

Sample Draw Oxygen Monitor System (OMS)

User Manual



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Revision Record

MANUAL, OXYGEN DEFICIENCY MONITOR | Part # 399374 Rev D

Revision	Description	Date
A	Initial Release	August, 2013
B	Updated Introduction; added installation location information; added <i>Sample Draw Sensor Tubing</i>	December, 2013
C	Updated remote display alarm indicator information	February, 2017
D	Updated warranty	May, 2020

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NOTES, CAUTIONS AND WARNINGS



Note: Denotes helpful information intended to provide tips for better use of the product.

CAUTION

Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.

WARNING

Warning: Denotes a hazard. Failure to follow instructions could result in **SEVERE** personal injury and/or property damage. Included text gives proper procedures.



See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.



Refer to Manual: When product is marked with this symbol, see the instruction manual for additional information. If the instruction manual has been misplaced, download it from ets-lindgren.com, or contact ETS-Lindgren Customer Service.



High Voltage: Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury or death.

ONLY QUALIFIED PERSONNEL should operate or service this equipment.



CONTACT ETS-LINDGREN PRIOR TO SERVICING. Servicing (or modifying) the unit by yourself may void your warranty.

INTRODUCTION

The ETS-Lindgren Sample Draw Oxygen Monitoring System (OMS™) is a self contained oxygen deficiency detection system suitable for remote sampling of confined spaces; this single point monitor is designed for the continuous detection and measurement of ambient oxygen concentration levels.

As a compact gas monitoring system, the OMS is ideal for the continuous monitoring of the air in MRI rooms, labs, freezers, confined spaces, and other shielded enclosures where inert gases may displace the oxygen and create a danger for patients and staff. The OMS is suitable for indoor and outdoor use, and is intended to be installed outside of the shielded enclosure.

Each system consists of a long life zirconium oxide sensor cell and 3 wire transmitter. Unlike electrochemical sensor cells, the zirconium oxide sensor cell provides stable oxygen readings even in areas where temperature and humidity levels are changing. The OMS may be used as a standalone gas detector or connected to your own centralized control and surveillance system.

Technology

Long-Life Zirconium Oxide Sensor Cell

The heart of the monitoring system is a zirconium sensor, which responds to low oxygen conditions within seconds and provides accurate measurements over a wide temperature and humidity range. The zirconium sensor will operate continuously for eight or more years, requiring minimum maintenance. There are no zero or span calibration pots to adjust, and when compared to disposable sensors, the long life zirconium sensor can save hundreds of dollars in annual maintenance.

Unlike concentration cells, the zirconium sensor does not need an oxygen reference gas for proper operation. The OMS can detect low oxygen levels in confined spaces and process tools without the need of a reference gas.

Smart Electronics

The OMS incorporates a special electronic circuit that continuously monitors sensor operation. With the addition of the alarm relay option, any cell degradation or complete failure will be detected immediately. This smart circuitry alerts the user to sensor faults and other electrical problems that may interrupt surveillance through the standard mA signal output signal or through the optional fault relay option.

Ideal for continuously monitoring oxygen levels in confined spaces or areas where inert gases are used, the OMS does not drift or lose sensitivity with weather or temperature changes. The electronics are housed in a NEMA Type 4X enclosure.

Standard Configuration



Note: The OMS must be installed outside of the shielded enclosure.

- Oxygen Monitoring System
- Power supply
- Dust filter

Optional Remote Display

The remote display receives oxygen concentration information from the OMS. Up to two remote displays can be connected. See page 53 for installation information.



Other Optional Items

- Remote Horn and Strobe
- Waveguide Installation Kit

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

MAINTENANCE

WARNING

Calibrate or challenge the OMS ONLY outside the MRI suite.

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.



Maintenance of the OMS is limited to the procedures described in this manual, and should be performed only by qualified personnel.



Warranty may be void if non-authorized procedures are performed, or if performed by non-qualified personnel.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Recommended Routine Maintenance

The Sample Draw Oxygen Monitoring System (OMS™) is a continuous gas detection system that measures and detects hazardous gas leaks in the workplace, and therefore requires periodic maintenance to ensure proper operation. The frequency with which this routine maintenance is performed depends on your environment and company policies. Following are recommendations intended as a general guideline.

Every 6-12 Months

- Visual checks: Check for power and proper operation. The OMS should output a 17.34 mA signal when the oxygen level is at 20.9%. Also, the display should indicate 20.9% oxygen when the oxygen is at ambient levels.
- Sensor verification with nitrogen: The ambient oxygen level is 20.9%; therefore, under ambient conditions verification of the OMS to 20.9% oxygen is constantly performed. The OMS requires periodic testing with nitrogen only to verify the cell response to low oxygen levels. See *Sensor Verification* on page 49 for detailed steps.

Annually

Depending on the environment, the filter should be replaced every 12 months; in dusty environments, the filter may need to be replaced more frequently. If the filter becomes completely blocked, the internal flow sensor will detect the loss of flow and activate the fault relay and LED.

Replacement and Optional Parts



Note: ETS-Lindgren may substitute a similar part or new part number with the same functionality for another part/part number. Contact ETS-Lindgren for questions about part numbers and ordering parts.

Part Description	Part Number
Optional Remote Display	255552
Filter Replacement	255551

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

SPECIFICATIONS

Electrical Specifications

CAUTION

A regulated 24 VDC power supply is required.

Power:	24 VDC external power
Consumption:	Approximately 700 mA

Physical Specifications

Height:	7.0 in (178 mm)
Width:	5.0 in (127 mm)
Depth:	5.0 in (127 mm)
Weight:	4.0 lb (2 kg)
Enclosure Type:	NEMA Type 4X wall mount general purpose; not intended for explosive atmospheres or electrically classified areas

Performance Specifications

Sensor Type:	Long life zirconium oxide sensor cell, 0%–25%
Response Time:	Within 2 seconds of any change in oxygen
Fault Indicators:	± 2% of reading
Operating Temperature:	<ul style="list-style-type: none">Loss of VDC power (analog signal drops to 0 mA)Sensor cell failure: fault relay activated
Humidity:	0% to 95% relative humidity (RH) Contact ETS-Lindgren for sensors which can operate in 100% condensing RH environments

Gas Detection System Specifications

Type:	Long life zirconium oxide sensor cell, 0%–25%
Sensor Life:	8 to 10 years, under normal conditions
Transmitter:	<ul style="list-style-type: none">Microprocessor electronics with built in 3 digit backlit LCD displayJoystick-operated menus

Signal Outputs

Local Display:	Digital display calibrated for oxygen
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Note: The range is stated on the serial number and can be accessed via the joystick on the front panel. In the measurement mode push the joystick down to scroll the gas and range on the display. Push the joystick down again to stop the scrolling and re-display the gas.

Standard:	Analog Output: DC 4-20mA
Optional:	<ul style="list-style-type: none">Relay Output: Dual level user selectable alarm relays and one fault relayRated: 2 amps @ 30 VDC; 2 amps @ 240 VAC

Default Factory Settings



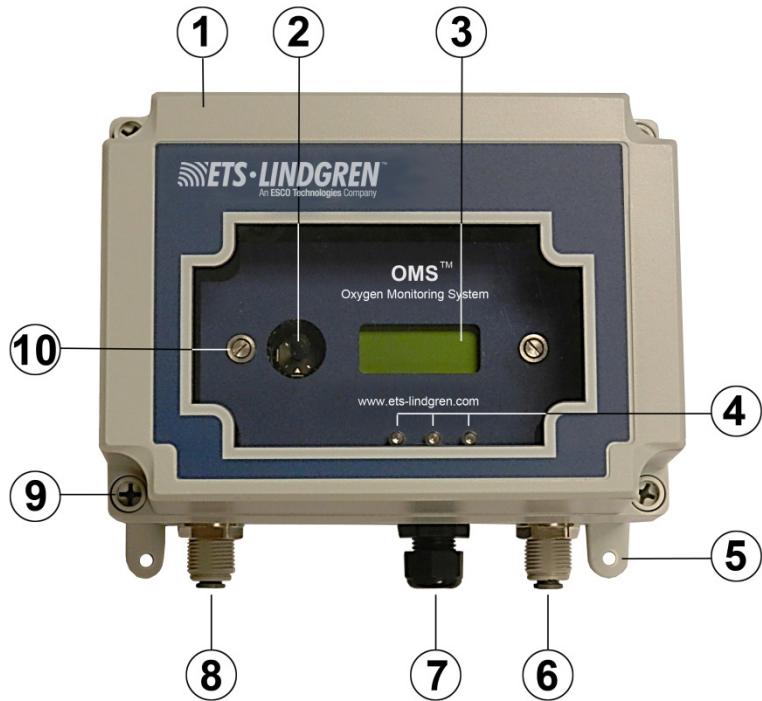
Note: The built in relay settings are user changeable; see *Main Menus and Submenus* on page 41 for more information.

Menu Function / Description	Factory Default
Set 4–20 mA loop To set the OMS 4 mA (zero) and 20 mA (span) to your PLC or distributive control system.	The mA output is set at the factory using a calibrated Fluke meter.
Set Formats; LED and Alarm Relay State To set the relays to energize (normal) or de-energize (fail safe) when the alarm activates. Note: The LED indicators on the front panel are connected directly to the alarm relays.	Alarm 1 = Normal Alarm 2 = Normal Fault - Normal
Alarm Delay To set the time to wait until the relay alarms activate.	Alarm = 5 seconds
Zero Suppression Note: This function is not enabled on the OMS.	000 = 0.00%
Set Alarm Thresholds To set the level to alarm. Note: The Audio Alarm feature is optional.	Alarm 1 = 19.5 % Alarm 2 = 18.0 % Audio = 19.5%
Set Alarm Hysteresis Use when utilizing the OMS for control or valves and process; see page 46 for more information.	Alarm 1 = 0.0 % Alarm 2 = 0.0 % Audio = 0.0 %

Menu Function / Description	Factory Default
Sensor Adjustment For use when dynamically gas calibrating the OMS to a known span gas; see page 46 for more information.	No factory default
Sensor Adjustment Manage Passwords To change the password from the factory default to a new password.	Factory default is 557

COMPONENT VIEWS

Front View Exterior



1. **Front cover**—Removable, waterproof cover that protects the interior of the transmitter; fastened by four captive screws.
2. **Joystick**—Used to select and adjust the built in menus. The OMS features dual level user selectable alarms.
3. **Digital display**—Displays the oxygen levels in percentage; the normal oxygen level on Earth is 20.9%.
4. **Alarm relay LEDs**—Three multi colored LED indicators, from left to right:
 - Alarm 2—Red
 - Alarm 1—Orange
 - Fault—Yellow
5. **Mounting feet (4)**
6. **Sample inlet**—Permits the flow of oxygen to enter the sensor.
7. **Cable strain relief**—The sealed opening in the transmitter housing for connecting the input power, 4–20 mA output, and relay wiring.
8. **Sample exhaust**—Permits the flow of oxygen to exit the enclosure.
9. **Front cover fasteners (4)**—Four captive screws attach the front window to the base unit.
10. **Front panel fastening screws (2)**

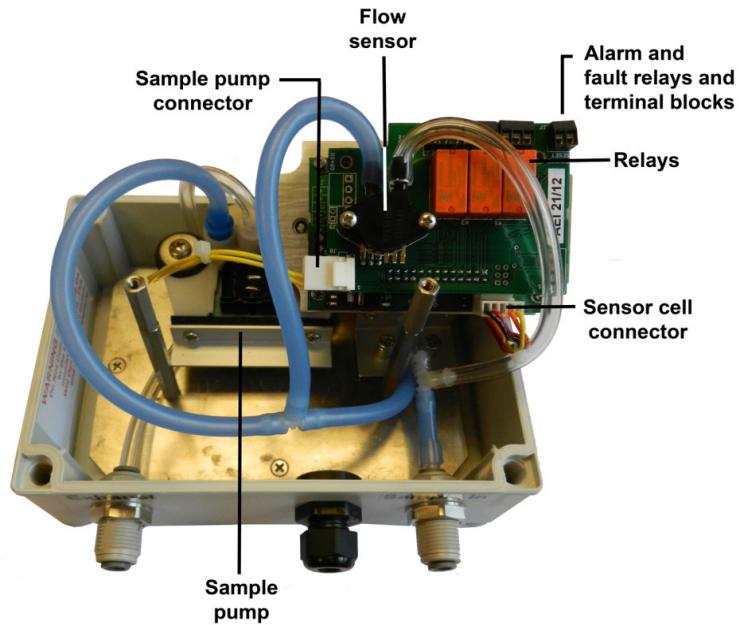
Front View, Cover Removed



1. **Sample pump**—Brings in a sample to the sensor. Flow rate is preset at the factory, and is continuously protected with a built in flow sensor. For more information, see *Instrument Faults* on page 32.
2. **Sensor assembly**—A zirconium oxide sensor cell that detects and measures the level of oxygen. When exposed to oxygen, the sensor outputs an electrical signal proportional to the actual concentration of oxygen.
3. **Retaining screws for electronics panel (2)**—These mount the display front panel and electronics to the enclosure.



When unfastening the front panel electronics, apply upwards pressure on the back of the front panel to release the captive screw.



Front view with electronics panel rotated

Transmitter Interior



The fuse is field-replaceable.



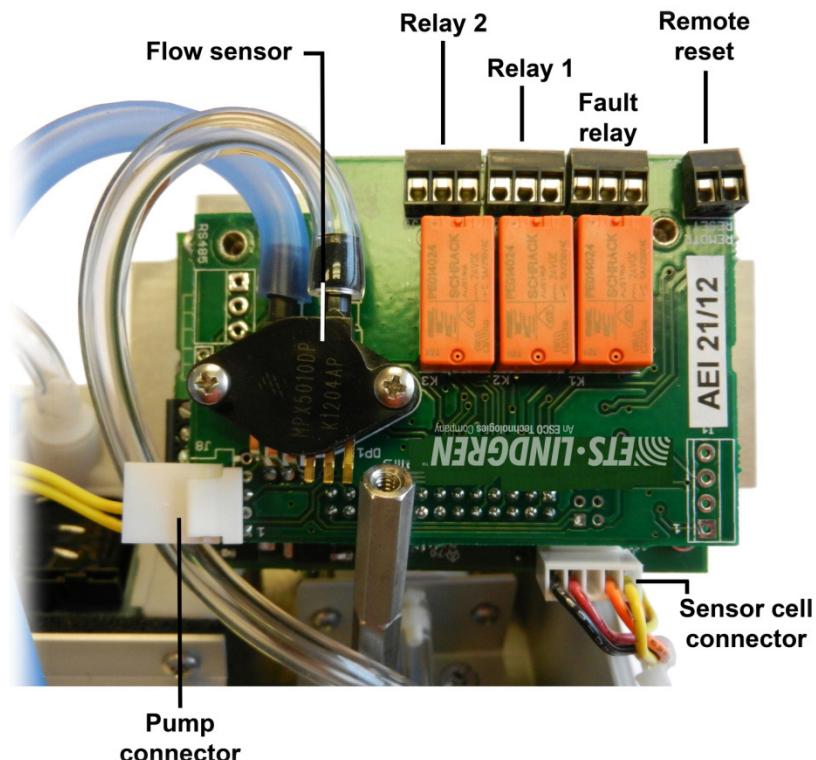
The power analog output terminal block is a 5 pin terminal block where the 24 VDC power and 4–20 mA analog output connections are made

Alarm Relay Board



For the relays, from left to right:

NC-C-NO



BEFORE YOU BEGIN INSTALLATION

CAUTION

Before installing or connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

CAUTION

Failure to follow the instructions in this chapter may damage the OMS and/or the sensor.

Site Requirements

WARNING

The OMS is not designed for installation in a hazardous area. Contact ETS-Lindgren for information on special enclosures for use in a hazardous environment.

CAUTION

The OMS must be installed outside of the MRI room; otherwise, the OMS may interfere with the normal operation of the MRI system.



The OMS must be installed outside of the shielded enclosure.

The Sample Draw Oxygen Monitoring System (OMS™) enclosure should be mounted in an area free of vibration and electrical noise or interference. If possible, avoid areas with high temperatures or condensing humidity.

Connect to 24 VDC Regulated Power



The OMS requires 24 VDC regulated power.

Do not connect the OMS to any voltage that exceeds 24 Volts DC.

Do not connect the OMS to any AC voltage.

Connect OMS and Sensor Before Powering

CAUTION

To avoid damage to the sensor:

- Do not power the OMS with the sensor unplugged from the main PC board.
- Do not connect the sensor to the PC board while the OMS is powered.

Do Not Exchange the Sensor Electronics

CAUTION

The sensor is matched to the electronics. Never exchange the electronics with a sensor from a different OMS.

Use Proper Calibration Steps

WARNING

Calibrate or challenge the OMS ONLY outside the MRI suite.

CAUTION

When calibrating or challenging the OMS:

- Do not expose the OMS to flow rates that exceed a half liter per minute (500 cc per minute).
- When testing sample draw monitors use an on demand regulator to expose the span gas to the OMS.
- Expose the OMS to span gas blends that only consist of oxygen and nitrogen. Do not expose the OMS to any combustible gas (methane, hydrogen, etc.). Exposure to combustible span gases can damage the sensor.

Keep Away from Silicone Compounds

CAUTION

Do not expose the OMS to silicone compounds. Exposure to silicone compounds can cause a loss of sensitivity.

Keep Away from High Air Flow

CAUTION

Do not expose the OMS to high air flow or install it directly in front of fans. High air flow can cool the sensor and cause inaccurate readings.

Keep Away From a Water Stream

CAUTION

Do not expose the sensor directly to a water stream. Cover and protect the OMS and power supply if located in an area that requires wash downs.



Contact ETS-Lindgren for information on purchasing a waterproof enclosure.

INSTALLATION

CAUTION

Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

CAUTION

Prior to performing any of the steps in this chapter, see *Before You Begin Installation* on page 21.

CAUTION

The OMS must be installed outside of the MRI room; otherwise, the OMS may interfere with the normal operation of the MRI system.



The OMS must be installed outside of the shielded enclosure.

Mounting the OMS

The Sample Draw Oxygen Monitoring System (OMS™) is designed primarily for wall mounting and should be installed at a height convenient for operation, maintenance, and viewing of the instrument display. The transmitter and sensor should be installed in a location where gas leaks are likely to occur or where released gases may accumulate.

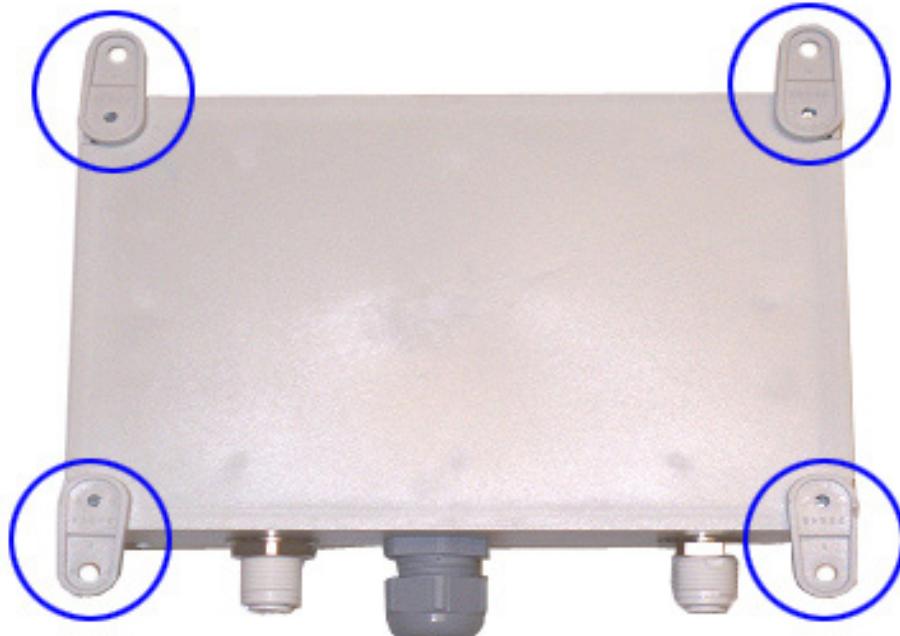
Transmitter and Sensor



Leave clearance room on the bottom of the OMS for the filter, which adds an additional 3.75 inches.

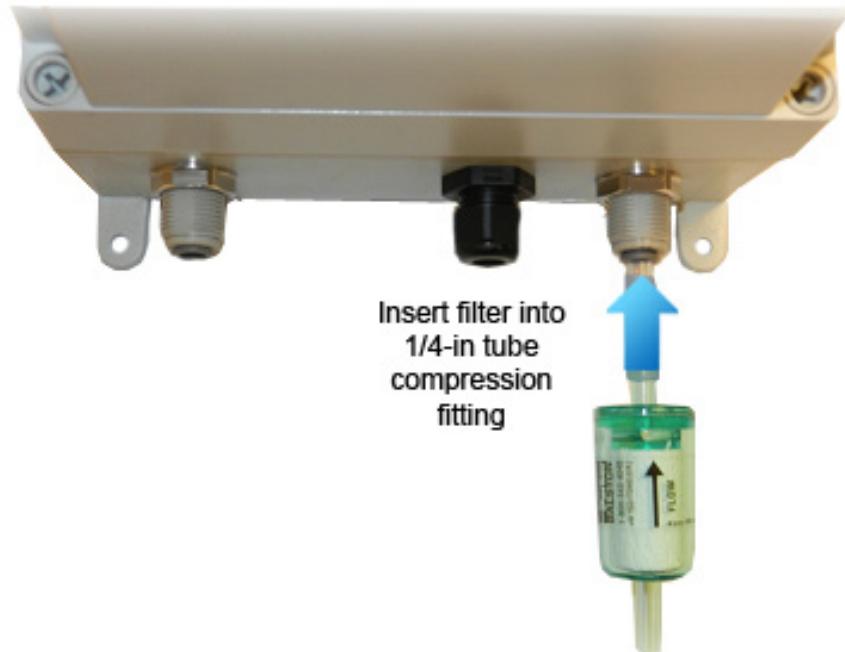
The OMS should be mounted no closer than 12 inches above floor level. Airflow within the monitored area, the characteristics of the gas (lighter or heavier than air), and the position of workstations and personnel should all be considered in determining the most suitable installation location.

Enclosure Mounting Feet



The four mounting feet can be oriented in any direction. The feet can also be removed for mounting the OMS flush with a wall or other surface.

Dust Filter



To protect the pump from dust, a particulate filter is provided.

1. Attach the filter to the sample inlet by inserting the filter into the 1/4 in tube compression fitting.
2. Verify the correct flow by aligning the arrow towards the OMS.

Sample Draw Sensor Tubing

CAUTION

A penetration panel area contains active electrical equipment and connections; contact with this equipment can be life threatening.



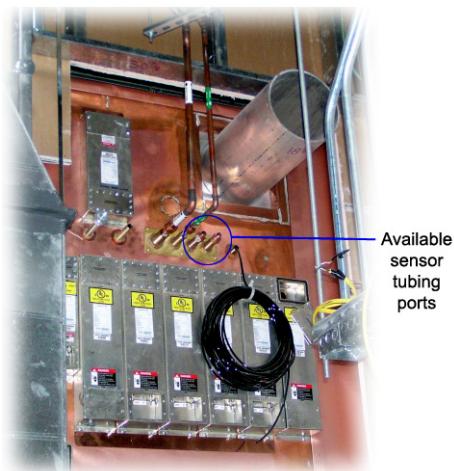
Installation must be performed by a qualified individual.



Run transparent polyurethane 1/4 in (7 mm) tubing (not included) a maximum of 100 feet (30 meters) from the display unit, through a waveguide, and into the interior of the MRI room or shielded enclosure.

The OMS flow pump continuously samples air drawn from end points up to a maximum of 100 feet (30 meters) from the unit. For optimal sensing, position the end point of the tube near the ceiling of the monitored space. A tuned pipe waveguide allows the tubing to enter the shield but attenuates electromagnetic interference (EMI) from entering.

Using an Available Waveguide



(Magnet penetration panel area shown)

1. In the equipment room locate the penetration panel and determine if there is an available waveguide port. Any unused pipe waveguide with a 1/2 in diameter or greater can be used. If there is no waveguide available, go to see *Using Kit 55160 to Install Waveguide* on page 26.
2. If one of the following types of waveguides is available, then route the sensor tubing through and into the MRI room or other shielded enclosure:
 - If a threaded pipe waveguide is available: Install standard threaded plastic bushings to ensure that the sensor tubing is not abraded over time.
 - If a medical gas port that consists of a copper tube is available: Use a type of grommet to protect each end of the waveguide tube.

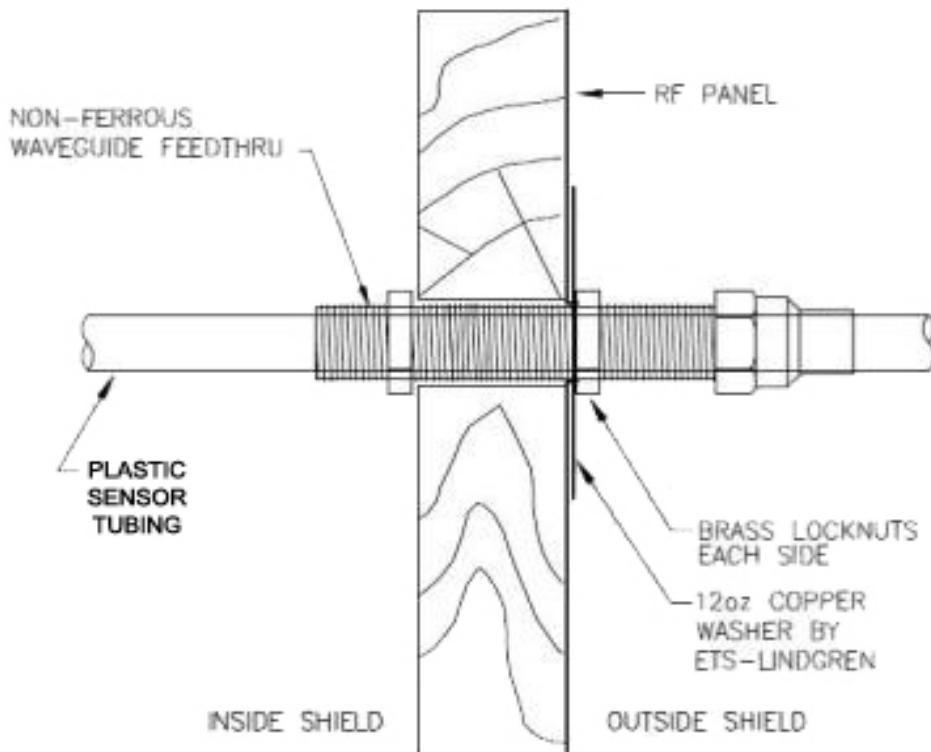
Using Kit 55160 to Install Waveguide

The Waveguide Kit 551060 includes the following:

- 1/2-in threaded brass pipe waveguide (1 each)
- 1/2-in brass bee nuts (2 each)



To prevent linen dust or other airborne particulate matter from clogging the sensor tubing, use a small filtered terminus that can be serviced easily.



1. Locate the area in the penetration panel to place the 1/2 in pipe waveguide.
2. Using a hole saw with the same inner diameter as the 1/2 in pipe waveguide outer diameter, gently cut through the copper shielding. This can be done by hand-rotating the hole saw in reverse, or by marking the copper and using a box cutter to remove the copper.
3. Cut through the plywood with the hole saw.
4. Use a 3M™ Scotch Brite™ pad or fine steel wool to clean the copper surface where the waveguide will pass through the shield; do not use sandpaper.
5. Run one of the brass bee nuts down to the approximate half point of the waveguide.

Slide the 12 oz copper washer onto the waveguide so that it will rest between the copper shield face and the bee nut.

Insert the waveguide.

6. On the inside of the shield install the second bee nut and hand tighten.

On the outside of the shield grip the waveguide and tighten the bee to a snug torque.

7. Route the 1/4 in sensor tubing through the waveguide.
8. For an MRI room: Inside the MRI room, route the sensor tubing along the inside of the finished ceiling to a point above the magnet, or to a point between the top of the magnet and a return air grill.

Wiring



A 3 wire shielded cable: 3 conductor, 18 AWG stranded General Cable E2203S.30.860, or equivalent is recommended. The maximum permissible cable length is 0.62 miles (1 km).



The OMS requires a single, 3 wire shielded cable for analog output and 24 VDC power input. The analog out and VDC power in connections are made on the terminal block inside the transmitter housing.

Pin#	Connection	Description
-	Common (Signal Ground)	0V
-	Common (Signal Ground)	0V
MA	Signal Out	DC 4-20 mA-Output
+	Power	DC + 24 V Input
+	Power	DC + 24 V Input

Additional contacts for +24 VDC Power and Common have been added to accommodate additional wiring for remote horns and strobes.

Connecting a Remote Horn and Strobe to OMS

The following illustrates how to connect a remote horn and strobe (federal signal horn/strobe, or equivalent) to the OMS with **Alarm Relay #1** set to **Normally Open**.

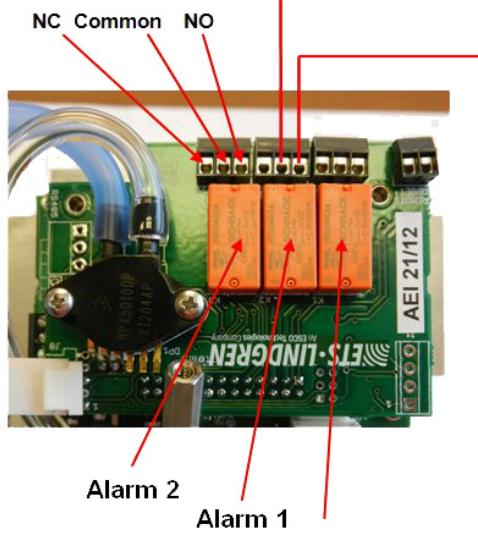
Main power board



Common

115 VAC / 24 VDC 1 amp
regulated power supply

18 AWG, 2-conductor, stranded
control and instrumentation
cable, Belden 8461 or equivalent



Relay board

Federal signal
horn and strobe



+

+

-

-

-

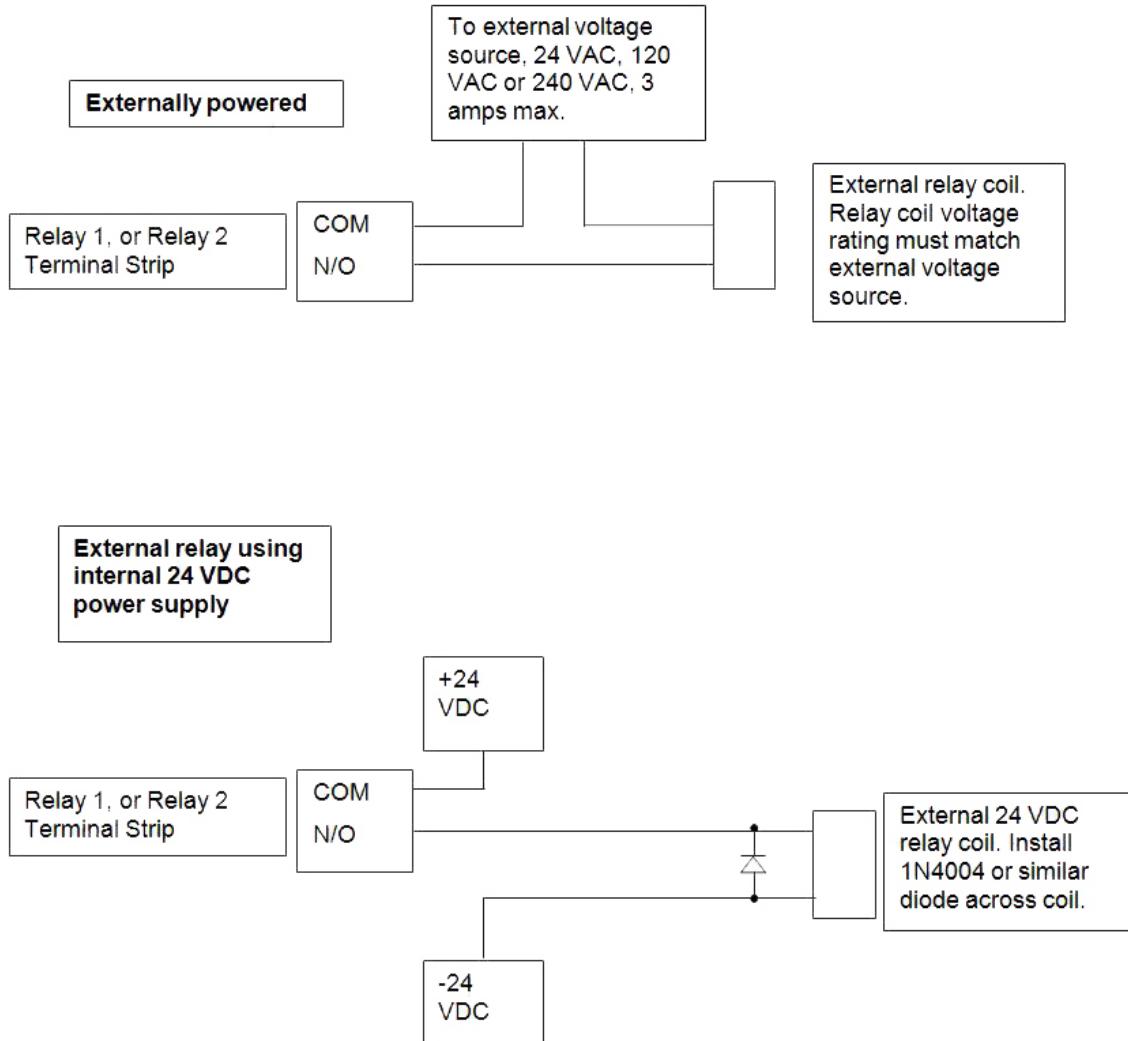
-

-

Connecting a Remote Fan Contactor to OMS

CAUTION

Use 24 VAC voltage inside the OMS; do not use 120 VAC or higher voltage,



Initial Startup

Once installation of the OMS is complete, it is ready for startup. Follow these steps prior to putting the OMS into operation:

1. Check the integrity of all wiring.
2. Apply 24 VDC power to the power supply PCB board. The sample pump will activate and the digital display second line will quickly display the digital transmitter module (DTM), serial number, and software version.



- To display the DTM numbers: Push the joystick to the left.
- To display the gas and range: Push the joystick down. The gas and range will continuously scroll.

To stop the scrolling: Push the joystick down

The OMS should now be powered up. The display will show a 4 minute, (240 second) countdown as the current to the sensor stabilizes. The monitor will output a 4 mA signal during the entire warm up period.



- Do not make any adjustments to the reading until after the OMS has been powered for at least one hour.

After the countdown, the sensor will continue to reach its operating temperature for approximately 30 minutes and the reading that is displayed will slowly increase to ambient.



- Immediately after the countdown, the OMS will display **FLOW FAILURE: OUT OF RANGE** on the top line and disappear. This is a fault history message only and is generated at startup to verify the integrity of the system. The message will automatically clear and **Oxygen** will display on the top line and 20.9% will display on the bottom line.

If the fault is still present, the actual fault code will display on the bottom line.

The OMS should now be operating properly and ready for operation.



- For information on adjusting the OMS to the ambient oxygen level, see *Set Sensor Adjust* on page 46.



- Pump Adjustment:** The OMS has a built in digitally controlled flow controlled sample pump. The pump flow is set at the factory and should not require adjustment. It has a range to accommodate tubing lengths of three feet to over 100 feet. If flow adjustment is necessary, contact ETS-Lindgren.

Normal flow rate is between 0.10 and 0.25 liters per minute.

OPERATION

CAUTION

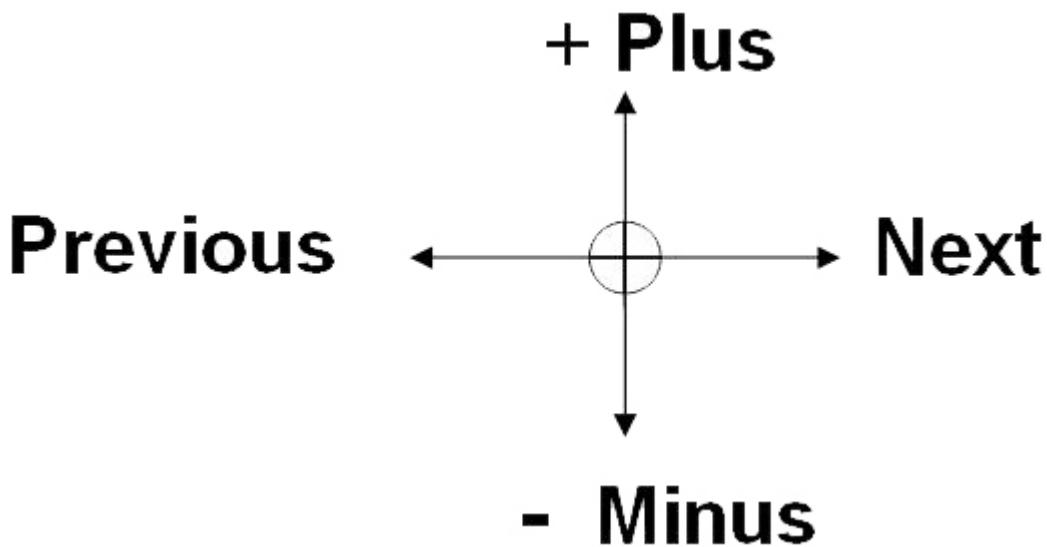
Before placing the OMS into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Joystick Operation



The joystick has a built in delay to prevent accidental tampering with the menus; deliberate entries are required.

The Sample Draw Oxygen Monitoring System (OMS™) uses an 8 position joystick with a center pushbutton for selecting menus and changing values. The joystick is programmed to standard protocol as follows:



+ Plus	Push the joystick in this direction to increase the value.
- Minus	Push the joystick in this direction to decrease the value.
Next	Push the joystick in this direction to moves to the next level of the menu hierarchy.
Previous	Push the joystick in this direction to go back to the last level of menu hierarchy.
Enter	Push the joystick directly in the center to enter the information.

Main Operation Mode

Step	Display
To select the main menu from any submenu, push the joystick to the left until the main menu displays.	Oxygen 20.9%

Internal Sample Flow Rate

The OMS has an internal sample pump flow rate that is programmed at the factory and cannot be changed in the field. A flow sensor on the relay board continually monitors flow rate and when a loss of flow is detected, a signal is sent to the fault relay and the front mounted LED will activate. Sample flow to the monitor is continuously monitored and controlled by the flow control microprocessor.



If the sample line is blocked, the fault indicator will illuminate and the pump will accelerate and attempt to re establish the proper flow rate. If the line is cleared, the pump will speed and slow down and the fault light will turn off when the flow rate is back to factory setting.

For the recommended filter maintenance, see page 12.

Signal Outputs

The OMS outputs a continuous 4–20 mA analog signal proportional to the measured concentration of oxygen; 4 mA represents 0% oxygen, and 20 mA represents 25% oxygen, which is the full range. In the event of a system fault, a specific factory defined code will be displayed on the display, indicating the exact nature of the system fault.

Instrument Faults



When using your own power supply, make sure that the voltage is regulated to 24 VDC \pm 0.5 Volts. A voltage that is too low or too high will activate a **Supply Voltage Out of Range** fault and disable the OMS.

The OMS incorporates a number of self checking features to ensure reliable operation. If a fault condition is detected, the analog output signal is altered as follows:



All system faults are displayed on the front panel. Each fault has a unique code to identify the specific problem. Contact ETS-Lindgren if a fault is displayed.

Condition	Analog Signal
Supply Voltage Out of Range Fault Code 16	Analog output drops to 2 mA
Transmitter cable cut	Analog output drops to 0 mA
O2 Cell Current Fault Fault Code 128	Analog output drops to 2 mA (0 mA on request) Fault Relay activates (available with Relay Option only)
O2 System Warm Up	Analog output drops to 2 mA Fault Relay activates and turns off when system is in Oxygen Operation Mode
O2 Cell Voltage Fault Fault Code 64	Analog output drops to 2 mA Fault Relay activates (available with Relay Option only)
No Flow to Oxygen Sensor Fault Code 32	Analog output drops to 2 mA Fault Relay activates
EEPROM Fault 08	Analog output drops to 2 A (0 mA on request)

Loss of Power Indicator

If the OMS loses 24 VDC power, the 4–20 mA analog output signal drops to 0 mA. The display will show a blank screen.

Alarm Reset

If the OMS is supplied with the optional alarm relays, when the monitors alarms are activated, the built in alarm relays, panel mounted LEDs, and optional audio horn will also activate.

When the relay settings are non latching, the alarm relays, LEDs, and horn will automatically reset.

If the relay settings are latching, then a manual reset of the alarms is required. Resetting the alarms can be performed by using the joystick or using the remote reset function.

- Joystick—To reset the alarms, enter the password, and then push the joystick directly in the center to enter the information.
- Remote Reset—The alarm relay board has a 2 pin connector for wiring to a remote switch. When connected to a switch, this remote reset will bypass the joystick and a password will not be needed to reset the alarms.



The oxygen levels must recover above the alarm thresholds before the horn can be reset from the remote reset switch or joystick.

PROGRAMMING THE OMS

CAUTION



Before placing the OMS into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Only qualified personnel should program the OMS.

The Sample Draw Oxygen Monitoring System (OMS™) is supplied with user selectable settings to adjust the alarm settings, 4 and 20 mA output, and minor sensor adjustments. The settings are arranged in menus that are accessed by moving the joystick. Use the password set at the factory to access the menus.



The OMS will continuously monitor oxygen while accessing the menus. The alarm, fault relays, and mA output are all active and on line while making changes to the menus.

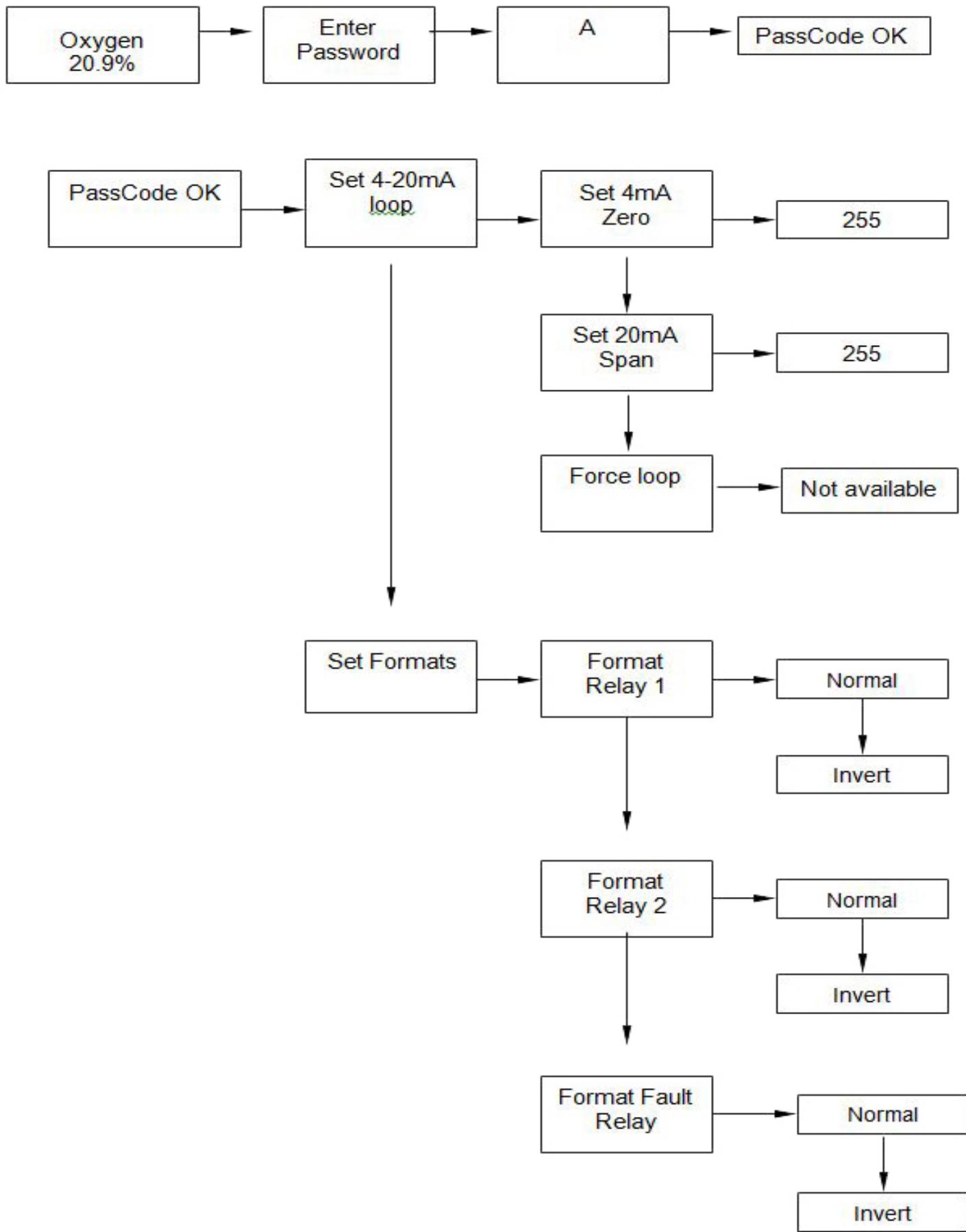
Program Flowchart

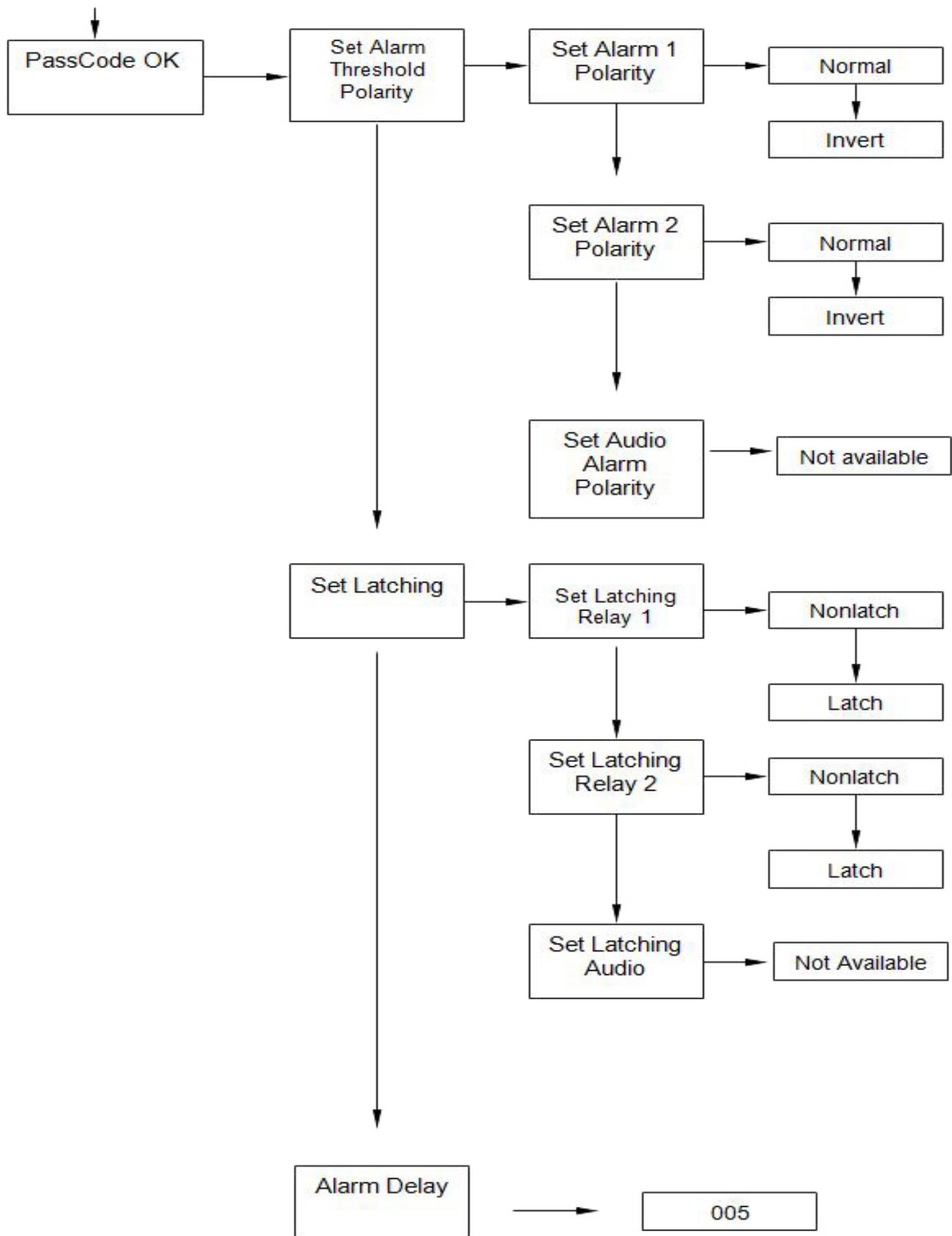


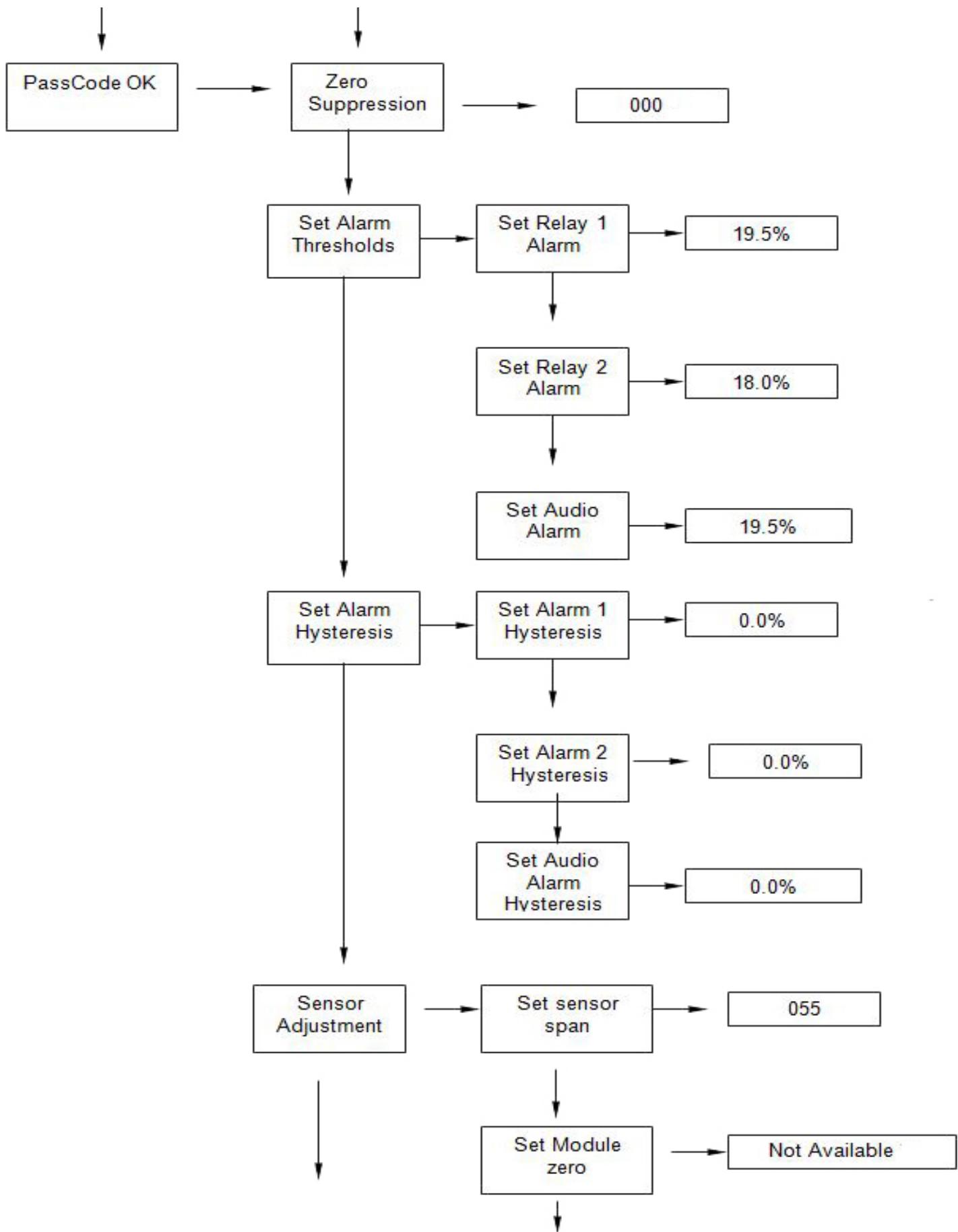
All numerical values shown in the flowcharts on the following pages are examples; the values are not factory defaults.

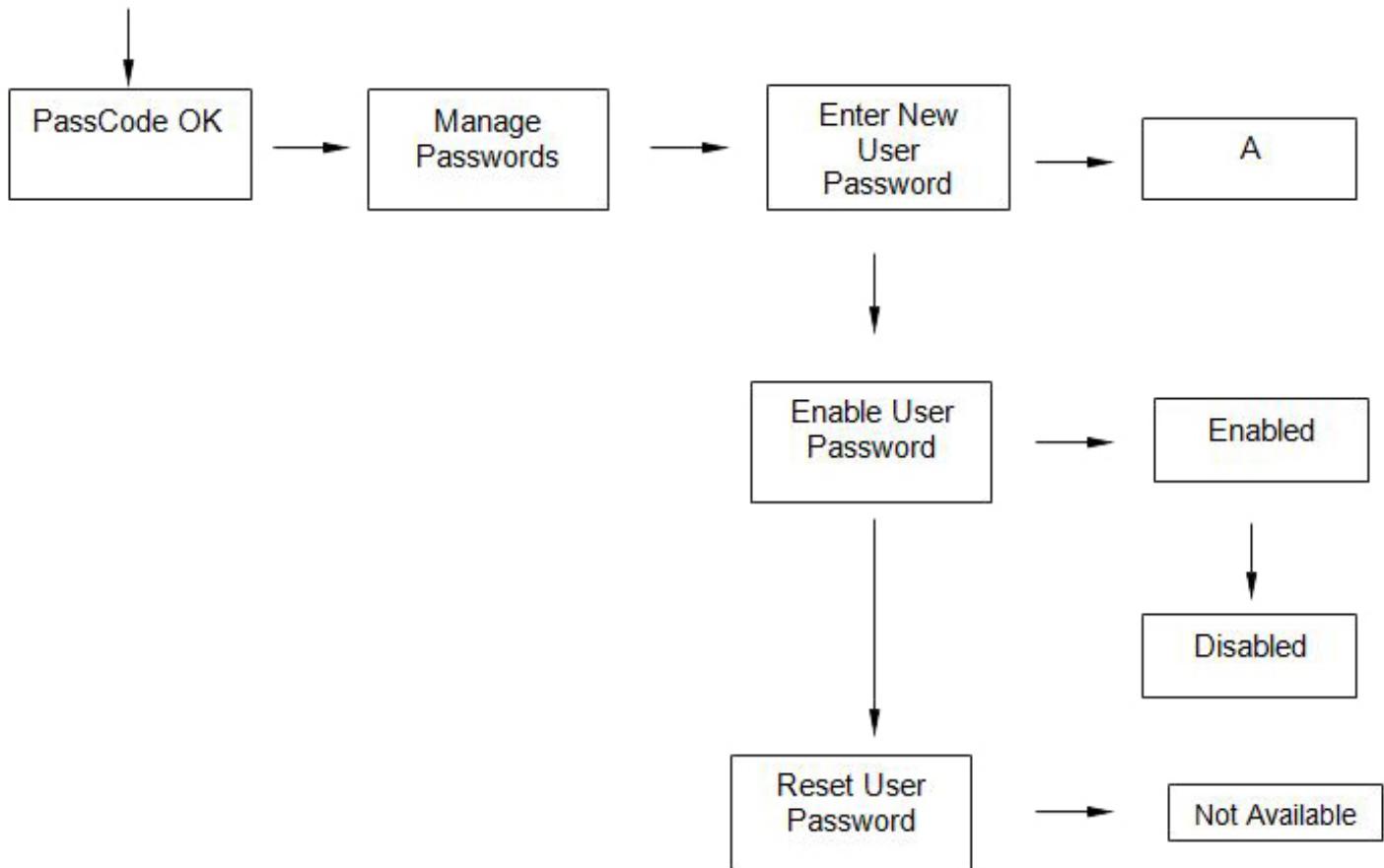


The **Zero Suppression** function is not available for oxygen.









Passwords



If you forget your password, contact ETS-Lindgren for instructions on password recovery. You will need to provide the digital transmitter module (DTM) for the OMS, which is displayed by moving the joystick to the left.

Enter Password

The OMS has a factory set password to prevent unauthorized access to the menus; the password is **557**. Following are the steps to enter the password:

Step	Display
1. Push the joystick once to the right.	Enter Password
2. Push the joystick again once more to the right to enter the input screen.	The letter A will appear and flash.



The display has characters A–Z and 0–9. Pushing the joystick up or down will scroll through the alphanumeric characters.

3. Push the joystick up or down to enter the first digit.	The character to be entered will flash.
4. Push the joystick to the right to select the second entry, and then push the joystick up or down to select the second digit.	The character being entered will flash and the first character entered will remain illuminated.

Step	Display
5. Push the joystick to the right to select the third entry, and then push the joystick up or down to select the third and final digit.	The character being entered will flash, and the first and second characters entered will remain illuminated.
6. Push the joystick in the center to enter the password.	Password OK.



The display has characters A–Z and 0–9. Pushing the joystick up or down will scroll through the alphanumeric characters. If an incorrect password was entered, the display will show **Password Failed**. Push the joystick to the left to access the monitoring mode. From this mode you can re-enter the password.

Change Password

The OMS has a factory set password to prevent unauthorized access to the menus; the password is **557**. Following are the steps to change the password:

Step	Display
1. Push the joystick down to access the Manage Passwords menu.	Manage Passwords
2. Push the joystick to the right to enter the input screen.	Enter New User Password
3. Push the joystick to the right to enter the input screen.	The letter A will appear and flash.



The display has characters A–Z and 0–9. Pushing the joystick up or down will scroll through the alphanumeric characters.

Step	Display
4. Push the joystick up or down to enter the first digit.	The character to be entered will flash.
5. Push the joystick to the right to select the second entry, and then push the joystick up or down to select the second digit.	The character being entered will flash and the first character entered will remain illuminated.
6. Push the joystick to the right to select the third entry, and then push the joystick up or down to select the third and final digit.	The character being entered will flash, and the first and second characters entered will remain illuminated.
7. Push the joystick in the center to enter the new password.	Re-Enter New Password.
8. Repeat steps 4-7 to re-enter the new password.	New-Password Entry OK



If the re-entered password does not match the initial entry, **Re-Enter Password** will display, and you will need to repeat the entire process starting with step 2 of *Change Password*, above.

Enable/Disable Password Function

This function allows you to activate or deactivate the password function on the OMS.

Step	Display
1. Push the joystick down.	Enable User Password
2. Push the joystick to the right to display the status.	If activated, Enabled will display.
3. Push the joystick up or down to change the status to Enabled or Disabled, and then push the joystick in the center to enter the new status.	Enable User Password.

Main Menus and Submenus

The OMS provides menus for adjusting mA outputs, alarm relay settings, sensor adjustments, and zero suppression for toxic and corrosive gas sensor cells.

Set 4–20 mA Loop

This set of menus is used to adjust the 4 mA and 20 mA output from the OMS. It also provides a function to send an actual output between 4 mA and 20 mA to test any remote control and alarm system attached to the OMS.



To read the mA output, the OMS must be connected to a remote PLC controller or to a SCADA system. You can also connect the OMS to a volt meter to read the mA output. Please contact ETS-Lindgren for more information.

Step	Display
1. From this main menu, push the joystick to the right to select the submenu used to adjust the 4 mA output.	Set 4mA Zero
2. To change the value, push the joystick to the right to display the 4 mA setting.	The display will indicate a value between 0 and 255 counts.
3. Push the joystick up to increase the value and push it down to decrease the value; Enter to accept the value.	The 4 mA output sent from the OMS will change as the number on the display changes.
4. Push the joystick to the left to go back to the previous main menu.	Set 4mA Zero
5. Push the joystick down to access the next submenu, which is used to adjust the 20 mA output.	Set 20mA Span
6. To change the value, push the joystick to the right to display the 20 mA span setting.	The display will indicate a value between 0 and 255 counts.
7. Push the joystick up to increase the value and push it down to decrease the value; Enter to accept the value.	The 20 mA output sent from the OMS will change as the number on the display changes.
8. Push the joystick to the left to go back to the previous main menu.	Set 20mA Span



You will be able to access the **Force Loop** submenu, but because the **Force Loop** function was designed for toxic and corrosive gases, it is not available for use on the OMS.

Set Formats

This set of menus is used to adjust the relay states for the two gas alarm relays and the individual instrument fault relay.



To access this menu, the OMS must be installed with the relay module. If not installed, the display will indicate **N/A** (not available).

Step	Display
1. Push the joystick down to access the next main menu, Set Formats . This is used to set the two alarm relays and the fault relay settings from a normally de-energized state (Normal) to a normally energized state (Inverted).	Set Formats
2. Push the joystick to the right to select the submenu used to adjust the first level alarm relay state.	Format Relay 1
3. Push the joystick to the right to display the relay state.	INVERT
4. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value	NORMAL will display, and then will default to the Set Formats menu.
5. Push the joystick to the right	Format Relay 1
6. Push the joystick down to access the next menu, used to adjust the second level alarm relay state	Format Relay 2
7. Push the joystick to the right to display the relay state.	INVERT
8. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value.	NORMAL will display, and then will default to the Set Formats menu.
9. Push the joystick to the right.	Format Relay 1
10. Push the joystick twice to select the fault relay to be adjusted.	Format Fault Relay
11. Push the joystick to the right to display the relay state.	INVERT
12. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value.	NORMAL will display, and then will default to the Set Formats menu.

Set Alarm Threshold Polarity

Alarm Threshold Polarity determines if an alarm concentration is set above or below a threshold value. For example, if an alarm of 19.0% for oxygen is selected, the Alarm Threshold Polarity must be set to **INVERT** for the alarm to activate when the reading goes **below** 19.0%.

For toxic and corrosive gases, a **NORMAL** setting for the Alarm Threshold Polarity causes the system to alarm when the gas concentration **exceeds/goes above** an alarm set point.

Step	Display
1. Access this menu from the Set Formats menu by pushing the joystick down.	Set Alarm Threshold Polarity
2. Push the joystick to the right.	Set Alarm 1 Polarity

Step	Display
3. Push the joystick to the right to display the relay state.	INVERT
4. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value.	NORMAL will display, and then will default to the Set Alarm 1 Polarity menu.
5. Push the joystick down to access the next submenu.	Set Alarm 2 Polarity
6. Push the joystick to the right to display the relay state.	INVERT
7. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value.	NORMAL will display, and then will default to the Set Alarm 2 Polarity menu.
8. Push the joystick down to access the next submenu.	Set Audio Alarm Polarity



To access this menu, the OMS must be installed with the audio option module. If not installed, the display will indicate **N/A** (not available)



The optional built in horn is designed to operate in only one alarm mode. It will activate in either a decreasing alarm or an increasing alarm mode.

9. Push the joystick to the right to display the relay state.	INVERT
10. Push the joystick down to change the relay state to NORMAL , and then Enter to accept the value.	NORMAL will display, and then will default to the Set Audio Alarm Polarity menu.

Set Latching

This sets the relay alarm state for the two gas alarm relays and the individual instrument fault relay to a latching or non latching state. In a latching state, the relay will remain activated until the user manually selects the Enter key. In a non latching state, the alarm relay will automatically reset once the gas concentration has returned to 20.9% for oxygen.



To access this menu, the OMS must be installed with the relay module. If not installed, the display will indicate **N/A** (not available).

Step	Display
1. Push the joystick to the right to select the submenu to adjust the first level alarm relay state	Set Latching Relay 1
2. Push the joystick to the right to display the relay state.	LATCHING
3. Push the joystick down to change the relay state to NON LATCHING , and then Enter to accept the value.	NONLATCH will display, and then will default to the Set Latching menu.
4. Push the joystick to the right to select the submenu.	Set Latching Relay 1
5. Push the joystick down to adjust the second level alarm relay state.	Set Latching Relay 2

Step	Display
6. Push the joystick to the right to display the relay state.	LATCHING
7. Push the joystick down to change the relay state to NON LATCHING , and then Enter to accept the value.	NONLATCH will display, and then will default to the Set Latching menu.
8. Push the joystick to the right to select the submenu.	Set Latching Relay 1
9. Push the joystick twice to ad-just the audio alarm relay state.	Set Latching Audio Alarm



To access this menu, the OMS must be installed with the audio alarm option module. If not installed, the display will indicate **N/A** (not available).

10. Push the joystick to the right to display the relay state.	LATCHING
11. Push the joystick down to change the relay state to NON LATCHING , and then Enter to accept the value.	NONLATCH will display, and then will default to the Set Latching menu.

Reset Latching Alarm

To reset a latching alarm relay, you must enter the password correctly and then push the joystick down to send the reset command. The OMS also has an internal 2 pin terminal block for connecting a remote reset switch.

Set Alarm Delay

The Alarm Delay is the amount of time an alarm level concentration of oxygen must be present before the gas concentration alarm(s) will be activated.

Use this menu to set a user-selected time delay for activating alarm relays 1 and 2, from 0 seconds to 255 seconds. When an alarm level has been exceeded, the alarm relays will activate after this period of time.

Step	Display
1. Push the joystick down to access the Alarm Delay main menu.	Alarm Delay
2. Push the joystick to the right to display the time setting function. Push the joystick up to increase the value or down to decrease the value, and then Enter to accept the value.	The display will indicate a value between 0 and 255 seconds, and then will default to the Alarm Delay menu.



The alarm delay is only available for alarm 1 and alarm 2; there is no delay for the fault relay. Any system fault will immediately activate the fault relay.

Set Zero Suppression

Although these settings can be changed, this function is disabled on the OMS; it is only used to decrease the sensitivity of selected gas sensors. The factory default is set at **000**.

Set Alarm Threshold



To access this menu, the OMS must be installed with the audio alarm option module.

Step	Display
1. Push the joystick to the right to select the first submenu.	Set Relay 1 Alarm Threshold
2. This is the gas concentration at which the first level alarm will be activated. To display the setting, push the joystick to the right. Push the joystick up to increase the value or down to decrease the value, and then Enter to accept the value.	The display will indicate a value between 00.0% and 25.5%, and then will default to the Set Relay 1 Alarm Threshold menu.
3. Push the joystick to the right to select the next submenu.	Set Relay 2 Alarm Threshold
4. This is the gas concentration at which the second level alarm will be activated. To display the setting, push the joystick to the right. Push the joystick up to increase the value or down to decrease the value, and then Enter to accept the value.	The display will indicate a value between 00.0% and 25.5%, and then will default to the Set Relay 2 Alarm Threshold menu.
5. Push the joystick down to select the next submenu.	Set Audio Alarm Threshold
6. This is the gas concentration at which the audio alarm will be activated. To change the displayed value, push the joystick to the right to display the second level alarm setting. Push the joystick up to increase the value or down to decrease the value, and then Enter to accept the value.	The display will indicate a value between 00.0% and 25.5%, and then will default to the Set Audio Alarm Threshold menu.



To access this menu, the OMS must be installed with the audio alarm option module. If not installed, the display will indicate **N/A** (not available).



The audio can be set to only one alarm level. Choose between alarm level 1 and alarm level 2, or select a different setting.

Set Alarm Hysteresis

The OMS may be used as a control system. When used to regulate oxygen levels, a dead band, hysteresis may be required. This menu sets the alarm hysteresis to a desired concentration of oxygen. When using hysteresis, the alarm set point becomes an average alarm setting for an action to occur. When adding the hysteresis value to the alarm set point, this then defines the alarm and dead band for an action to occur.

For example, to require a valve to close at 14.9% oxygen level and to reopen at 15.5% oxygen level, set the alarm threshold at 15.2% and the hysteresis value at 0.3%.

Valve off: Average alarm set point = 15.2% - Hysteresis 0.3% = 14.9%

Valve on: Average alarm set point = 15.2% + Hysteresis 0.3% = 15.5%

Step	Display
1. Push the joystick down to access the menu.	Set Alarm Hysteresis
2. Push the joystick to the right.	Set Alarm 1 Hysteresis
3. Push the joystick up to increase the percentage; the maximum value is 2.5%. Push the joystick down to decrease the percentage. Enter to accept the value.	The display will indicate the selected value, and then will default to the Set Alarm 1 Hysteresis menu.
4. Push the joystick down to access the next submenu.	Set Alarm 2 Hysteresis
5. Push the joystick to the right to display a value 0.0%. Push the joystick up to increase the percentage; the maximum value is 2.5%. Push the joystick down to decrease the percentage. Enter to accept the value.	The display will indicate the selected value, and then will default to the Set Alarm 2 Hysteresis menu.
6. Push the joystick down to access the next submenu.	Set Alarm Audio Hysteresis
7. Push the joystick to the right to display a value 0.0%. Push the joystick up to increase the percentage; the maximum value is 2.5%. Push the joystick down to decrease the percentage. Enter to accept the value.	The display will indicate the selected value.

Set Sensor Adjust



Warm up the OMS for two hours prior to making any adjustments to the sensor.

Sensor Adjust sets the oxygen readout to a known concentration. It is recommended to adjust the oxygen display to ambient oxygen levels of 20.9%.

Step	Display
1. Push the joystick down to access the menu.	Sensor Adjustment
2. Push the joystick to the right to access the submenu.	Set Sensor Span
3. Push the joystick up to increase the counts and decrease the percent oxygen value displayed. Push the joystick down to decrease the counts and increase the oxygen value displayed. Adjust to a value of 20.9% ± 0.1% , and then Enter to accept the value.	The display will indicate a value between 0 and 255 counts, and then will display the selected value of 20.9% ± 0.1% . Then the display will default to Set Sensor Span .



The actual oxygen reading will fluctuate from 20.8% to 21.0%.

Step	Display
4. Push the joystick to the left to go back to the main menu.	Sensor Adjustment



Set Module Zero is not available for the OMS; it was designed for toxic and corrosive gas monitors. Push the joystick to the left to exit this menu.

SENSOR VERIFICATION

WARNING

Calibrate or challenge the OMS ONLY outside the MRI suite.

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

CAUTION



Observe all safety guidelines when generating and using nitrogen.

Sensor verification should be performed only by qualified personnel. Warranty may be void if performed by non qualified personnel.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Earth is a source of calibrated oxygen at 20.9%, and therefore under ambient conditions. Verification of the Sample Draw Oxygen Monitoring System (OMS™) to 20.9% oxygen is constantly being performed. As the sensor ages over time, it may require a slight adjustment to 20.9%. The OMS also requires periodic testing with nitrogen to verify the cells response to 0% oxygen.

Required Gas and Equipment



The required gas and equipment are available from your gas supplier or from Air Liquide at 800-638-1197.

Nitrogen and an on demand regulator are recommended to expose the OMS to a known span gas. You may purchase both items from your gas supplier or from Air Liquide.

Air Liquide Part Number	Description
CZF6D400281	Nitrogen 105 liter cylinder, 99.99%
18102509	Regulator, On Demand

Sensor Verification Procedure

Prior to performing the procedure, place the OMS in a clean, non oxygen deficient environment.



Warm up the OMS for two hours prior to making any adjustments to the sensor.



If the OMS is connected to a controller, put the controller in standby mode to avoid accidental alarms.



If required by your safety protocol, you may subject the OMS to different concentrations of oxygen span gas.

Under ambient non oxygen deficient environments, the OMS will display 20.9%. As the sensor ages, the reading may decrease in value. To adjust the reading to 20.9%:

Step	Display
1. Enter the password, and then push the joystick down to select the Sensor Adjustment menu.	Sensor Adjustment
2. Push the joystick to the right to access the submenu.	Set Sensor Span
3. Push the joystick up to increase the counts and decrease the percent oxygen value displayed. Push the joystick down to decrease the counts and increase the oxygen value displayed. Adjust to a value of 20.9% \pm 0.2% , and then Enter to accept the value.	The display will indicate a value between 0 and 255 counts, and then will display the selected value of 20.9% \pm 0.2% . Then the display will default to Set Sensor Span .
4. Push the joystick to the left to return to the main menu.	Sensor Adjustment

Sensor Verification to Nitrogen



ETS-Lindgren recommends challenging the OMS with nitrogen every 6 to 12 months.

The filter on the OMS has a 1/4 in male tube fitting designed to connect sample tubing from a nitrogen cylinder. Expose the OMS to nitrogen using the on demand regulator. The reading will drop off to 1% or below in less than one minute when the sensor is exposed to pure nitrogen. The system will recover to 20.9% when the nitrogen is removed.

Sensor Verification to Known Concentration of Oxygen

CAUTION

Protect the OMS from wind and high airflow when gas calibrating with test gas.



Test the OMS in an upright position to allow the span gas to fully saturate the sensor.



To see the exact span gas concentration the OMS must be completely immersed into a span gas environment.

To see a true zero, the OMS must be completely immersed into a zero oxygen environment.

The sensor inlet on the OMS has a 1/4 in compression tube fitting designed to connect to the filter. Connect 1/4 in diameter sample tubing from a nitrogen cylinder directly to the filter. Expose the OMS directly from the nitrogen cylinder and the reading will drop off to the span gas concentration in less than one minute. The final reading should be within $\pm 0.3\%$ of the span gas concentration.



REMOTE DISPLAY ALARM INDICATOR

The Remote Display Alarm Indicator is designed to display remote oxygen concentration information from the oxygen monitor. The O2 monitor has a built in 4-20mA output. The remote display alarm easily connects to the monitor's input power and mA output connection. An 18 AWG, three conductor, shielded control and instrumentation cable, Belden 8770 or equivalent, is recommended for the connection. The maximum permissible cable length is 250 feet. You can simultaneously connect one remote display to one Air Check Oxygen monitor and one programmable logic controller, PLC.



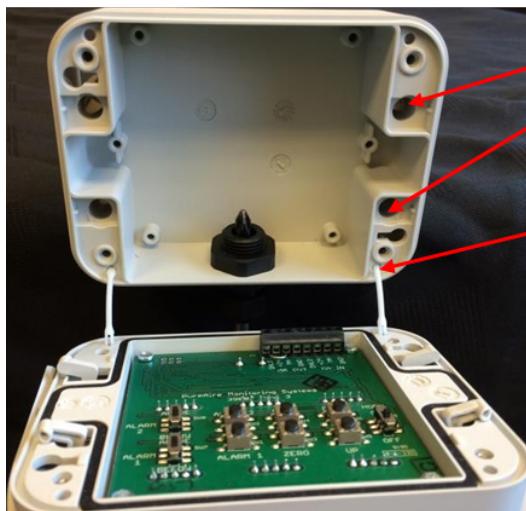
How to Mount the Remote Display Alarm Indicator



1. Open the two side doors to expose the front panel screws.



2. Loosen the 4 screws to separate the front panel from the case.



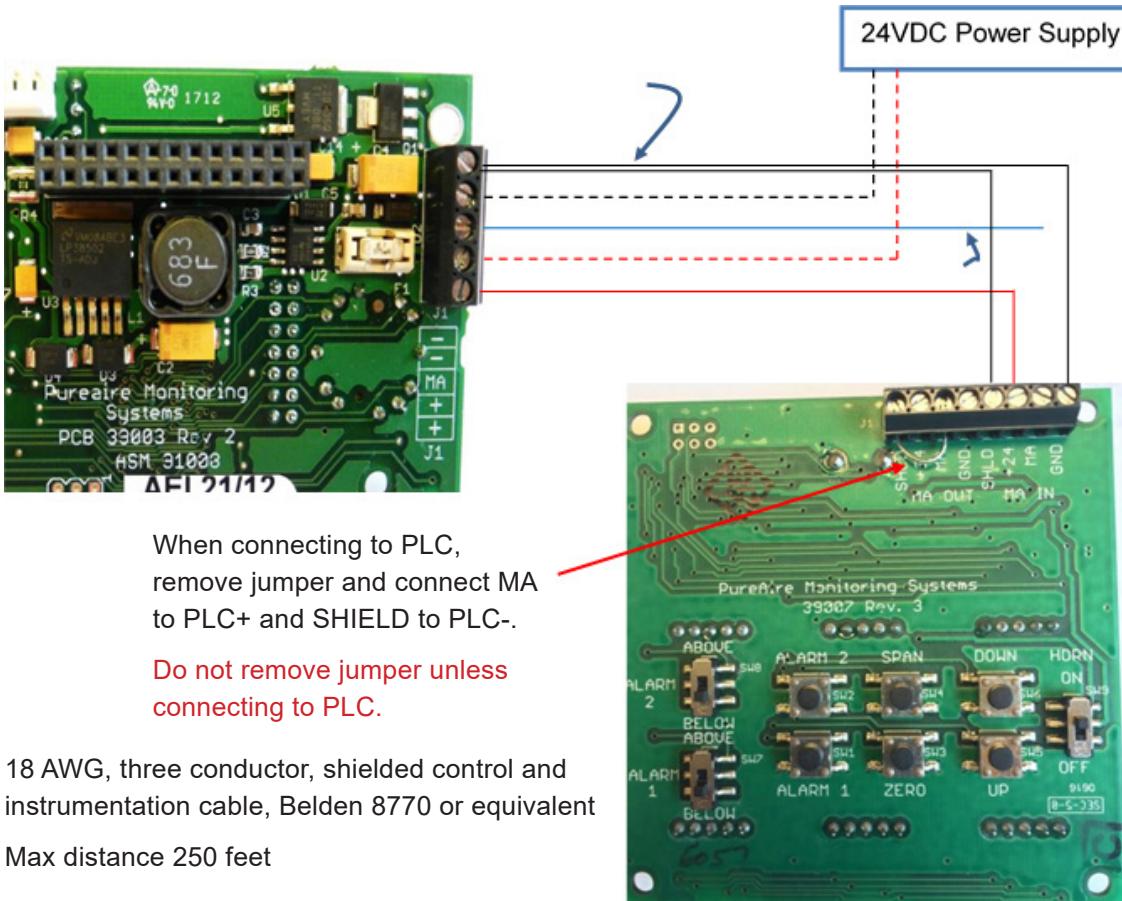
Mount the case to a wall or other flat surface. There are 4ea. through holes for fastening the case.

The case is designed to be flush mounted.

→ The front cover can be removed from the case by gently pulling on the plastic hinges. (They will stay connected to the front cover).

To connect the front cover, just push the plastic hinge into the case.

How to Wire the Remote Display Alarm Indicator

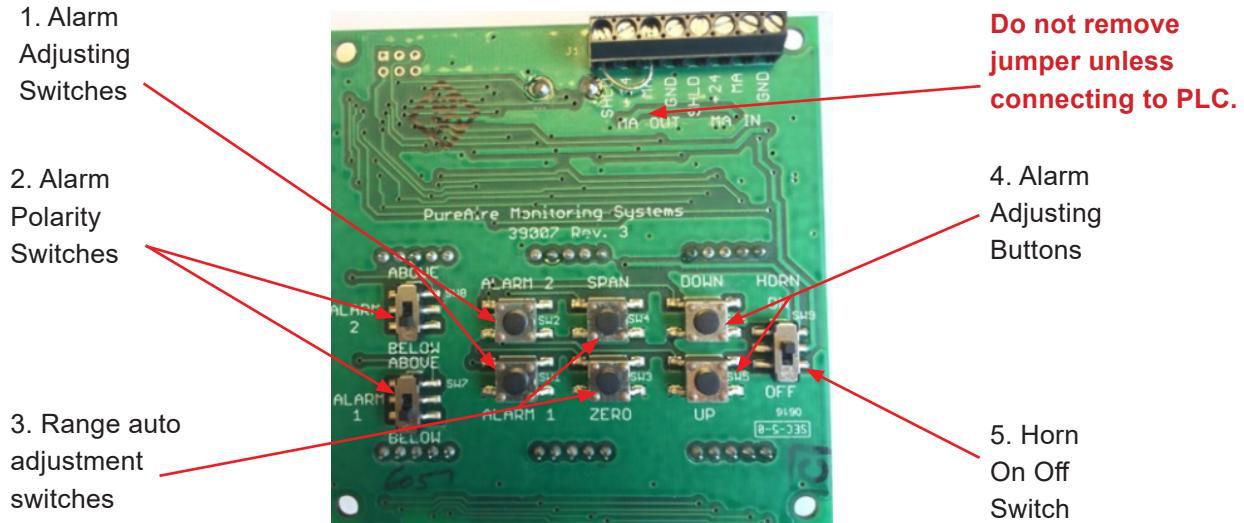


CAUTION

Make all wire terminations with the power OFF. Failure to do so can damage the oxygen monitor and remote display and void your warranty.

Identification of Switches and Controls

- 1. Alarm Adjusting Switches** – These switches are used to select the alarm level to be adjusted. They are factory set at 19.5% for Alarm 1 and 18% for Alarm 2. (Normally set at the factory)
- 2. Alarm Polarity Switches** – These switches are used to select when the alarms will activate. For oxygen the alarm switches are set for “Below”. If the readings go below ambient, 20.9% then the internal horn and LED’s will activate. When used with our toxic gas monitors, the polarity is set to “Above”. (Normally set at the factory)
- 3. Range Auto Adjustment Switches** – These switches are used to adjust the zero and full scale reading on the Remote Display Alarm Indicator. When sending a 4mA and 20mA signal from your oxygen monitor, pushing these switches will automatically adjust the zero and full scale readings on the Remote Digital Display.
- 4. Alarm Adjusting Buttons** – These buttons are used to increase, (UP) or decrease (DOWN) the alarm settings.
- 5. Horn On/Off Switch** – This switch is used to turn the internal audio horn on and off. In the On position, any alarm will activate the audible horn. To disable the internal horn, turn the switch to Off.



How to Set up and Operate the Remote Display

CAUTION

Entering the setup menus will disable the real time oxygen readings.

After wiring the remote display to your Oxygen monitor, turn on the power to your oxygen monitor. During the warm up the remote display will illuminate a yellow fault LED and the display will read FLt, (indicating that the oxygen monitor is in fault). This will clear after the oxygen monitor completes the 4 minute warm-up.



During warm up



After warm up

How to Set the Zero and Full Scale Range

This will need to be set up in the field to adjust to the length of cable between the oxygen monitor and the remote display alarm indicator. To perform this in the field, first enter the password on your oxygen monitor and select the "Set 4-20mA loop" menu. (See Section *Set 4-20mA loop* in your oxygen manual).

On your oxygen monitor, use the joystick to select "Set 4mA Zero". This sends a 4mA signal to the remote display. On the back of the remote display push the ZERO button for 3 seconds. You'll see the display reset and automatically adjust itself to the new zero. If necessary, you can push the joystick up or down to fine tune the zero reading.



Both AI1 and AI2 LEDs will also be illuminated.

Once adjusted, use the joystick to select "Set 20mA Span". This sends a 20mA signal to the remote display. On the back of the remote display push the SPAN button for 3 seconds. You'll see the display reset and automatically adjust itself to the new span of 25%. If necessary you can push the joystick up or down to fine tune the full scale reading.



→ To fine tune the reading to match the reading on the oxygen monitor, use the "Set 20mA Span" menu. Push the joystick up or down until both displays match.

CAUTION

If the oxygen monitor is in the measuring mode and the ZERO push button is pressed an "Err" will be displayed on the remote display and no readings will be recorded. **If the SPAN push button is pressed in the measuring mode, the remote display will automatically adjust to 25.0%.** You will need to repeat the above adjustment procedure again for the remote display to mirror the oxygen monitor. **NEVER PUSH THE SPAN in the measuring mode.**

How to Set the Internal Alarms on the Remote Display

The Remote Display has two user selectable alarms with a separate horn tone to identify Alarm 1 from Alarm 2. Both are preset at the factory; AL1 = 19.5% and AL2 = 18%. They can be changed in the field.

To set Alarm 1, Press Alarm 1 for two seconds to enter the alarm change mode. The display will show the current alarm setting and the right most decimal point will be lit. Use the UP or DOWN buttons to increase or decrease the alarm value. When done, push the Alarm 1 button for 2 seconds to get back to the monitoring mode.

To set Alarm 2, Press the Alarm 2 button for two seconds to enter the alarm change mode. The display will show the current alarm setting and the left most decimal point will be lit. Use the UP or DOWN buttons to increase or decrease the alarm value. When done, push the Alarm 2 button for 2 seconds to get back to the monitoring mode.

APPENDIX A: WARRANTY



See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your Oxygen Monitoring System.

Duration of Warranties for Oxygen Monitoring System

All product warranties, except the warranty of life, and all remedies for warranty failures are limited to one year.

Product Warranted	Duration of Warranty Period
Sample Draw Oxygen Monitoring System (OMS™)	1 Year

