OMNI – 4000
S/N 6705 and Above
Operation and Maintenance Manual

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Introduction

This manual has been written to facilitate the rapid and effective use of the OMNI-4000 gas detector.

Organization of the Manual

This manual describes all the operations for which the OMNI-4000 can be used. They have been grouped in four sections:
- ♦ Section One: The physical description of the instrument
- ♦ Section Two: Description of the use of the OMNI-4000 in the field
- ♦ Section Three: Maintenance, adjustment, replacement of sensors, & calibration, etc.
- ♦ Section Four: Detailed description of the technical characteristics of the OMNI-4000

Using the Manual

We recommend that the complete manual be read by the user. This manual has been written to provide information which is essential to each phase of use.

To Use the Instrument Immediately

We recommend that the manual be read in its entirety, prior to activation of the OMNI-4000. If so desired, to activate the OMNI-4000 immediately, activate it in conjunction with this manual, refer to pages 4 to 8. This will enable you to become familiar with the device and the features before actual use in the field.

CAUTION: Never start the calibration procedure unless the corresponding cylinder of gas is available. Scrolling through the calibration menu without applying corresponding gas will cause the installed sensor to be out of calibration and showing a Fault condition.

If instrument is new or otherwise in proper working order, this problem can only be corrected by performing the complete calibration procedure with proper calibration gas.

Do Not Neglect To Read The Complete Manual Before Engaging In Field Use Of This Instrument.

Illustrations

The illustrations within this manual are intended to familiarize the user with the features of the OMNI-4000 and to provide the user with the knowledge to operate the device in a safe environment.

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

NOTE: [important information about use of instrument – if not followed may have to redo some steps.]

CAUTION: [affects equipment – if not followed may cause damage to instrument, sensor etc…]

WARNING: [affects personnel safety – if not followed may cause bodily injury or death.]
Upon Receipt, Unpack

Unpack the OMNI-4000 and examine it for shipping damage. If such damage is observed, notify both ENMET customer service personnel and the commercial carrier involved immediately.

Regarding Damaged Shipments

**NOTE:** It is your responsibility to follow these instructions. If they are not followed, the carrier will not honor any claims for damage.

- This shipment was carefully inspected, verified and properly packaged at our company and delivered to the carrier in good condition.
- When it was picked up by the carrier at ENMET, it legally became your company’s property.
- If your shipment arrives damaged:
  - Keep the items, packing material, and carton “As Is.” Within 5 days of receipt, notify the carrier’s local office and request immediate inspection of the carton and the contents.
  - After the inspection and after you have received written acknowledgment of the damage from the carrier, contact ENMET Customer Service for return authorization and further instructions. Have your Purchase Order and Sales Order numbers available.
- ENMET either repairs or replaces damaged equipment and invoices the carrier to the extent of the liability coverage, usually $100.00. Repair or replacement charges above that value are your company’s responsibility.
- The shipping company may offer optional insurance coverage. ENMET only insures shipments with the shipping company when asked to do so in writing by our customer. If you need your shipments insured, please forward a written request to ENMET Customer Service.

Regarding Shortages

If there are any shortages or questions regarding this shipment, please notify ENMET Customer Service within 5 days of receipt at the following address:

ENMET Corporation
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 734-761-3220 Fax

Check Order

Check, the contents of the shipment against the purchase order. Verify that the OMNI-4000 is received as ordered. Each OMNI-4000 is labeled with its target gas. If there are accessories on the order, ascertain that they are present. Check the contents of calibration kits. Notify ENMET customer service personnel of any discrepancy immediately.

Serial Numbers

Each OMNI-4000 is serialized. These numbers are on tags on the equipment and are on record in an ENMET database.
Figure 1-1: Exterior Features of OMNI-4000

OMNI-4000 S/N 6705 and above

Figure 1-2: Features of the OMNI-4000 Control Panel

Figure 1-3: Switches for Operation and Programming
1.0 General Description

OVERVIEW: In this section the OMNI-4000 and its components are described by means of a number of diagrams. The OMNI-4000: The OMNI-4000 is a portable multi-gas detector. It can simultaneously detect the presence of up to four gases by means of special sensors for each type of gas to be detected. Included are explosive gases (methane, propane, butane, etc.), toxic gases (carbon monoxide, hydrogen sulfide, chlorine, etc.), and the oxygen content of the air.

1.1 General Characteristics

These are presented below. Complete specifications and sensor characteristics are presented in Section 4.

- Simultaneous detection of up to 4 gases
- Interchangeable factory-set sensors
- Automatic switchover between "explosive gas %" and "volume %" scales, optional
- Storage of events
- Instantaneous STEL and TWA alarms
- RS232C port for direct connection to a serial printer or compatible personal computer
- Intrinsic Safety Approval

1.2 Main Components

These are those operated by the user. They are shown in Figures 1-1, 1-2, and 1-3. A detailed description of each main component is given in the next chapter.

OPERATION OF THE DEVICE

The OMNI-4000 is a gas detector which can be used with up to four sensors, each one for a different type of gas. Thus, depending on the number and type of sensors installed, the OMNI-4000 detects the presence of the corresponding gases in the immediate environment. Sensors can be easily removed and replaced by other available sensors for different gases.

When fitted with a pump system and a calibration cover, the OMNI-4000 can be used to measure the concentrations of gases in difficult-to-reach areas or before entry into confined spaces.

When the instrument is on and not in alarm, a confidence beep is emitted and the general alarm indicator light blinks every 30 seconds, showing that the device is operating correctly. The OMNI-4000 has received intrinsic safety approval for the European equivalent of Class 1, Div. I, Groups A, B, C and D hazardous areas.

1.3 Operating the OMNI-4000: In the Field

Control is by means of the four touch-sensitive switches on the front panel. See Figure 1-3 in which these switches are named. These switches are used:

- To turn the device on and off
- To acknowledge the gas audio alarm
- To turn on the backlighting system for the LCD display, which automatically turns off after approximately 15 seconds
- To select the menus during operation

1.4 Programming

Access for programming is obtained by inserting the programming plug into the appropriate socket or after opening the instrument. The same touch sensitive switches on the OMNI-4000, shown in Figure 1-3, then enable:

- The device to be turned on and off
- The programming choice to be entered
- Scrolling in a menu
- The selection of a menu
The names associated with the operational mode of these switches are also used for the programming mode. The programming functions of the BACKLIGHT and MENU switches are indicated by arrows on the control panel, which are used in certain statements on the display.

1.5 Gas Detection

The OMNI-4000 can be fitted with four of many available gas sensors. See Figure 1-4. Channel No. 1 is reserved for a sensor for the detection of explosive gases. If an infrared CO2 smart block is used, it must be installed in Channel No. 2. Channels No. 2, 3 and 4 can be a selection of smart block sensor assemblies which are sensitive to oxygen or specific toxic gases, such as CO, H2S, HCL, Cl2, etc. Sensor characteristics are given in Figure 4-1.

A channel can be programmed as "Enabled" or "Disabled" as desired by means of the keys on the device.

There is an option which allows the automatic changeover from the explosive gas measurement in the "0-100% LEL" range to the "0-100% Gas" by volume range. This option can be implemented only when that the device has both an explosive gas sensor and an oxygen sensor.
1.6 Sensor Readings

Instantaneous Readings

The gas content measured by each of the enabled sensors can be seen on the alphanumeric display. This is divided into four independent quadrants, each corresponding to a sensor or "Channel." See Figure 1-5.

It is therefore possible to see a maximum of four readings at the same time. The amount of available useful data is greater than the display capacity of each quadrant, so the measurements are displayed alternately as follows:

- Reading: Sensor gas
- Reading: Unit of measurement

Thus the operator alternately sees displayed:

- The quantity and chemical description of the gases that can be detected
- The quantity and unit of measurement of the gases that can be detected

![Figure 1-5: Channel Information Quadrants](image-url)
Type of gas – unit of measurement, showing the alternation information displayed to the operator.

*For example:* The values for the concentration of methane gas (0% LEL CH₄), of CO (10 ppm CO), of NO₂ (0.0 ppm NO₂).

*Example:* of oxygen (20.9% O₂) are clearly visible.

![Alternating Display](image)

**Figure 1-6: Example of Alternating Display**

### 1.6.1 Enabled and Disabled Channels

The enabled channels and those disabled, either by programming or because a sensor is not installed in a channel, are clearly displayed, as in the following example:

The top section of Figure 1-7 shows an **OMNI-4000** with an explosive gas sensor installed; the other three channels are either disabled or without sensors. The bottom section of Figure 1-7 shows an **OMNI-4000** with three toxic gas sensors installed, and with the explosive gas channel disabled or without a sensor.

![Disabled Channels](image)

**Figure 1-7: Examples of Display with Disabled Channels**

### 1.6.2 Memorized Readings

When in use the **OMNI-4000** continually stores the readings. These can then be displayed later as histograms of the stored readings. Data obtained during operations is stored when the device is turned off.

### 1.7 Alarms

These are both visual (indicator lamps and display) and audible alarms. See Figure 1-8.
1.7.1 Gas Alarms
According to the programming and the type of gas, the gas alarms can be triggered when a value is exceeded:

- Instantaneous value, on all four channels
- Both deficiency and enrichment values on an oxygen channel
- Short Term Exposure Limit (STEL), corresponding to a sliding mean over 15 minutes, for each channel with a toxic sensor installed
- Time Weighted Average (TWA), corresponding to a sliding mean over 8 hours, for each channel with a toxic sensor installed

As soon as at least one channel exceeds one of these preset alarm thresholds, the OMNI-4000 emits a shrill intermittent audible signal, and the general alarm lights blinks. At the same time, the indicator lamp for the involved channel blinks and an alarm message appears on the display (ALARM, TWA, STEL, Min, etc.), alternately with the readings in the active quadrants.

![Figure 1-9: Examples of FAULT and a TWA Alarm Display](image)

1.7.2 Fault Alarms
There are two categories of faults:

- Those concerning the sensors (Over Range, Sensor used, New calibration requested - after a major divergence during the self-adjustment). These generate individual messages which are displayed in the appropriate quadrant of the display, as well as visual and audible alarm signals. See Figure 1-10, top.
- Faults affecting the device itself, such as low batteries or an electronic failure. The corresponding fault message appears on the display. It has priority over all other messages concerning the sensors. See Figure 1-10, bottom.

![Figure 1-10: Examples Of Fault Information.](image)
Figure 1-11: ENTER Switch, Used to Acknowledge an Audio Alarm

Figure 1-12: Example of a Histogram
1.7.3 Acknowledging Alarms

Acknowledging Gas Alarms

1. This means canceling only the audio alarm, not the entire gas alarm. When a channel is in alarm and the ENTER switch shown in Fig. 1-11 is pressed, the audio alarm stops, but the both the general and channel alarm lamps continue blinking until the reading is below the programmed alarm threshold level. As soon as the reading is within the preset limits, the alarm lamps automatically go out. This applies equally for the instantaneous alarms and the TWA and STEL alarms.

Acknowledging Fault Alarms

2. A fault alarm can be acknowledged only after the fault has been cleared from the channel.

1.8 Memorization of Readings-Histograms

The OMNI-4000 can store the readings taken for later printout or display on a computer screen, in the form of histograms. See Figure 1-12.

The histogram function enables the printout and/or display on a personal computer or work-station of the readings and events stored in the OMNI-4000 during the period of operation.

Clearing the memory can only be performed during the printout procedure. The OMNI-4000 can be turned off without affecting the data stored in it.

Operating Principles

In order to make maximum use of the data printed out as charts, the principles underlying the memorization of data are described below.

1.9 Data Stored

The OMNI-4000 stores groups of data as soon as it is switched on and then cyclically. Each of these groups has the same structure and content:

1. The average reading of concentrations for each enabled sensor over a period of one minute, at a rate of one sampling operation per second

2. The events on each channel:
   - Resetting
   - Faults
   - Instantaneous and average alarms
   - Types of maintenance requested (programming, calibration, sensor replacement)
   - The date and time
   - The low battery condition
   - The self-adjustment request
   - The maintenance function request

1.9.1 Memory Capacity

The number of readings which can be stored is limited by the size of the memory of the OMNI-4000. The recording capacity is 48 hours, with a limit of 8 events per channel per each 24 hours.

If the quantity of data to be stored exceeds the storage capacity of the OMNI-4000, the oldest data are lost (FIFO - First In, First Out - procedure). The lost data are replaced by the new data.
1.9.2 Data Available
The device computes, for each channel in use and at a rate of once per second, an average on a period of one minute. The averaged data is stored in the memory. The following data can be read from the OMNI-4000 serial port:

- A personal computer with the COM4000 Communications software can be used to display the average readings per minute.
- A serial printer can be used to printout the data relating to the average for each quarter of an hour. Thus, a printout shows the average reading over a period of 15 minutes; this new average is calculated by the OMNI-4000 during the printing.

1.9.3 Length of Data Storage
The data stored by the OMNI-4000 are held even if the device is left unused for a long period. The storage duration is 3 to 5 years and is dependent on the life of the internal lithium battery.

1.9.4 Clearing the Stored Data
To clear the data, touch the ENTER switch; to retain the data, touch the BACKLIGHT switch. This is performed by means of a request on the display after the printout of the stored data. Displayed alternately are:

```
To Clear Memory

Accept: ENTER
Cancel: →
```

Figure 1-13. Display of the Clear Data Request Following Printout

1.10 Printer or Computer Connection
These must be PC compatible and fitted with a serial RS 232C interface. See Figure 1-14. It is configured as follows:

- 9600 bauds
- 8 bits
- Even parity
- 1 Stop bit
- XON/XOFF protocol
- IBM Emulation

Figure 1-14: PC Compatible Serial Printer, Used for Printing the Histograms
1.11 Batteries

The OMNI-4000 is fitted with two batteries:

- One NI-CAD battery pack, rechargeable. See Figure 1-15. The operating life depends upon the use and ambient temperature. CO2 and BRH smart blocks reduce operation life. Operating life with versions pump and smart block combinations is given in Table 4-2, in section 4 appendix.

- A lithium battery, non-rechargeable, for the storage of the data in the OMNI-4000, in particular while the OMNI-4000 is non-operational. The life of this battery is between 3 and 5 years. See Figure 1-16 for the location of the lithium battery.

**WARNING**: Substitution of batteries or other components may compromise the intrinsic safety of the instrument.

![Figure 1-15: The removable Ni-Cad Battery Pack](image1)

![Figure 1-16: The Lithium Battery Location Inside the Instrument](image2)
1.12 Smart Block Sensor Assemblies

These sensor assemblies for the OMNI-4000 must be handled with extreme care. Impact, excess temperatures or penetration of water can negatively affect the readings or in extreme cases destroy the sensors. See Figure 1-17 for sensor locations.

The toxic, CO2, BRH and oxygen smart block sensor assemblies contain electronic components. One of these components is a memory (EEPROM) in which the manufacturer has stored the characteristics of the sensor: reading range, sundry corrective coefficients, TWA and STEL alarms, date of manufacture, serial number, etc. Also, "rate of wear" information enables the OMNI-4000 to automatically signal the optimum moment for the replacement of a sensor assembly.

No calibration adjustments are necessary to enact a change of smart block sensors from one gas to another. In the interest of safety, we recommend a test with gas to check its correct operation - it is possible that the sensor was damaged in transit and is not sensitive enough, and this can only be assessed with a gas check.

1.13 Intrinsic Safety

The OMNI-4000 has been tested and approved for intrinsic safety, which allows it to be used in hazardous atmospheres. Opening of the instrument enclosure in a hazardous area is not allowed. The OMNI-4000 has been passed EEX ia IIC T4.

The OMNI-4000 has also been tested and certified by the Canadian Standards Association to CSA Standard C22.2 No. 152-M1984, Combustible Gas Detection Instruments. Under this standard, the performance of the combustible gas detection channel, only is evaluated.

Figure 1-17 Sensor locations Inside the Instrument
Figure 2-1: OMNI-4000 On a Shoulder Strap

Figure 2-2: Attachments for Remote Sampling
2.0 Operation

2.1 Using the OMNI-4000

This Chapter deals with the positioning of the OMNI-4000 for taking readings and the use of the remote sampling system.

2.1.1 Positioning the Instrument

The operator can:

• Work while the OMNI-4000 monitors the atmosphere
• Or, take readings using a sampling system

In order to monitor the atmosphere correctly, the openings for the sensors of the OMNI-4000 must always be unrestricted. A blocked sensor opening results in a reduced evaluation of the gas concentration, which may prove fatal for the operator.

Carrying the OMNI-4000 with a Shoulder Strap

A shoulder strap allows the OMNI-4000 to be carried by the operator. See Figure 2-1. The device is designed so that the sensors are facing away from the clothing. Thus, the gas exchange openings can be seen, and are unrestricted in use, and the display can be clearly seen.

2.1.2 Use With a Sampling Probe

The OMNI-4000 can be connected to a sampling system, enabling readings to be taken in inaccessible areas or prior to entering a confined space.

Setting-Up the Sampling System

• Position the calibration cover on the OMNI-4000 body. See Figure 2-2. Fasten it in place with the captive screw.
• Connect the vinyl hose between the cover nipple and the inlet to the squeeze pump or to the motorized sampling pump.
• Ensure that pumping direction is correct by checking the flow of air into the sensors during pumping.

Pumping and Readings

• When using the squeeze bulb, squeeze the bulb rapidly and continuously for 2 seconds for each foot of hose before looking at the reading.
• Wait until the readings have stabilized before confirming them. They may be over estimated (explosive gases) or under estimated (oxygen) during pumping as a result of the movement of air.

Dismantling the Pumping System

• Always remove the calibration cover after using the probe. Failure to do so may lead to an underestimation in the readings which may be fatal for the operator.

2.1.3 Use with an Integral Sampling Pump

The instrument may be purchased with an integral sampling pump, the BP-4000, or such a pump may be added in the field. The pump replaces the instrument battery pack, and includes a battery pack of larger capacity, sufficient to power both the instrument and the pump. The integral pump adds about 2 inches to the length of the instrument. Note that the instrument battery pack and the integral pump battery pack require two different chargers. See battery life table 4-2 in section 4.
To Replace the Instrument Battery Pack with the Integral Pump and Battery Pack

- Release the instrument battery pack captive screw. See Figure 2-2.
- Push the battery pack out with your hand. It comes out on the circuit board side, opposite the gas sensor openings.
- Push the integral pump and battery pack in from the circuit board side.
- Tighten the captive screw, securing the integral pump and battery pack into place.

**Figure 2-2: Attachments for Remote Sampling**

To Use the Pump

Connect the sample tubing, or wand to the pump inlet. Use the small length of special pipe to connect the pump outlet to the inlet of the calibration cover, which is positioned on the OMNI-4000 chassis as in Figure 2-2A. Turn on the pump by means of the pump switch. If the flow rate decreases below a specified level, the instrument common alarm activates and a message is displayed.

**Caution:** The pump on/off switch does not turn off the instrument and the instrument on/off switch does not turn off the pump. *Failure to turn off both sections can damage the battery pack.*

**Figure 2-2A: OMNI-4000 with BP-4000 Pump and Battery Pack**
2.1.4 Use the OMNI-4000 as a Hand-Held or Stationary Beacon

The location of the instrument may be changed to detect various gases. When used as a stationary beacon, the OMNI-4000 should be vertical with the battery pack acting as the base. See Figure 2-3. Depending on the type of gas to be detected or liable to be present, the device is located:

- At ground level for heavy gases, such as H₂S
- At mid-height (approximately 1.5 meter) or at the outlet of an air vent for the general detection of gases and the monitoring of the oxygen and CO
- At height for the detection of light gases, such as methane, hydrogen, or ammonia

Although there is an audio alarm, it is essential that the operator must be able to see the general alarm indicator lamp in a noisy environment. See Figure 2-4. There is an earphone socket on the device.

2.2 Start Up Procedure

There is a choice of three procedures when the device is turned on:

- **Standard Start Up Procedure** (see section 2.2.1) suitable for most cases. However, if a small reading is displayed while you are in a known clean environment, go to section 2.2.4.
- **Start Up with Selection of Reference Explosive Gas or Vapor** (see section 2.2.2). A procedure enabling the choice of the reference explosive gas, useful when searching for a known specific explosive gas
- **Start up with Auto Set** (see section 2.2.4). A procedure known as Auto Set or Auto Zero which allows the automatic reset of. This procedure must be used regularly.
2.2.1 Standard Start-Up

- Press the ON/OFF switch lightly
- The device performs a series of tests for a number seconds, displaying:

![Test in progress
Version: USA 1](image)

**Figure 2-5: Start-up Display**

- If the internal battery, sensor, electronics, etc. tests are successful, the readings from the sensors are displayed.

*Example:*

<table>
<thead>
<tr>
<th>Gas</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEL</td>
<td>10 ppm</td>
</tr>
<tr>
<td>ppm</td>
<td>0.0</td>
</tr>
<tr>
<td>%</td>
<td>20.9</td>
</tr>
<tr>
<td>CH4</td>
<td>0.0</td>
</tr>
<tr>
<td>CO</td>
<td>0.0</td>
</tr>
<tr>
<td>NO2</td>
<td>0.0</td>
</tr>
<tr>
<td>O2</td>
<td>20.9</td>
</tr>
</tbody>
</table>

**Figure 2-6: Gas Symbols alternation with Units of Measure (% or ppm)**

- If the tests are incorrect, the device triggers an alarm (rapid beeping, general alarm and affected channel alarm indicator lamps blink). Refer to the section on "Alarms.

2.2.2 Start-Up with Selection of Reference Explosive Gas or Vapor

Selection of mode

- Hold down the BACKLIGHT switch, and
- Turn on the device by pressing ON/OFF switch
- Release both switches
- The display shows:

![Test in progress
Version: USA 1](image)

• Then:

![Type of gas
Methane](image)

2.2.3 Selection of Reference Explosive Gas or Vapor

- A different reference gas is displayed each time the MENU switch is pressed. There are twenty-seven (27) preset reference gases, in the "0-100% LEL" range. A twenty-eighth (28) choice allows the selection of an "Other" gas corresponding to a special need; the data for this gas must be input, as explained in Section 3. The display starts with the gas currently selected.
- Confirming the choice: When the desired gas is displayed, press the ENTER switch. The display reads: "Test in progress," prior to beginning the working phase. The reference explosive gas is now the selected gas.
- Aborting the procedure: Press the BACKLIGHT switch or the ON/OFF switch. The reference gas remains the same as when the device was turned on. NOTE: If the operator does not enter any data for a period of approximately 10 seconds, the **OMNI-4000** goes into test mode and normal reading mode without changing the reference gas, the same as aborting the procedure.
- If the tests are invalid, the device triggers an alarm (rapid beeping and blinking of the alarm indicator lamp).
The device is now ready for use.

![Table]

<table>
<thead>
<tr>
<th>Gas</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH₄</td>
<td>0.0 NO₂, 10 CO</td>
</tr>
<tr>
<td>BUT</td>
<td>0.0 NO₂, 10 CO</td>
</tr>
</tbody>
</table>

**Figure 2-7: Example of Changing Reference Gas**

%LEL CH₄ (Left) to, %LEL Butane (Right)

### 2.2.4 Start Up with Auto Set (Auto Zero)

**Selecting the Mode**

If, after doing a standard start up in a known clean air environment, one or more channels have a small reading displayed. This special start up procedure can be used to set the explosive gas sensor(s) and the toxic gas sensor(s) to zero and the setting of the oxygen sensor to 20.9%.

- Make sure that the device is in an area where there is no explosive or toxic gas, and with a normal oxygen concentration, such as a well-ventilated or outside area.
- Hold down the ENTER switch
- Turn the device on by pressing the ON/OFF switch
- Release both switches

The display shows:

![Auto set In progress]

Then:

![Tests In progress, Wait for display To stabilize]

Prior to displaying the actual reading for each operational sensor, for instance:

![Table]

<table>
<thead>
<tr>
<th>Gas</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH₄</td>
<td>Disabled, 20.9 O₂</td>
</tr>
</tbody>
</table>

- When the readings have stabilized, press ENTER.

If the auto set procedure has been satisfactorily performed, the display shows:

![Auto set: ENTER, Cancel: ]

- Press ENTER again, and the following is displayed momentarily:

![Auto set: Done]

**Auto Set Not Possible**

If the ambient temperature is below 0°C or above 45°C or if the batteries are too low, the self-adjustment procedure cannot be performed. The display shows:

![Auto set Not possible]
Auto Set Performed

- With the exception of the oxygen reading set at 20.9%, the other readings are automatically set at a useful value:

<table>
<thead>
<tr>
<th>Channel no. 1</th>
<th>Channel no. 2</th>
<th>Channel no. 3</th>
<th>Channel no. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrant no. 1</td>
<td>Quadrant no. 2</td>
<td>Quadrant no. 3</td>
<td>Quadrant no. 4</td>
</tr>
<tr>
<td>0 LEL 0 ppm 20.9</td>
<td>0 ppm 0 ppm 20.9</td>
<td>0 LEL 10 ppm</td>
<td>0 ppm 20.9</td>
</tr>
</tbody>
</table>

- If the tests are negative, the device triggers an alarm, the rapid beeping and blinking of alarm indicator lamps. Otherwise, the device is ready for use.

NOTE: The auto set procedure is not time limited, i.e. the operator must exit it, one way or the other.

2.2.5 Readings

This paragraph describes the operations performed in the gas reading mode.

2.3 Lighting

Reading in poorly lit areas is facilitated by pressing the BACKLIGHT switch. The backlighting of the display allows the data to be seen clearly. It is automatically turned off after fifteen (15) seconds.

The backlight can be used in hazardous environments, those containing explosive gases, as the OMNI-4000 has the required Intrinsic Safety Approval.

2.3.1 Displaying the Instantaneous Readings

In automatic operation, all instantaneous readings concerning the gases are constantly displayed.

The display is divided into four independent quadrants, each of which corresponds to a sensor or "channel."

Quadrant no. 1
Channel no. 1

Quadrant no. 2
Channel no. 2

Quadrant no. 3
Channel no. 3

Quadrant no. 4
Channel no. 4

Figure 2-8: The Quadrants of the Display, Corresponding with Four Channels of Gas Detection

The display capacity is limited in each quadrant, therefore the readings are displayed alternately as follows:

- Reading: Sensor gas symbol
- Reading: Unit of measurement

Thus the operator sees alternately displayed:

- The quantity and chemical description of the gases that can be detected
- The quantity and unit of measurement of the gases that can be detected
2.3.2 Automatic Switching to the "0-100% GAS" Range
An option allows the automatic switching from the measurement of explosive gas in the "0-100% LEL" range to the "0-100% GAS" by volume range whenever the reading is above 100% LEL of the selected reference gas. This reading can only be taken with a device which has both an explosive gas sensor and an oxygen sensor installed. If the instrument is equipped with explosive gas sensor and an oxygen sensor from the factory, the option is active.

During an actual reading the orange Over Range indicator lamp lights. See Figure 2-11. The reading is displayed alternately as follows:

\[
\begin{array}{c|c}
25\% & 0 \text{ ppm} \\
0.0 \text{ ppm} & 15.6\%
\end{array}
\quad
\begin{array}{c|c}
25 \text{ gas} & 0 \text{ CO} \\
0.0 \text{ NO2} & 15.6 \text{ O2}
\end{array}
\]

Figure 2-10: The 0 – 100% GAS by volume option for the Explosive Gas Channel

The display shows, for channel no. 1, alternately the symbol "\%" and then the word "GAS." The Over Range indicator lamp lights.
2.4 Display of Supplementary Data

When the device is operating normally, the operator can access a variety of information concerning gases and a number of internal variables of the instrument (battery voltage, date and time).

This information can be displayed by repeatedly pressing the MENU switch. The data stored in the device is then displayed. Starting from the display of instantaneous readings,

2.4.1 Date and Time

This information is shown as "DD-MM-YY" (day-month-year) and "hr-min-sec (hours-minutes-seconds).

![Figure 2-12: Example of Date and Time Display](image)

2.4.2 Battery Charge Condition

This is in volts (Figure 2-13, left) and by bargraph. A gradual reduction in available energy ultimately leads to the message in Figure 2-13, right. Voltage below 6.4 V automatically disconnects the battery and the display goes off.

![Figure 2-13: Example of the Battery Voltage Level and Warning Display](image)

2.4.3 Minimum-Maximum

General information concerning each channel (unit of measurement, type of gas and the min. and max. values) is then displayed. Each time the MENU switch is pressed, the data for the next operational channel is displayed.

![Figure 2-14: Example Minimum – Maximum Menu](image)

The information is displayed in turn as the MENU switch is pressed.

The Min and Max values are those encountered during the last time period that the instrument has been on. If a channel is disabled, it is so indicated.
2.4.5 STEL and TWA
This information, programmed by the manufacturer and contained in the internal memory of the sensor and the instrument, is available whenever at least one toxic sensor is connected and operational, and the instrument is ON:

- The STEL data (Short Term Exposure Limit) for each toxic channel (STEL symbol, type of gas, reading and unit of measurement) is displayed each time the MENU switch is pressed. Press it again to display the next operational channel. The STEL values are only displayed after the device has been on for at least fifteen minutes.

- The TWA (Time Weighted Average) for each toxic channel (TWA symbol, type of gas, reading and unit of measurement) is displayed each time the MENU switch is pressed. Press it again to display the next operational channel. The TWA values are only displayed after the device has been on for at least two minutes.

![Figure 2-15: Example of Display of the STEL](image)

The procedure is identical to the Min/Max procedure.

2.4.6 Returning to the Operational Mode
This occurs immediately after the last information on the STEL/TWA values on an OMNI-4000 with at least one toxic sensor installed, or after the min.-max. values for an OMNI-4000 with no toxic sensor installed.

Return to the instantaneous readings at any time can be obtained:

- Immediately, by pressing the BACKLIGHT switch
- Automatically after a 30 second delay

NOTE: Other displays are also available with this procedure. However, they can only be accessed after connection of a printer or computer.
### 2.5 Alarms

To warn the operator of a hazard, such as the presence of gas, lack of oxygen, STEL/TWA thresholds exceeded and/or internal faults, the **OMNI-4000** triggers:

- An audible alarm consisting of a rapid intermittent sound, the gas alarm, or continuous sound, the battery alarm
- A visual alarm consisting of the general alarm indicator lamp and the indicator lamp for the appropriate channel
- The display of information messages concerning the alarm

As the operator becomes aware of the alarm through the audible and visual alarm signals, the exact type of alarm is indicated on the display.

#### 2.5.1 Continuous Sound Alarm

**Cause** - This occurs when:

- The **OMNI-4000** battery is low, and
- At least one reading has exceeded the maximum permissible value.

**Alarms Triggered**

- Continuous sound alarm,
- general alarm indicator lamp and appropriate channel indicator lamp lit. See Figure 2-16.

- Display of one of the following messages:
  - "Battery low"
  - "> 100 LEL"
  - "Over range"
  - "New Cal."

![Figure 2-16: Location of Alarm Indicator Lights](image-url)
The action to be taken depends upon the MESSAGE displayed.

| MESSAGE: Battery low | ▪ Recharge the batteries  
▪ There is approximately 20 minutes of operating time left, after which the device stops operating.  
▪ This alarm cannot be acknowledged; pressing ENTER has no effect. |
|----------------------|-------------------------------------------------------------------|
| MESSAGE: >100LEL     | ▪ Only concerns the explosive gas channel  
▪ Effect:  
▪ Latching of the display quadrant concerned  
▪ Continuous audible alarm which cannot be acknowledged  
▪ Explosive gas channel and general alarm indicator lamps are lit  
▪ Return to normal operation by turning OFF and restarting the **OMNI-4000**  
▪ Proceed with care in the area as there is a concentration of explosive gas above the LEL |
| NOTE: This alarm occurs only when the "0-100% GAS" option has not been selected. If the **OMNI-4000** is programmed with this option, the reading goes directly to the "0-100% GAS" range; an instrument programmed with this option must include an oxygen sensor to be operational. |
| MESSAGE: Over range  | ▪ Only concerns the toxic gas channels  
▪ Effect:  
▪ Continuous audible alarm which cannot be acknowledged  
▪ Toxic channel and general alarm indicator lamps are lit  
▪ Leave the area immediately as there is an excessive concentration of toxic gas |
| MESSAGE: New Cal     | ▪ Automatic zero reset (auto set) cannot be performed because, for instance, there is an excessive drift from zero of a sensor  
▪ Replace the affected sensor. See Section 3. |
2.5.2 Intermittent Audio Alarm

Cause
- The alarm threshold of at least one operational channel has been exceeded.

Figure 2-17: Explosive Gas Alarm Features

Figure 2-18: Oxygen Alarm Features
Channel 4 Shown as an Oxygen Channel

Figure 2-19: Toxic Gas Alarm Features
Channels 2 and 3 are Toxic Gas Channels
Alarms Triggered

- Intermittent audible alarm
- General alarm indicator lamp blinking
- One or more alarm indicator lamps blinking
- Display of an explanatory message in the appropriate display quadrant
- The reading of the channel in alarm is frozen at the maximum recorded value

Action

- Find out which channel or channels are in alarm by means of the channel alarm indicator lamps. See Figures 2-17, 2-18, and 2-19. The corresponding quadrant alternately displays "ALARM", the reading and the type of gas.
- Refer to the paragraph below concerning the type of gas:
  - "LEL Alarm" paragraph for an explosive gas channel (%LEL)
  - "Oxygen Alarm" paragraph for an oxygen channel
  - "Toxic Gas Alarm" paragraph for a toxic gas channel

LEL ALARM  (Figure 2-17)

OMNI-4000 without oxygen sensor

- Be careful, explosive gas present
- Press ENTER to acknowledge the buzzer and reactivate the display

OMNI-4000 with oxygen sensor and Over Range option

- Be careful, explosive gas present
- Press ENTER to:
  - Attempt to acknowledge the buzzer. Acknowledgement is possible if
  - The reading is below 10%LEL.
  - And reactivate the display

OXYGEN ALARM  (Figure 2-18)

The oxygen reading must be between the two thresholds for oxygen abundance and oxygen deficiency. The alarm is triggered whenever the reading is not between the High Alarm and Low Alarm thresholds.

- Leave the area as quickly as possible. Excess and lack of oxygen are both dangerous
- Press ENTER to acknowledge the buzzer and reactivate the display

TOXIC GAS ALARM  (Figure 2-19)

Three types of reading can trigger the toxic gas alarm:

- Exceeding of the maximum instantaneous permissible value
- Exceeding of the permissible TWA (Time Weighted Average)
- Exceeding of the permissible STEL (Short Term Exposure Limit)

In each of these cases, a specific message cyclically replaces the reading in the appropriate channel:

- "ALARM" whenever the maximum permissible instantaneous value has been exceeded. The reading is frozen in order that the operator can see the maximum value recorded.
- "STEL AL" when the Short Term Exposure Limit has been exceeded (sliding mean of 15 minutes)
- "TWA AL" when the Time Weighted Average has been exceeded (sliding mean over 8 hours)

Proceed as follows:

- Leave the area as quickly as possible. High instantaneous or accumulated excesses (STEL or TWA) are equally dangerous
- Press ENTER to acknowledge the buzzer and reactivate the display
2.6 Turning the OMNI-4000 Off

To turn the OMNI-4000 off, press the ON/OFF switch for three seconds. The display shows the countdown as follows before turning off:

*Example of Display countdown:*

```
OFF
HOLD for 3 sec 3
```

```
OFF
HOLD for 3 sec 2
```

```
OFF
HOLD for 3 sec 1
```

When the device is turned off, the stored values (sensor setting values, alarm thresholds, histograms, etc.) are not lost. The data can be stored for between 3 and 5 years, depending on the life of the lithium battery.

When the device is returned from the field, the batteries may be recharged and the exposure histograms printed, as explained below.

2.7 Recharging the Battery

The following applies to both the standard OMNI-4000 instrument and the OMNI-4000 with the BP-4000 pump. See section 4, table 4-2 for expected battery life.

The battery can be charged either while attached to or removed from the instrument. To remove the battery pack, release the captive screw; see figure 2-20. Push the pack out; it slides toward the circuit board side, opposite the gas sensor openings.

Two different chargers are available. One is a standard single rate charger; the other is a dual rate charger.

To charge with the standard single rate charger:

- Plug the charger into 110 VAC.
- Plug the charger into the battery pack. The connectors are polarized.
- The red charge indication lamp lights.
- Leave the battery on charge for 12-14 hours. Never charge longer than 72 hours with the standard charger.

Fully charged instruments without BRH Smart blocks should not be left idle longer than one months without recharge; those with BRH Smart blocks should be recharged every week when not in use, when using the standard charger.

**CAUTION:** Failure to do so can damage the battery pack

To charge with the dual rate charger:

- Plug the charger into 110 VAC.
- Plug the charger into the battery pack. The connectors are polarized.
- There is a pre-charge interval of from 3 - 23 minutes; the battery is trickle charged while the charger microprocessor acquires and evaluates the battery. During this time the green charge light is on and may flash.
- The battery is then charged at full rate for 5 to 6 hours.
- When the battery is fully charged, the green light flashes. The battery is ready for use.
- Leave the battery on charge when not in use. The green light is on and flashing, indicating a periodic trickle charge.

When a battery is discharged to the low battery condition or beyond, the dual rate charger microprocessor may have difficulty acquiring the battery, and the full rate charge cycle is not initiated. In this case, the charger indicates a false full charge, with the green light continuing to flash. After the 23 minute maximum acquisition time, disconnect the charger from the battery for a minute and then reconnect it.
WARNING: Substitution of batteries or other components may compromise the intrinsic safety of the instrument.
2.8 Printing the Histograms

The Histograms function enables printout or transfer to a personal computer of the values and events stored by the OMNI-4000. This data is stored during the normal operation of the device. Clearing of the information in the memory can be performed only during the printing procedure.

Connection to a Printer

NOTE: This must be PC compatible and fitted with an RS 232C interface configured as follows:

- 9600 bauds
- 8 bits
- Even parity
- 1 Stop bit
- XON/XOFF protocol
- IBM Emulation

The Connecting Cable

This can be supplied as an option. You can also make your own using Figure 2-21. The programming plug, which has pins 2 and 4 connected, can be used as a part of the connecting cable if desired.

Connections

- Connect the DIN plug of the connecting cable, shown on the left side of Figure 2-22, to the OMNI-4000.
- Connect the 25 pin plug of the connecting cable, shown on the right side of Figure 2-22, to the serial port of the printer.
- Check the configuration of the switches in the printer and position the switches on the front of this to "ON" and "ON-LINE." Refer to the printer instruction manual.

Connection to a Compatible Personal Computer

This requires software known as COM4000. Refer to the manual for this software to install it on the PC. The cable is shown schematically in Figure 2-21.

Review of the Histograms

The histograms can only be reviewed only after the OMNI-4000 has been in operation for at least:

- Fifteen minutes for printing
- One minute for display on a PC

Choice of Printing Procedure

- Connect the cable between the OMNI-4000 and the printer or computer. See Figure 2-23
- Turn the OMNI-4000 on by pressing the ON/OFF switch
- Press and release the Menu Selection switch until the display alternately shows:

  To print History

  Accept: ENTER Cancel: →

- Pressing the ENTER switch starts the printing
- Pressing any other switch returns the OMNI-4000 to the main menu without altering the data
Figure 2-21: Wiring of Connectors for Serial Printer or PC RS 232C Link

Figure 2-22: 9 Pin Sub D Receptacle, Left
25 Pin Sub D Plug, Right

Figure 2-23: Connection to a Serial Printer
Review of Data
This concerns the **OMNI-4000** whether connected to a serial printer or the serial port of a compatible personal computer.

During the printing, the **OMNI-4000** automatically chooses one of two displays:

- If the data storage time is less than 15 minutes, the data is presented in the form of charts, as in Figure 2-24A.
- If the data storage time is at least 16 minutes, the data is presented in the form of graphs, as in Figure 2-24B.

Optional Clearing of the Memory
At the end of the printing procedure, the display shows:

The operator has the choice of:

- Canceling all the data still stored (clear the memory) and just reviewed, prior to putting the **OMNI-4000** back into operation. This choice is implemented by pressing the ENTER switch.
- Saving the data and putting the **OMNI-4000** back into operation. This choice is implemented by pressing the BACKLIGHT switch.

Return to Normal Mode
This is automatic after pressing a switch, per the above procedure. Remove the printer cable.
2.9 Interference Gas Response

Often electrochemical gas detection cells respond to gases other than those they are designed to be specific to. H₂, for example, commonly causes a response in CO cells. This response is called “interference.” In the OMNI-4000, compensating circuitry is employed to null out interference signals. On the whole, this compensating circuitry works well, but it does work better for some combinations of cells than others. The Table 2-1 indicates what can be expected from exposure of the instrument to possible interfering gases.

### Table 2-1: Compatibility of Smart Block Sensors

<table>
<thead>
<tr>
<th>Interfering Gas Concentration in ppm</th>
<th>Channel</th>
<th>O₂ 300</th>
<th>CO 50</th>
<th>CO 25</th>
<th>H₂S 25</th>
<th>H₂S 10</th>
<th>SO₂ 25</th>
<th>NO 50</th>
<th>NO 25</th>
<th>NO₂ 10</th>
<th>H₂ 1000</th>
<th>Cl₂ 10</th>
<th>HCN 10</th>
<th>HCL 30</th>
<th>NH₃ 100</th>
<th>ETO</th>
<th>Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂</td>
<td>*</td>
<td>+/−20</td>
<td>+/−5</td>
<td>+/−5</td>
<td>+/−10</td>
<td>Incom1</td>
<td>+/−6</td>
<td>/</td>
<td>+/−10</td>
<td>+/−6</td>
<td>/</td>
<td>+/−4</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>*</td>
</tr>
<tr>
<td>CO</td>
<td>*</td>
<td>+/−5</td>
<td>+/−2</td>
<td>+/−4</td>
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<td>/</td>
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<td>+/−3</td>
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<td>*</td>
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<tr>
<td>H₂S</td>
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<td>SO₂</td>
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</tr>
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<td>O₃</td>
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<td>*</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>*</td>
</tr>
<tr>
<td>PH₃</td>
<td>*</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>*</td>
</tr>
<tr>
<td>COCl₂</td>
<td>*</td>
<td>/</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>*</td>
</tr>
<tr>
<td>BRH</td>
<td>*</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>Incom1</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>*</td>
</tr>
</tbody>
</table>

* = Not tested
Incom1 = Incompatibility type 1: for the stated concentration, the interference is too high to produce accurate readings.
Incom2 = Incompatibility type 2: for the stated concentration, the interference is too negative to produce accurate readings.

+/−10 = Some Interference on the indicated channel; Maximum range in ppm given
/
= Limited Interference less than 2% of the interfering gas concentration

For example: If 25 ppm SO₂ is applied to a CO channel, it will cause a maximum signal equivalent to plus or minus 5 ppm CO.
If the same gas is applied to an H₂S channel, it will cause a larger interference signal.
If the same gas is applied to a NO₂ channel, it will cause a maximum interference signal of 2% of 25 ppm, which is 0.5 ppm.
Figure 3-1: Accessing the Maintenance Menu

- Program A Sensor
  - MENU Switch
  - ENTER Switch
  - Programming Sub-Menu

- Calibrate A Sensor
  - MENU Switch
  - ENTER Switch
  - Calibration Sub-Menu

- Replace Comb Sensor
  - MENU Switch
  - ENTER Switch
  - Change expl. gas Sensor sub-menu

- Set date and time
  - MENU Switch
  - ENTER Switch
  - Date and Time Sub-menu

Figure 3-2: Diagram of Maintenance Menu Loop
3.0 Maintenance

3.1 Scheduling OMNI-4000 Maintenance

The sensor responses of an OMNI-4000 should be checked at least every thirty days, by exposing the sensors to appropriate gases and monitoring for expected instrument response. It is recommended that all MOS block and combustible LEL sensors of an OMNI-4000 instrument be completely recalibrated at least every ninety days, and the Smart Block toxic sensors every six months, utilizing the procedures given in this manual. Good practice dictates more frequent checking and calibration under particularly dangerous conditions and conditions of heavy usage. Some instrument users check sensor responses at the beginning of every period of usage, such as every shift. National, state, local, or company specifications may dictate minimum calibration intervals.

3.2 The Maintenance Menu

3.2.1 Accessing the Maintenance Menu

When the device is ON, the main menu can be accessed in either one of two ways:

- After opening the enclosure on the circuit board side and positioning the switch towards the center of the device. See Figure 3-1, right side.
- Without opening the enclosure by inserting the special plug in the DIN socket located on the side of the enclosure. See Figure 3-1, left side. The DIN plug is needed for many operations, Ref: Section 3.3 and 3.5

This description is given for the purposes of information only. It is recommended that the detailed instructions given in the following chapters on maintenance be followed carefully. It is often safer not to open the enclosure and thus to avoid any possibility of incorrectly handling any of the components.

When one of these two actions has been performed, the display shows "Programming a channel" to signal that the Main Maintenance Menu has been accessed.

NOTE: Insufficient battery voltage prevents access to the main menu. The operator is warned with a "Maintenance impossible" message. It is possible to continue by connecting the charger or by changing the battery pack.

Sub-Menus

Once the Maintenance Menu appears, the first of the four menus available is displayed: "Program a sensor." Then, the following menus are available, by using the MENU switch:

- Calibrate a sensor
- Replacing the explosive gas sensor
- Set Date and Time

The structure of the Maintenance Menu as a flow-chart is shown in Figure 3-2. Each time that the MENU switch is pressed, the next item is displayed; this forms a loop. To select a menu, press the ENTER switch.

3.2.2 Overview: Program a Sensor Menu

This menu is used for:

- Selecting the channel for programming
- Enabling or disabling the selected channel
- Informing the operator of the sensor type and measurement range
- For an explosive gas channel, selecting the reference gas from amongst the 27 preset gas types or entering the coefficient for a 28th gas
- For an oxygen channel, programming the low and high alarm thresholds
- For toxic channels, programming the instantaneous alarm levels
3.2.3 Overview: Calibrate a Sensor Menu
This menu is used for:

- Selecting the channel for programming
- Calibrating the zero point and sensitivity of the sensor assemblies using a calibration gas. An oxygen sensor only require its sensitivity to be adjusted using pure air.

**CAUTION:** Never start the calibration procedure unless the corresponding cylinder of gas is available. Scrolling through the calibration menu without applying corresponding gas will cause the installed sensor to be out of calibration and showing a Fault condition.

If instrument is new or otherwise in proper working order, this problem can only be corrected by performing the complete calibration procedure with proper calibration gas.

3.2.4 Overview: Replace the Explosive Gas Sensor Menu
This menu is used for:

- Selecting the channel for programming
- Calibrating the zero point and sensitivity of the explosive gas sensor using a calibration mixture (methane)

**NOTE:** There are no menus for the toxic and oxygen smart block sensors as these are factory set. The data for each of these is contained in the built-in memory of the sensor.

3.2.5 Overview: Set Date and Time Menu
This menu is used to update the internal calendar and clock of the **OMNI-4000**. This data is used for the time scales, specifically for the printing or down-loading of the stored readings (min, max, STEL, TWA) to an external computer.

3.2.6 Detail: Program a Sensor Menu
This menu is used for:

- Selecting the channel (sensor) for programming
- Enabling or disabling the selected channel
- Informing the Operator of the sensor type and measurement range,
- For explosive gas sensors, selecting the reference gas from amongst the 27 preset gas types or inputting the coefficient for the 28th gas
- For an oxygen channel, programming the low and high alarm thresholds.
- For toxic channels, programming the instantaneous alarm levels

**Error Display**
It is not possible to program a channel without a sensor installed. When the data is entered (erroneous entry), the display momentarily shows the following:

**Bad or absent cell block**
Selecting the Maintenance Menu

After inserting the special plug into the DIN connector located on the side of the enclosure, as shown in Figure 3-3; the display shows "Program a Sensor" to signal access to the main maintenance menu. Press the ENTER switch to access the programming menu. The display shows:

![Select Sensor: CH4](image)

**Figure 3-3: Position of DIN Plug**

Channel 1 is always the explosive gas channel. *If CO2 smart block is used, it is installed in channel 2 only.* Channels (2, 3 and 4) can be fitted with any other oxygen or toxic gas sensor assembly:

- Press the MENU switch to increment the channels in sequence
- Press the ENTER switch to select the desired channel appears

Selecting the Channel Status

A channel can be either enabled or disabled. A channel which is enabled allows the gas readings to be taken with the sensor installed in the channel.

**NOTE:** When a sensor is removed from a channel, that channel must be disabled.

Proceed as follows given that a channel is selected with the ENTER switch, as described above:

- Each time the MENU switch is pressed either "Enabled" or "Disabled" is displayed. Press the ENTER switch to select the status of the channel.

Choosing "Disabled" for any channel leads directly to the "Confirming Data" paragraph. Choosing "Enabled" allows the programming to continue as described below.
Selecting the Type of Gas for the Explosive Gas Channel, Channel 1.

Twenty-seven (27) explosive gases are preprogrammed and can be selected and displayed. See the FIGURE 3-4. Also, a gas known as "Other" can be given a multiplier coefficient by the operator. Proceed as follows:

- After Enable is selected, the present gas is displayed
- Press the MENU switch repeatedly to view the list of 27 gases presented one-by-one on the display
- If the desired gas is not the "Other" gas, press the ENTER switch to select the gas and go to the "Setting An Alarm Threshold for the Explosive Gas Channel".

**Figure 3-4: Table of Gases, Associated Parameters and Coefficients**

List of pre-programmed gases and vapors. The coefficients are given relative to methane.

<table>
<thead>
<tr>
<th>Gas</th>
<th>LEL</th>
<th>UEL</th>
<th>Vapor Density</th>
<th>Coefficient CH4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl acetate</td>
<td>2.1%</td>
<td>11.5%</td>
<td>3.0</td>
<td>1.35</td>
</tr>
<tr>
<td>Acetone</td>
<td>2.15%</td>
<td>13%</td>
<td>2.1</td>
<td>1.25</td>
</tr>
<tr>
<td>Acetylene</td>
<td>1.5%</td>
<td>100%</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Butane</td>
<td>1.5%</td>
<td>8.5%</td>
<td>2.0</td>
<td>1.60</td>
</tr>
<tr>
<td>1,3 – Butadiene</td>
<td>1.4%</td>
<td>16.3%</td>
<td>1.85</td>
<td>1.25</td>
</tr>
<tr>
<td>2 – Butanone</td>
<td>1.8%</td>
<td>11.5%</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Dimethylether</td>
<td>3.0%</td>
<td>27.0%</td>
<td>1.6</td>
<td>1.55</td>
</tr>
<tr>
<td>Ethanol</td>
<td>3.3%</td>
<td>19.0%</td>
<td>1.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Ethylene</td>
<td>2.7%</td>
<td>37.0%</td>
<td>0.98</td>
<td>1.2</td>
</tr>
<tr>
<td>Natural gas</td>
<td>5.0%</td>
<td>15.0%</td>
<td>0.55</td>
<td>1.05</td>
</tr>
<tr>
<td>Hexane</td>
<td>1.2%</td>
<td>7.4%</td>
<td>3.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>4.0%</td>
<td>75.6%</td>
<td>0.069</td>
<td>0.55</td>
</tr>
<tr>
<td>Isobutane</td>
<td>1.5%</td>
<td>1.5%</td>
<td>2.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>2.15%</td>
<td>13.5%</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Methane</td>
<td>5.0%</td>
<td>15.0%</td>
<td>0.55%</td>
<td>1.0</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>2.6%</td>
<td>100%</td>
<td>1.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>2.3%</td>
<td>?</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Pentane</td>
<td>1.4%</td>
<td>8.0%</td>
<td>2.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Propane</td>
<td>2.0%</td>
<td>9.5%</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Propylene</td>
<td>2.0%</td>
<td>11.7%</td>
<td>1.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Gasoline, 95 octane</td>
<td>1.1%</td>
<td>6%</td>
<td>3 to 4</td>
<td>2.4</td>
</tr>
<tr>
<td>Toluene</td>
<td>1.2%</td>
<td>7.0%</td>
<td>3.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Xylene</td>
<td>1.0%</td>
<td>7.6%</td>
<td>3.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Diesel</td>
<td>0.6%</td>
<td>6%</td>
<td>&gt; 4</td>
<td>5.0</td>
</tr>
<tr>
<td>Methanol</td>
<td>5.5%</td>
<td>44.0%</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Kerosene(JP4)</td>
<td>0.7%</td>
<td>5.0%</td>
<td>&gt; 4</td>
<td>7.5</td>
</tr>
<tr>
<td>Octane</td>
<td>1.0%</td>
<td>6.0%</td>
<td>3.9</td>
<td>1.7</td>
</tr>
</tbody>
</table>
• If the chosen gas is the "Other" gas, a multiplier coefficient must be entered. If the coefficient associated with the gas of interest is not known, contact ENMET customer service personnel. Proceed as follows:

• The displayed message reads:

```
<table>
<thead>
<tr>
<th>Coef: Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
</tr>
</tbody>
</table>
```

• Select the coefficient units to display by pressing the MENU switch. When the desired value is reached, press BACKLIGHT switch.

• Select the tenths of a unit by repeatedly pressing the MENU switch. When the desired value is reached, press BACKLIGHT switch.

• Select the hundredths of a unit by repeatedly pressing the MENU switch. When the desired value is reached, press ENTER switch.

The complete coefficient is then stored. The maximum allowable values for the coefficient are between 0.50 and 9.99.

For an Oxygen Sensor.

When a channel with an oxygen sensor installed is selected, and enabled: the display reads:

```
<table>
<thead>
<tr>
<th>Type of gas</th>
<th>OXYGEN</th>
</tr>
</thead>
</table>
```

• Press ENTER switch to display:

```
<table>
<thead>
<tr>
<th>Scale</th>
<th>30.0% O2</th>
</tr>
</thead>
</table>
```

Once ENTER has been pressed, go to the "Setting an Alarm Threshold" paragraph. The memory of each smart block sensor assembly is factory programmed with the characteristic value of the sensor. The operator cannot modify this data. The OMNI-4000 recognizes automatically the type of sensor connected.

For a Toxic Gas Sensor

The display for an enabled channel reads, for instance:

```
<table>
<thead>
<tr>
<th>Type of gas</th>
<th>CARBON MONOXIDE</th>
</tr>
</thead>
</table>
```

• Press ENTER switch to display:

```
<table>
<thead>
<tr>
<th>Scale</th>
<th>1,000 ppm CO</th>
</tr>
</thead>
</table>
```

Once ENTER has been pressed, go to the "Setting an Alarm Threshold" paragraph. The memory of each smart block sensor assembly is factory programmed with the characteristic values of the sensor. The operator cannot modify this data. The OMNI-4000 automatically recognizes the type of sensor connected.
3.3 Setting an Alarm Threshold

3.3.1 For an Explosive Gas Channel

For all explosive gases except "Methane - Range 0-5%"

- A message is displayed, for instance:

<table>
<thead>
<tr>
<th>Comb. Alarm:</th>
<th>20LEL</th>
<th>CH4</th>
</tr>
</thead>
</table>

To modify the alarm threshold, proceed as follows: The allowable alarm values are between 0 and 60% LEL:

- Select the tenths by repeatedly pressing the MENU switch. When the desired value is displayed, press BACKLIGHT switch.
- Select the units by repeatedly pressing the MENU switch. When the desired value is displayed, press the ENTER switch.

For Methane - Range 0-5% only.

- A message is displayed, for instance:

<table>
<thead>
<tr>
<th>Comb. Alarm:</th>
<th>1.1%</th>
<th>CH4</th>
</tr>
</thead>
</table>

To modify the alarm threshold, proceed as follows: the allowable alarm values are between 0 and 3.0% CH4:

- Select the units by repeatedly pressing the MENU switch. When the desired value is displayed, press BACKLIGHT switch.
- Select the tenths by repeatedly pressing the MENU switch. When the desired value is displayed, press the ENTER switch.

3.3.2 For an Oxygen Channel:

There are two alarm values to be programmed, the High Alarm and Low Alarm values:

- The maximum permissible high alarm value is the upper value on the sensor measurement scale.
- The minimum permissible low alarm value is the lower value on the sensor measurement scale. The maximum lower alarm value is the high value of the sensor measurement scale.

**Entering the High Alarm Value**

The device displays, for instance:

| Alarm high | 23.5% | O2 |

- Press the ENTER switch to confirm the choice. Go to the "Confirming Data Entries" paragraph, below.
- Press MENU switch to reset the alarm value to 00.0% O2.
- Press MENU switch to modify the alarm value displayed, as follows:
  - Select the tens by repeatedly pressing the MENU switch. When the desired value is displayed, press BACKLIGHT switch.
  - Select the units by repeatedly pressing the MENU switch. When the desired value is displayed, press BACKLIGHT switch.
  - Select the tenths by repeatedly pressing the MENU switch key. When the desired value is displayed, press ENTER switch and this leads into the data entry procedure for the low alarm value.

**Entering the Low Alarm Value**

The procedure is the same as for "Entering the High Alarm Value." Pressing the ENTER switch completes the process.
3.3.3 For a Toxic Gas Channel

There is only one alarm threshold to program. The display reads, for instance:

<table>
<thead>
<tr>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0030 ppm</td>
</tr>
<tr>
<td>CO</td>
</tr>
</tbody>
</table>

- Press the ENTER switch to confirm the choice. See the "Confirming Data Entries" paragraph.
- Press the MENU switch to reset the alarm value to 0000 ppm.
- Press the MENU switch to modify the alarm value displayed, as follows:
  - Select the value to the far left by repeatedly pressing the MENU switch. When the desired value is displayed, press the BACKLIGHT switch.
  - Continue the procedure until the right-hand numbers are complete. When the desired value is displayed, press the ENTER switch and this leads into the data entry confirmation procedure.

NOTE: The number of figures making up the alarm value depends upon the type of sensor. This alarm value can therefore be situated between 1,000 ppm and 0.1 ppm, depending upon the type of sensor installed.

Confirming the Data Entries

The data has been memorized by the OMNI-4000 but not yet confirmed. This procedure enables them to be confirmed. The display reads:

| Accept: ENTER |
| Cancel: →     |

- The above data which was entered is memorized when the ENTER switch is pressed, or
- The above data is lost and the data existing prior to this procedure is preserved, when any other switch than ENTER is pressed.
- In either case, the main menu is displayed when a switch is pressed.

To Return to Operator Mode

- Remove the programming plug
- The OMNI-4000 is now ready for use

3.4 Detail: Calibrate a Sensor Menu

This sub-menu is used after changing a sensor or the appearance of the "OUTSIDE RANGE" message, which signals a significant drift in measurements. It enables:

- The selection of the channel aid program
- The automatic adjustment, without using a screwdriver, of the zero and sensitivity of the selected sensor by means of a calibration gas cylinder. The oxygen sensor only requires adjustment of its sensitivity with pure air.

CAUTION: Never start the calibration procedure unless the corresponding cylinder of gas is available. Scrolling through the calibration menu without applying corresponding gas will cause the installed sensor to be out of calibration and showing a Fault condition.

If instrument is new or otherwise in proper working order, this problem can only be corrected by performing the complete calibration procedure with proper calibration gas.

General

It is not possible to program a channel which does not contain a sensor assembly. When the entered data (erroneous entry) is confirmed, the display momentarily indicates:

| Bad or absent cell block |
Selecting the Maintenance Menu
With the device turned on, plug in the DIN plug. See Figure 3-5. The display reads "Program a sensor" signaling access to the main maintenance menu.

Figure 3-5: Position of DIN Plug
NOTE: Insufficient battery voltage prevents access to the main menu. The operator is warned with a "Maintenance impossible" message. Maintenance operations can be continued either by connecting the charger or by changing the battery pack.

Selecting the Calibration Menu
• The display reads:

  Program a sensor

• Press once the MENU switch. The display now reads:

  Calibrate a sensor

• Confirm the choice by pressing the ENTER switch. The display reads; for example:

  Select sensor: H2S
3.5 Selecting the Channel for Calibration

There is a channel for each sensor. Channel 1 is reserved for the explosive gas sensor. If a CO2 smart block is used, it is installed in channel 2.

- To change the channel, press the MENU switch
- To confirm the choice and proceed with the calibration of the displayed channel, press the ENTER switch

3.5.1 Calibration of the Explosive Gas Channel

- The calibration cover
- A vinyl hose, approximately 1 meter long
- A cylinder of calibration gas of known content, 20%LEL methane, for example

Preparing the OMNI-4000

- Attach the calibration cover,
- Connect the calibration gas cylinder to the injection cover with the vinyl hose; See Figure 3-6
- The channel has been selected. If not, refer to the "Selecting the Channel for Calibration" paragraph, above.

![Figure 3-6: Calibration Gas Equipment Arrangement](image)
Inputting the Calibration Gas Value

This procedure defines the content of the calibration gas to be applied to the explosive gas channel sensor. The maximum permissible content is 100% LEL.

The display reads:

<table>
<thead>
<tr>
<th>Cal gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%LEL</td>
</tr>
<tr>
<td>CH4</td>
</tr>
</tbody>
</table>

To modify this value:
- Select the units by repeatedly pressing the MENU switch. When the desired value appears, press BACKLIGHT switch.
- Select the tenths of a unit by repeatedly pressing the MENU switch. When the desired value appears, press BACKLIGHT switch.
- Select the hundredths of a unit by repeatedly pressing the MENU switch. The units and tenths can be accessed again by pressing the BACKLIGHT switch. When the calibration gas value is complete, press the ENTER switch.

The value of the calibration gas to be applied is memorized.

Calibrating the Zero Point

This must be performed in an area that is free of gas contamination. The display reads, for instance:

<table>
<thead>
<tr>
<th>Zero value</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 LEL</td>
</tr>
<tr>
<td>CH4</td>
</tr>
</tbody>
</table>

- Press the ENTER switch. The zero is set automatically by the OMNI-4000 electronics for future internal calculations.

Calibrating the Sensitivity

The display shows the offset value obtained during the zero calibration phase, for example:

<table>
<thead>
<tr>
<th>Span value</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 LEL</td>
</tr>
<tr>
<td>CH4</td>
</tr>
</tbody>
</table>

The value is always stated in % LEL CH4. Do not press a switch.
- Apply the calibration gas. You must be able to just hear the gas. The flow rate must be approximately 1 l/min.
- When the readings have stabilized, press the ENTER switch. The display shows:

| Accept: ENTER |
| Cancel: ➔     |

Press: • The ENTER switch to confirm the reading. The return to the initial "Calibrate a Sensor" menu is automatic unless there is a problem (See "Problems" paragraph). It is now possible to calibrate another channel by pressing ENTER. It should be noted that the channel has automatically been incremented. If there are not further channels to calibrate, go to the "Return to The Operator Mode" paragraph.
- Pressing any other switch results in the return to the initial "Calibrate a Sensor" menu without memorizing the value entered during the above calibration procedure.
Problems
As soon as ENTER has been pressed after the sensitivity measurement, the display may show:

- "Excessive zero offset": Check the local atmosphere (gas present) and recalibrate. If the fault persists, change the sensor.
- "Scale Exceeded": A discrepancy exists between the injected calibration gas value and that set in the "Inputting the Calibration Gas Value." Perform the calibration procedure again. If the fault persists, change the sensor.
- "Cell used": A possible discrepancy exists between the applied calibration gas values and that set in the "Inputting the Calibration Gas Value," or calibration was attempted without the gas. Perform the whole calibration procedure again. If the fault persists, change the sensor.

3.5.2 Calibration of an Oxygen Channel

Equipment Required: None

Preparation of the OMNI-4000

- The OMNI-4000 calibration cover must not be in place. See Figure 3-7.
- The "Oxygen" channel must be selected; if not refer to the "Selecting the Channel for Calibration" paragraph.

Calibrating the Sensitivity

The display shows a value, for instance:

- As soon as the reading has stabilized, press the ENTER switch. The OMNI-4000 adjusts the oxygen reading to 20.9% O₂ later. The display shows:

  Span value: 20.6% O₂

  Accept: ENTER
  Cancel: ➔

- As soon as ENTER has been pressed, the return to the initial menu ("Calibrate a Sensor") is automatic. It is now possible to calibrate another channel by pressing ENTER. It should be noted that the channel has automatically been incremented. If there are no further channels to calibrated return to The Operator Mode by removing the DIN plug.

Problems
As soon as ENTER is pressed after the sensitivity measurement, the display may show "Sensor used." The sensor should then be replaced.
3.5.3 Calibration of a Toxic Gas Channel

Equipment Required
- The calibration cover
- A calibration adapter for the type of gas to be calibrated:
  - For reactive gases, 8" Teflon lined tubing, cylinder regulator and reactive gases (ex. H2S, NH3, SO2, HCl etc…)
  - For non-reactive gases, Tubing and cylinder regulator
- A cylinder of calibration gas with a known content and corresponding to the type of sensor to be calibrated

Preparing the OMNI-4000

**NOTE: DIN Plug must be installed. See Figure 3-3**

- Attach the OMNI-4000 calibration cover. See Figure 3-8
- Connect the calibration gas cylinder to the calibration cover with a vinyl hose
- If the channel has not been selected refer to the section 3.2.2 Overview: Program a Sensor Menu.

Use:
- Cylinder Regulator 02506-004 with 17 liter cylinder
- Cylinder Regulator 02506-002 with 34 liter cylinder (ex. H2S, NH3, HCl etc.)
- Cylinder Regulator 02506-005 with 103 liter cylinder (ex. CO2)

**Calibration Arrangement for the Majority of Gasses**

**Humidifier**

*Used with BRH Sensor*

Fill humidifier bowl 1/3 full with clean, tap water. The tube should **NOT** go under the water line. No bubbles should be visible when gas is flowing.

Cylinder regulator part number 03700-005.

**Top View of Humidifier**

Note: In this application, the direction of gas flow is the opposite of the indicator arrow on the humidifier assembly.

**Calibration Arrangement for BRH Gases**

*Figure 3-8: Calibration Gas Equipment Arrangement*
CALIBRATION CONTINUED FROM PREVIOUS PAGE:

Inputting the Calibration Value
- This procedure defines the content of the calibration gas which will be applied into the toxic sensor. The maximum permissible content is the maximum value of the sensor range. The display shows a message such as:

```
Cal gas:  
0300 ppm CO
```

To modify this value:
- Move to the digit to change in the number by repeatedly pressing the BACKLIGHT switch.
- Display the desired number by repeatedly pressing the MENU switch.
- Continue as above until the desired number (calibration gas value) has been obtained, then press the ENTER switch. The value of the calibration gas to be used is memorized.

Calibrating Zero
This operation must be carried out in an environment that is free of gas contamination.
The display shows, for example:

```
Zero  
005 ppm CO
```

- Press ENTER. The value is automatically reset to zero by the OMNI-4000.

Calibrating the Sensitivity
The display shows the offset value as memorized when the zero was set. Do not press a switch.

```
Span Value  
005 ppm CO
```

- Apply the calibration gas. You must be able to just hear the gas. The flow rate must be approximately 1 l/min.

**Warning:** This operation is performed using a toxic gas!
- When the reading has stabilized, press ENTER. The display shows:

```
Accept: ENTER  
Cancel: ➔
```

- Press:
- **ENTER** to confirm the data entry and allow the return to the initial "Calibrate a Sensor" menu. It is now possible to calibrate another channel by pressing ENTER. It should be noted that the channel number has automatically been incremented. If there are no further channels to calibrate, return to the Operator Mode by removing DIN plug.
- **Pressing any other switch**, results in return to the initial "Calibrate a sensor" menu without memorizing the value entered during the above calibration procedure.

Problems
As soon as ENTER has been pressed after the sensitivity calibration, the display may show:
- "Excessive zero offset": Check the local atmosphere (gas or cigarette smoke present during calibration of a CO channel) and recalibrate. If the fault persists, change the sensor.
- "Scale Exceeded": A discrepancy exists between the content of the calibration gas and that set in the "Inputting the Calibration Gas Value" procedure. Perform the calibration procedure again. If the fault persists, change the sensor.
- "Sensor used": A possible discrepancy exists between the applied calibration gas value and that set during the "Inputting the Calibration Gas Value" operation, or the calibration was attempted but gas was not used. Perform the calibration procedure again. If the fault persists, change the sensor.
Returning to Operator Mode
• Remove the calibration cover
• Remove the programming plug
• The OMNI-4000 is now ready for use

3.6 Replacing the Explosive Gas Sensor
This sub-menu is used to configure the OMNI-4000 following the installation of a new explosive gas sensor. It also allows the zero point and the sensitivity of the explosive gas sensor to be set by means of a calibration mixture (methane).

CAUTION: Never start this procedure unless the corresponding cylinder of gas is available.

Equipment Required
- A small phillips head screwdriver
- A new explosive gas sensor
- The calibration cover
- A vinyl hose, approximately 1 m.
- A cylinder of calibration gas of known contents (for instance, or 20% LEL methane)
- A precision screwdriver

Preparing the OMNI-4000
• Use the screwdriver to remove both covers of the enclosure

Replacing the Explosive Gas Sensor
• Remove the old explosive gas sensor. See Figure 3-9
• Install the new explosive gas sensor. There is a groove to ensure correct positioning.
• Put the cover which protects the sensors back into place and secure it.

Figure 3-9: Location of the Explosive Gas Sensor
Selecting the Maintenance Menu
Turn the device On and position the maintenance switch towards the center of the instrument. See Figure 3-10.

![Figure 3-10: Position of Maintenance Switch](image)

**Figure 3-10: Position of Maintenance Switch**

Replacement of Explosive Gas Sensor

The display shows: "Program a Sensor" to signal access to the Main Maintenance Menu.

NOTE: Insufficient battery voltage prevents access to the main menu. The operator is warned with a "Maintenance impossible" message. It is possible to continue by connecting the charger or by changing the battery pack.

Selecting The "Replacing an Explosive Gas Sensor" Menu

- The display shows:

  ![Program a sensor](image)

- Press the MENU switch twice. The display shows:

  ![Change comb. sensor](image)

- Confirm the selection by pressing ENTER. The display shows:

  ![Calibration gas 20% LEL CH₄](image)

Inputting the Calibration Gas Value

This procedure defines the content of the gas to be applied to the sensor during the calibration operation. The maximum permissible concentration is 100% LEL CH₄.

The display currently shows: "Calibration gas." To change the displayed value:

- Select the units by repeatedly pressing the MENU switch. When the desired number is displayed, press BACKLIGHT switch.

- Select the tenths by repeatedly pressing MENU switch. When the desired number is displayed, press BACKLIGHT switch.

- Select the hundredths by repeatedly pressing MENU switch. To return to the units or tenths of a unit, press BACKLIGHT switch. When the complete number is displayed, press ENTER.

The value of the calibration gas to be applied is memorized.
Setting the Zero
The display shows alternately:

- Press ENTER to display the zero value. The display shows, for example:

  **Zero**
  **5%LEL CH4**

- Set the zero point using the zero potentiometer; see Figure 3-11. Turn the potentiometer clockwise to increase the displayed value.

  **Zero**
  **10.0% CH4**

The display must show a value close to zero:

In case of problems with the setting, replace the sensor.

- Press ENTER when the smallest possible value has been obtained.

Setting the Sensitivity
Preparing the Equipment:

- Attach the calibration cover; see Figure 3-12.
- Connect the calibration gas cylinder to the calibration cover using the vinyl hose.

Figure 3-11: Location of Explosive Gas Channel Zero Potentiometer

Figure 3.12: Calibration Gas Equipment Arrangement
Starting the Setting Procedure:
The display shows alternately:

- Press ENTER to display the sensitivity reading. The display shows, for example:

  Please wait for stabilization  Alternating with  Then set zero

- Apply the calibration gas. You must just be able to hear the gas. The flow rate must be approximately 1 l/min.
- When the reading has stabilized, adjust the value by turning the sensitivity potentiometer. See Figure 3-13. The value is increased by turning it clockwise.

![Sensitivity Potentiometer](image)

**Figure 3-13: Location of Explosive Gas Channel Sensitivity Potentiometer**

- When a value corresponding, or as near as possible, to the calibration gas value has been reached, press ENTER. The display shows:

  **Sensitivity**
  20%LEL  CH4

- If no errors are detected and when ENTER is pressed, the display shows:

  Program a sensor

**Problems**

As soon as ENTER has been pressed after the sensitivity calibration, the display may show:

- "Zero incorrectly set": Check the local atmosphere (gas present) and recalibrate. If the fault persists, change the sensor.
- "Sensitivity incorrectly set": A discrepancy exists between the injected calibration gas content and that set in the "Inputting the Calibration Gas Value" procedure. Restart the calibration procedure. If the fault persists, change the sensor.
Returning to Operator Mode

- Slide the maintenance switch to the left; refer to Figure 3-10
- Replace the circuit board cover
- Remove the calibration cover

Figure 3-10: Position of Maintenance Switch
Replacement of Explosive Gas Sensor

The **OMNI-4000** is now ready for use
3.7 Replacing the Oxygen Sensor
This procedure is used when a new oxygen sensor is installed.

Equipment Required
- A small phillips head screwdriver
- A new oxygen sensor

Replacing the Oxygen Sensor
- Use the screwdriver to remove the cover which contains the sensor openings. See Figure 3-14
- Remove the old oxygen sensor
- Install the new sensor. The connector ensures a correct fitting. Be careful not to damage the male part of the connector.
- Put the cover protecting the sensors back into place

Figure 3-14: Acceptable Locations of Oxygen and Toxic Sensors
Possible locations of the oxygen sensor are channels 2, 3, and 4. See Figure 3-14.

Checking the Oxygen Sensor
In the interests of safety, check the sensor by:
- Pressing the ON/OFF switch
- Checking that the displayed reading is 20.9%, in a normally ventilated environment. If it is not, attempt on auto-zero or calibration. If this doesn't work, replace the sensor.
3.8 Replacing a Toxic Gas Sensor

This procedure is used for the installation of a new toxic gas sensor.

Equipment Required

- A small phillips head screwdriver
- A new toxic gas sensor

Replacing the Toxic Gas Sensor

- Use the screwdriver to remove the cover which contains the sensor openings
- Remove the old toxic gas sensor
- Install the new toxic gas sensor. The connector ensures a correct fitting. Be careful not to damage the male part of the connector.
- Put the cover protecting the sensors back into place

Possible locations of toxic sensors are channels 2, 3, and 4. See Figure 3-14.

![Figure 3-14: Acceptable Locations of Oxygen and Toxic Sensors](image)

Checking the Toxic Gas Sensor

In the interests of safety, check the toxic gas sensor by applying a calibration gas of known contents. To do this:

- Turn the OMNI-4000 on by pressing the ON/OFF switch
- Using the calibration cover, apply the gas as during a calibration
- Check that the concentration of the calibration gas from the cylinder corresponds to the display for the appropriate channel
- Remove the gas and the calibration cover

NOTE: See Section 6.3 for location of Specialty / Reactive Gas sensors
3.9 Changing the Date and Time

This sub-program is used to update the **OMNI-4000** internal calendar and clock. This data is used to define the time scales for the printing and down-loading to a computer of stored data.

Selecting the Maintenance Menu

Turn the instrument ON, and insert the programming plug into the DIN connector located on the side of the unit. See Figure 3-15.

![Figure 3-15: Location of Lithium Battery](image)

N.B.: Insufficient battery voltage prevents access to the main menu. The operator is warned with a "Maintenance Impossible" message. It is possible to continue by connecting the charger or by changing the battery pack.

Selecting the "Setting Time and Date" Menu

- The display shows:
  
  ![Program a sensor]

- Press the MENU switch three times. The display shows:
  
  ![Set Date and time]

- Confirm the selection by pressing ENTER
Changing the Date
The display reads, for instance:

**Date**
06:10:99

- Move to the desired position in the date by pressing the BACKLIT switch.
- Display the desired value by repeatedly pressing the MENU switch.
- Repeat these steps until the date is correct and then press ENTER.

Changing the Time
The time is not incremented during the display. The display shows, from left to right, hours, minutes and seconds, e.g.:

**Time**
PM 04:23:03

- Move to the desired time in hours by repeatedly pressing the BACKLIT switch.
- Display the desired value by repeatedly pressing the MENU switch.
- Repeat these steps until the time is correct, and then press ENTER.

Confirming the Date and Time
The following message is displayed:

**Accept:** ENTER
**Cancel:** →

- Press:
  - ENTER to confirm and memorize the data, and to return to the Main Menu.
  - Any other switch: the data entered during the above operation is lost and the initial values remain. The display returns to the Main Menu.

Returning to the Operator Menu
- Remove the programming plug.
- The **OMNI-4000** is now ready for use.

3.9 Replacing the Lithium Battery
When the **OMNI-4000** is turned off, the electronic circuits for the date and time are powered by an independent lithium battery with a life expectancy of 3 to 5 years. The battery must be replaced at the end of this period, or when a drift in time or difficulty in memorizing the date is observed. Proceed as follows:

- Remove the battery pack.
- Remove the cover protecting the sensors and remove the sensors.
- Remove the second cover over the circuit board.
- Remove the flat connector (keyboard-printer circuit board link).
- Remove the screws securing the circuit board.
- Carefully remove the circuit board vertically. The lithium battery can now be seen. See Figure 3-15.
- Remove the old and insert the new lithium battery: the connections are soldered. Do not attempt to recharge the lithium battery.
- Replace the circuit board, the securing screws, the connector, the sensors, the two covers and put the battery pack back in place.
- Reset the date and time as described in the preceding section.
4.0 Appendixes

4.1 Technical Characteristics

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

**Model:** OMNI-4000

**Configuration:**
- One hot wire explosive gas sensor
- One to three other electrochemical, semi-conductor (BRH) or infra-red (CO2) sensors

**Gases Detected:** See table of characteristics of sensors

---

**Figure 4-1: Characteristics of OMNI-4000 Sensors**

<table>
<thead>
<tr>
<th></th>
<th>Exp</th>
<th>O2</th>
<th>O3</th>
<th>CL2</th>
<th>CLO2</th>
<th>CO</th>
<th>BRH</th>
<th>H2</th>
<th>H2S</th>
<th>HCL</th>
<th>HCN</th>
<th>NH3</th>
<th>NO</th>
<th>NO2</th>
<th>ETO</th>
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<th>HF</th>
<th>AsH3</th>
<th>SiH4</th>
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<tr>
<td><strong>Guaranteed</strong></td>
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</tr>
</tbody>
</table>

(1) In ppm except for flammable gasses, oxygen and CO2.
(5) In seconds to 90% of final value.
(6) In °C
(7) Average life in months.
(8) In months.

Certain types of gases require that they be monitored by using a motorized sampling system. **ENMET** Corporation places these types of gases in the category of Specialty / Reactive Field. They include Cl2, HCL, COCL2, CIO2, HF, O3, AsH3, PH3 and similar gases. In some cases the location of the sensor inside of the Omni is critical. Reference the chart in Section 6.3.
Measurements: Continuous for all operational sensors

Sensors; Electrochemical:
Interchangeable preset units
Automatic recognition by device (EEPROM)

Display: Alphanumeric LCD, 2 lines of 16 characters
Plain messages

Display Backlight: Timed

Optional Switchover of Explosive Gas Detection Ranges:
Automatic for "% Gas" scale to "% Volume" scale; must have an oxygen sensor installed

Sensor Failure Identification by individual indicator lamps
Plain language messages
Corresponding display "frozen." Other channels operational
Continuous audio and general visual alarm

Ni-CAD Battery Failure Plain language display
Continuous audio and general visual alarm

Operational Checks Automatic calibration on request (optional)
Self-test on start-up
Audio and visual signals every 30 seconds
Readings displayed plainly

Alarms Explosive Gas: One instantaneous threshold adjustable over the 0-50% LEL range.

Oxygen: Two instantaneous thresholds adjustable over the full measurement scale of the sensor (oxygen depletion and abundance)

Toxic (per sensor):
- One instantaneous alarm threshold adjustable over the full measurement scale
- One TWA threshold
- One STEL threshold


**Alarm Information**

General audio and visual alarm (display, indicator lamp)
Individual channel alarms (alarm or fault)
Explosive Gas range switchover indicator (% Gas - % Volume)
Plain language display on fault or alarm per channel

**Outputs**

Optional

**OMNI-4000** /serial printer connector. Optional interface for parallel printer
**OMNI-4000** /PC compatible link

**Associated Software**

Maintenance and monitoring software for LOTUS, EXCEL, etc. data bases

**Power Supply**

NI-CAD battery pack, replaceable in hazardous atmosphere
Lithium battery for data storage

**Recharging Time**

NI-CAD battery pack only:
12-14 hours with standard charger.
5 -6 hours with dual rate charger.

**Tightness:**

IP 64

**Weight:**

Approximately 1 kg

**Dimensions:**

194 x 119 x 58 mm

**Approval:**

EEX ia IIC T4
CSA 22.2 152-M1984

**Accessories:**

110 Vac, 220 VAC, or 12 VDC standard charger
110 VAC dual rate charger
Earphones for noisy environments
Automatic sampling pump
Manual sampling pump
Aspirators with and without probe
Calibration kits
<table>
<thead>
<tr>
<th>OMNI-4000 Configuration</th>
<th>Battery Life in Hours</th>
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</thead>
<tbody>
<tr>
<td>Combustible sensor + CO2 + Other toxic sensors</td>
<td>12</td>
</tr>
<tr>
<td>Combustible sensor + toxic sensors</td>
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<tr>
<td>Combustible sensor + CO2 + BRH + other toxic sensors</td>
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</tr>
<tr>
<td>Combustible sensor + BRH + toxic sensors</td>
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</tr>
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<tr>
<td>Combustible sensor + toxic sensors + BP21(pump)</td>
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<td>Combustible sensor + CO2 + BRH + toxic sensors + BP21(pump)</td>
<td>6</td>
</tr>
<tr>
<td>Combustible sensor + BRH + toxic sensors + BP21(pump)</td>
<td>9</td>
</tr>
</tbody>
</table>

### 5.0 WARRANTY

*ENMET* warrants new instruments to be free from defects in workmanship and material under normal use for a period of one year from date of shipment from *ENMET*. The warranty covers both parts and labor excluding instrument calibration and expendable parts such as calibration gas, filters, batteries, etc. Equipment believed to be defective should be returned to *ENMET* within the warranty period (transportation prepaid) for inspection. If the evaluation by *ENMET* confirms that the product is defective, it will be repaired or replaced at no charge, within the stated limitations, and returned prepaid to any location in the United States by the most economical means, e.g. Surface UPS/RPS. If an expedient means of transportation is requested during the warranty period, the customer is responsible for the difference between the most economical means and the expedient mode. *ENMET* shall not be liable for any loss or damage caused by the improper use of the product. The purchaser indemnifies and saves harmless the company with respect to any loss or damages that may arise through the use by the purchaser or others of this equipment.

This warranty is expressly given in lieu of all other warranties, either expressed or implied, including that of merchantability, and all other obligations or liabilities of *ENMET*, which may arise in connection with this equipment. *ENMET* neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than that, which is set forth herein.

NOTE: When returning an instrument to the factory for service:
- Be sure to include paperwork.
- A purchase order, return address and telephone number will assist in the expedient repair and return of your unit.
- Include any specific instructions.
- For warranty service, include date of purchase
- If you require an estimate, please contact *ENMET* Corporation.

There is Return for Repair Instructions and Form on the last pages of this manual. This form can be copied or used as needed.
6.0 Addendum Nonstandard Calibrations

6.1 Gas Cylinder Calibration with Pump Module

It is highly recommended that all calibrations be done with the pump module in operation. This requires special cylinder adapters called Flow Demand Regulators. They are available from ENMET Corp. under part number:

- 03510-001 for 17 liter cylinders
- 03510-002 for 34 liter cylinders.

The calibration procedures are the same as for standard ambient monitoring devices.

**NOTE:** Some calibration gases (HF, O₃, COCl₂, etc…) can not be obtained in cylinders. In these cases an ozone generator or HF permeation tube, for example, must be used. Contact ENMET Corporation for information.

---

![Diagram of Calibration with Pump Module]

**Figure A-1: Calibration with Pump Module**

6.2 Calibration of Ozone

Ozone sensors have cross sensitivity to some other gasses such as chlorine and NO₂. The sensitivity of the ozone sensor is much greater than these other gasses. If calibration gas levels of gasses such as Chlorine and NO₂ are applied while the ozone sensor is installed it will cause sever over reaction on the ozone sensor. If an ozone sensor is to be calibrated it should be removed during all other sensor calibrations. The ozone sensor should be reinstalled and then calibrated only after all other sensors have been calibrated.

The above factors should also be considered when monitoring relatively high concentration of other gases.

For accurate detection of O₃, channels with installed NO₂ or Cl₂ smart blocks, should be disabled. See section 1.6.1.
6.3 Specialty / Reactive Gases

Certain types of gases require, or it is recommended, that they be monitored by using a motorized sampling system. **ENMET** Corporation places these types of gases in the category of Specialty / Reactive. They include Cl₂, HCL, COCL₂, ClO₂, HF, O₃, AsH₃, PH₃ and similar gases. The original sensor positions are noted on the Certificate of Calibration supplied with the instrument. The location of the sensor inside of the Omni is critical for maintaining the original factory calibration.

**NOTE:** If these sensors are removed, exchanged or replaced, they should be placed in the same original position to avoid altering the calibration.

If the position is changed, or a new sensor installed the sensor/instrument must be calibrated.

Due to the characteristics of these gases the air sample MUST reach the sensor as soon as possible for proper detection. And this factor is a greater influence for some gases than others. Therefore, the sensor position is determined to optimize performance for each particular combination of sensors. A specially designed sampling pump; wand and sampling hose must be used.

The sensor response is greatest when the sensor is installed in Position 4, where the gas first enters the instrument. The signal is lowest for Position 2.

<table>
<thead>
<tr>
<th>Position 4</th>
<th>Position 3</th>
<th>Position 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Response</td>
<td>Reduced Response</td>
<td>Lowest Response</td>
</tr>
</tbody>
</table>

The sensor response is matched to the proper instrument display reading, in ppm, by performing the gas calibration process.

**NOTE:** Do Not, for Any Reason, remove the sample shield from the sensor cover. Doing so can cause a leak in the sampling system after the sample shield is reattached. **To replace Sensors**, remove the 4 Sensor cover screws.

![Figure A-2: Modified Pump Module for Specialty/Reactive Gases](image-url)
Calibration of a Specialty/Reactive Gas Channel

Calibration of these gases must be preformed with motorized sampling pump in place. This requires that ENMET Corporation flow demand regulator be used, part number

- 03510-001 for 17 liter cylinders
- 03510-002 for 34 liter cylinders.
- A cylinder of calibration gas with a known content and corresponding to the type of sensor to be calibrated

**NOTE:** Some calibration gases (HF, O₃, COCl₂ etc...) can not be obtained in cylinders. In these cases an ozone generator or HF permeation tube, for example, must be used. Contact ENMET Corporation for information.

Preparing the OMNI-4000

- Insert the programming DIN plug
- Connect the calibration gas cylinder to the Sample shield
- If the channel has not been selected refer to the "Selecting the Channel for Calibration" paragraph

Inputting the Calibration Value

- This procedure defines the content of the calibration gas which will be applied into the toxic sensor. The maximum permissible content is the maximum value of the sensor range. The display shows a message such as:

<table>
<thead>
<tr>
<th>Cal gas:</th>
<th>05.0 ppm HF</th>
</tr>
</thead>
</table>

To modify this value:

- Move to the digit to change in the number by repeatedly pressing the BACKLIGHT switch.
- Display the desired number by repeatedly pressing the MENU switch.
- Continue as above until the desired number (calibration gas value) has been obtained, then press the ENTER switch. The value of the calibration gas to be used is memorized.

Calibrating Zero

This operation must be carried out in an environment that is free of gas contamination.

The display shows, for example:

<table>
<thead>
<tr>
<th>Zero</th>
<th>01.5 ppm HF</th>
</tr>
</thead>
</table>

- Press ENTER. The value is automatically reset to zero by the OMNI-4000.

Calibrating the Sensitivity

The display shows the offset value as memorized when the zero was set. Do not press a switch.

<table>
<thead>
<tr>
<th>Span Value</th>
<th>05.1 ppm HF</th>
</tr>
</thead>
</table>

- Apply the calibration gas.

**Warning:** Calibration procedures must be performed under an exhaust hood or in a well ventilated area.

- When the reading has stabilized, press ENTER. The display shows:

<table>
<thead>
<tr>
<th>Accept: ENTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel: →</td>
</tr>
</tbody>
</table>

- Press: ENTER to confirm the data entry and allow the return to the initial "Calibrate a Sensor" menu. It is now possible to calibrate another channel by pressing ENTER. It should be noted that the channel number has automatically been incremented. If there are no further channels to calibrate, go to the "Return to the Operator Mode" paragraph.
- Pressing any other switch results in return to the initial "Calibrate a sensor" menu without memorizing the value entered during the above calibration procedure.
Problems
As soon as ENTER has been pressed after the sensitivity calibration, the display may show:

- "Excessive zero offset": Check the local atmosphere (gas or cigarette smoke present during calibration of a CO channel) and recalibrate. If the fault persists, change the sensor.
- "Scale Exceeded": A discrepancy exists between the content of the calibration gas and that set in the "Inputting the Calibration Gas Value" procedure. Perform the calibration procedure again. If the fault persists, change the sensor.
- "Sensor used": A possible discrepancy exists between the applied calibration gas value and that set during the "Inputting the Calibration Gas Value" operation, or the calibration was attempted but gas was not used. Perform the calibration procedure again. If the fault persists, change the sensor.

Returning to Operator Mode
- Remove the programming plug

The **OMNI-4000** is now ready for use
Returning an Instrument for Repair

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

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

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

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

Failure to provide this information can result in processing delays.

*ENMET* charges a one hour minimum billing for all approved repairs with additional time billed to the closest tenth of an hour. All instruments sent to *ENMET* are subject to a minimum $30 evaluation fee, even if returned un repaired. Unclaimed instruments that *ENMET* has received without appropriate paperwork or attempts to advise repair costs that have been unanswered, after a period of 60 days, may be disposed of or returned unrepaired COD with the evaluation fee.

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

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

**Note:** Warranty of customer installed components.

- If a component is purchased and installed in the field, and fails within the warranty term, it can be returned to *ENMET* and will be replaced, free of charge, per *ENMET*’s returned goods procedure.
- If the entire instrument is returned to *ENMET* Corporation with the defective item installed, the item will be replaced at no cost, but the instrument will be subject to labor charges at half of the standard rate.
Repair Return Form

Mailing Address:

ENMET Corporation
PO Box 979
Ann Arbor, Michigan 48106

Phone Number: 734.761.1270
FAX Number: 734.761.3220

Shipping Address:

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

Your Mailing Address: ____________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

Your Shipping Address: ____________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

Contact Name: _____________________________ Your Phone: ________________
Your PO/Reference Number: _________________ Your FAX: _________________

Payment Terms:  ☐ COD
☐ VISA / MasterCard ___________________________ ______________________
                     Card number                Expiration

Return Shipping Method:

☐ UPS: ☐ Ground       ☐ 3 Day Select    ☐ Next Day Air  ☐ ND Air Saver  ☐ 2-Day Air
☐ Federal Express:   ☐ Ground ☐ Express Saver ☐ P-1 ☐ Standard ☐ 2-Day Air
☐ FedEx Account number: _________________________

Would you like ENMET to insure the return shipment?

☐ No    ☐ Yes    Insurance Amount: $__________________