

ENMET Corporation
PO Box 979
Ann Arbor, MI 48106-0979

Catalytic & MOS
Sensor/Transmitter Installation
Manual

80003-029

MCN-182, 02/11/98
MCN-204, 02/29/00
MCN-230, 02/29/00
MCN-234, 04/25/00
MCN-240, 10/30/00
MCN-247, 11/21/00
MCN-253, 04/05/01
MCN-265, 12/13/01
MCN-290, 11/20/02

Table of Contents

1.0 INTRODUCTION.....	1
1.0.1 Unpack	1
1.0.2 Check Order.....	1
1.0.3 Serial Numbers.....	1
1.2 Features of Sensor / Transmitter.....	2
1.2.1 Magnetic Switches and Potentiometers	2
2.0 CATALYTIC COMBUSTIBLE GAS SENSOR/TRANSMITTER INSTALLATION	3
2.1 Installation.....	3
2.1.1 Mounting	3
2.1.2 Wiring	4
2.2 Calibration.....	4
2.3 Standard Range and Alarm LED.....	5
3.0 MOS COMBUSTIBLE AND TOXIC VAPOR SENSOR/T TRANSMITTER INSTALLATION.....	6
3.1 Installation.....	6
3.1.1 Mounting	6
3.1.2 Wiring	7
3.2 Initial Calibration.....	8
3.3 Purge	8
3.4 Span Adjustment.....	8
3.5 Calibration.....	8
4.0 WARRANTY.....	9
ADDENDUM : AMMONIA CALIBRATION.....	10

List of Illustrations

Figure 1a: Features of Sensor/Transmitter.....	2
Figure 1: Mounting Dimensions of Catalytic Combustible Gas Sensor/Transmitter.....	3
Figure 2: Terminal Strip Positions for Catalytic Combustible Gas Sensor/Transmitter.....	4
Figure 3: Catalytic Combustible Gas Sensor/Transmitter.....	5
Figure 4: Mounting Dimensions of MOS Sensor/Transmitter.....	6
Figure 5: Terminal Strip Positions for MOS Sensor/Transmitter.....	7
Figure 6: Gas cylinder and Typical Calibration Adapter.....	8
Figure 7: Calibration Adapter with Humidifier.....	8

Reference information:

NOTE: [important information about use of instrument – if not followed may have to redo some steps.]

CAUTION: [affects equipment – if not followed may cause damage to instrument, sensor etc...]

WARNING: [affects personnel safety – if not followed may cause bodily injury or death.]

1.0 Introduction

The **ENMET** catalytic and MOS sensor/transmitters (S/T) are, three or four wire 4-20 ma S/T for the detection of combustible and toxic gas. They are meant to be used in conjunction with an appropriate power supply and *controller*. Each S/T is in an enclosure rated for use in a Class I, Div. 1, Groups B, C, D, classified area.

NOTE: *All specifications stated in this manual may change without notice.*

1.0.1 Unpack

Unpack the **sensor/transmitter (S/T)** and examine it for shipping damage. If such damage is observed, notify both **ENMET** customer service personnel and the commercial carrier involved immediately.

Regarding Damaged Shipments

NOTE: It is your responsibility to follow these instructions. If they are not followed, the carrier will not honor any claims for damage.

- This shipment was carefully inspected, verified and properly packaged at our company and delivered to the carrier in good condition.
- When it was picked up by the carrier at **ENMET**, it legally became your company's property.
- If your shipment arrives damaged:
 - Keep the items, packing material, and carton "As Is." Within 5 days of receipt, notify the carrier's local office and request immediate inspection of the carton and the contents.
 - After the inspection and after you have received written acknowledgment of the damage from the carrier, contact **ENMET** Customer Service for return authorization and further instructions. Have your Purchase Order and Sales Order numbers available.
- ENMET** either repairs or replaces damaged equipment and invoices the carrier to the extent of the liability coverage, usually \$100.00. Repair or replacement charges above that value are your company's responsibility.
- The shipping company may offer optional insurance coverage. **ENMET** only insures shipments with the shipping company when asked to do so in writing by our customer. If you need your shipments insured, please forward a written request to **ENMET** Customer Service.

Regarding Shortages

If there are any shortages or questions regarding this shipment, please notify **ENMET** Customer Service within 5 days of receipt at the following address:

ENMET Corporation
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 734-761-3220 Fax

1.0.2 Check Order

Check, the contents of the shipment against the purchase order. Verify that the **S/T** is received as ordered. Each **S/T** is labeled with its target gas. If there are accessories on the order, ascertain that they are present. Check the contents of calibration kits. Notify **ENMET** customer service personnel of any discrepancy immediately.

1.0.3 Serial Numbers

Each **S/T** is serialized. These numbers are on tags on the equipment and are on record in an **ENMET** database.

1.2 Features of Sensor / Transmitter

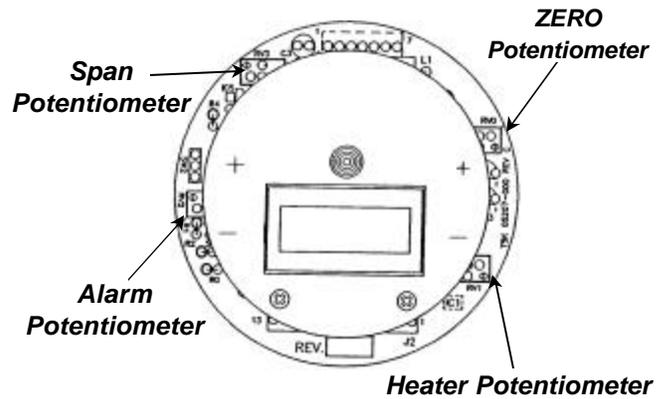
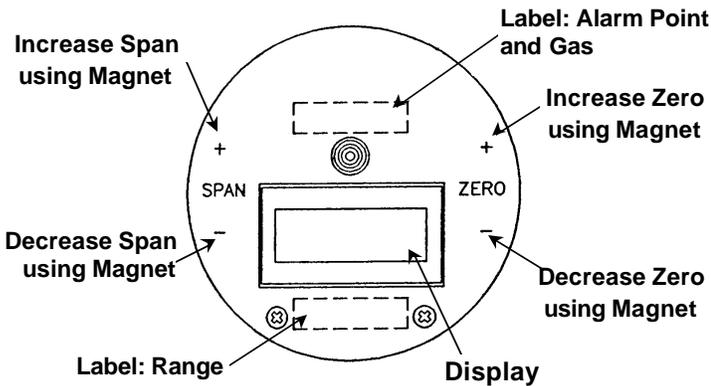
1.2.1 Magnetic Switches and Potentiometers

Magnetic switches control the span and purge potentiometer; a magnetic field pulse is applied by momentarily putting the end of the magnet in proximity to the switch and then removing it. Since the magnetic field penetrates the window, the enclosure cover is not removed in order to perform calibration.

The switch locations are indicated by “+ and -”. “+” increases the value and “-” decreases it. Incremental changes in span can be obtained by momentarily putting the end of the magnet in proximity to the switch and then removing it; when the magnet is held in proximity to the switch and not removed, the switch indexes continuously to the end of its range.

See **figure 1a**, Locations of Typical Indicators and Controls on Display Plate for the locations of the following magnetic switches

+	Span increase	For increasing span.	}	NOTE: Do not adjust these unless calibration gas is applied to the sensor.
-	Span decrease	For decreasing span.		
P	Purge	When the purge option is present. For cleaning of a contaminated sensor, the heater voltage is increased up to 20% by activating the purge switch for a short time. There is an associated yellow LED, indicating when purge is activated.		



CAUTION: This POT is factory set; resetting may damage sensor

Locations of Typical Indicators and Controls on Display Plate

Potentiometer Locations

Figure 1a: Features of Sensor/Transmitter

See **figure 1a, Potentiometer Locations** for the locations of the following manual potentiometers on the S/T circuit board:

RV0	Zero	For zeroing of the display in clean air. Refer to calibration procedure, section 3.2 use this potentiometer before applying calibration gas.
RV1	Heater	For adjusting the heater voltage of MOS sensors. Do not reset this potentiometer unless advised by ENMET personnel.
RV2	Alarm	For setting the point at which the red LED on the S/T face plate is illuminated. Use the zero potentiometer to set the display at the alarm point value desired, then use this potentiometer to set the LED to turn on at this point. Then return the display to zero. The factory default setting is the high alarm set point.
RV3	Span	For manually setting the span. <i>Do not reset this potentiometer unless advised by ENMET personnel.</i>

CAUTION: Area must be declassified before removing cover to access these potentiometers.

2.0 Catalytic Combustible Gas Sensor/Transmitter Installation

The **ENMET** catalytic combustible gas sensor/transmitter (S/T) is a three or four wire 4-20 mA S/T for the detection of combustible gas. The S/T is meant to be used in conjunction with an appropriate power supply and controller. The S/T is in an enclosure rated for use in a Class I, Div. 1, Groups B, C, D, classified area.

2.1 Installation

CAUTION: Area must be declassified during installation.

2.1.1 Mounting

Mount the enclosure, using the two mounting holes provided see **figure 1**. Pay particular attention to the source and density of the gas being detected when choosing the location.

CAUTION: Before connecting S/T to controller remove the power source to controller. Failure to do so may cause damage to sensitive components.

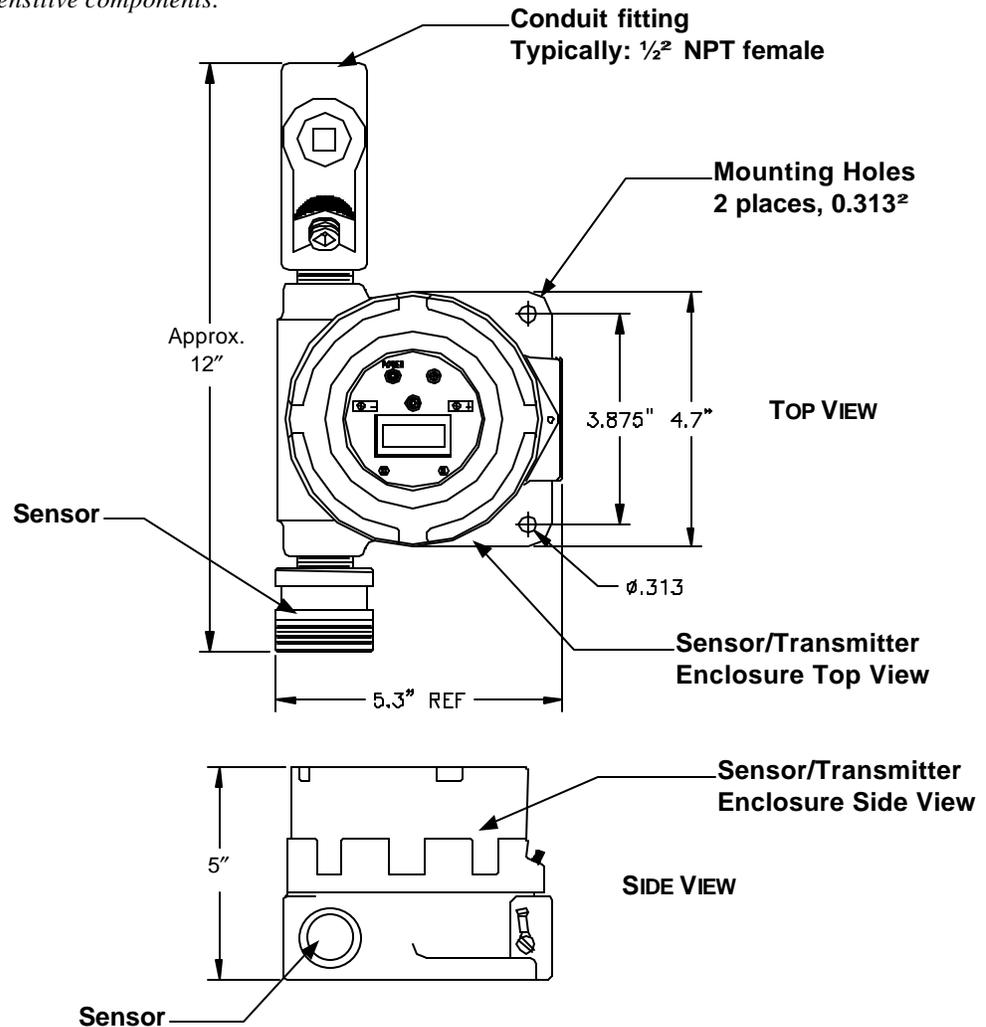


Figure 1: Mounting Dimensions of Catalytic Combustible Gas Sensor/Transmitter

2.1.2 Wiring

Run conduit and 16 AWG wires to the enclosure from the power supply and controller. Since combustible gas may be present, the S/T may be installed in a Class I Division 1 classified area as defined by the National Electrical Code, and wiring must meet the provisions of that Code. All wires must pass through the seal fitting provided, and the fitting must be potted after wiring is complete.

Open the enclosure, and remove the display from the circuit board by pulling it straight out. Release the two circuit board retaining screws and remove the circuit board, exposing the terminal strip in the bottom of the enclosure. Do not disconnect the circuit board wiring.

Connect the wires from the power supply and controller to the terminal strip. See **figure 2** locations are as follows:

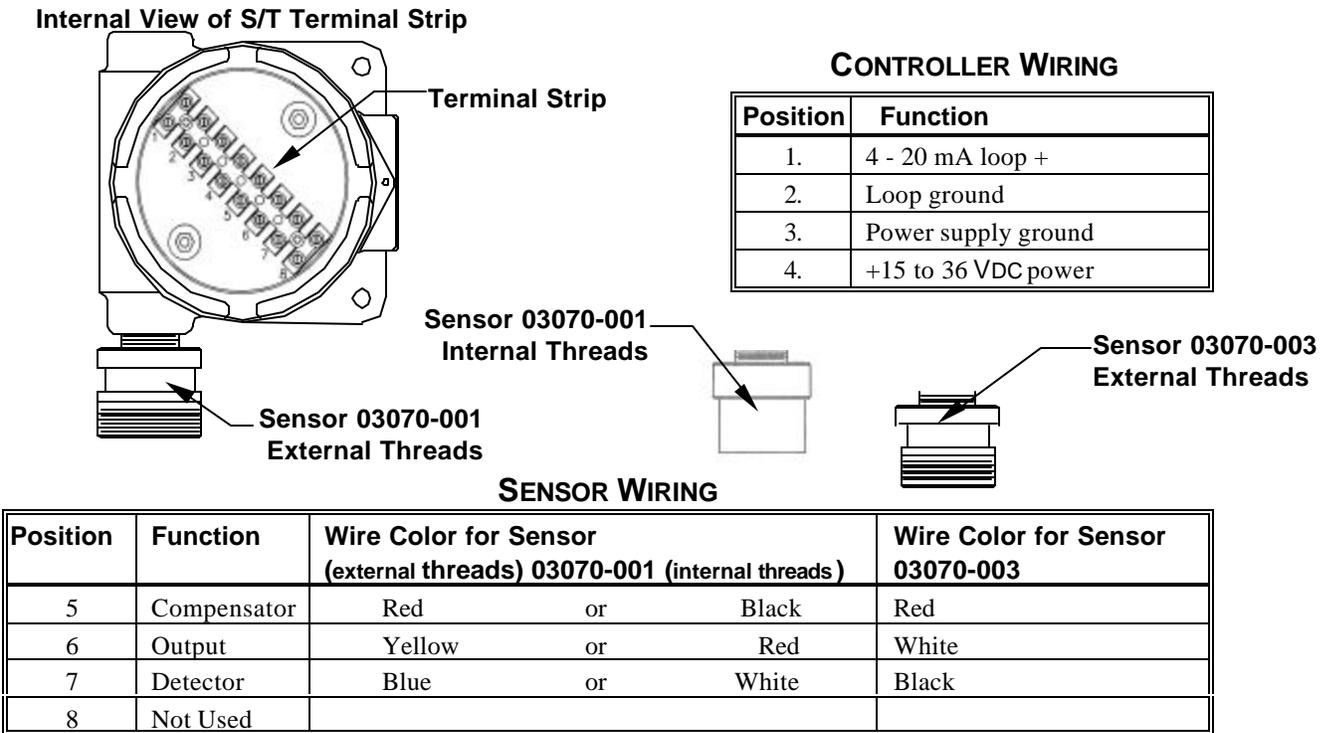


Figure 2: Terminal Strip Positions for Catalytic Combustible Gas Sensor/Transmitter

When using the S/T as a three wire device, use either ground as both power supply and loop ground.

After connecting the wires, replace the circuit board and the display, assure the LEDs are in the lenses. Replace the enclosure cover.

See the instruction manual of the Controller being used with this S/T for the connection locations for these wires.

2.2 Calibration

Wait 24 hours after initially supplying power to the sensor/transmitter(S/T) before initial calibration. The S/T has been precalibrated at the factory, and initial field calibration should result in only fine tuning to circuit, as well as a way to check that installation is successful. It is not necessary to open the enclosure to make adjustment; the span and zero potentiometers are operated with magnets from outside the enclosure.

CAUTION: Do not open in classified area.

Do Not Adjust The Span Potentiometer Without Calibration Gas Applied to The Sensor; if this is done, the S/T is rendered uncalibrated and incorrect. Magnetic switches control the span and zero potentiometers. The switch locations are indicated by “+ and – Span” and “+ and – Zero” on the display panel per **Figure 3**; “+” increases the value and “–” decreases it. Incremental changes in span and zero can be obtained by momentarily putting the end of the magnet in proximity to the switch and then removing it; when the magnet is held in proximity to the switch and not removed, the switch indexes continuously to the end of its range.

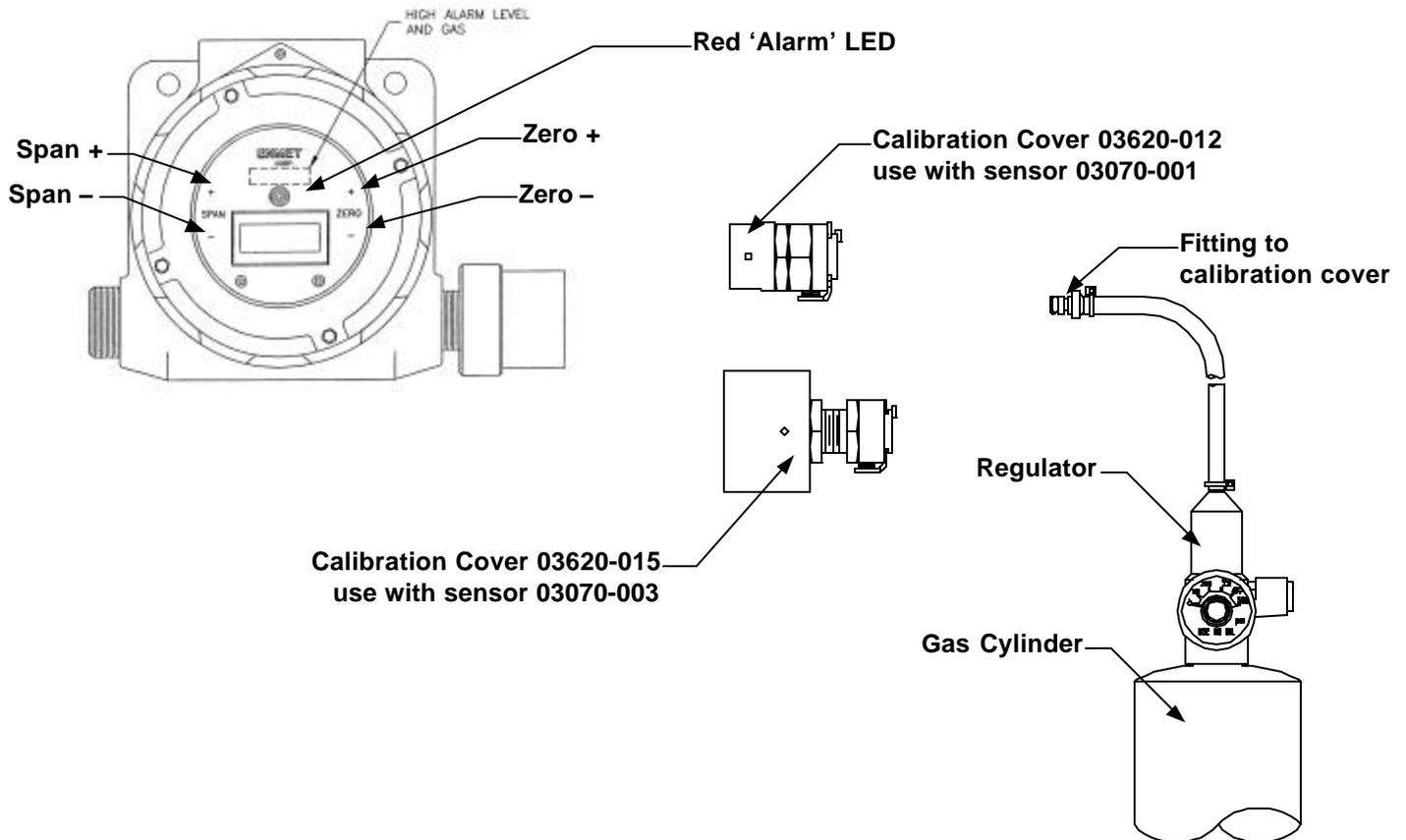


Figure 3: Catalytic Combustible Gas Sensor/Transmitter

1. Apply the calibration gas associated with the S/T to the sensor. See to **Figure 3**.
2. Allow the gas to flow 3 minutes.
3. Use the magnet to adjust the span potentiometer up or down, until the display reads the calibration gas value.
4. Remove the calibration gas.
5. In clean air, adjust the zero point if necessary, using the magnet to adjust the zero potentiometer.
6. If the zero point adjustment is large, greater than 10% LEL, apply the calibration gas again, and make a second span adjustment.
7. Calibration is complete.

2.3 Standard Range and Alarm LED

The standard range is 0-100%LEL of the combustible gas being monitored, with 100%LEL producing 20mA in the loop. The red alarm LED is set to turn on at the high alarm level of the gas. The high alarm level and particular gas are indicated above the LED.

3.0 MOS Combustible and Toxic Vapor Sensor/Transmitter Installation

3.1 Installation

CAUTION: Area must be declassified during installation.

3.1.1 Mounting

Mount the enclosure, using the two mounting holes provided see **figure 4**. Pay particular attention to the source and density of the gas being detected when choosing the location.

CAUTION: Before connecting S/T to controller remove the power source to controller. Failure to do so may cause damage to sensitive components.

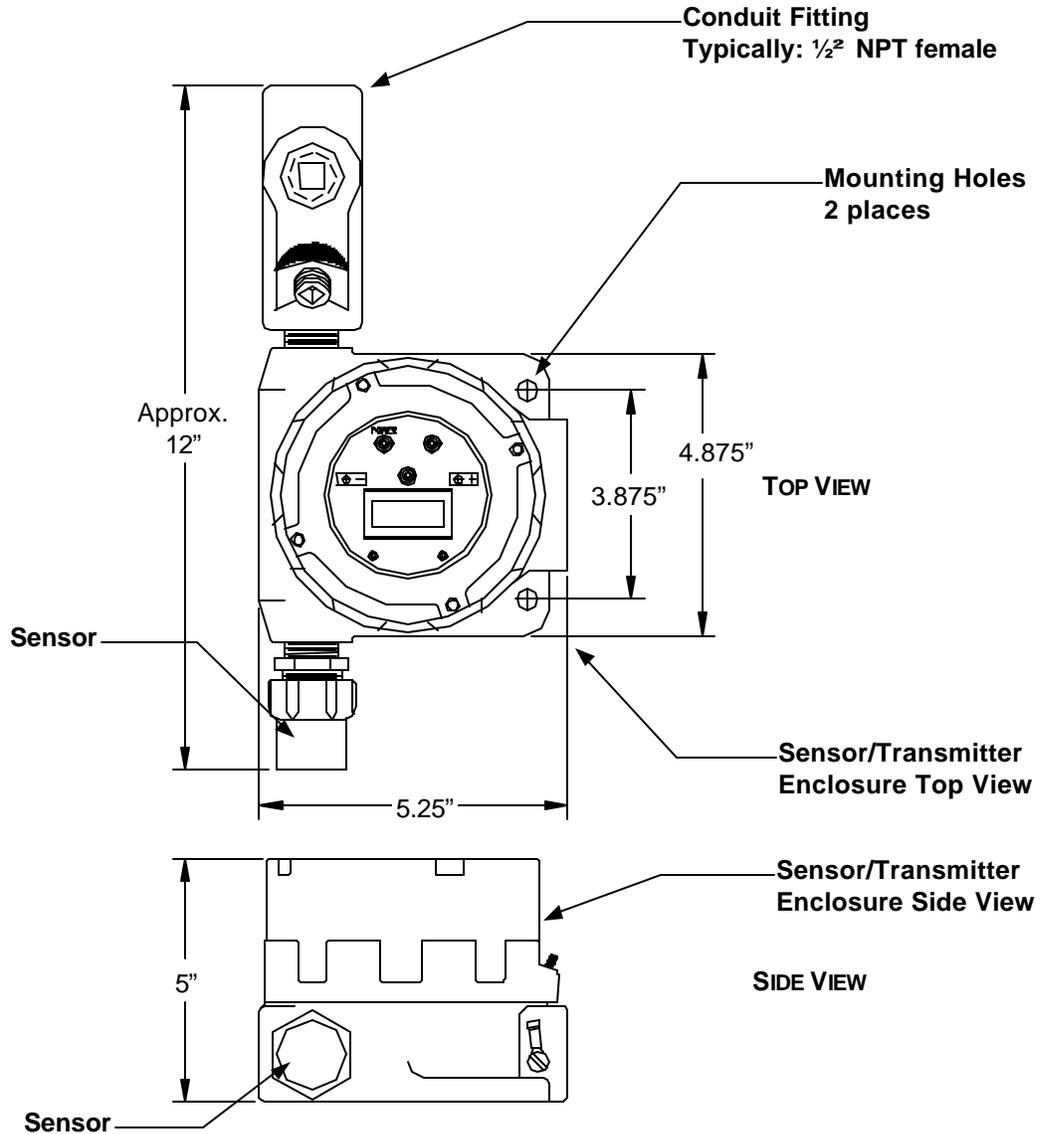


Figure 4: Mounting Dimensions of MOS Sensor/Transmitter

3.1.2 Wiring

Run conduit and 16 AWG wires to the enclosure from the power supply and controller. Since combustible gas may be present, the S/T may be installed in a Class I Division 1 classified area as defined by the National Electrical Code, and wiring must meet the provisions of that Code. All wires must pass through the seal fitting provided, and the fitting must be potted after wiring is complete.

Open the enclosure, and remove the display from the circuit board by pulling it straight out. Release the two circuit board retaining screws and remove the circuit board, exposing the terminal strip in the bottom of the enclosure. Do not disconnect the circuit board wiring.

Connect the wires from the power supply and controller to the terminal strip TB1.

See **figure 5** locations are as follows:

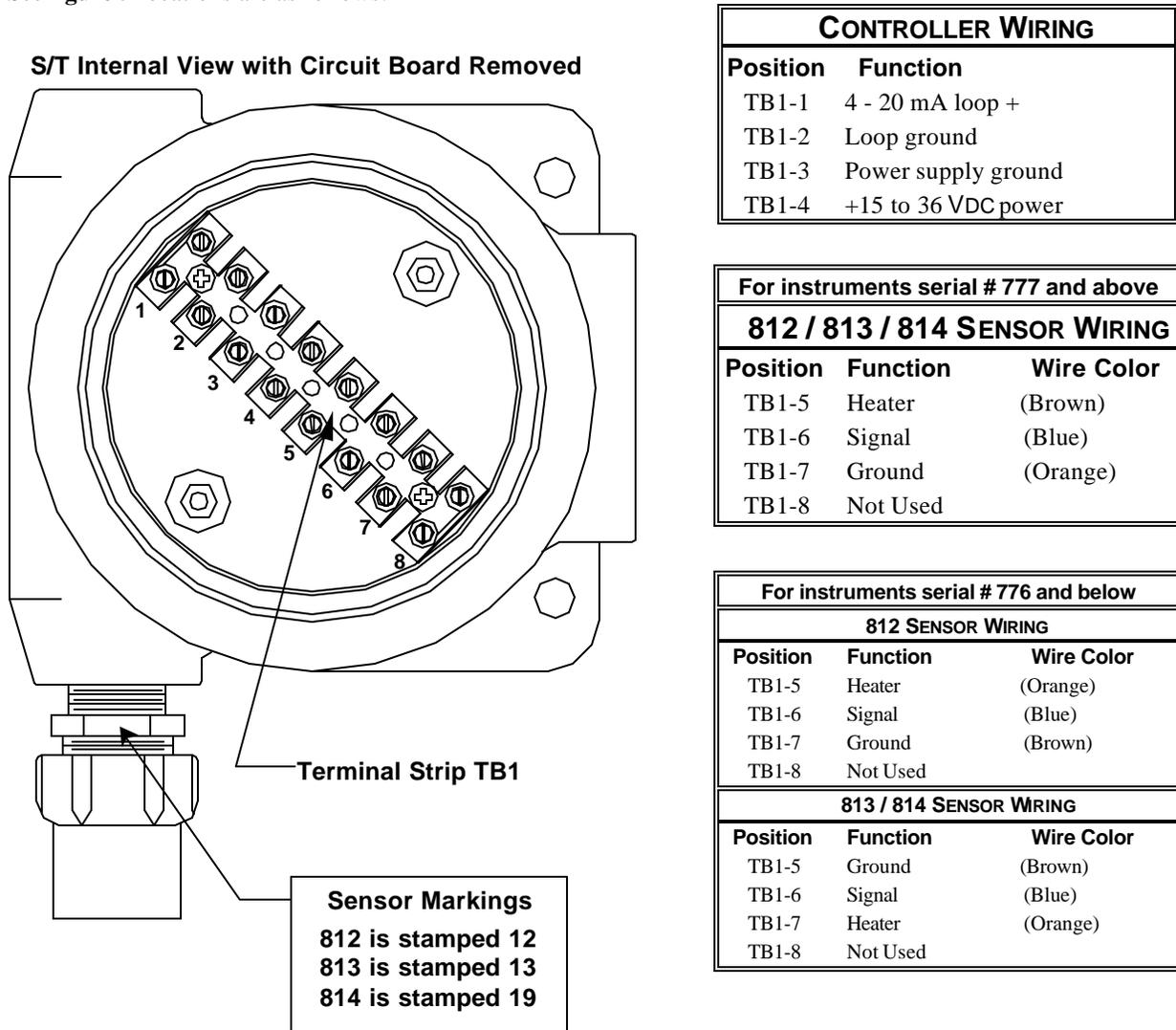


Figure 5: Terminal Strip Positions for MOS Sensor/Transmitter

See the instruction manual of the Controller being used with this S/T for the connection locations for these wires.

When using the S/T as a three wire device, use either ground as both power supply and loop ground.

After connecting the wires, replace the circuit board and the display; assure the LEDs are in the lenses. Replace enclosure cover.

3.2 Initial Calibration

The S/T has been precalibrated at the factory before shipment, and initial field calibration should result in only fine-tuning of the circuit. Wait at least 24 hours after initially supplying power to the S/T before initial calibration. If purge option is available, see purge section 3.3.

It is important to zero the S/T before applying the calibration gas. If the display is not reading at or very close to zero, apply clean air to the sensor.

If sensor does not zero:

- ***Declassify the area before opening the enclosure.***
- Apply clean air (20.9% O₂ 78.1% N₂) to the sensor and adjust the *zero manual potentiometer* to provide a reading of zero on the display. See the circuit board diagram **figure 1a** for the location of this potentiometer.
- Then close the enclosure.

NOTE: These potentiometers are accessible without removing the display plate.

3.3 Purge

When this option is present, activate before calibration. While activating the purge switch the yellow LED is lit to indicate the purge switch is active. A sensor needs only 10 to 30 seconds of purge. After removal of magnet the switch and heater voltage will return to their normal state. After purge, the sensor needs to stabilize for 30 minutes before applying calibration gas.

3.4 Span Adjustment

Do Not Adjust the Span Potentiometer Without Calibration Gas Applied To The Sensor; if this is done, the S/T is rendered uncalibrated and incorrect.

- If your calibration kit is supplied with a humidifier, fill the humidifier bowl half way with clean tap water. See **figure 7**
- Attach the calibration adapter to the cylinder of gas associated with the S/T. See **figure 6**
- Attach the calibration cover over the sensor. See **figure 6**
- Apply the calibration gas to the sensor typically 3 minutes.
- Use the magnet to adjust the span potentiometer up or down, until the display reads the calibration gas value.
- Remove the calibration gas.

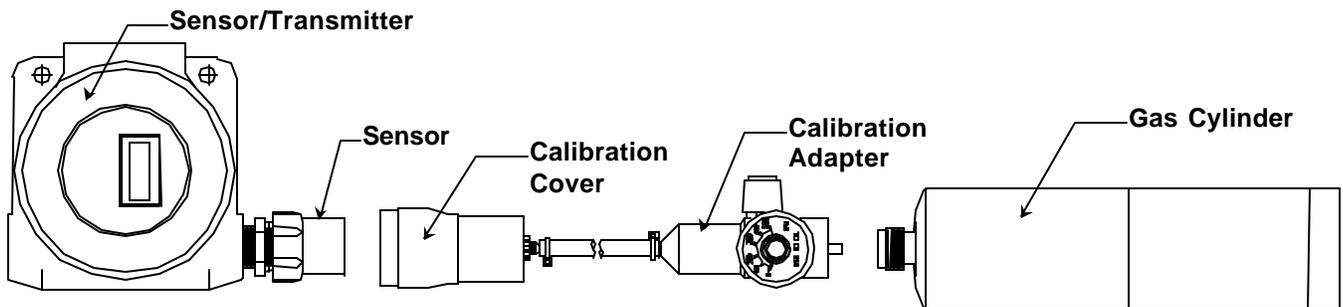


Figure 6: Gas cylinder and Typical Calibration Adapter

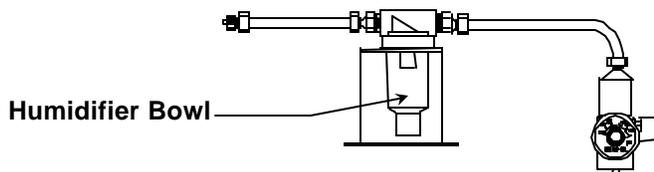


Figure 7: Calibration Adapter with Humidifier

3.5 Calibration

Subsequent calibrations are performed without opening the enclosure by applying calibration gas and using the magnet to set the span as described above.

4.0 WARRANTY

ENMET warrants new instruments to be free from defects in workmanship and material under normal use for a period of one year from date of shipment from **ENMET**. The warranty covers both parts and labor excluding instrument calibration and expendable parts such as calibration gas, filters, batteries, etc... Equipment believed to be defective should be returned to **ENMET** within the warranty period (transportation prepaid) for inspection. If the evaluation by **ENMET** confirms that the product is defective, it will be repaired or replaced at no charge, within the stated limitations, and returned prepaid to any location in the United States by the most economical means, e.g. Surface UPS/RPS. If an expedient means of transportation is requested during the warranty period, the customer is responsible for the difference between the most economical means and the expedient mode. **ENMET** shall not be liable for any loss or damage caused by the improper use of the product. The purchaser indemnifies and saves harmless the company with respect to any loss or damages that may arise through the use by the purchaser or others of this equipment.

This warranty is expressly given in lieu of all other warranties, either expressed or implied, including that of merchantability, and all other obligations or liabilities of **ENMET** which may arise in connection with this equipment. **ENMET** neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than that which is set forth herein.

NOTE: When returning an instrument to the factory for service:

- Be sure to include paperwork.
- A purchase order, return address and telephone number will assist in the expedient repair and return of your unit.
- Include any specific instructions.
- For warranty service, include date of purchase
- If you require an estimate, please contact **ENMET** Corporation.

There are Return for Repair Instructions and Form on the last pages of this manual. This Form can be copied or used as needed.

Addendum: Ammonia Calibration

Calibration Procedure for EX-5000 MOS Ammonia

The EX-5000 MOS Ammonia sensor requires special calibration techniques that are not common with other gases.

All MOS sensors require at least 15% RH for proper operation. RH of 50% or greater is ideal for MOS sensor calibration. The common technique for humidifying dry gas from a cylinder is to bubble it through a humidifier assembly. However, ammonia is readily absorbed in water.

ENMET Corporation has supplied a special calibration adapter for ammonia that allows the humidifier bowl to be 1/3 full of water, but not bubble the gas sample. Instead the gas sample is passed over the water. It is still able to pick up enough humidity to properly calibrate the sensor, but not enough to lose all of the ammonia calibration gas.

For up to 0-500 ppm range Ammonia transmitters, the proper calibration gas cylinder is approximate 300 ppm NH₃ in air. While flowing the 300 ppm ammonia through the calibration adapter humidifier assembly, ***approximately 200 ppm is the actual concentration going to the sensor***, the difference being absorbed by the water surface. See the cylinder for the humidified output.

Open the valve on the calibration adapter regulator, and attach the calibration cup to the sensor. Verify that the gas sample is passing over the water by looking for gentle ripples on the water surface and not bubbling. Flow rate is preset by the regulator and needs no adjustment. Apply the calibration gas for four minutes. At the end of four minutes, use the magnet to adjust the – or + buttons and make the display read the humidified output +/- 20 ppm.