

ODEM-2 Oxygen Deficiency/Enrichment Monitor

Operators Manual

For Part Number ODEM-2095



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System Overview

EMS Healthcare LLC has developed the **ODEM-2** specifically for detecting oxygen gas concentrations in areas where gas leaks are a safety concern such as a gas manifold room with only one entry/exit.

The **ODEM-2** (ODEM-2095) performs continuous oxygen deficiency and enrichment monitoring using a highly accurate, calibrated oxygen sensor that provides oxygen concentration in real-time on a display unit which can be configured with the sensor built-in or on a 5m cable for remote sensing. The display unit includes both audible and visual indicators if the oxygen level is outside OSHA specified limits and a button to silence the audible alarm.

In either the local or remote configurations, an additional display unit can be added to the system for displaying oxygen concentration in another location. Two relay outputs are also included for connecting the local alarm signal to remote alarm panels if the facility requires it. Additionally, the alarm indication can be latched, requiring personnel to hold the silence button to clear the alarm indication after oxygen levels have returned within limits. The default is unlatched so the alarm indication will self-clear once oxygen levels return within limits.

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System Specifications

Part Number		ODEM-2095
Description		Oxygen monitoring for deficiency (<19.5%) and enrichment (>23.5%) levels. If either level is exceeded, a local visual/audible alarm is triggered.
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	1/2" opening for ambient air diffusion
	Sensor Electrical Interface	M8 4-pole connector with keyway (5m connectorized cable included with remote sensing configuration)
Alarm	Local Alarm	Red light on front panel and 95dB audible buzzer when oxygen levels are outside safe limits (audible buzzer can be silenced)
	Push-to-Silence Button	Black button on front panel below the alarm light – momentary push to silence the audible indicator, push and hold to reset the alarm status
	Two Relay Outputs	2-wire dry contact, normally open relays commanded closed during normal operation (opens on alarm below 19.5% or above 23.5% O ₂ 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)	5 Watts including oxygen transducer
Physical (Control/Display Unit)	Dimensions	5" (W) x 7" (H) x 3" (D)
	Weight	6.5 pounds (2.9 kg) including transducer and wiring
	Enclosure Type	NEMA 1,2,4,4X rated, polycarbonate, indoor/outdoor use

Protections: Short circuit / Overload / Over-voltage

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System Equipment

The ODEM-2 can be purchased from EMS Healthcare LLC in two different configurations: 1) with the O2 sensor installed locally in the main enclosure, or 2) with the O2 sensor mounted in a remote O2 sensor enclosure with a 5m cable to connect it to the main display unit.

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-2 Display Unit	Main unit with programmed display panel, custom circuit board with 2 dry contact relay alarm outputs, visual and audible alarm indicators, and push-to-silence button assembled in a polycarbonate enclosure. If purchased with a local sensor, the O2 sensor will be mounted in the enclosure.	1
EMS Healthcare	ODEM-2 Remote O2 Sensor	Oxygen concentration sensor in wall-mount enclosure and 5m cable with M8 4-pole right-angle connector on one end and pigtail on the other.	1

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

ODEM-2 Installation with Remote O2 Sensor

ODEM-2 installation must be performed by a qualified technician

For the ODEM-2 configuration with a remote sensor, the main display unit should be installed outside the area being monitored (e.g., outside the entry door to a gas manifold room) where personnel who need to enter the area can see the O2 reading and detect the audible and visual alarms if the reading is outside the safe range.

The main display unit can be wall-mounted using the available knockout screw holes in the back panel of the enclosure. Screws and drywall anchors are not included.

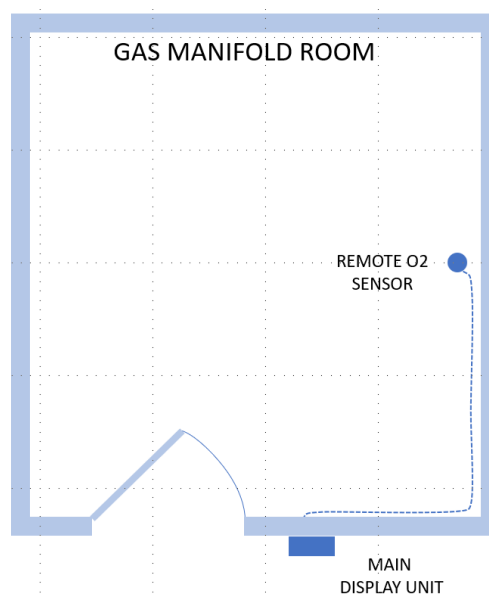


FIGURE 1 - MANIFOLD ROOM LAYOUT

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Once the main display unit is located, the remote O2 sensor can be located within the area to be monitored (see Figure 1). In this configuration, the ODEM-2 includes a 5m long cable between the main display unit and the remote O2 sensor so the sensor location is constrained by this cable length. After the remote O2 sensor location within the 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.



FIGURE 2 – REMOTE O2 SENSOR

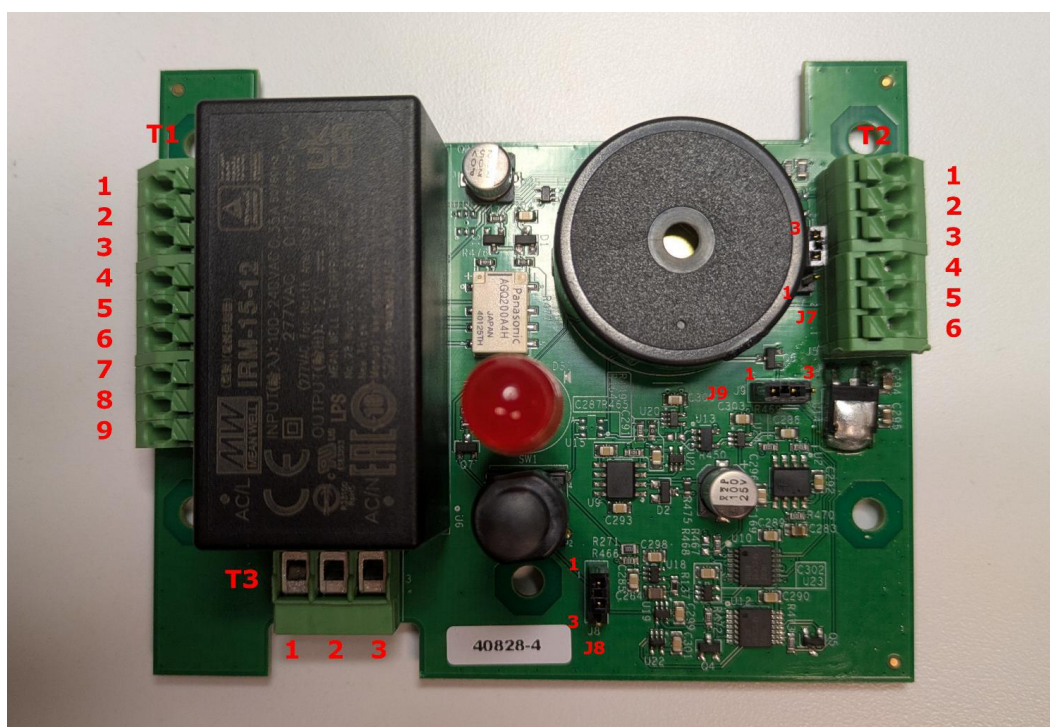
ODEM-2 Installation with Local O2 Sensor

ODEM-2 installation must be performed by a qualified technician

For the ODEM-2 configuration with a local sensor, the main display unit should be installed in the area being monitored where personnel can see the O2 reading and detect the audible and visual alarms if the reading is outside the safe range. The main display unit should be wall-mounted at a height of 1.5m from floor level using the available knockout screw holes in the back panel of the enclosure. Screws and drywall anchors are not included.

Electrical Terminations

The main display unit requires a 120VAC source which should be provided from an essential power circuit. See Figure 3 for electrical connections inside the unit cover. Cable penetrations are made through sidewall or backwall knockouts of the enclosure. There are three wiring terminals (T1, T2, T3) and three jumper terminals (J7, J8, J9) in the unit (see Figure 3 below).



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CAUTION: Sensor cable connections must be mated to the O2 sensor module and the ODEM terminal prior to 120VAC power being applied to the unit.

T1: User Signal Terminal

This terminal for connecting the following signals:

- 1) O2 Sensor Input (Pins 1 – 3)
- 2) O2 Current Loop Output Pass-Through to a secondary ODEM-2 display (Pins 4 -5)
- 3) ALARM Relay 1 (Pins 6 and 7)
- 4) ALARM Relay 2 (Pins 7 and 8)

Pin #	Signal	Notes
1	O2 Sensor VCC (Brown)	Connection for remote/local O2 sensor
2	O2 Sensor Signal (Blue)	Connection for remote/local O2 sensor
3	O2 Sensor GND (White)	Connection for remote/local O2 sensor
4	O2 Sensor Output Signal	Optional signal for additional display unit
5	O2 Sensor Output GND	Optional signal for additional display unit
6	ALARM1A	Optional Alarm output to Master/Remote Alarm Panel
7	ALARM1B	Optional Alarm output to Master/Remote Alarm Panel
8	ALARM2A	Optional Alarm output to Master/Remote Alarm Panel
9	ALARM2B	Optional Alarm output to Master/Remote Alarm Panel

T2: APM Terminal (pre-wired by manufacturer)

This terminal is used to connect the printed circuit board to the display meter on the front cover.

T3: User Power Input Terminal

This terminal is for connecting the 120VAC power input.

Pin #	Signal
1	AC Line
2	AC Ground (Not connected internally)
3	AC Neutral

Selectable Operating Modes Via Jumpers

J7: 4-20mA Current Loop Pass Through

- Connecting the jumper between pins 1 and 2 passes the 4-20mA current loop to the O2 Sensor Output Pins (4 and 5 of terminal T1) which can then be wired to an additional ODEM-2 display unit.
- Connecting the jumper between pins 2 and 3 ends the 4-20mA current loop on this PCB. Use this if there is only one ODEM-2 display unit or if this ODEM-2 display unit is the last in the chain. This is the default configuration.

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J8 and J9: Alarm Output Type Selection – Latching or Non-Latching

- Connecting the jumper between pins 1 and 2 selects the latching mode.
- Connecting the jumper between pins 2 and 3 selects the non-latching mode. This is the default configuration.

Typical installation steps are as follows:

1. Install a recessed wiring box (not included) into the wall outside the gas manifold room next to the entry door. This wiring box is where the Remote Display Unit will be located so it can be easily viewed before entering the room.
2. Run 120VAC wiring (14 awg typ) from an essential power circuit to the wiring box.
3. Locate and wall-mount the O2 sensor in the manifold room about 1.5m above floor level and near the exhaust vent location to maximize gas flow past the sensor.
4. Route the sensor cable from the sensor to the wiring box.
5. Drill a 1/2" hole in the back side of the ODEM enclosure base, feed the 120VAC and O2 sensor wires through the hole, and mount the enclosure base using wall anchors.
6. Connect the O2 sensor wiring to the T1 signal push-type terminals.
7. Connect 120VAC wiring to the T3 power screw-type terminals.
8. Screw the front cover to the base.
9. Apply 120VAC power to the unit.

Initial Power Application

On initial application of 120VAC power following system installation, the ODEM-2 will power up in WARM-UP mode and the O2 sensor output will show readings from 0% to >50% before stabilizing around 20.9% after 3 minutes. During this warm-up period, no alarms will be issued. After 3 minutes, the system will automatically transition to OPERATING mode with the O2 readings indicating ambient O2 concentration around 20.9%.

Once the O2 readings are stable around 20.9%, perform the following gas test to confirm unit operation:

- **Test for Oxygen Depletion:** Apply a small dose of oxygen-depleted gas (e.g., Nitrogen or CO2 or by simply by exhaling) near the sensor opening to confirm the unit detects an oxygen deficiency (<19.5%) condition and triggers the alarm indicators.
- **Test for Oxygen Enrichment:** Apply a small dose of oxygen-enriched gas (e.g., portable oxygen cannister such as "Boost") near the sensor opening to confirm the unit detects an oxygen enrichment (>23.5%) condition and triggers the alarm indicators.

System Operation

The ODEM-2 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%

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If the system detects oxygen levels exceeding either limit, both visual and audible alarm indicators will be triggered. In the default non-latching mode, both the visual and audible alarm indicators and relay outputs will clear once the oxygen level returns to the safe range between 19.5% and 23.5%. In this mode, the audible alarm can be silenced with a momentary press of the button on the front panel.

In latching mode, both visual and audible alarm indicators and relay outputs will remain active until personnel reset the alarm using the button on the front panel. A momentary press of the button will silence the audible alarm and a press and hold (~5 seconds) will reset the alarm status. If oxygen is still outside the safe limits, the alarm will be re-initiated; otherwise, the alarm indicators will remain off until a new alarm condition is detected.

System Maintenance

EMS Healthcare recommends checking the O2 sensor against the deficiency and enrichment limits on an annual basis to verify unit operation.

First, ensure the room being monitored is well-ventilated with ambient air and the sensor is reading approximately 20.9%. Then, perform the following gas test to confirm unit operation remains normal:

- **Test for Oxygen Depletion:** Apply a small dose of oxygen-depleted gas (e.g., Nitrogen or CO2 or by simply by exhaling) near the sensor opening to confirm the unit detects an oxygen deficiency (<19.5%) condition and triggers the alarm indicators.
- **Test for Oxygen Enrichment:** Apply a small dose of oxygen-enriched gas (e.g., portable oxygen cannister such as “Boost”) near the sensor opening to confirm the unit detects an oxygen enrichment (>23.5%) condition and triggers the alarm indicators.

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

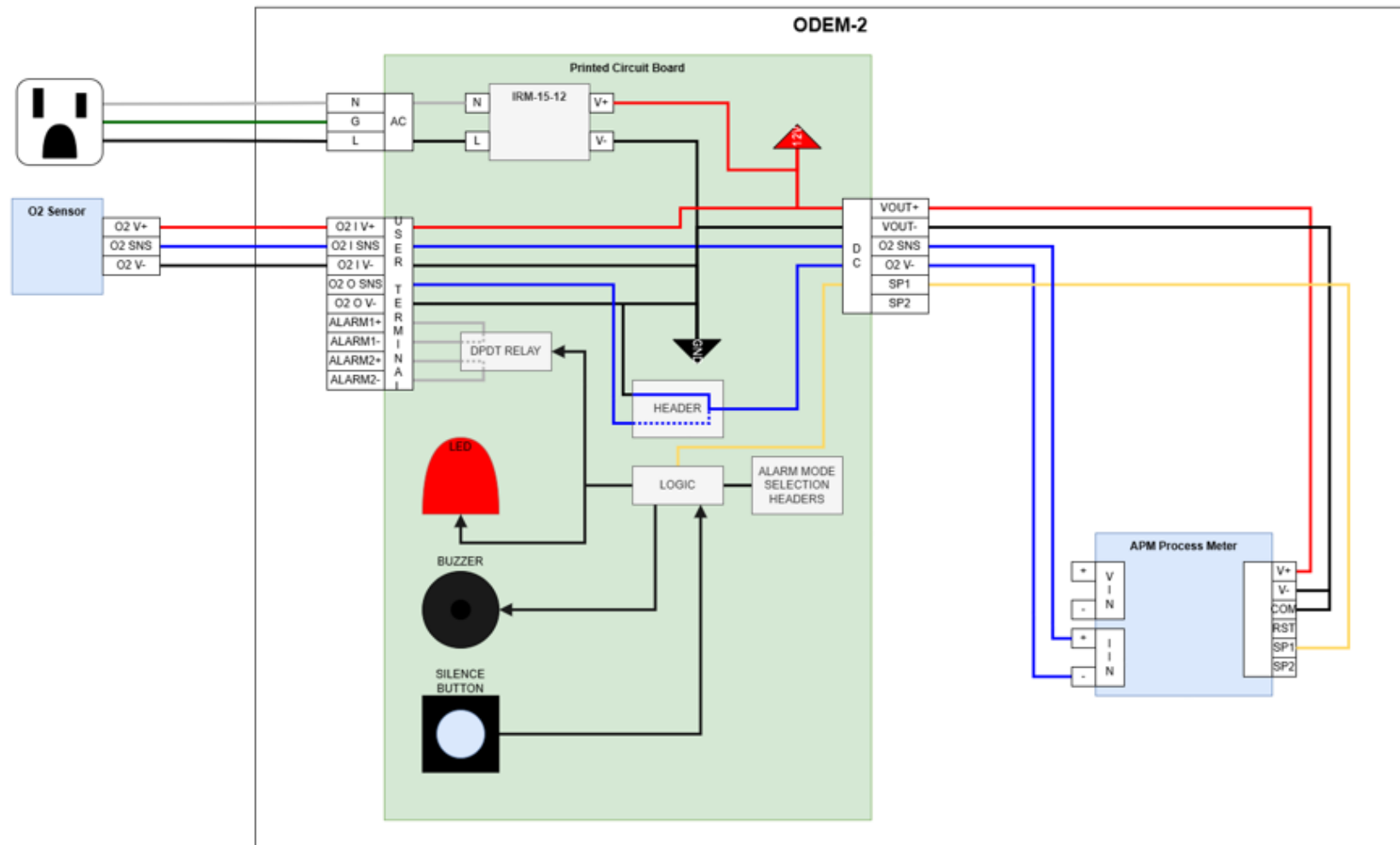
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System Troubleshooting Guide

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.
	12VDC power supply failure	Verify power supply is providing 12VDC. 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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Schematic Diagram



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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:

- a) that have not been installed in accordance with EMS Healthcare’s written specifications and instructions;
- 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.

Limitation of Liability. NOTWITHSTANDING ANYTHING TO THE CONTRARY HEREIN, TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, UNDER NO CIRCUMSTANCES SHALL EMS HEALTHCARE BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, PUNITIVE, SPECULATIVE OR INDIRECT LOSSES OR DAMAGES WHATSOEVER ARISING OUT OF OR IN ANY WAY RELATED TO ANY OF THE PRODUCTS OR GOODS SOLD OR AGREED TO BE SOLD BY EMS HEALTHCARE TO THE BUYER. TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, EMS HEALTHCARE’S LIABILITY IN ALL EVENTS IS LIMITED TO, AND SHALL NOT EXCEED, THE PURCHASE PRICE PAID.