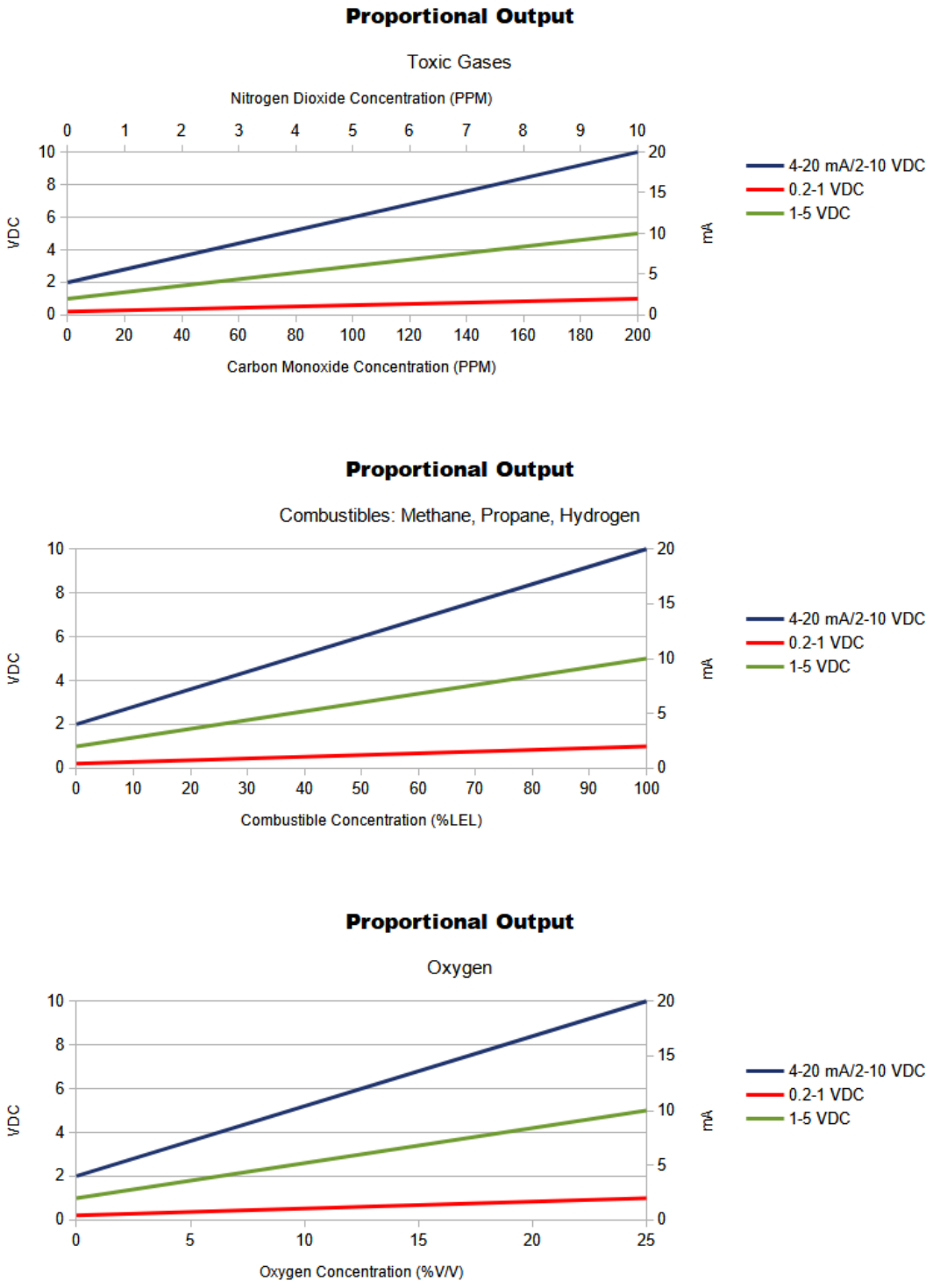


Figure 13: Proportional Output Scales (OFFSET ON)

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