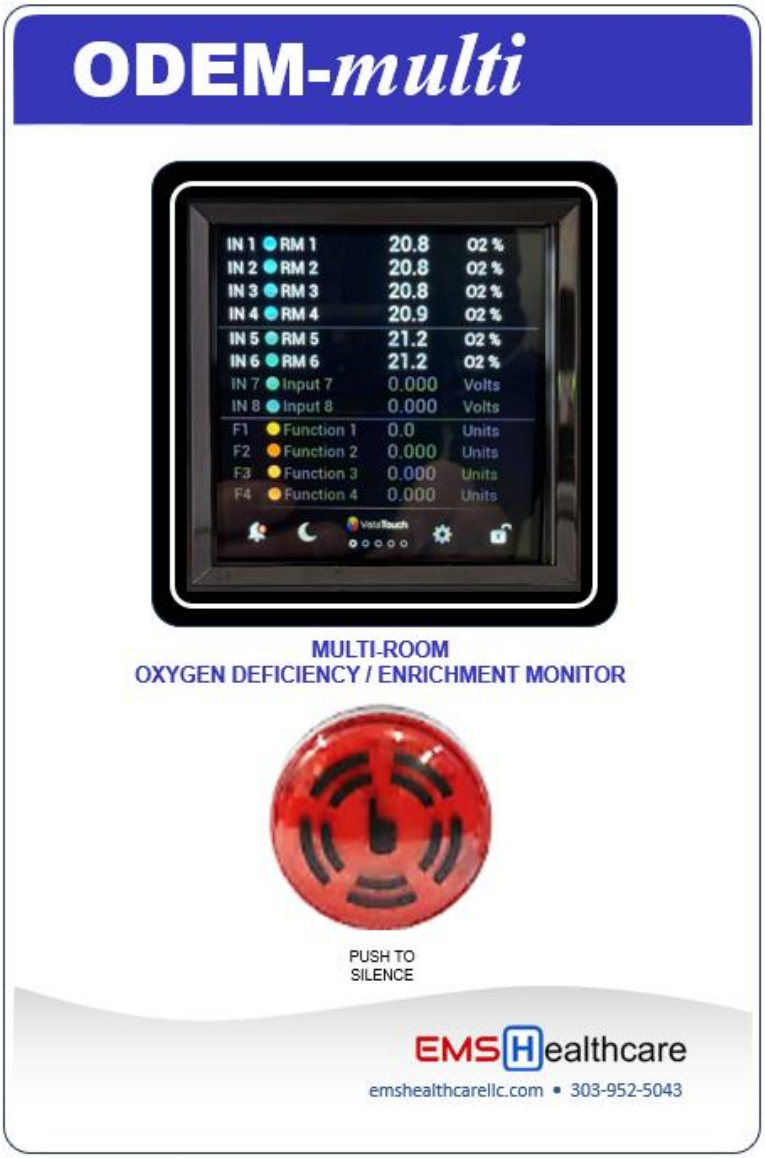
3991 Evergreen Pkwy Access Rd
Evergreen, CO 80439
303-952-5043
www.EMSHealthcareLLC.com

Multi Room Oxygen Deficiency/Enrichment Monitor

Operators Manual

For Model Number ODEM-Multi



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System Overview

EMS Healthcare LLC has developed the **ODEM-Multi** specifically for detecting oxygen gas concentrations in multiple separate rooms where oxygen gas is available and may present a human safety or fire safety risk, like operating rooms within a local clinic.

The **ODEM-Multi** performs continuous oxygen deficiency and enrichment monitoring in multiple rooms using a highly accurate, calibrated oxygen sensor located in each room to provide real-time oxygen concentrations on a centrally located display unit. The central display unit includes both audible and visual indicators if the oxygen level in any room is outside OSHA specified limits and a push-to-silence feature for the audible alarm. In addition to the local alarm indicators, the central display unit also includes a relay output for connecting the local alarm signal to a remote alarm panel if the facility requires it.

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System Specifications

Model Number		ODEM-Multi
Description		Oxygen monitoring in multiple locations for deficiency (<19.5%) and enrichment (>23.5%) levels. If either level is exceeded in any room being monitored, a visual/audible alarm is triggered on the central display unit.
Performance	Response Time	Within 1 second of any change in oxygen levels
	Accuracy	± 0.5% of FS
	Repeatability	± 1% of reading
	Operating Temp	-22° to 122°F (-30° to +50°C)
	Humidity	0 – 98% RH, non-condensing
Oxygen Monitoring	Range	0 – 95% oxygen concentration
	Sensor Gas Interface	Remote sensor with 1/2" opening for ambient air diffusion
	Sensor Electrical Interface	M8 4-pole connector with keyway (10m connectorized cable included with each remote sensor)
Alarm	Local Alarm	Red light on front panel and 80dB audible continuous buzzer when oxygen levels are outside safe limits (audible buzzer can be silenced). Indicators are self-clearing when oxygen levels return to within limits.
	Push-to-Silence Button	Touching a finger to the lens of the alarm lamp on the front panel will silence the audible indicator
	Relay Output	2-wire dry contact, normally open relay commanded closed during normal operation (opens on alarm below 19.5% or above 23.5% O2 or loss of power). Can be connected to Facility Alarm Panel or Building Automation System.
Electrical	Voltage Source	110-120 VAC, 60 Hz (internal power supply includes short circuit/overload/over-voltage protection)
	Power (max)	19 Watts including 4 remote sensors
Physical (Control/ Display Unit)	Dimensions	6" (W) x 9" (H) x 5" (D)
	Weight	20 pounds including 4 remote sensors and 10m cabling to each
	Enclosure Type	NEMA 4X rated, polycarbonate, indoor/outdoor use

Protections: Short circuit / Overload / Over-voltage

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System Equipment

The ODEM-Multi can be purchased from EMS Healthcare LLC with two, three, or four remote O2 sensors for monitoring up to 4 separate rooms (please contact us if you require monitoring more than 4 rooms). These remote O2 sensors come with 10m cables for connection to the central display unit (longer cable lengths are available on request).

Depending on the configuration purchased, the following materials may be included in the delivered package to support system installation.

Manufacturer	Part Name	Part Description	Qty
EMS Healthcare	ODEM-Multi Central Display Unit	Main unit with programmed touchscreen display panel, 1 dry contact relay alarm output, visual and audible alarm indicators, and push-to-silence feature assembled in a polycarbonate enclosure.	1
EMS Healthcare	ODEM Remote O2 Sensors	Remote Oxygen concentration sensors in wall-mount enclosures and 10m cable with M8 4-pole connector.	Up to 4 sensors and cables

In addition to this material list, the installer will need to provide all the necessary tools along with materials specific to the facility where the installation will occur to complete the installation. These additional materials are detailed in the System Installation section of this manual.

System Installation

Central Display Unit Installation

Equipment installation must be performed by a qualified technician

The central display unit should be installed outside the area being monitored but in close proximity to accommodate remote sensor cabling to each room (See Figure 1).

The central display unit should be wall-mounted using the provided mounting feet for the enclosure or drilling holes in the back of the mounting enclosure. Screws and drywall anchors are not included.

Once the central display unit is mounted, sensor cabling can be routed to each room for connection to the remote O2 sensors.

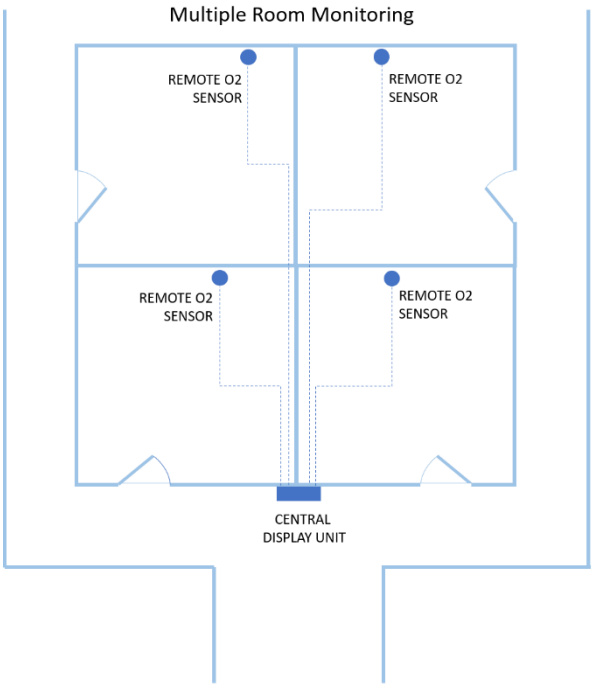

FIGURE 1 - OVERALL SYSTEM LAYOUT

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Electrical Terminations

The central display unit requires a 120VAC source which should be provided from an essential power circuit. 120VAC lead wires (16 awg black (L), white (N), green (GND)) are provided out of the back of the enclosure for convenient connection to source wiring inside a junction box. Also provided out of the back of the enclosure are alarm wires (18 awg black, white) to a remote alarm panel withing the facility. These wires are connected to dry-contact outputs of an internal relay. All remote O2 sensor cables are hardwired inside and provided out of the back of the enclosure for routing to each room. See **Table 1** for electrical connections inside the unit cover. If access is required to the inside of the enclosure, the front cover is secured to the base with 6 screws (Phillips #2 head). Please exercise caution when removing the cover since it is not hinged and there is wiring connecting items on the front cover with items in the base.

CAUTION: Sensor cable connections must be mated to each O2 sensor module prior to 120VAC power being applied to the central display unit.

Table 1 – External Interface Connections within Unit

Terminal #	Signal	Notes
10	120VAC Neutral	Power source for system
20	120VAC Ground	Power source for system
CB input	120VAC Line	Power source for system
11	Alarm Output +	Optional Alarm output to Master/Remote Alarm Panel
21	Alarm Output -	Optional Alarm output to Master/Remote Alarm Panel
2	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 1
12	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 1
22	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 1
3	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 2
13	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 2
23	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 2
4	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 3
14	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 3
24	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 3
5	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 4
15	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 4
25	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 4
6	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 5
16	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 5
26	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 5
7	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor – Room 6
17	O2 Sensor GND (White)	Connection for remote/local O2 sensor – Room 6
27	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor – Room 6

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Remote O2 Sensor Installation

FIGURE 2 – REMOTE O2 SENSOR

Once the central display unit is mounted, each remote O2 sensor can be located within the rooms to be monitored. Each remote sensor includes a 30m long cable for connection to the central display unit so the sensor location is constrained by this cable length. After the remote O2 sensor location within each room is identified, considering cable length and routing, the sensor should be wall-mounted at a height of 1.5m from floor level which is approximately nose height for an adult human. The remote O2 sensor is assembled into an enclosure (see Figure 2) for easy wall mounting; however, the installer will need to provide screws and drywall anchors. The room-end of each cable has an M8 4-contact connector for connecting to each remote sensor. Once the remote sensor is mounted to the wall, route and connect the sensor cable to the connector on top of the sensor. Ensure the keyway on the cable M8 connector is aligned with the keyway on the sensor connector before screwing the connector shell down. If the keyways are aligned, the cable connector should slide into the sensor connector, enabling the threaded portion to engage.

Typical installation steps are as follows:

1. Install a recessed junction box (not included) into the wall outside the rooms to be monitored. This junction box is where the Central Display Unit will be located so it can be easily viewed before entering any of the rooms.
2. Run 120VAC wiring (14 awg typ) from an essential power circuit to the wiring box for connection to the power leads from the unit.
3. Locate and wall-mount the O2 sensors in each room to be monitored about 1.5m above floor level and near the room HVAC return location to maximize gas flow past the sensor.
4. Route the sensor cable from the central display unit to each sensor and connect.
5. Connect 120VAC source wiring to the pigtails coming out of the central display unit.
6. Apply 120VAC power to the unit only after all electrical connections have been made.

Initial Power Application

On initial application of 120VAC power following system installation, the ODEM-Multi will power up in WARM-UP mode and each O2 sensor output will show readings from 0% to >50% before stabilizing around 20.9% after 3 minutes. During this warm-up period, alarm indications will be active – push to silence the audible buzzer. After 3 minutes, all O2 sensor readings should indicate ambient O2 concentrations of approximately 20.9% in each room, assuming nominal room environments are present.

Note: In a room well-ventilated with fresh ambient air, each O2 sensor should indicate approximately 20.9% +/- 0.5%. Percentage of oxygen can vary slightly based on ambient conditions such as elevation, temperature, relative humidity, HVAC exchange rates and number of persons present in each room.

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System Operation

The ODEM-Multi continuously monitors O2% levels against pre-programmed O2 deficiency and enrichment limits as defined in OSHA 1910.146:

- Oxygen Deficiency – Oxygen level below 19.5%
- Oxygen Enrichment – Oxygen level above 23.5%

Touchscreen Display Views

The default view on the display shows all active inputs in a list format (inputs and functions that are not active are grayed out). The view lists all rooms that are being monitored and indicates the current real-time oxygen concentration within each room.

FIGURE 3 – DEFAULT MAIN VIEW

Swiping the touchscreen to the right will show different views of the sensor input data. In the view below (Figure 4), individual room sensor oxygen concentrations are shown in a graphical display. Touching the UP or DOWN arrows in the upper right on the screen will cycle through each room sensor.

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FIGURE 4 – INDIVIDUAL ROOM GRAPHICAL VIEW

In the following view (Figure 5), individual room sensor oxygen concentrations are shown numerically with the current value indicated along with minimum, maximum, and average values since the unit has been operating or the since the input data was last reset. Again, touching the UP or DOWN arrows in the upper right on the screen will cycle through each room sensor.

FIGURE 5 – INDIVIDUAL ROOM NUMERICAL VIEW

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In the following view, four room sensor oxygen concentrations are shown graphically in a tile view.

FIGURE 6 – FOUR ROOM TILE VIEW

Alarm Indications

If the system detects oxygen levels exceeding either limit in any room being monitored, both visual and audible alarm indicators will be triggered. The display background will turn RED, the alarm lamp below the display screen will light up and emit an 80dB continuous tone, and the relay output will open. The audible indicator can be silenced by touching the alarm lamp lens. Both the visual and audible alarm indicators and relay output will clear once the oxygen level returns to the safe range between 19.5% and 23.5%.

System Maintenance / Testing Procedures

The non-depleting zirconium oxide sensor utilized in the ODEM-Multi can deliver accurate readings for 10 years or more without the need for calibration or replacement.

Sensor Test:

It is recommended that each sensor be checked annually to confirm proper operation. Testing requires a supply of certified 20.9% oxygen span gas. Apply the gas near the sensor and allow the reading to stabilize. Verify that the reading is within the acceptable range of 20.4% and 21.4%. If the reading is outside the acceptable range, it will need to be replaced.

CAUTION: do NOT unplug the sensor cable unless power to the unit has been shut off first

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Alarm Test:
In some cases, it may be necessary to test the hi and low alarms. For instance, if the alarm outputs are connected to remote alarm indicators and you need to confirm proper wiring and alarm functions. The following procedures can be followed to test each alarm condition:

Oxygen Depletion Test: Apply a small dose of Nitrogen gas near the sensor opening to confirm the unit detects an oxygen deficiency (<19.5%) condition and triggers the alarm indicators.

Oxygen Enrichment Test: Apply a small dose of Oxygen gas (with a known concentration greater than 23.5%) near the sensor opening to confirm the unit detects an oxygen enrichment (>23.5%) condition and triggers the alarm indicators.

System Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Non-operational/ No display	120VAC supply is off	Verify unit is receiving 120VAC
	Internal wire connection issue	Verify all internal connections are secure/tight.
	24VDC power supply failure	Verify power supply is providing 24VDC. If not, contact manufacturer for replacement.
No local alarm indication	Internal wire connection issue	Verify all internal connections are secure/tight.
No alarm output signal	Internal wire connection issue	Verify all internal connections are secure/tight at terminal connections. Contacts open when in alarm.
Oxygen reading incorrectly	Sensor cable is damaged	Inspect cable, especially at each end, for damage. If damage is found, contact manufacturer for replacement
	Sensor needs replacement	Contact manufacturer for replacement.

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Limited Warranty

General. EMS Healthcare warrants each of our products to be free from defects in material and workmanship ("defects") at the date of shipment. This warranty shall apply only to products that are purchased and used in the United States of America. EXCEPT AS SET FORTH BELOW, NO OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL EXIST IN CONNECTION WITH THE SALE OR USE OF SUCH PRODUCTS. TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. All warranty claims must be made in writing and delivered to EMS Healthcare at the company address listed on our website (www.emshealthcarellc.com), or such claim shall be barred. Upon timely receipt of a warranty claim, EMS Healthcare shall inspect the product claimed to have a defect, and EMS Healthcare shall repair, or, at its option, replace, free of charge, any product which it determines to have a defect; provided, however, that if circumstances are such as to preclude the remedying of defect by repair or replacement, EMS Healthcare shall, upon return of the product, refund to the buyer any part of the purchase price of such products paid to EMS Healthcare. Freight for returning products to EMS Healthcare for inspection shall be paid by the buyer. The warranties and remedies herein are the sole and exclusive remedy for any breach of warranty or for any other claim based on any defect, or non-performance of the products, whether based upon contract, warranty or negligence.

Period of Warranty – Parts and Labor. EMS Healthcare warrants and represents all products shall be free from defects for the first eighteen (18) months from the date of shipment by EMS Healthcare, or twelve (12) months from the documented date of startup, whichever occurs first. During such warranty period, EMS Healthcare shall be fully liable for all defects within the product.

Exceptions. Notwithstanding anything to the contrary herein, EMS Healthcare shall have no warranty obligations with respect to products:

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b) that have not been maintained in accordance with EMS Healthcare's written instructions;
c) that have been materially modified without the prior written approval of EMS Healthcare;
d) that experience failures resulting from operation, either intentional or otherwise, in excess of rated capacities or environmental conditions or in an otherwise improper manner;
e) that have ordinary wear and tear.

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