

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

EX-5155-MOS
Toxic Gas
Sensor/Transmitter
Manual

Manual Part Number
80003-098
MCN-425, 11/10/09

Table of Contents

1.0 INTRODUCTION	1
1.1 Unpack	1
1.2 Check Order	1
1.3 Serial Numbers.....	1
2.0 FEATURES OF THE EX-5155-MOS.....	2
3.0 INSTALLATION OF THE EX-5155-MOS	3
3.1 Mounting the EX-5155-MOS Enclosure	3
3.2 Wiring the EX-5155-MOS to a Control Unit.....	4
4.0 OPERATION OF THE EX-5155-MOS	6
4.1 Start up.....	6
4.1.1 Typical Start Up.....	6
4.1.2 Alternate Start Up.....	6
4.1.3 Purge	7
4.2 Normal Display Mode.....	7
4.2.1 Alarm Conditions EX-5155-MOS.....	7
5.0 MAINTENANCE OF THE EX-5155-MOS.....	8
5.1 Maintenance Menu.....	8
5.2 Calibration of the EX-5155-MOS	9
5.2.1 Zero Adjust.....	11
5.2.2 Gas Span.....	11
5.2.3 Exit Maintenance Menu	11
5.3 Heater Voltage Settings	13
5.4 Sensor Replacement.....	13
6.0 REPLACEMENT PART NUMBERS.....	14
7.0 WARRANTY.....	14
ADDENDUM: AMMONIA CALIBRATION	15

List of Figures and Tables

Figure 1: EX-5155-MOS Features	2
Figure 2: EX-5155-MOS Mounting Dimensions.....	3
Figure 3: Terminal Positions EX-5155-MOS Sensor/Transmitter	5
Table 1: EX-5155-MOS maintenance Menus Sequence.....	8
Figure 4: Calibration Adapter EX-5155-MOS Sensor/Transmitter	9
Table 3: Examples of Standard and Non-Standard Calibration Gas	10
Table 2: Calibration Time	11
Figure 5: EX-5155-MOS Maintenance Menu Flow chart	13
Figure 6: Sensor Replacement	13

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 EX-5155-MOS** sensor/transmitters (S/T) is a 3-wire, 24 VDC 4-20mA S/T for the detection of toxic gas, utilizing a Metal Oxide Semiconductor (MOS) sensor. The **EX-5155-MOS** is meant to be used in conjunction with an appropriate power supply and *controller*. The **ENMET EX-5155-MOS** sensor/transmitter has been designed and approved to be used in a Class I, Div. 1, Groups B, C, D, classified areas. The approval was issued by CSA International.

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

1.1 Unpack

Unpack the **EX-5155-MOS** 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

1.2 Check Order

Check the contents of the shipment against the purchase order. Verify that the **EX-5155-MOS** is received as ordered. [Each **EX-5155-MOS** 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.

1.3 Serial Numbers

Each **EX-5155-MOS** is serialized. These numbers are on tags on the equipment and are on record in an **ENMET** database.

2.0 Features of the EX-5155-MOS

See **Figure 1** for location of features:

Feature	Description
Display	LCD: Indicates the level of gas detected by sensor
Gain Potentiometer (POT)	POT 1: Display contrast adjustment POT 2: Does Not apply to MOS, not used <i>Do not adjust</i> POT 3: Does Not apply to MOS, not used <i>Do not adjust</i> POT 4: MOS Heater Voltage, <i>Do not adjust unless advised by ENMET</i>
Visual Alarms	LED indicators: Power / Fault Indicator LED, Green / Red Alarm (3) Indicator Red LED, user adjustable
Magnetic Switches	MENU: Advances the instrument display through menus (Zero, Span, Exit) SELECT: Selects the Zero, Span, Exit menu or sets proper calibration values for Zero or Span
Sensor	For sensing gas at PPM or LEL levels, see Table 3 for sensor types

Magnetic switches control the instrument maintenance functions. The switch locations are indicated by **MENU** and **SELECT**. A magnetic field pulse is applied by momentarily putting the end of the magnet in proximity to the switch and then removing it. Referred to as tap. Since the magnetic field penetrates the window, the enclosure cover is not removed in order to perform calibration.

Three alarm points are preprogrammed into the **EX-5155-MOS** sensor/transmitters. At each alarm point, an LED on the front panel is activated. These internal alarm settings are independent of the 4-20mA output alarm values that can be set at a controller.

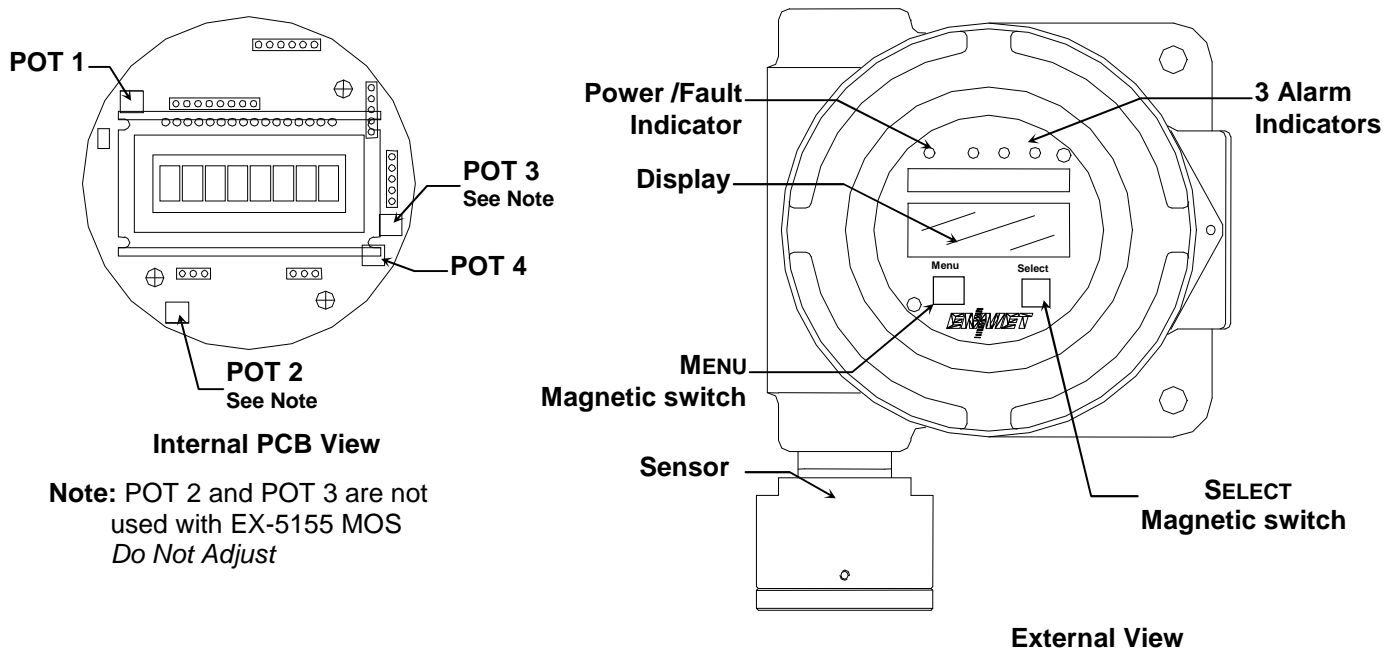


Figure 1: EX-5155-MOS Features

3.0 Installation of the EX-5155-MOS

CAUTION: Area must be declassified during installation.

The **ENMET EX-5155-MOS** gas sensor/transmitter (S/T) is a 3-wire, 24 VDC, 4-20 mA S/T for the detection of toxic gas. The S/T is meant to be used in conjunction with an appropriate power supply and controller. The **ENMET EX-5155-MOS** sensor/transmitter has been designed and approved to be used in a Class I, Div. 1, Groups B, C, D, classified areas. The approval was issued by CSA International. Appropriate wiring, conduit and fittings are required for proper installation in an explosion proof rated environment.

CAUTION: Since the sensor/transmitter detects gas only at the sensor location, pay attention to the possible sources of gas, the density of the gas, locations where the gas may be confined and locations where the gas may damage or injure property or personnel, when choosing locations of sensor/transmitters. Also, take into consideration environmental factors when deciding on S/T location. Avoid locations where the S/T may be damaged by liquid immersion, excessive heat or other known hazards. Also, take precautions to insure condensation inside of the conduit does not enter the S/T.

3.1 Mounting the EX-5155-MOS Enclosure

Mount the enclosure, using the two mounting holes provided see **Figure 2**. Pay particular attention to the source and density of the gas being detected when choosing the location. Mount the S/T near the ceiling for lighter than air gases /vapors and near the floor for heavier than air gas/vapors. Contact **ENMET** if you have questions regarding your application.

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

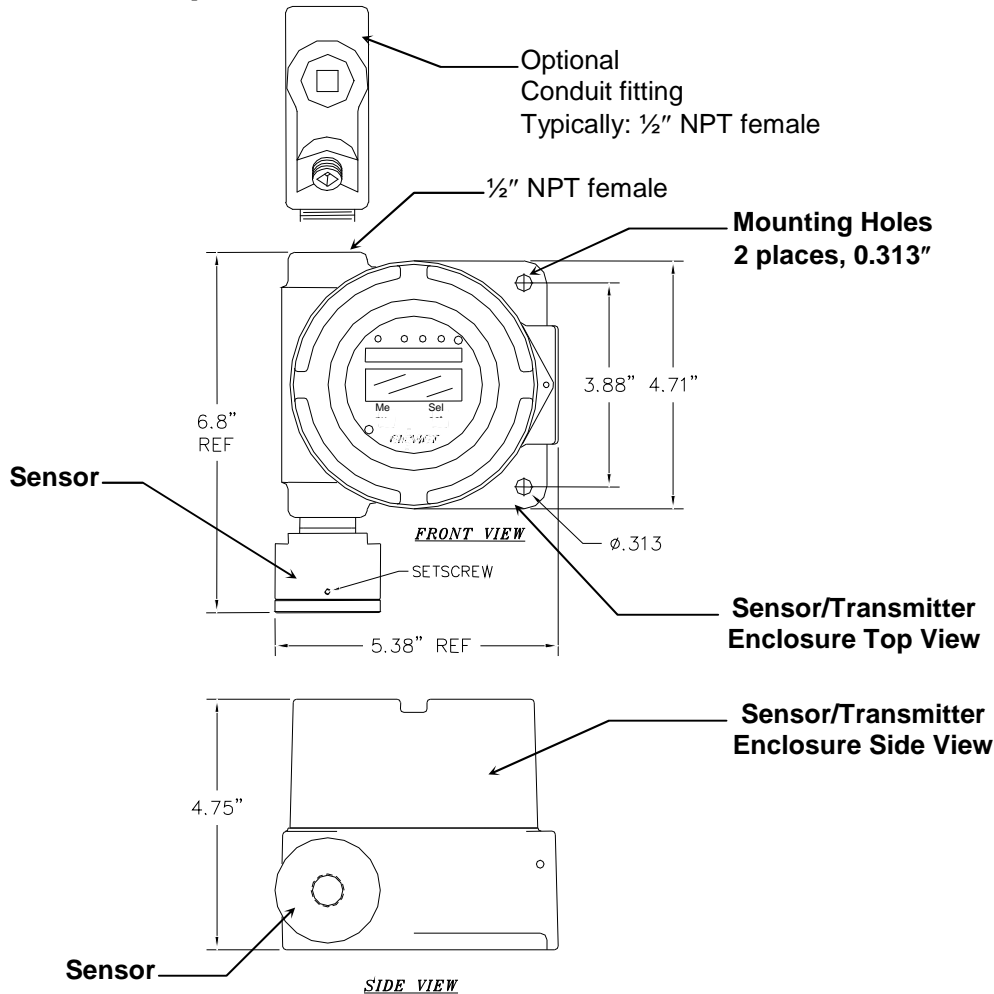


Figure 2: EX-5155-MOS Mounting Dimensions

3.2 Wiring the EX-5155-MOS to a Control Unit

CAUTION: Area must be declassified during installation.

Run conduit and 16 AWG (1.5MM²) wires to the enclosure from the power supply and controller. If the **EX-5155-MOS** is installed in a hazardous location as defined by the National Electrical Code, then *ALL* wiring must be in accordance with the National code and any local governing codes.

Open the enclosure, and remove the 2 screws that retain the display overlay to the circuit board.

Use caution when removing the over lay. Do not damage the magnetic switches.

Remove the two overlay standoffs and remove the circuit board, exposing the terminal strips on the bottom of the circuit board. Do not disconnect the circuit board wiring.

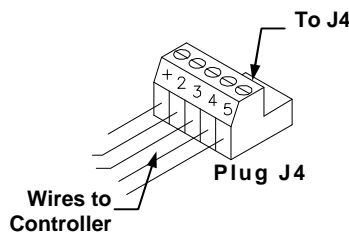
Connect the wires from the controller (power supply) to the supplied J4 plug then attach to J4 terminal.

Connect the wires from the sensor to the supplied J8 plug then attach to the J8 terminal.

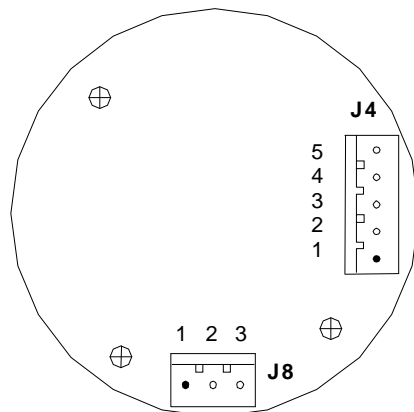
See **Figure 3** for locations

J4 PLUG – TERMINAL TO CONTROLLER WIRING

Position	Function
1 +	24 VDC power
2	GND
3	4 - 20 mA out
4*	RS-485 D+
5*	RS-485 D-



*Contact **ENMET** for Modbus address information



Circuit Board Bottom View

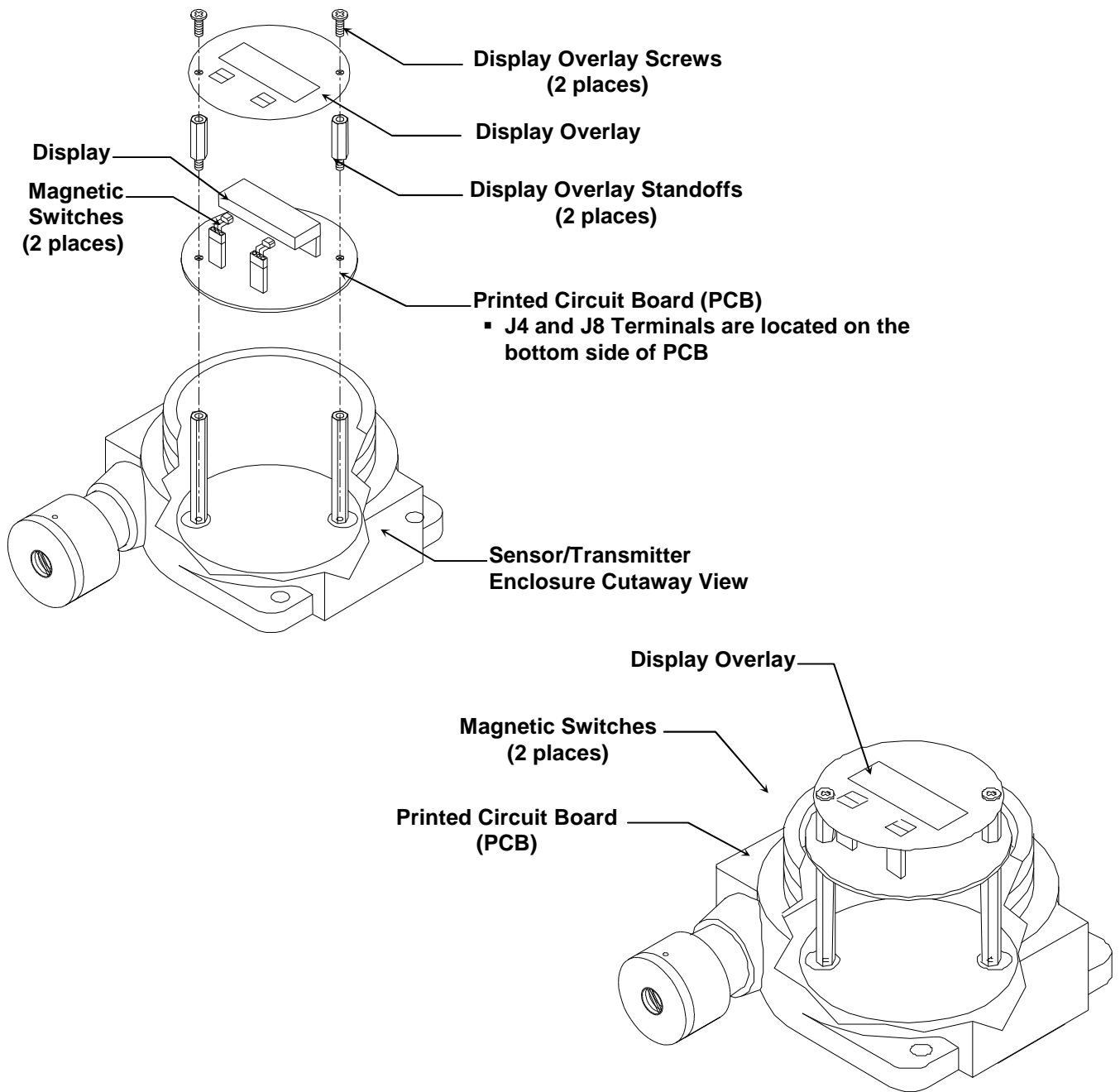


Figure 3: Terminal Positions EX-5155-MOS Sensor/Transmitter

When wiring is complete, reassemble the **EX-5155-MOS**. Use caution when installing the overlay so as not to damage the magnetic switches. Put the cover back on the S/T *Do Not* apply power to the S/T without the cover in place.

4.0 Operation of the EX-5155-MOS

It is best to have the **EX-5155-MOS** transmitters powered up and operational for 24 hours before applying calibration or test gas to them.

When the **EX-5155-MOS** transmitter is first powered up, it goes through a series of momentary screens, which identify the instrument model number, serial number and software revision. After all of the momentary screens have been displayed, the instrument arrives at the Main Gas Display showing the gas concentration and unit of measurement.

Depending on transmitter configuration and calibration condition, the furthest right character in the display may flash a letter indicating the instrument status. See the Section 4.1.2 below.

4.1 Start up

4.1.1 Typical Start Up

When power is supplied to the **EX-5155-MOS**, the S/T will display the following sequence of information:

NOTE: Software revision may cause variations of display output.

Example of Display	Function
	The instrument: Model EX-5155-MOS Note MOS is not displayed
	The instrument: Serial Number
	The instrument: Software Revision
IF the right most character is a flashing W 	The instrument is in Warm-up mode <ul style="list-style-type: none"> This should last about 1 minute The Signal Output is held at 4mA during warm-up
 For Toxic Gas	The instrument: Normal Display Mode Measurement of target Gas
IF the right most character is a flashing C, F, P or R See Section 4.1.2	

4.1.2 Alternate Start Up

Depending on **EX-5155-MOS** S/T configuration and calibration condition, the furthest right character in the display may flash a letter indicating the instrument status. See the table below.

Purging occurs automatically for instruments with sensors that require purging. Purge will occur for 5 minutes on instrument start-up, followed by a 5-minute recovery period. At the end of the recovery period, the transmitter should be ready for operation. If additional purge time is required, refer to Section 4.1.3 for more information.

Example of Display (may also display 0 LEC)	Function
IF the right most character is a flashing C 	The last calibration of the instrument was invalid <ul style="list-style-type: none"> The instrument must be recalibrated
IF the right most character is a flashing F 	There is a sensor fault
IF the right most character is a flashing P 	The sensor is being purged: <ul style="list-style-type: none"> This function is required for certain sensor types The duration of purge cycle varies with sensor type The Signal Output is held at 4mA during purge
IF the right most character is a flashing R 	The instrument is in Recovery mode after completing the purge cycle <ul style="list-style-type: none"> This should take about 5 minutes

4.1.3 Purge

Purging is a function that temporarily increases the sensor heater voltage to clean off contaminants. Some sensors operate at higher heater voltages where purging is not required. The **EX-5155-MOS** S/T is configured at the factory for the installed sensor purging requirements.

Purge times vary from 5 – 25 minutes depending on the sensor installed.

Some sensors require additional purge time after start up. Particularly if the sensor is new or the system powered down for an extended period of time.

To initiate a purge: Turn the power off and back on. This will initialize a purge cycle.

See **Figure 5** for the Operational portion of the Maintenance Menu Flow Chart.

4.2 Normal Display Mode

When the **EX-5155-MOS** is installed as described in section 3, and in clean air, the **POWER** green LED is on, the display is lit and the information on the display is measurement of the target gas detected by the **EX-5155-MOS**. The red alarm and fault LEDs are not lit.

To advance through displays of operational information tap the magnet over the **MENU** button.

NOTE: Software revision may cause variations of display output.

See sequence of operational information below:

Display Measurement of the target gas Tap the magnet over the MENU button			
Display indicates Alarm 1 Set point Tap the magnet over the MENU button			
Display indicates Alarm 2 Set point Tap the magnet over the MENU button			No Function for the SELECT button in this mode
Display indicates Alarm 3 Set point Tap the magnet over the MENU button			
Display indicates mA Span range (Full Scale) Tap the magnet over the MENU button Display returns to gas measurement			

Operational Display Flow Chart

4.2.1 Alarm Conditions EX-5155-MOS

There are three alarm set points available. These alarm set points can be changed within limits; see the maintenance section of this manual for the procedure.

If the gas concentration increases above that of the alarm set point, the associated red LED is lit.

5.0 Maintenance of the EX-5155-MOS

CAUTION: Do not open the EX-5155-MOS S/T in a classified area.

CAUTION: Do Not Attempt A Span Procedure Without Calibration Gas Applied to The Sensor; if this is done, the S/T is forced into a calibration fault mode.

Magnetic switches control the **MENU** and **SELECT** functions. The **MENU** and **SELECT** switch locations are indicated on the display panel, see **Figure 3**. The **MENU** switch is used to display the various menu options and make incremental changes to numbers such as alarm points, calibrations gas, etc. The **SELECT** switch is used to select that option, set zero or span digit. Most maintenance functions are controlled by simple taps of the supplied magnet on the transmitter glass, below the **MENU** and **SELECT** boxes on the front panel.

5.1 Maintenance Menu

To enter the maintenance menu hold the magnet over the **MENU** switch for 2 to 4 seconds

Table 1 indicates the maintenance menu sequence see **Figure 5** for a detailed maintenance menu flow chart.

Table 1: EX-5155-MOS maintenance Menus Sequence

Example of Display	Function
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">5ppm</div>	Normal Display Mode Measurement of target gas
Hold the magnet over MENU switch for 2 – 5 seconds to enter the Maintenance Menu The Power/Fault LED will flash Green – Red to indicate the EX-5155-MOS is in Maintenance Mode	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Exit</div>	To exit the maintenance Menu and return to the Normal Display Mode: If intended function Tap the magnet over SELECT switch
Tap the magnet over the MENU switch to advance to the Zero procedure	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Zero</div>	For adjusting Zero: If intended function Tap the magnet over SELECT switch
Tap the magnet over the MENU switch to advance to the Span procedure	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Span</div>	For adjusting the Span: If intended function Tap the magnet over SELECT switch
Tap the magnet over the MENU switch to advance to each Alarm set point procedures	
<div style="display: flex; flex-direction: column; align-items: center; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">Alarm1</div> <div style="border: 1px solid black; padding: 5px; width: 120px; margin: 0 auto;">Alarm2</div> <div style="border: 1px solid black; padding: 5px; width: 140px; margin: 0 auto;">Alarm3</div> </div>	For adjusting the Alarm 1, 2 and 3 set points: If Intended function Tap the magnet over SELECT switch
Tap the magnet over the MENU switch to advance the mA Span set point procedure	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">mA Span</div>	For adjusting the mA Span set point: If intended function Tap the magnet over SELECT switch

Taping the **MENU** switch without taping the **SELECT** switch will allow you to cycle through the menu options. You must Tap the **SELECT** switch in order to change the desired operation.

NOTE: If the S/T fails to respond, the magnet may have become weak and may need to be replaced.

5.2 Calibration of the EX-5155-MOS

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas. The Zero function sets the clean air reference point and the Span function sets the sensitivity of the instrument.

Initial Calibration: Wait 24 hours after initially supplying power to the **EX-5155-MOS** 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 calibration functions are operated with magnets from outside the enclosure through the MENU and SELECT switches. Do Not open the S/T unless the area is de-classified.

Calibration Zero and Span functions are two separate procedures. They operate independently of each other. It is recommended that the Zero procedure be done prior to the Span procedure. **ENMET** Corporation recommends at least quarterly calibration of the **EX-5155-MOS** transmitters.

Calibration equipment is available from **ENMET** Corporation to calibrate the **EX-5155-MOS** sensor/transmitters. A calibration adapter will have a fitting for the gas cylinder on one side, and a cover to go over the sensor housing on the other.

Generally, a cylinder of 20.9% Oxygen is used to provide a fresh air reference or Zero point for the calibration. Another cylinder is used to provide the Span reference point for calibration. Depending on the instrument calibration, the Span gas may be the same gas that the instrument is calibrated to display, or it may be another gas, which **ENMET** has found to have a similar response. *Sensors require a humidified calibration gas sample. Fill the humidifier bowl, half way up with clean fresh water prior to attaching the Zero or Span gases. Be careful not to let the humidifier bowl tip, allowing water to enter the gas delivery tubing. See Table 3 for standard and Non-standard calibration gases.*

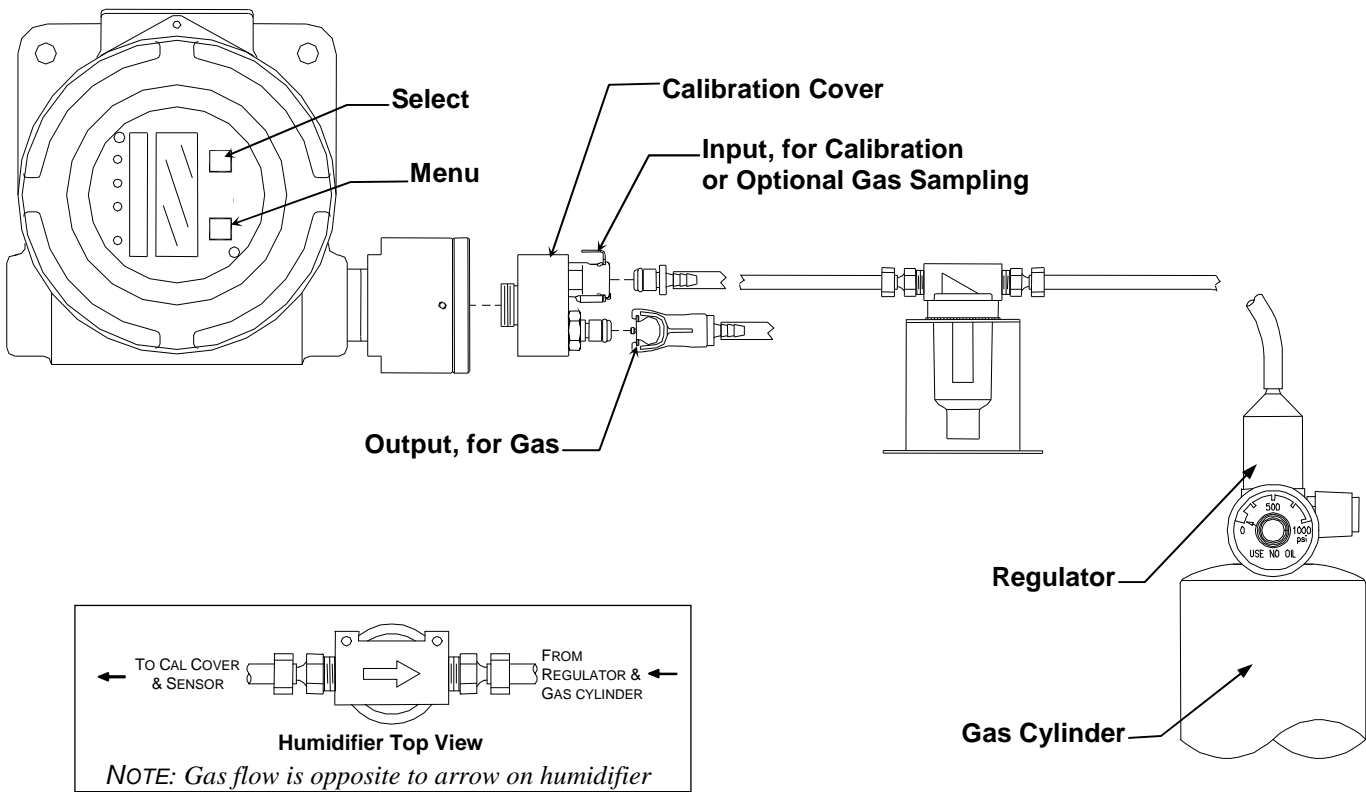


Figure 4: Calibration Adapter EX-5155-MOS Sensor/Transmitter

Table 3: Examples of Standard and Non-Standard Calibration Gas

Gas	Range	Alarm 1*	Alarm 2*	Alarm 3*	Sensor Part Number	Span Calibration Gas	Calibration Point
Gas Type/ Standard							
Methyl Chloride	0 – 400 PPM	100 PPM	200 PPM	300 PPM	03033-812	100 PPM Methyl Chloride	100 PPM Methyl Chloride
Carbon Monoxide	0 – 400 PPM	35 PPM	50 PPM	100 PPM	03033-109	100 PPM Carbon Monoxide	100 PPM Carbon Monoxide
Hydrogen Sulfide	0 – 100 PPM	10 PPM	20 PPM	50 PPM	03033-812	100 PPM Carbon Monoxide	20 PPM Hydrogen Sulfide
Hydrogen	0 – 1000 PPM	200 PPM	500 PPM	800 PPM	03033-813	800 PPM Hydrogen	800 PPM Hydrogen
Gas Type/ Non – Standard							
Considered <i>Special Calibrations</i>, use for examples only. Consult <i>ENMET</i> for specifications and availability.							
Ammonia	0 – 300 PPM	150 PPM	300 PPM	300 PPM	03033-019	300 PPM Ammonia	See Addendum Ammonia Calibration
Freon 134A	0 – 2000 PPM	500 PPM	1000 PPM	1500 PPM	03032-832	2% LEL Methane	1200 PPM Freon 134
Freon 12	0 – 2000 PPM	500 PPM	1000 PPM	1500 PPM	03032-832	300 PPM Carbon Monoxide	1200 PPM Freon 12
Freon 22	0 – 2000 PPM	500 PPM	1000 PPM	1500 PPM	03032-832	2% LEL Methane	730 PPM Freon 22
Acetone	0 – 2000 PPM	500 PPM	750 PPM	1000 PPM	03033-813	500 PPM Hydrogen	1150 PPM Acetone
Methylene Chloride	0 – 200 PPM	25 PPM	50 PPM	100 PPM	03033-812	100 PPM Methyl Chloride	140 PPM Methylene Chloride

*NOTE: These internal sensor/transmitter alarms are independent of the 4-20mA Controller alarm point settings.

5.2.1 Zero Adjust

A ZERO function should be performed only when the **EX-5155-MOS** sensor/transmitter is exposed to fresh air. If the air at the sensor is in question, use a cylinder of 20.9% oxygen to provide a clean air reference. Attach the cylinder to the calibration adapter, fill the humidifier bowl halfway with water and allow gas to flow over the sensor for 3 – 4 minutes.

Enter the maintenance menu by placing the magnet over **MENU** switch for 2 to 4 seconds. See **Figure 5, EX-5155-MOS Maintenance Menu** flow chart.

The second menu available is the Zero.

Tap the **SELECT** switch to perform a Zero.

- *If the Zero is successful*, Cal OK appears on the display and in 1 – 2 seconds, display will change to Span. If you wish to Span the sensor Tap the **SELECT** switch you are now ready to apply gas. **Proceed to gas span step 2**
If you wish to Exit the maintenance menu, Tap **MENU** switch until Exit is displayed, then tap **SELECT** switch to return to the instrument Normal Gas Display
- *If the Zero is Not successful*, sensor is outside of safe parameters to be zeroed, the display will read Bad Zero. Repeat Section 5.2.1 Zero Adjust making sure to use a cylinder of 20.9% Oxygen.

5.2.2 Gas Span

It is recommended that the Zero Function be performed first.

Enter the maintenance menu. See **Figure 5, EX-5155-MOS Maintenance Menu** flow chart.

1. Tap the **MENU** switch once to show Span on the display.
2. Tap the **SELECT** switch to perform a Span procedure. The display will alternate between the calibration gas concentration and a signal level.

NOTE: You can change the Calibration Gas Level. **HOLD** the magnet over the **SELECT** switch for 2 – 4 seconds
The **MENU** switch changes digit indicated by underscore cursor
The **SELECT** switch locks underscored digit and moves to next digit

3. Attach the associated calibration gas cylinder to the regulator and calibration cover. See to **Figure 3**.
4. Open the valve to apply the calibration gas to the sensor.
5. Watch for the signal level to stabilize. Refer to **Table 4** for typical response times.
6. Once the signal level has stabilized, the **EX-5155-MOS** will automatically lock in the calibration data and:
 - If the Span is successful, Cal OK appears on the display momentarily, then advances to Alarm 1. Remove calibration gas. To exit maintenance menu tap the **MENU** switch until Exit appears, then tap the **SELECT** switch.
 - If the sensor is outside of acceptable parameters, Bad Span is displayed momentarily, then returns to Span. Remove calibration gas. Tap the **MENU** switch until Exit appears, then tap the **SELECT** switch. Check span gas and repeat calibration in 30 – 60 minutes.
 - If the sensor did not respond to gas, Same mV is displayed momentarily, then returns to Span.
→ Remove calibration gas, tap the **MENU** switch until Exit appears, then tap the **SELECT** switch and try calibration again in 30-60 minutes.
If the sensor will not calibrate See Section 5.4.
 - NOTE: Some software revisions require the **SELECT** switch be tapped to accept the signal.
7. Calibration is complete.

Table 2: Calibration Time

Sensor Type	Calibration Gas Concentration	Calibration Gas Application Time
MOS	PPM	3 – 4 minutes

5.2.3 Exit Maintenance Menu

Exit maintenance, by tapping on the **MENU** switch until Exit appears on the display. Tap the **SELECT** switch to return to the instrument Normal Gas Display.

Normal Display Mode

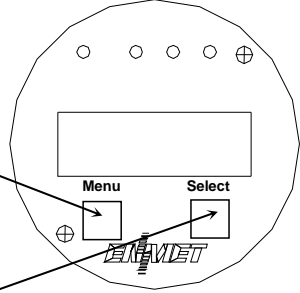
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">5ppm</div>		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	<p>HOLD the magnet over the MENU switch for 2 – 4 seconds to enter the Maintenance Menus</p>	
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Exit</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<p>Tap the SELECT switch to return to the Normal Display Mode. <i>See Section 5.2.3</i></p>	<p>Tap the magnet over the MENU switch to cycle through Maintenance Menus</p>	
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Zero</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">PV: 0</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<p>Tap the SELECT switch to initiate Zero adjustment</p> <p>If the Zero signal is within Preset Specs the EX-5155-MOS will display Cal OK, <i>See Section 5.2.1</i></p> <p>If the Zero signal is not within Preset Specs the EX-5155-MOS will display Bad ZERO</p> <p>NOTE: Some software revisions require the SELECT switch be tapped to accept the signal.</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	OR	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Cal OK</div>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Bad ZERO</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Span</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">PV: 0</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">20</div>			
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Cal OK</div>		
		OR		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Same mV</div>		
		OR		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Bad Sens</div>		
<p>NOTE: You can change the Calibration Gas Level.</p> <p>SELECT HOLD the magnet over the SELECT switch</p> <p>The MENU switch changes digit indicated by underscore cursor</p> <p>The SELECT switch locks underscored digit and moves to next digit</p> <p>See Section 5.2.2</p> <p>Apply Calibration Gas until signal value becomes stable (about 1 to 4 minutes) See Figure 4</p> <p>If cal is good display will indicate OK or Same</p> <p>If cal is not within preset "range" display will indicate Bad Sens</p> <p>NOTE: Some software revisions require the SELECT switch be tapped to accept the signal.</p>				
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Alarm1</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">^ 10</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SetTDsec</div>			
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Alarm2</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">^ 20</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SetTDsec</div>			
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">Alarm3</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SELECT</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">^ 50</div>		
<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">MENU</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">SetTDsec</div>			
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;">0</div>		

Figure 5: Continued on next page

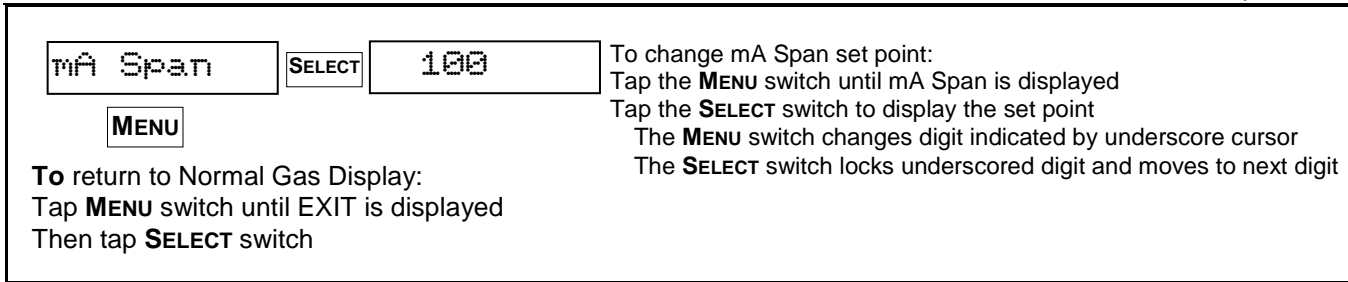


Figure 5: EX-5155-MOS Maintenance Menu Flow chart

5.3 Heater Voltage Settings

Heater Voltages are necessary for MOS sensors. They are preset at the factory and should not require field adjustment. Do not adjust these voltages unless specifically instructed to do so by **ENMET** Corporation Technical Support Staff.

CAUTION: Improper adjustment of heater voltages can damage sensors voiding any warranties and also alter the operating characteristics of the sensor in such a way that the **EX-5155-MOS** may not respond to it's target gas.

5.4 Sensor Replacement

CAUTION: Area must be declassified during sensor replacement.

Sensors should be replaced when they can no longer be calibrated. Replacement sensor part numbers are listed in Section 6.0 of this manual. If you do not know the proper part number for your sensor, be sure to have the **EX-5155-MOS** serial number available when contacting your Distributor or **ENMET** Corporation Technical Support.

To replace a sensor, it is not necessary to open the transmitter housing.

Remove the set screw from sensor housing base.

Unscrew the sensor housing cover and remove spacer. *Note the orientation of spacer.*

Unplug the sensor from PC Board.

Plug new sensor into PC Board and replace spacer. *Replace spacer with grooved edge toward sensor housing cover.*

Reassemble the sensor housing.

After the new sensor has been installed, it is suggested to allow the sensor to stabilize for 24 hours.

A Factory calibration must be performed.

After entering the Maintenance menu, advance to the Zero menu. Then while viewing the Zero menu, hold the magnet over the **MENU** switch for 2-4 seconds.

After 2-4 seconds, an F will appear on the far right hand side of the display. The F indicates that the instrument is in Factory mode.

Perform the calibration Zero and Span procedures as outlined in Section 5.2. Be sure that the F is present when selecting the Zero and Span functions.

The Factory calibration sets a calibration window for future standard instrument calibrations.

Only perform a factory calibration when installing a new sensor!!

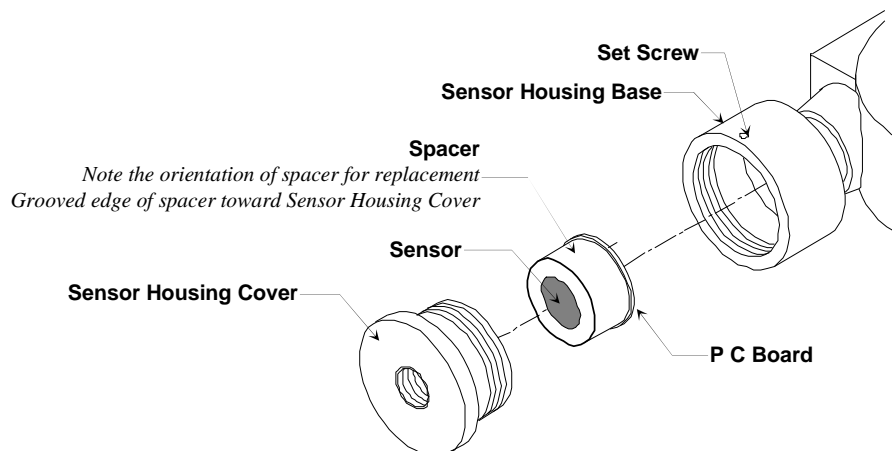


Figure 6: Sensor Replacement

6.0 Replacement Part Numbers

ENMET replacement part numbers:

Description	Part Number
For EX-5155-MOS p/n 10014-018	
Sensor	03015-000 03018-000 03019-000
Consult ENMET Distributor or ENMET Corp for additional sensors	
Regulator	03700-001
Overlay	06000-058
Magnet	50030-001
Calibration/Sampling Adapter	03700-034
Calibration Gas, Consult ENMET Distributor or ENMET Corp.	

7.0 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/FedEx Ground. 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.

Manual Part Number

80003-098

October 2007

MCN-399, 03/21/08

MCN-425, 11/10/09

Addendum: Ammonia Calibration

Calibration Procedure for EX-5155-MOS Ammonia

The EX-5155-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 and TAP the **SELECT** switch to make the display read the humidified output +/- 20 ppm.

Fresh clean water must be used for each calibration.

Notes:



PO Box 979
680 Fairfield Court
Ann Arbor, Michigan 48106-0979
734.761.1270 Fax 734.761.3220

Returning an Instrument for Repair

ENMET instruments may be returned to the factory or any one of our Field Service Centers for regular repair service or calibration. The **ENMET** Repair Department and Field Service Centers also perform warranty service work.

When returning an instrument to the factory or service center for service, paperwork must be included which contains the following information:

- A purchase order number or reference number.
- A contact name with return address, telephone and fax numbers
- Specific instructions regarding desired service or description of the problems being encountered.
- Date of original purchase and copy of packing slip or invoice for warranty consideration.
- If a price estimate is required, please note it accordingly *and be sure to include a fax number.*

Providing the above information assists in the expedient repair and return of your unit.

Failure to provide this information can result in processing delays.

ENMET charges a one hour minimum billing for all approved repairs with additional time billed to the closest tenth of an hour. All instruments sent to **ENMET** are subject to a minimum evaluation fee, even if returned unrepaired. Unclaimed instruments that **ENMET** has received without appropriate paperwork or attempts to advise repair costs that have been unanswered, after a period of 60 days, may be disposed of or returned unrepaired COD with the evaluation fee.

Service centers may have different rates or terms. Be sure to contact them for this information.

Repaired instruments are returned by UPS/FedEx Ground and are not insured unless otherwise specified. If expedited shipping methods or insurance is required, it must be stated in your paperwork.

Note: Warranty of customer installed components.

If a component is purchased and installed in the field, and fails within the warranty term, it can be returned to **ENMET** and will be replaced, free of charge, per **ENMET**'s returned goods procedure.

If the entire instrument is returned to **ENMET** Corporation with the defective item installed, the item will be replaced at no cost, but the instrument will be subject to labor charges at half of the standard rate.



Repair Return Form

Mailing Address:
ENMET Corporation
PO Box 979
Ann Arbor, Michigan 48106

Shipping Address:
ENMET Corporation
Attn: Repair Department
680 Fairfield Court
Ann Arbor, Michigan 48108

Phone Number: 734.761.1270
FAX Number: 734.761.3220

Your Mailing Address:

Your Shipping Address:

Contact Name: _____ **Your Phone:** _____

Your PO/Reference Number: _____ **Your FAX:** _____

Payment Terms: COD

(Check one) **VISA / MasterCard** _____
Card number Expiration Card Code

American Express _____
Card number Expiration Card Code

Name as it appears on the credit card _____

Return Shipping Method:

UPS: Ground 3 Day Select Next Day Air ND Air Saver 2-Day Air
 UPS Account number: _____

Federal Express: Ground Express Saver P-1 Standard 2-Day Air
 FedEx Account number: _____

Would you like ENMET to insure the return shipment?

No Yes **Insurance Amount:** \$ _____