MULTISENSE-1000
GAS CONCENTRATION TRANSMITTER

User Manual

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The Multi-Sense series from Enmet offers complete versatility in the function and use of a stationary gas detector.

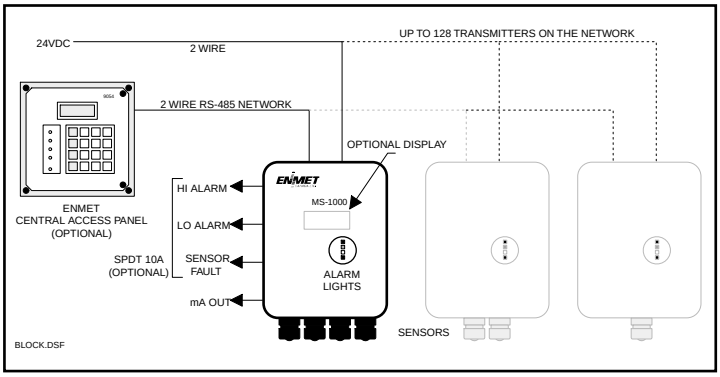
The unique controller design allows you to input a variety of sensor technologies into one unit. Even more flexible is that up to six sensor styles can be accommodated onto one unit at the same time. Where a common control function is required, this allows you to mix and match sensors to provide the best available technology to suit your specific application, while at the same time saving you the capital and installation costs of multiple units.

The Multi-Sense provides a common set of relays for high, low, and fault alarm conditions as well as a 4-20 mA output dedicated to your sensor of choice. A 4-line display is also available to simultaneously display the concentrations all of the sensors in use.

The sensors can be mounted remote from the Multi-Sense unit or integral to the electronics depending on the sensor style and location. (Unit pictured above has one integral sensor)

For jobs that require a single point monitor, the Multi-Sense operates as a complete stand-alone unit. For larger area monitoring, multiple discrete units may be desirable or the Enmet 9000 Scanner can be used. This will monitor a field of up to 128 units. At the central panel, multiple relay functions are available for zone control or a proportional 4-20 mA is available that outputs the highest gas concentration indicated in the entire field. This style of output is ideal when using variable speed fans for ventilation control. The Enmet 9000 uses an RS-485 for rapid field updating (every 2 seconds). This configuration also means that only one four wire run of cable is required for the entire field of sensor stations.

Metallic Oxide Semiconductor (MOS):	general broad range monitoring of toxics, combustibles, and refrigerants
Enhanced MOS:	selective monitoring of CO
Electrochemical:	O2 and selective toxic monitoring (ie. CO, NO2, NH3, CL2, H2S, etc.)
Pellister Pair (Catalytic):	combustible gas monitoring including Hazardous Location Classifications
Infrared:	selective monitoring of CO2 and general Group A1 refrigerants
Analog Input:	4-20 mA input from any field device



MULTI-SENSE SPECIFICATIONS

Power Input:	24 vdc @ .3 amp typical or 115 vac or 230 vac, 50/60 hz (specify at time of order).
Signal Output:	4-20 mA non-isolated proportional to calibrated gas range. Direct or inverse acting (output must be designated to one sensor only)
Communication:	RS-485 available for use with Scanner or Handheld calibrator.
Relay Output: (optional)	SPDT 10 amp @ 250 vac, dry, (failsafe High or Low selectable). Three relays available (function may be field determined). Typical configuration: low, high, fault.
Relay Delay	Delay ON: 0-999 seconds Delay OFF: 0-999 seconds
Display (optional)	4-line LCD of gas concentration, simultaneaous display of all sensors activated.
Audio Output:	SPDT, .4 amp @ 125 vac (2 amp @ 20 vdc), dry.
Audio Silence:	Terminals available for optional or customer supplied Push to Acknowledge/Silence.
Sensor Input:	All ports may be used simultaneously. Relay action is common to all. Port 1: Electrochemical (excluding NO, ETO, NH3) Port 2: Catalytic (combustible) or MOS Broad Range (toxic or combustible) Port 3: MOS Enhanced CO Port 4: Oxygen or 4-20 mA FlyPort 5: Electrochemical (including NO, ETO, NH3) FlyPort 6: MOS Broad Range (toxic or combustible) Note: Catalytic, MOS Broad Range, and 4-20 mA may be remote from circuit.
Sensor	Specifications vary depending on target gas and sensor type. Refer to individual sensor specifications.
Calibration:	On board dial entry and push button with Gas Standard. Optional Handheld calibrator or Scanner.
Enclosure:	250mm high x 120mm wide x 90mm deep (24vdc models). Type 4X fiberglass reinforced polycarbonate (sensor rating Type 1).
Temperature	-20 deg. C to +60 deg. C
Humidity:	0-90% non-condensing. Equipment mounted in non-wetted areas only.
Approvals:	General Purpose Electrical Safety CSA, cUL, UL Note: Remote mounted catalytic sensor is available for Hazardous Locations.

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1.0 INSTRUMENT OVERVIEW

1.1 FEATURES

- Simultaneous connection to up to 6 gas sensors: 2 Electrochemical cells, Combustible (catalytic pair), Oxygen (or 4-20mA input from remote transmitter), enhanced MOS type for CO, broad band MOS. Sensors may be added when needed.
- Independent High and Low Alarm settings for each connected sensor.
- High, Low, and Sensor Fault LED's plus SPDT 10A/120VAC contacts (common to all sensors).
- Delay to On and Off for both high and low alarms (total of 4 independent delay timers)
- Invertable 4-20mA or 0-20mA sourced current output
- Uses RS-485 Modbus protocol to communicate with the ARJAY/ENMET Central Access Panel or Hand Held Calibrator
- Optional LCD for viewing gas concentrations from attached sensors.
- User specified custom features may be added by contacting Arjay/Enmet Canada.

1.2 DESCRIPTION

The Multisense-1000 unit is offered with up to 6 gas sensors:

1. 2 x Electrochemical sensors for toxic gases such as CO, NO2, H2s, Chlorine and ammonia. The second sensor requires an optional circuit board, which plugs into the main circuit board.
2. Combustible sensor: catalytic pair principle approved by CSA for combustible gas detection.
3. Enhanced MOS sensor for CO detection.
4. Oxygen sensor. In place of the oxygen sensor, a 4-20mA input can also be accepted from a remote gas detector/transmitter. The Multisense-1000 can also provide the loop 24V if required.
5. Broadband MOS sensor (requires optional plug in circuit board).

The Multisense-1000 can monitor up to 6 sensors and simultaneously display up to 4 concentrations on the optional 4 line by 20 character LCD.

The unit may be used as a standalone transmitter or as part of a networked gas monitoring system where up to 128 Multisense-1000 units may be linked on a 2-wire RS485 connection. The networked approach allows more complex control strategies based on the gas concentrations of a number of transmitters.

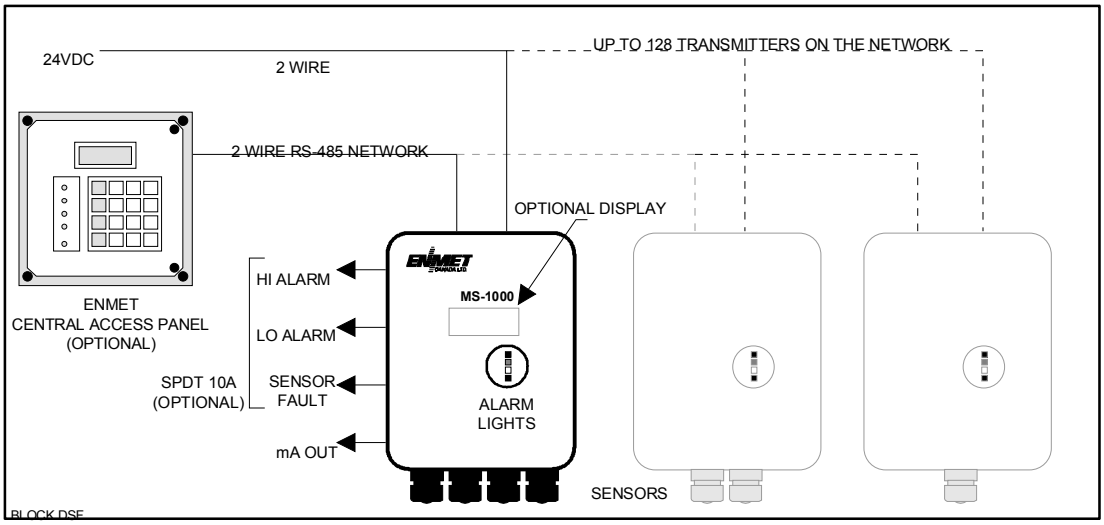

Figure 1.0

1.3 SPECIFICATIONS

OPERATION

The Multisense-1000 supports up to 6 gas sensors. Sensor readings are displayed 4 at a time on an optional LCD. The Multisense-1000 is also accessible by an optional Arjay/Enmet Modbus network master (Central Access Panel or CAP) via the RS-485 interface.

USER INTERFACE

Calibration and setup	rotary switches, pushbutton, and LED status lights.
Display	Optional 4 line X 20 Character LCD with optional backlight.
Network	RS-485 Modbus protocol connection. Used with the ARJAY/ENMET CAP unit.
Units / gas names	field selectable.

INPUTS

Integral Sensors	Up to 6 sensors: 2 x Electrochemical, Catalytic pair Combustible, Enhanced MOS for CO, Oxygen cell, and broadband MOS sensor.
Remote Sensors	The combustible sensor may be mounted remote to the Multisense. A 4-20mA (or 0-20mA) input signal from a remote transmitter may be connected to the MS-1000 in place of the oxygen sensor. If required, 24VDC is available for loop-powered transmitters. The mA signal can be scaled and displayed with a field selectable name such as NO2 etc.

OUTPUTS

mA output	The mA output only reflects the status of the field selectable "Master Sensor". The Master Sensor is field selectable from any of the installed sensors. The mA output is field selectable for 4-20mA or 0-20mA, Direct or Invertible into 650 ohms max. 0.5% resolution (Isolated output optional).
Alarms	The 3 alarms (High, Low and Sensor Fault) reflect the common status of any active sensor i.e. the Low Alarm is active if any sensor is in low alarm. Each sensor has independently set high and low alarms.

Alarm Indication	High (Red), Low (Yellow), Sensor Fault (Red) and No Alarms (Green).
Alarm Delay	Delay to On and Delay to off for both high and low alarms (4 independent delays). Delay range: 0-999 seconds field adjustable.
Relay Contacts	Relays for high, low and sensor fault. Contacts are SPDT 10A/120VAC. An additional relay is available for High Alarm annunciation (.4A resistive or .2A inductive at 125vac SPDT contacts) with an Alarm Acknowledge input.

PERFORMANCE

Range	999 ppm Field selectable and limited by the sensor type.
Accuracy	±5% of Full Scale Range

POWER 15VDC - 24VDC @ 0.300A max (120VAC @ 12VA optional)

MECHANICAL SPECIFICATIONS

Enclosure	24vdc - Nema 4X wall mount: 170mmH x 140mmW x 97mmD (8.5” x 4.5” x 3.5”), Weight 0.3 kg 115vac – Nema 4X wall mount with optional LCD: 254mmH x 203mmW x152mmD (10” x 8” x 6”), Weight 2.66 kg

ENVIRONMENTAL SPECIFICATIONS

Operating Temp.	0 - 55 Deg. C
Relative Humidity	90% max. with no condensation.

2.0 INSTALLATION

2.1 MECHANICAL INSTALLATION

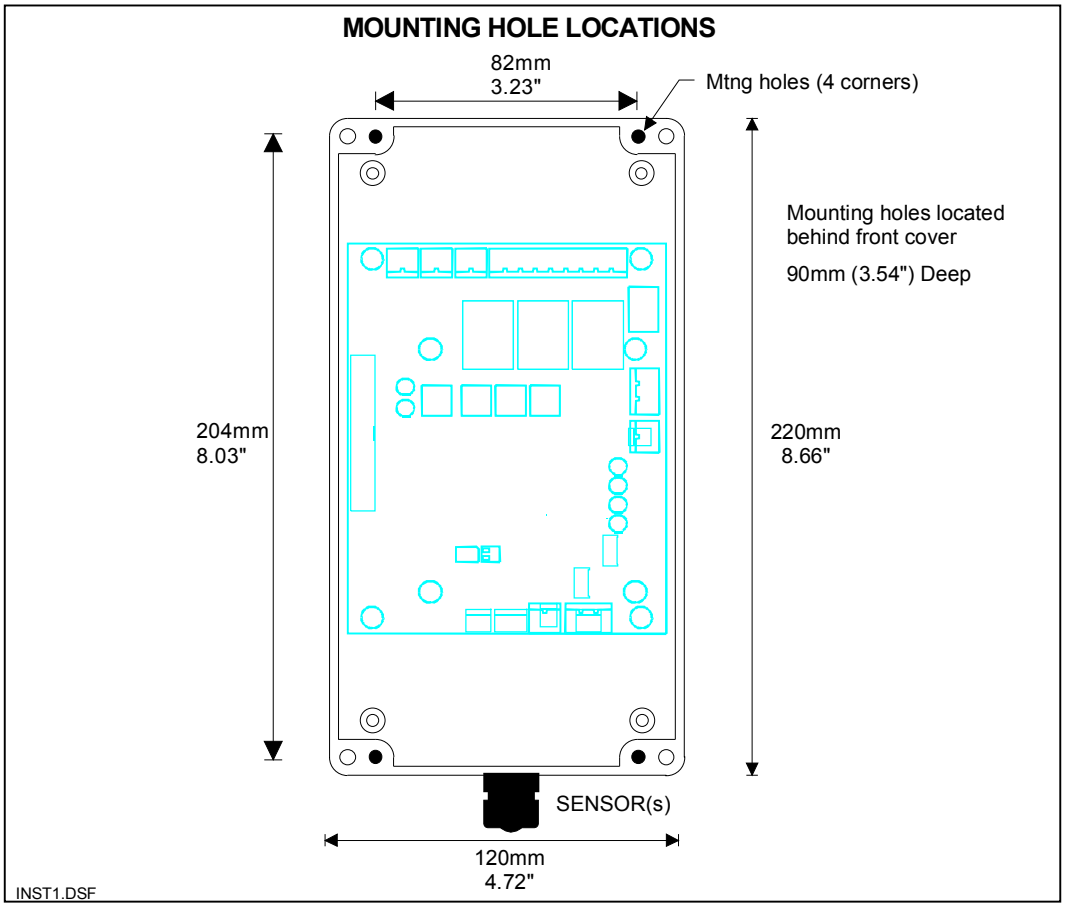

Figure 2.0

NOTE: Figure 2.0 is for Network Applications. See drawings at back of manual for standalone applications.

1. Locate the Multisense-1000 on a vertical surface away from drafts, open doors or windows, condensation or dripping moisture. The location should be easily accessible for calibration and testing.
2. The sensors should face downward to avoid dust or debris collecting on the sensor.

3. The vertical placement (above the floor) depends on the gas being monitored. Heavier than air gases should be sensed at the floor level, while lighter than air gases should be sensed close to the ceiling. The following is a general guide. For further assistance in sensor location consult your Arjay/Enmet representative.

• Carbon Monoxide (CO): same as air		Place about 4-6 feet above finished floor*
• Methane	Lighter than air	Place near ceiling
• Ammonia	Lighter than air	Place near ceiling
• Propane	Heavier than air	Place about 2 feet above finished floor
• Hydrogen Sulfide	Heavier than air	Place about 2 feet above finished floor
• Freon	Heavier than air	Place about 2 feet above finished floor

   * Check local building codes. (i.e. Ontario Building code requires mounting 2'11" to 3'11"

4. If the Remote Sensor option is being used, locate the Remote Sensor as per items 1 and 2 above.

2.2 ELECTRICAL INSTALLATION

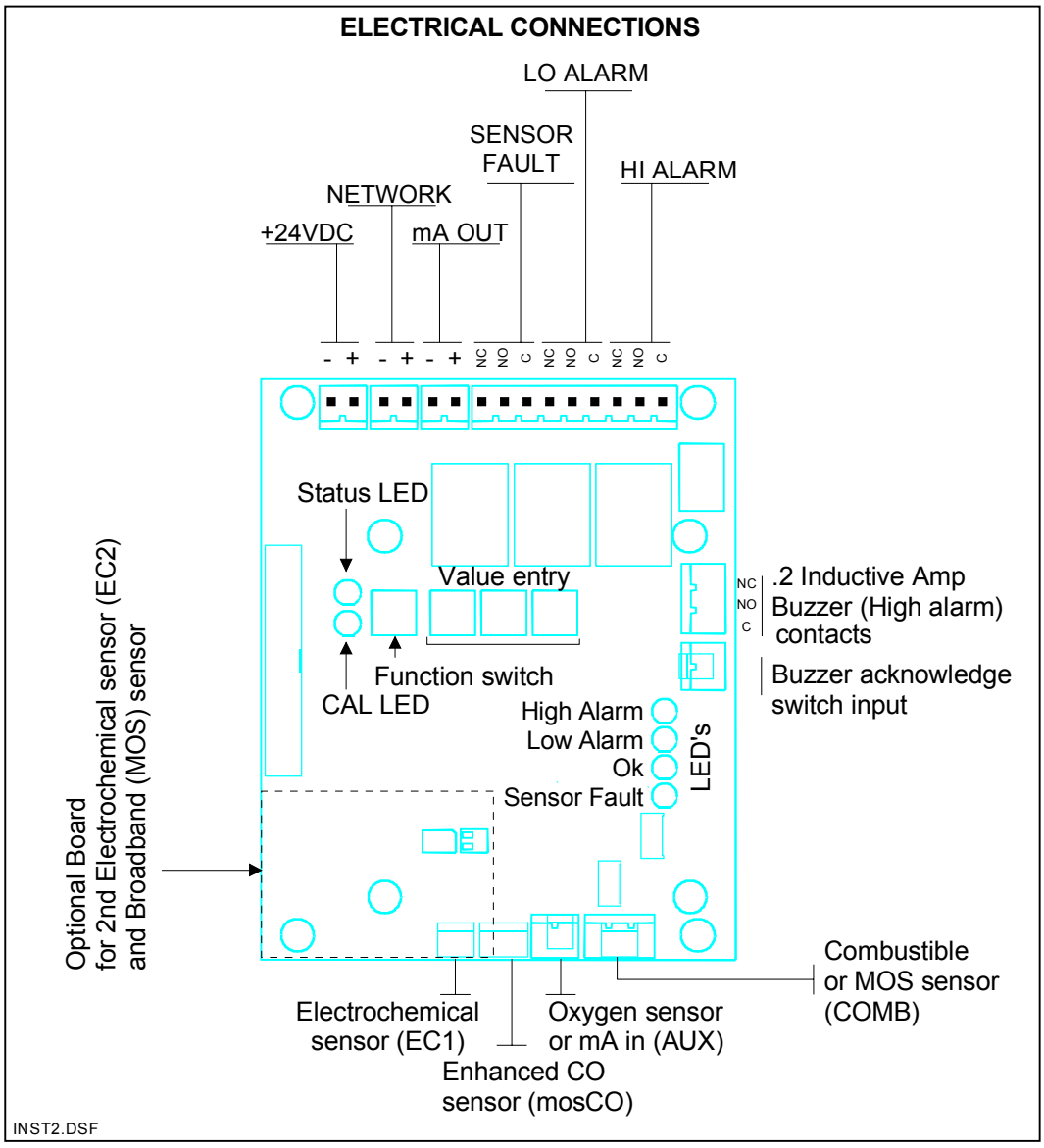

Figure 2.1

All user connections are via mating plug/receptacle connectors to make installation and service easier.

CAUTION:

THE UNIT HOUSES SENSITIVE ELECTRONIC COMPONENTS AND SHOULD BE HANDLED WITH CARE. IF PUNCHING OR DRILLING THROUGH THE ENCLOSURE WALLS IS NECESSARY MAKE SURE THAT THE INTERNAL ELECTRONIC MODULES ARE SHIELDED FROM DEBRIS ESPECIALLY METAL PARTICLES.

PLEASE MAKE SURE THAT THE CONNECTIONS HAVE THE POLARITY AS INDICATED OR THE CONTROLLER MAY BE DAMAGED.

3.0 STARTUP AND CONFIGURATION

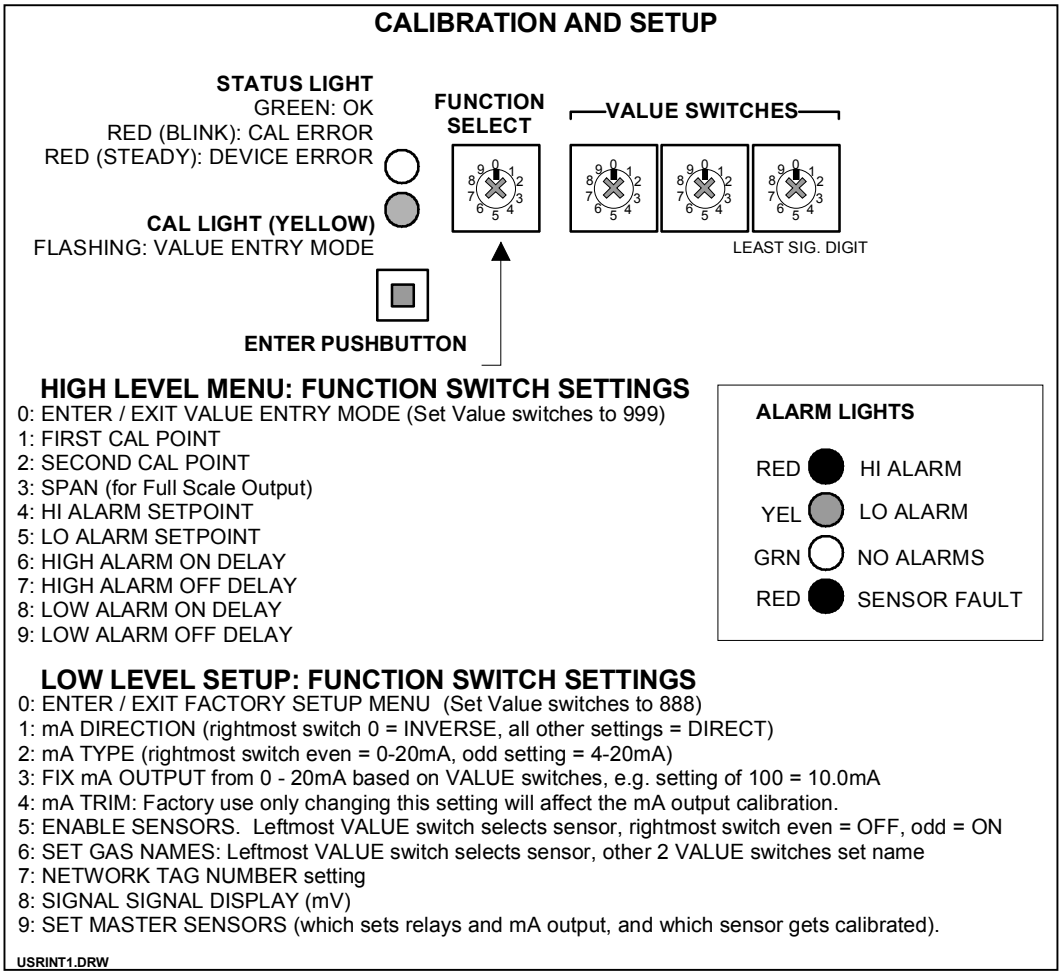

Figure 3.0

3.1 NOTES ON THE USER INTERFACE

All calibration and configuration is done via 4 rotary switches and the ENTER pushbutton. The left most rotary switch selects the desired function while the other three (to its right) are for entering values from 0 to 999. The ENTER pushbutton confirms the value entered.

If the entered value is out of the allowed limits, the system status light flashes red (from green) for 2 seconds.

3.1.1 MENU SYSTEM

There are 2 main menus: High Level and Low Level (see Figure 3.0 for details). Each menu is only accessible by entering its corresponding password.

Once the correct password is entered, the yellow CAL light flashes. After the settings have been changed, the password protection may be re-enabled by exiting the Value Entry Mode.

3.1.2 ENTERING / EXITING THE HIGH LEVEL MENU

Set the Function switch to 0 and the Value switches to 999. Then press the Enter pushbutton. The yellow LED will start to flash indicating the high level menu is now accessible.

To exit the High Level Menu, set the Function switch to 0, the value switch settings are not important. Press the Enter pushbutton. The yellow LED stops flashing indicating normal operation.

This section will be referenced by calibration and setup procedures described later in this manual.

3.1.3 ENTERING / EXITING THE LOW LEVEL MENU

Set the Function switch to 0 and the Value switches to 888. Then press the Enter pushbutton. The yellow LED will start to flash indicating the low level menu is now accessible.

To exit the Low Level Menu, set the Function switch to 0, the value switch settings are not important. Press the Enter pushbutton. The yellow LED stops flashing indicating normal operation.

This section will be referenced by calibration and setup procedures described later in this manual.

3.1.4 SENSORS

The Multisense-1000 may be ordered with up to 6 sensors. The sensors are of the following types:

1. **Electrochemical**: Up to 2 are supported. They are also called Toxic sensors and are referenced as **EC1** and **EC2** on the optional LCD. They are gas specific i.e. the response is mostly influenced by their intended target gas. A different sensor must be ordered for each target gas such as CO, NO2, H2S, and Chlorine. Typical lifetime is 2 years in clean air.
2. **Combustible Sensor**: This is referenced as **COMB** on the optional LCD. It is based on a catalytic bead pair, and is approved by CSA for combustible gas detection. It will typically respond to all combustible gases and so must be calibrated for the intended target gas. A sensor calibrated for any combustible gas has a mathematically predictable response to other combustible gases. Optionally, an MOS broadband sensor may be used in this sensor position instead of the catalytic bead pair type.
3. **Enhanced MOS CO sensor**: Referenced as **mosCO** on the optional LCD. Typical MOS sensors are broadband Hydrocarbon sensors i.e. they will respond to a wide range of hydrocarbon based gases. The Enhanced MOS CO sensor offered with the Multisense-1000 is designed to be much more specific to CO as well as more immune from temperature and humidity variations than typical MOS sensors
4. **Auxiliary input or Oxygen Cell**: Referenced as **AUX** on the optional LCD. Either an Oxygen sensor or a mA signal (from a remote mA transmitter) may be connected to this input. An Oxygen cell is essentially a fuel cell with a signal output proportional to the Oxygen concentration. Optionally, this input may be configured for connection to a remote 4-20mA (or 0-20mA) transmitter. The remote transmitter type does not need to be restricted to Oxygen – any other supported gas type transmitters may be connected. For mA transmitter applications, the input may be optionally configured for loop powered mode in which case the remote transmitter is supplied 24VDC power by the Multisense-1000 on the same 2 wires as the signal.
5. **Broadband MOS sensor**. Referenced as **MOS** on the optional LCD. This sensor used to detect a broad range of hydrocarbon based gases. Though it has varying responses to different hydrocarbons, it may be used to either detect a single gas or infer a total broadband concentration in applications where the gases likely to be present are known.

Each sensor type has a number that is used to identify it when selecting the master sensor, enabling or disabling sensors from the optional LCD, or setting the gas name for a particular sensor. The following table lists the sensors and their corresponding numbers. If using a handheld or Cap unit the designated numbers are 1-6. **This section will be referenced by setup procedures described later in this manual.**

SENSOR TYPE	DESIGNATED NUMBER
Electrochemical #1 (**EC1**)	0
Combustible (**COMB**)	1
Enhanced MOS CO (**mosCO**)	2
Auxiliary: Oxygen or mA transmitter (**AUX**)	3
Electrochemical #2 (**EC2**)	4
MOS (**MOS**)	5

Table 3.0

3.1.5 GAS NAME CODES (Used in configuration)

The gas name for each installed sensor may be selected. The name is for display purposes only and changing it does not alter calibration. The name is displayed on the optional display or at the Arjay/Enmet Central Access Panel (CAP) on a networked system. **This section will be referenced by setup procedures described later in this manual.**

GAS NAME	CODE (Right 2 most rotary switches)
Carbon Monoxide: CO (ppm)	00
Nitrogen Dioxide: NO_2 (ppm)	01
Methane: CH4 (%LEL)	02
Propane: C2H5 (%LEL)	03
Hydrogen Sulfide: H_2S (ppm)	04
Ammonia: NH_3 (ppm)	05
Chlorine: Cl (ppm)	06
Oxygen: O_2 (%)	07
Gasoline (%)	08
Hydrogen: H_2 (ppm)	09
Toxic (ppm) – generic name	10
Combustible (%LEL) – generic name	11
BRH (Broad Range Hydro Carbon) (ppm)	12
Carbon Dioxide: CO_2 (ppm)	13
Acetylene (ppm)	14
Sulfur Dioxide: SO_2 (ppm)	15

ClO2 (ppm)	16
Hydrogen Chloride: HCl (ppm)	17
Hydrogen Cyanide: HCN (ppm)	18
Ozone: O_3 (ppm)	19
Nitric Oxide: NO (ppm)	20
Temperature in deg. C	21
Temperature in deg. F	22
R134a	23
R123	24
R22	25

Table 3.1

NOTE: While in the Value Entry Mode, the relay control is disabled. This is to prevent nuisance alarms from occurring during calibration when the ppm value may be above the alarm setpoints.

3.2 STARTUP

Power up the unit. The status light should be green. The High, Low, and Sensor Fault LED's should go off in less than 5 minutes.

The unit is pre-calibrated at the factory, but field calibration is recommended at startup to verify proper operation of the unit and ensure safety of the area being monitored. A gas test using a Calibrated Gas Standard is necessary to ensure that the sensor responds to within specification and the associated equipment functions properly.

If calibration is required at any time, the unit must be powered up for a minimum period of time for the sensor to stabilize. During this time all other configuration parameters (alarm setpoints, time delay, network address, ma polarity) may be set as desired. The following table gives recommended minimum warmup times before calibration.

SENSOR TYPE	MINIMUM WARMUP PERIOD BEFOR CAL
Electrochemical Cell (Designated **EC1** or **EC2**)	1 minute
Combustible sensor (**COMB**: catalytic bead type)	1 - 2 hours
MOS CO sensor (**mosCO**)	24 hours
Oxygen Cell	1 minute
MOS	1 day (at least 8 hours)

Table 3.2

If the optional Liquid Crystal Display is installed, the startup screen will be similar to:

EC1: 0ppm CO
COMB : 0%LEL METH
mosCO: 0ppm CO
AUX : 0% O2

The values displayed are shown as an example. For each installed sensor, the sensor type (EC1, EC2, COMB, mosCO, AUX, or MOS) is displayed, then the concentration value, engineering units (i.e. ppm) and finally the gas name. The topmost line displays the master sensor (which sets the relay and mA outputs). If only one sensor was ordered, the 2nd to 4th lines are left blank. Note: Installed sensors may be removed from the display by disabling them via the rotary switches (this is explained later in section 4.1.2 of this manual).

3.3 CALIBRATION NOTES

The Multisense-1000 is pre-calibrated at the factory, but a gas test using a Calibrated Gas Standard is necessary to ensure the sensor responds to within specification and the associated equipment functions properly. Calibration should be performed on a 3-4 month basis. Consult the factory if a maintenance contract program is preferred.

Only the currently designated master sensor can be calibrated. Any of the installed sensors may be designated as the master sensor at any time. For a Multisense-1000 with multiple sensors, each sensor must be set as the master before it can be calibrated. After calibration, any other sensor can be set as the master. **Note: if the optional hand held calibrator is used (which uses a serial connection to communicate with the Multisense-1000, sensors can be calibrated and setup without first setting them as the Master sensor**.

All of the sensors except for Oxygen require a 2 point calibration. One of the points may be clean air (i.e. zero concentration of the target gas). **THE ENHANCED CO SENSOR (REFERENCED AS mosCO ON THE OPTIONAL DISPLAY) REQUIRES 2 NON ZERO CALIBRATION POINTS. When using the aux port with remote 4-20mA transmitter, calibration is typically done at the sensor (see sensor manual for calibration procedures).**

3.4 CALIBRATION PROCEDURE

1. Make sure that the Multisense-1000 has been powered up for the minimum warmup time for the sensor to be calibrated (see Table 3.2).
2. If the sensor to be calibrated is not the currently designated master sensor then follow steps 3-5 below to designate it as the master sensor. The designated Master Sensor is displayed on the topmost line of the optional LCD. If not sure then set the sensor as the Master to make sure.
3. Enter the Low Level menu by setting the value switches (See Figure 3.0) to 888 and the Function switch to 0. Press the Enter pushbutton. The yellow LED will start flashing to indicate the Low Level menu is now accessible.
4. Set the Function switch to 9 then set the rightmost switch to the desired sensor type as per Table 3.0 above. Press the Enter pushbutton to confirm the selection.
5. Set the Function switch to 0 and press the Enter pushbutton to leave the low level menu.
6. With the Function switch at 0 and 999 on the value switches, press the Enter pushbutton. The yellow LED will start to flash indicating the high level menu is now accessible.
7. Set the Function switch to 1 for the first calibration point. **NOTE: This step is not required for the Oxygen sensor, which is calibrated in air using a single point calibration**. Apply the first cal gas to the sensor. Set the value of this concentration on the Value switches. For example for

100 ppm CO set the switches to 100. For convenience, this may be 0 or clean air for all sensors except the Enhanced MOS CO (mosCO). The AUX sensor (if it is configured for use with a remote 4-20mA transmitter) is typically Factory Set for 4mA = 0, 20mA = Full scale (i.e. 0-100% LEL methane, would be 4mA = 0% LEL, 20mA = 100% LEL) and calibration is done at the sensor..

8. Wait for 2 minutes, then press the Enter pushbutton. This locks in the first calibration value. The second calibration point now needs to be entered to complete a calibration. Incomplete calibrations, do not affect the already stored calibration values.
9. Set the Function switch to 2 for the second calibration point. **Note: For Oxygen sensors, this is the only calibration point required**. Apply the second cal gas to the sensor. This is typically the value of the high alarm concentration, or the maximum expected concentration value to be monitored, or, in the case of Oxygen, the sensor may be calibrated in air, which is 20.9% oxygen. Set the Value switches to the gas concentration. For all sensors other than Oxygen (AUX), the value switches are integer values having a range of 000 to 999. For an Oxygen sensor, the value range is 00.0 to 99.9 where the rightmost switch is the first place of decimal. For an oxygen air calibration set the value to 209 for 20.9%.
10. Wait for 2 minutes, and then press the Enter pushbutton. This locks the second calibration value and the Multisense-1000 now calculates the calibration parameters for the sensors. If an error is detected, the Status LED blinks red for 2 seconds. Most likely causes of calibration failure are not setting (or forgetting to set) the Value switches to correspond to the actual concentration of cal gas used, or not correctly applying the calibration gas to the sensor, or not waiting long enough (2 minutes) for the sensor to stabilize in the cal gas applied. If the calibration is successful, the Status LED stays green.

3.5 SETTING THE SPAN

The Span is the Full Scale Gas Concentration in ppm. NOTE: it does not affect the calibration. The Span sets the mA output range. The measurement range of the sensor used limits its value. The Span is factory set, but may be field adjusted.

NOTE: Only the designated Master Sensor sets the mA output

1. If the yellow light is not already flashing, enter the High Level Menu as described in section 3.1.2
2. Set the FUNCTION switch to 3. If the master sensor is not Oxygen, set the value switches to the desired value in ppm. e.g. for a setpoint of 50 ppm, set the switches to 050. For an Oxygen sensor, the rightmost switch is the first place of decimal. For example, for a value of 30.5%, set the Values switches to 305. Press the ENTER pushbutton to enter the value. If no more changes are desired, exit the High Level Menu as described in section 3.1.2.

3.6 ALARM NOTES

Alarm points are normally factory set, but may be field adjusted. Each sensor has its own independent High and Low alarm values. Each sensor must be set as the designated Master Sensor in order to modify / view its alarm values. Therefore, the displayed High and Low Alarm values are dictated by the currently selected Master Sensor and will change as a new Master Sensor is selected.

The high and low alarms are both typically “Abundance” alarms i.e. the gas concentration must rise to or exceed the alarm value for the corresponding alarm to trigger. An exception is the Oxygen sensor (AUX input fitted with an Oxygen sensor). For Oxygen, one of three alarm types may be field selected:

1. Both High and Low Alarms are “Abundance” alarms i.e. the Oxygen concentration must rise to or exceed the alarm setting for the corresponding alarm to trigger
2. Both High and Low Alarms are “Deficiency” alarms i.e. the Oxygen concentration must fall to or below the alarm setting for the corresponding alarm to trigger.
3. The High Alarm is an “Abundance” type and the Low Alarm is a “Deficiency” type i.e. the Oxygen concentration must rise to or exceed the High Alarm for a high alarm to trigger and must fall to or below the Low Alarm for the low alarm to trigger.

Note: in each case, an alarm trigger must be present for at least the corresponding “Delay to ON” time before the alarm LED and optional relay are activated. Similarly, the alarm trigger must be absent for at least the “Delay to Off” time before the alarm LED and optional relay are de-activated.

3.7 SETTING THE ALARM TYPE FOR OXYGEN SENORS

As described in section 3.6, one of three control types may be selectable for an Oxygen sensor. This setting is usually pre-set at the factory, but may be field selected if necessary as follows:

Note: it is assumed in this procedure that an Oxygen sensor is installed in the AUX sensor position.

1. Enter the Low Level menu as described in section 3.1.3.
2. Set the Function switch to 5 (Enable Sensor setting).
3. Set the leftmost Value switch to 3 (AUX sensor code)
4. Set the middle Value switch to 0 for Both Abundance setting, or 1 for Both Deficiency setting, or 2 (or higher than 2) for High Abundance and Low Deficiency setting.
5. Set the rightmost Value switch to an odd number to enable the sensor.
6. Press the ENTER pushbutton to lock in the settings.
7. Exit the Low Level menu as described in section 3.1.3

3.8 SETTING THE HIGH ALARM SETPOINT

1. If the yellow light is not already flashing, enter the Value Entry Mode as described in section 3.1.2
2. Set the FUNCTION switch to 4. If the master sensor is not Oxygen, set the value switches to the desired value in ppm. e.g. for a setpoint of 50 ppm, set the switches to 050. For an Oxygen sensor, the rightmost switch is the first place of decimal. For example, for a value of 30.5%, set the Values switches to 305. Press the ENTER pushbutton to enter the value. If no more changes are desired, exit the High Level Menu as described in section 3.1.2.

3.9 SETTING THE LOW ALARM SETPOINT

NOTE: Always set the High Alarm Setpoint first. The Low Alarm Setpoint values are limited to be lower than the High Alarm Setpoint value to ensure proper operation.

NOTE: Each sensor has its own independent High and Low alarm values. Each sensor must be set as the designated Master Sensor in order to modify / view its alarm values. Therefore, the displayed High and Low Alarm values are dictated by the currently selected Master Sensor and will change as a new Master Sensor is selected.

1. If the yellow light is not already flashing, enter the High Level menu as described in section 3.1.2

2. Set the FUNCTION switch to 5. If the master sensor is not Oxygen, set the value switches to the desired value in ppm. E.g. for a setpoint of 50 ppm, set the switches to 050. For an Oxygen sensor, the rightmost switch is the first place of decimal. For example, for a value of 30.5%, set the Values switches to 305. Press the ENTER pushbutton to enter the value. If no more changes are desired, exit the High Level Menu as described in section 3.1.2.

3.10 SETTING THE ALARM DELAYS

These delays are common for all active sensors.

1. If the yellow light is not already flashing, enter the High Level menu as described in section 3.1.2
2. Set the Function switch to 6. Set the Value switches to the desired High Alarm Delay to On time in seconds, then press the Enter pushbutton to enter the value.
3. Repeat step 2 above with the Function switch set to 7 for the High Alarm Delay to Off time.
4. Repeat step 2 with the Function switch set to 8 for the Low Alarm Delay to On.
5. Repeat step 2 with the Function switch set to 9 for the Low Alarm Delay to Off.

Set the Function switch to 0 and press the Enter pushbutton to return to normal operation.

THIS COMPLETES THE STARTUP AND CONFIGURATION

4.0 LOW LEVEL MENU

Most of the functions in this menu are set at the factory and do not require field adjustment. The only exception is setting the Master Sensor so calibrations may be performed when multiple sensors are installed on a single Multisense-1000. Only the designated Master Sensor can be calibrated so in a multi-sensor system, each sensor must be individually set to be the Master before it can be calibrated. Also, only the Master Sensor sets the value of the mA output signal, **so after all sensor calibrations are done, set the master sensor to the sensor which is to set the mA output.**

Note: if the optional hand held calibrator is used (which uses a serial connection to communicate with the Multisense-1000, sensors can be calibrated and setup without first setting them as the Master sensor.

4.1 MENU SUMMARIES

Configuring the Multisense-1000 is done via 2 menus. Below is a summary of each menu:

4.1.1 HIGH LEVEL MENU

FUNCTION SWITCH SETTING	DESCRIPTION
0	Allows entry and exit to the High Level menu. Entry is allowed if the Function switch is set to 0, the Value switches set to 999 and the Enter pushbutton is pressed. The yellow light starts to flash indicating successful entry. To exit the Field Setup Menu, the Function switch is set to 0 the Enter pushbutton is pressed. The Value switch values are not important. The yellow light stops flashing indicating normal operation. See Also section 3.1.1.
1	The first calibration gas concentration (of a 2 point calibration). The Value switches are set to the ppm value of the calibration gas which is being used to gas the sensor. Note: the sensor

	must be exposed to the calibration gas for about 2 – 5 minutes before the Enter pushbutton is pressed to allow the reading to stabilize. This is detailed in section 3.3
2	The second calibration gas concentration. The values switches are again set to the ppm value of the 2nd calibration gas which is being used to gas the sensor. See above.
3	Sets the Span or Full Scale gas concentration. See section 3.5
4	Sets the High Alarm value for the currently selected Master Sensor. See section 3.8
5	Sets the Low Alarm value for the currently selected Master Sensor. See section 3.9
6	Sets the High Alarm On delay. See section 3.10
7	Sets the High Alarm Off delay. See section 3.10
8	Sets the Low Alarm On delay. See section 3.10
9	Sets the Low Alarm Off delay. See section 3.10

4.1.2 LOW LEVEL MENU

FUNCTION SWITCH SETTING	DESCRIPTION
0	Allows entry and exit to the Low Level menu. Set the Function switch to 0 then press the Enter pushbutton. The yellow light stops flashing indicating normal operation.
1	Sets the mA output direction: Direct where 20mA is at the Span value or INVERSE where 4mA is output at the Span value.
2	Sets the mA output type: 4-20mA or 0-20mA.
3	Fix the mA output based on the rotary switches instead of the gas concentration. The rightmost rotary switch sets the first place of decimal. For example setting the rightmost 3 switches to 100 set the output to 10.0mA.
4	Trims the mA output to compensate for component tolerances - done at the Factory. THIS IS NOT RECOMMENDED FOR FIELD ADJUSTMENTS since changing it will alter the accuracy of the mA output. If adjustment is required: measure the mA output with an accurate mA meter. Adjust the rightmost switch clockwise to increase and counterclockwise to decrease the output value to get as close as possible to 20.0mA reading on the mA meter. Press the Enter pushbutton to keep the change.
5	Enable / disable sensors. Each sensor may be enabled or disabled. Disabled sensors are not displayed on the optional display. Set the sensor to be modified on the 3rd from the rightmost rotary switch as per Table 3.0 in section 3.1.4. Then set the rightmost switch to an odd number to Enable or even number to Disable the sensor. Press the Enter pushbutton to confirm the change. Note: There are 2 special cases: 1. When the combustible sensor is selected, the 2nd from the rightmost rotary switch sets the kind of Combustible sensor installed: even values for this switch set Hotwire type, odd values set MOS type. Press the Enter pushbutton to confirm changes.

	2. When the Aux sensor is selected, and its gas name is set to Oxygen, then the 2nd from the rightmost rotary switch sets the kind of alarm type for oxygen. There are 3 options: • Rotary switch = 0 sets both the high and low Oxygen alarms for "Abundance" i.e. the Oxygen concentration in each case must be at or greater than the alarm value for an alarm. • Rotary switch = 1 sets both the high and low Oxygen alarms for "Deficiency" i.e. the Oxygen concentration in each case must be at or lower than the alarm value for an alarm. • Rotary switch = 2 or higher sets the high Oxygen alarm as an "Abundance" alarm and the low Oxygen alarm as a "Deficiency" alarm.
6	Sets the gas name for a sensor. For example, the Combustible sensor may be set for Methane. Changing the name does not change calibration or cause recalculation of concentrations. Set the sensor to be modified on the 3rd from the rightmost rotary switch as per Table 3.0 in section 3.1.4. Set the gas name as per Table 3.1 in section 3.1.5
7	Sets the Network Tag name of the Multisense-1000 unit. The Tag Name is for the whole Multisense-1000 and not per sensor. This is set at the factory. All network tag numbers in a system must be consecutive. Set the desired tag number on the 3 rightmost rotary switches for a maximum of 128. Press the Enter pushbutton to confirm the change.
8	Signal display: displays all sensor signal values in mV regardless whether they are enabled or not.
9	Set any of the 6 sensors as the Master Sensor. Master sensors set the 4-20mA output. Also, calibration, High, and Low Alarm values only apply to the currently selected Master Sensor To set: select the desired sensor number the rightmost rotary switch as per Table 3.0 in section 3.1.4 and press the Enter pushbutton.

5.0 TROUBLESHOOTING

ERROR DESCRIPTION	WHAT TO DO
1. No mA output and all lights off	• Check the power to the unit. The voltage should be 24VDC at the power connector with the positive and negative connected as shown on the connector label. • If the Power checks out, call Arjay/Enmet Service.
2. Displayed readings don't match actual gas concentrations. For example, display reads 10ppm CO in clean air.	• Recalibrate the sensor by first setting it as the Master Sensor, then following the calibration procedure as described in section 3. • If problem persists: call Arjay/Enmet Service
3. Sensor Fault light (Red) on	• Check Sensor connector. Disconnect then reconnect it to verify good contact. • Make sure unused sensor ports are made inactive. If unit has display, only the active sensor will show • Call ArjayEnmet Service
4. Alarm Relays do not activate	• The Alarm relays are common to all active sensors. Each sensor has independent High and Low Alarms, BUT these can only be set when the corresponding sensor is designated as the Master Sensor. To check, set each active sensor as the Master in turn and check its alarm values.

6.0 CONTROLLER SETTINGS SHEET

Checked by	
Model Number	
Serial Number	
Hardware Rev.	
Software Rev.	

The factory settings column below lists the typical default settings. These values may be changed by the user via the rotary switches on the Multisense-1000 board. If changed, please fill in the USER SETTING column for future reference.

PARAMETER	DESCRIPTION	FACTORY SETTING	USER SETTING
HIGH ALARM DELAY TO ON	The minimum time in seconds a High Alarm must exist before the High Alarm relay and indicator are activated.		
HIGH ALARM DELAY TO OFF	The minimum time in seconds the Multisense-1000 must be out of High Alarm before the High Alarm relay and indicator are de-activated.		
LOW ALARM DELAY TO ON	The minimum time in seconds a Low Alarm must exist before the corresponding relay and indicator are activated.		
LOW ALARM DELAY TO OFF	The minimum time in seconds the Multisense-1000 must be out of Low Alarm before the Low Alarm relay and indicator are de-activated		
NETWORK ADDRESS	Value from 1 to 128. The number is used by the Network Master to select which Multisense-1000 transmitter to communicate with via the RS-485 network.	1	
COMBUSTIBLE TYPE (IF APPLICABLE)	The standard combustible sensor type is the hot wire or pellistor pair. Alternatively, an MOS sensor may be used.		
AUX TYPE (IF APPLICABLE)	Used for Oxygen sensor **OR** mA input signal from an external mA transmitter **OR** external loop powered mA transmitter		
AUX (OXYGEN) ALARM TYPE (IF APPLICABLE)	For Oxygen sensors ONLY, one of 3 alarm types may be selectable: 1. Both High and Low Alarms are Abundance type 2. Both High and Low Alarms are Deficiency type 3. High Alarm is Abundance and Low Alarm is Deficiency type.		
SPAN	The Full Scale concentration in ppm		
mA Type	4-20mA or 0-20mA output	4-20mA	
mA OUTPUT	Direct acting: 4mA for 0 ppm & 20mA for full-	Direct Acting	

POLARITY	scale ppm Inverse acting: 20mA for 0 ppm & 4mA for full-scale ppm		
MASTER SENSOR	**Type or Port** Any of the 6 possible sensors may be set as the master sensor. This sensor sets the mA output. Only the master sensor is affected by the calibration procedure. If other sensors are installed, they each must be set to be the master for calibration. After calibration is done, then the intended sensor may be set to the master sensor.		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		
	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		
SENSOR #2	**Type or Port**		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		
	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		
SENSOR #3	**Type or Port**		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		
	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		
SENSOR #4	**Type or Port**		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		

	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		
SENSOR #5	**Type or Port**		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		
	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		
SENSOR #6	**Type or Port**		
	Sensor serial number		
	Gas name		
	High alarm value		
	Low alarm value		
	First Cal point Enter ppm and corresponding mV e.g. 0 ppm = 150mV		
	Second Cal point Enter ppm and corresponding mV e.g. 100 ppm = 400mV		