ENMET Corporation

PO Box 979

Ann Arbor, MI 48106-0979

MX-2100

Operation and Maintenance
Manual

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Reference information:

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.]**

1.0 Introduction

1.1 Warnings and Cautions

The **MX-2100** gas detectors are designed to detect hazardous atmospheric conditions. An indication of life threatening hazards should be taken very seriously. **NEVER ignore an alarm condition.**

Read this manual completely before engaging in field use of this instrument.

WARNINGS:

- Any rapid upscale combustible gas reading followed by a declining or erratic reading may indicate a gas concentration beyond the upper-scale limit. This may indicate a flammable concentration.
- Off-scale readings may indicate a flammable concentration.
- Electromagnetic interference (EMI) signals may cause incorrect operation.
- Before each day's usage, instrument sensitivity should be tested on a known concentration of methane between 25-50% LEL. Accuracy must be within –0 to +20% of the actual concentration applied. Accuracy may be corrected, if necessary, by performing sensor calibration.
- Oxygen deficient conditions can cause lower combustible gas readings than actual concentrations.
- Oxygen enriched conditions can cause higher combustible gas readings than actual concentrations.
- The instrument batteries should only be charged in a non-hazardous location.
- The instrument should only be connected to a computer in a non-hazardous location.

CAUTIONS:

- In case of an atmospheric alarm condition, follow your organization's established procedures for such a situation. Evacuating the affected area is usually the first course of action, followed by ventilation and re-testing of the environment prior to re-entry.
- *Do Not* store the instrument with the calibration cover, part number 02612-003, attached. Damage to the sensor may occur.
- Silicone compound vapors may adversely affect the **MX-2100** instrument's standard combustible sensor causing lower readings than actual concentrations. If the instrument has been exposed to silicone vapors it is strongly recommended that the instrument be recalibrated prior to its next use. Repeated exposure to silicone compounds will prematurely destroy the standard combustible sensor.
- The sensor sampling area must be kept clean. Contamination of this area can prevent proper operation of the sensors.
- 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.

Any sensor that fails calibration procedures should be replaced and recalibrated immediately.

Users may refer to ANSI/ISA RP12.13 or an equivalent international recommended practice for guidance in the use of combustible gas detection equipment.

MX-2100 instruments have an approval for Intrinsic Safety and are suitable for use in Hazardous Location environments.

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

1.2 Unpack

Unpack the **MX-2100** 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

1.2.1 Check Order

Check, the contents of the shipment against the purchase order. Verify that the **MX-2100** is received as ordered. Each **MX-2100** 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.

1.2.2 Serial Numbers

Each **MX-2100** is serialized. These numbers are on tags on the equipment and are on record in an *ENMET* database.

2.0 MX-2100 Features

2.1 MX-2100 Features

See **Figure 1** for location of features:

Feature	Description
Display	This is an LCD type display that lights up automatically in backlit mode when in alarm or fault. It is also a graphic display to optimize the readability of measurements. It displays measurements: • 5 measurements with units and types of gas, • indication of the channel to be calibrated, where applicable. It also displays parameters: • date and time, • minimum – maximum, • mean STEL and TWA values, • remaining battery life (by bar graph), • Location. **NOTE:** The display can be inverted for viewing from the top-down or from the bottom-up, depending on how the instrument is carried by the user (on belt, in pocket, etc.). Holding down the "ALARM" switch for 3 seconds performs this operation.
Audio Indicator	A built-in buzzer activates when an alarm is triggered.
Vibration	The **MX-2100** is equipped with a vibrator that activates with alarm condition.
Visual Indicator	A set of indicator lights installed on the top of the instrument indicates alarms which can be seen from every direction, regardless of the working environment.
ENTER Switch ⏻	A pushbutton switch located: Right most, below display. • Switch instrument On and Off, • Confirm settings in maintenance menus.
Audio Switch 🔇	A pushbutton switch located: Left most below display. • Acknowledge audio alarm • Display instrument read mode • Increments digits • Advances menu options.
Backlight Switch	A pushbutton switch located: Center position below display. • Backlighting of display • Scroll through parameters • Moves cursor to next digit • Reverses through menus

Figure 1: MX-2100 Features

2.2 MX-2100 Features

See **Figure 2** for location of features.

Feature	Description
Sensor Combustible	This removable, interchangeable and intelligent cell unit can detect explosive gases in the range 0 to 100% LEL. It **must** be positioned in the **MX-2100** as indicated in **Figure 2** below.
Sensor Toxic & Oxygen	These removable, interchangeable and intelligent cell units are fitted with an electrochemical cell and electronic components, including an EEPROM memory which stores the cell's specific characteristics (measuring range, various correction coefficients, STEL and TWA alarms, date of manufacture, serial number, etc.). Another item of data called the "wear rate" is used by the **MX-2100** to automatically determine the optimal time to replace the cell. These types of cell unit are therefore also referred to as "Smart Block". They are positioned as indicated in **Figure 2**
Power Pack	The **MX-2100** is power-supplied by a rechargeable battery pack (NiMH) or non-rechargeable AAA alkaline batteries. Under normal operating conditions, battery life varies according to the configuration (sensors) and the power supply (rechargeable or non-rechargeable batteries). Typical battery life is approximately 14 hours.
Battery Charger	The **MX-2100** is supplied with an intelligent battery charger. Average charging time is about 2 hours and 30 minutes. **See Section 3.9** for more information on the battery charger.
Charge Base	The **MX-2100** is supplied with charge base with a charge jack to attach the battery charger. That attaches to the top of the instrument
Calibration Cover	The **MX-2100** is supplied with calibration cover with a quick release fitting for attaching calibration adapter. **See Sections 4.3 and 4.4** for calibration information.

CAUTION: The instrument must be turned off when removing and inserting sensors. Failure to do so may cause damage to the instrument or sensor.

CAUTION: Do Not leave the calibration cover attached to the instrument when not in use. Doing so may cause damage to the sensors.

Toxic Sensor (Small Models)
Oxygen Sensor w/1 year life (Small Model)

Combustible Sensor
LEL 0 – 100% Gas

Oxygen Sensor – w/2 year life (Large Model)
    OR: CO/H2S, CO2 IR, Semiconductor,
         SO2, ETO, etc.

Note: Standard Configuration from Factory
- 2 Toxic Sensors (Small Model)
- Combustible LEL
- Oxygen 2 year Life (Large Model)

SENSORS

Batteries:
Rechargeable Battery Pack
O**R** **Non-rechargeable Batteries**

MX-2100 Internal Views

Figure 2: MX-2100 Sensor and Power Pack Location

**Charge Jack to plug
in Battery Charger**

**Quick Release Fitting
to calibration regulator**

MX-2100 Charge Base   **MX-2100 Calibration Cover**
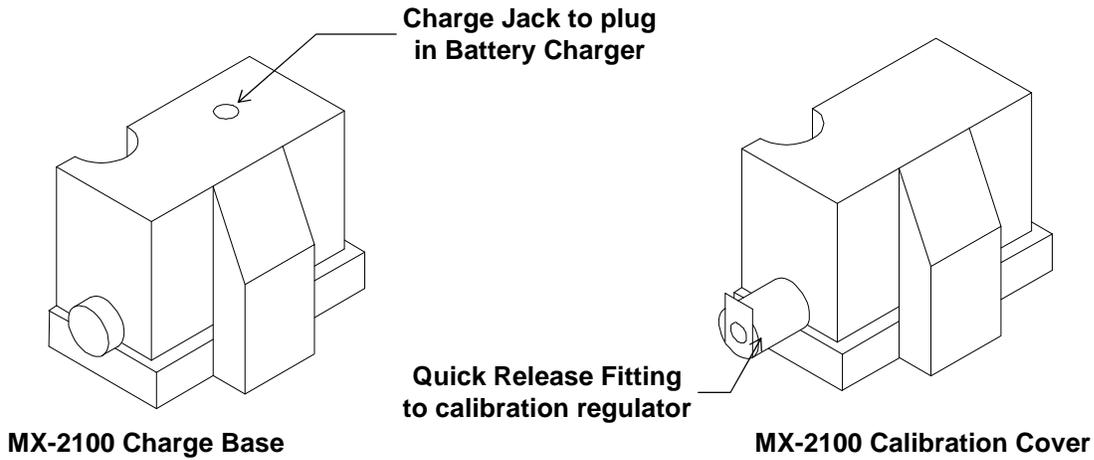
Figure 2A: MX-2100 Charge Base and Calibration Cover

3.0 Operation

The gas content measured by each of the sensors "in service" can be viewed on the alphanumeric display.

This is divided into four separate areas, each one corresponding to a "measuring channel".

See example in **Figure 3**.

**Data Field
First Toxic Channel**

**Data Field
Second Toxic Channel**

**Data Field
Oxygen or Toxic Channel**
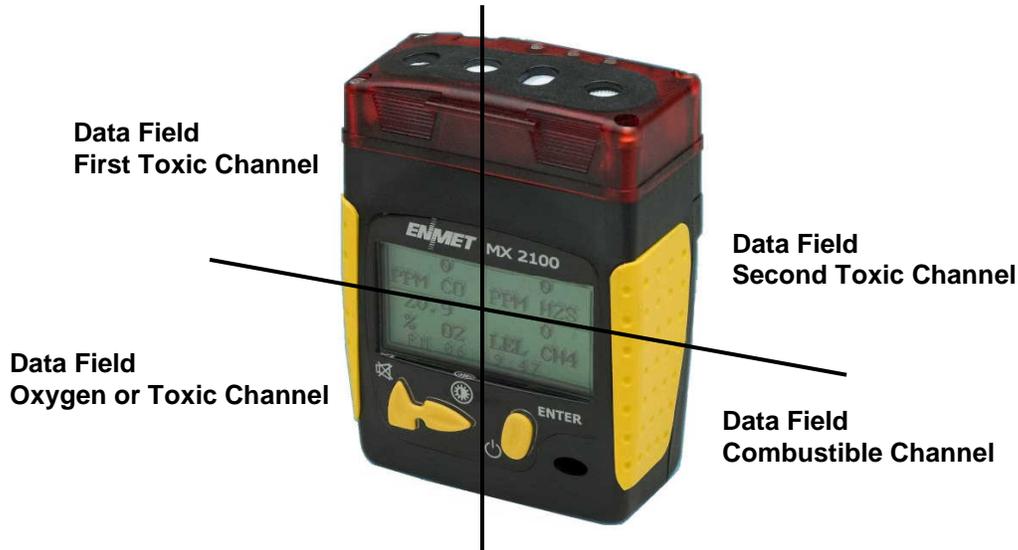
**Data Field
Combustible Channel**

Figure 3: MX-2100 Display of Measurements

A maximum of four measurements can be displayed simultaneously.

In each field, the measurement is displayed as follows: Measurement, measuring unit and gas symbol

The time is also shown at the bottom of the display.

> NOTE: The display can be inverted for viewing from the top-down or from the bottom-up, depending on how the instrument is carried by the user (on belt, in pocket, etc.). Holding down the "ALARM" switch for 3 seconds performs this operation.

If five channels are used,

the display in the last position will alternate.

If there are no toxic sensors, the Oxygen and Combustible measurements will be displayed at the top of the display.

3.1 Turning On MX-2100

CAUTION: *Before turning on the MX-2100, check that the necessary sensors are connected.*

When you turn the instrument on, you have a choice of two procedures:
- A standard procedure used in most cases,
- A procedure allowing you to select a reference explosive gas, this procedure being useful when checking for a specific gas methane, butane, ethane etc.

3.1.1 Turning on in standard mode

Briefly press the "Enter" switch.

The instrument carries out a visual, audio and vibration self-test phase for a few seconds and indicates:
- The **ENMET** logo,
- Current measurements.

Standard Instruments CO, H2S, O2, CH4 (Methane)

> NOTE: During normal operation, a visual and audio signal indicates that the **MX-2100** is operating correctly. This signal interval can be modified or disabled, as required, using COM2100 software program.

3.1.2 Selection of Combustible Gas Display During Power-Up

1. Hold down the Audio or Backlight Switch.
2. Switch on the instrument by pressing the Enter Switch.
3. Release the Audio/Backlight Switch.

   The display shows the *ENMET* logo for a few seconds while it performs its self-tests.

   It then displays the list of preprogrammed gases, with the currently selected gas in the dark field.
4. Choosing a new reference gas:
   - Each time you press the Audio switch, the list scrolls downwards and, each time you press the Backlight switch, the list scrolls upwards. Thirty-one reference gases are preprogrammed in the range 0-100% LEL (or 0-5% volume CH4). A thirty-second (32) "Other" lets you select a gas according to your specific requirements. The data specific to that gas are entered in the workshop.
   - Confirm the choice: when the chosen gas is displayed, press the ENTER switch. The instrument advances to "Testing" mode, as described in the previous section, before going on to the working phase.

   The instrument is ready to use.

If you do not confirm any gas, after a certain time, the **MX-2100** switches to the test phase and to the normal scanning phase without changing the reference gas.

- If the tests are unsatisfactory, the instrument switches to alarm mode (rapid pulsating audio signal and flashing light).

NOTE: The chosen "reference gas" will be retained as the chosen gas until a different reference gas is chosen.

3.2 Turning Off MX-2100

The instrument is turned off by holding down the ENTER switch for 3 seconds.

During this time, the countdown Stop, 3, 2, 1 is shown on the display, at the bottom, while the instrument is shutting down.

When the instrument is turned off, the stored values (sensor adjustment data, alarm thresholds, histogram, etc.) are not lost.

The theoretical storage time for these values is two years (provided that the main batteries are never discharged).

When the instrument is returned to the workshop, it is useful to recharge the batteries or to print out the exposure histograms.

3.3 Display Backlight

Measurements can be read in dark places by pressing the Backlight switch.

The display is then lit up in so the data can be read easily. This backlight is automatically deactivated after 30 seconds.

The lighting function can be used in hazardous locations, i.e. containing explosive gases, as the **MX-2100** is intrinsic safe.

The display backlight is automatically activated in case of alarm or fault.

3.4 Scrolling Through Stored Parameters

When the instrument is in normal operating mode, you can view real-time gas measurements and the instrument internal data (battery voltage, date and time).

With the instrument in normal operating mode, press the Backlight switch repeatedly to scroll through the parameters for each measuring channel.

Sequence	Parameter
1	Display Backlight and Date display
2	Current location: name and date This line is displayed if the instrument is equipped with the Location option. **See Section 3.9**
3	Remaining Battery Life
4	*Alternating Display:* Current measurements ←→ minimums detected by each channel
5	*Alternating Display:* Current measurements ←→ maximums detected by each channel
6	*Alternating Display:* Current measurements ←→ STEL of each Toxic channel
7	*Alternating Display:* Current measurements ←→ TWA of each Toxic channel
8	The message: "Enter Maintenance Code" This is the access to the **MX-2100** maintenance mode. To enter the maintenance mode **See Section 4.0** If code entered is incorrect the instrument will return to normal operating mode.

To exit the list before the end: press the Audio switch to return to the normal operation mode.

3.5 Alarms

Visual alarms: messages in uncoded mode on the display, indicator lights

Audio alarms: buzzer and vibrator.

Types of alarms:
- Alarm 1: two-tone slow
- Alarm 2: two-tone fast
- Fault: single-tone

3.5.1 Gas Alarms

Depending on the programming used and the type of gas, the "gas alarms" can be triggered on exceeding a preset value:

- 2 instantaneous thresholds per channel for Combustible, Toxic or Oxygen. These thresholds are adjustable.
  See **Table 4** for factory settings

- High and low thresholds on Oxygen channel (2 low thresholds on option),

- 1 instantaneous threshold on the Catharometric channel, if installed,

- Exposure limit (STEL) corresponding to a sliding average over 15 minutes for each channel equipped with a toxic gas sensor,

- Mean exposure (TWA) corresponding to a sliding average over eight hours for each channel equipped with a toxic gas sensor.

As soon as the predefined alarm thresholds are exceeded on at least one channel, the **MX-2100** triggers an audio and light signal. The alarm message or messages (FAULT, ALARM, TWA, STEL, min., etc.) and the measurement value in the corresponding field appear on the display.

3.5.2 Fault Alarms
Faults can be classified into two categories:

- Faults concerning sensors: out of range, worn sensor, request for calibration in case of a major deviation during auto-adjustment. These faults generate individual messages shown on the relevant quadrant of the display, a visual alarm and a continuous audio alarm.

- Faults concerning the instrument itself (discharged batteries or electronic fault). The corresponding fault message appears at the bottom of the display. It takes priority over all other messages concerning the sensors.

Table 1: Examples of Fault Alarms

Low Battery	• The batteries must be charged. • The remaining battery life is about 20 minutes after which the instrument will automatically shut down. • This alarm cannot be acknowledged, only the audio signal can be cancelled.

" > 100% LEL: outside range"	• This can only occur on the combustible channel.
	  ▪ The display in the quadrant concerned is frozen,
	  ▪ It is impossible to acknowledge the continuous audio signal,
	  ▪ The general alarm indicator lights come on in steady mode.
	• Normal operating conditions can be restored by stopping and restarting the **MX-2100**, in a clean environment.
	• This occurs when the level of combustible gas exceeds 100%LEL. Extreme care must be taken. Follow appropriate safety precautions under these conditions.

"Outside range"	• Readings are more then 20% of scale in a negative direction, • Readings are more then 120% for toxic gas and oxygen.
"New calibration"	• Automatic adjustment of the zero is impossible owing to, for example, excessive deviation of the zero on the sensor. • Replace the sensor concerned.

3.5.3 Acknowledging Alarms

Acknowledging Gas Alarms:
This does not cancel the gas alarm but only the audio signal. When the Audio switch is pressed:

The fast audio alarm is stopped but the alarm indicator light continues flashing until the measurement is lower than the programmed alarm threshold. The visual signal is automatically disappears as soon as the measurement returns within the defined limits.

A function to re-activate the audio alarm, if the alarm condition persists for a given time, is available with COM2100 software.

Acknowledging Fault Alarms:
It is impossible to acknowledge a fault alarm.

Fault alarms are cleared automatically as soon as the fault has disappeared.

3.6 Measurements

All the instantaneous measurements regarding gases are displayed simultaneously and continuous.

The display is divided into four separate fields (quadrants). **See Figure 3**.

The following information can be read:
- Measurement which is displayed continuously,
- The measuring unit preceding the gas symbol.

In normal operation mode in ambient air, measurement is continuously displayed.

NOTE: Due to cross sensitivities some types of toxic gas sensors are not compatible or reading may be affected.
Example: • Non-compatible: H2S & NO2, and NO2 & SO2.
• Cross sensitive: CL2 & NO2, and NO & NO2.
For further information contact you local *ENMET* Corporation distributor or *ENMET* Corporation.

3.6.1 Using the MX-2100 in Diffusion Mode

WARNING: **MX-2100** sensors must always be unobstructed in order to be able to carry out the measurements correctly. If obstructed, gas readings could be underestimated and could be fatal to the user.

The persons using the instrument can:
- Use **MX-2100** as a stationary monitor by placing the **MX-2100** in the vertical position.
  According to the type of gas to be detected or liable to be present, the instrument should be placed:
    ◆ On the ground in order to detect heavy gases (H2S),
    ◆ At mid-height (about one meter above the ground) or at the outlet of a ventilation port for general detection of a maximum gas level or monitoring of oxygen,
    ◆ In a high position for the detection of light gases (hydrogen, methane etc.).
- Use **MX-2100** as portable instrument, taking measurements at various locations with a sampling system.
  The **MX-2100** is fitted with a belt clip or an optional harness can be used. These accessories avoid the sensors being placed against clothing, so that the gas exchange openings are unobstructed.

NOTE: The detection of some types of gases requires, or are enhanced by, the use of a motorized sampling pump module.
Example: CL2 requires a sampling pump module while HCL, SO2 and NO2 responses are enhanced.
For further information contact you local *ENMET* Corporation distributor or *ENMET* Corporation.
Consult *ENMET* Corporation regarding monitoring of HF and Ozone.

3.6.2 Using the MX-2100 in Remote Sampling Mode

The **MX-2100** can be equipped with a sampling system to measure gas concentrations either in normally inaccessible locations or before entering places which may be contaminated by gas (such as tanks, sewers or tunnels).

When using Sampler systems:
- Wait for the measurements to stabilize. There may be either overestimated (combustible gases) or underestimated (oxygen) during sampling because of the movement of air.
- When an electric pump is used, wait a few seconds before reading the measurement. Approximately 1 second for every foot of tubing or sampling wand. Any fault in the pumping system will be indicated by an audio alarm and the display.

When using a manual pumping systems:
Before taking a reading, wait for the measurements to stabilize. They may be inaccurate while using a hand aspirator due to pressure fluctuations during each squeeze of the bulb, either overestimated (explosive gases) or underestimated (oxygen) during manual pumping (with bulb) owing to the movement of air and the bleeding of the system.

CAUTION: If fluids are a possibility in the area to be sampled it is recommended that a hydrophobic filter be added to the sample pump to prevent fluid from entering the instrument.

3.6.3 Storing histogram measurements

The **MX-2100** can store measurements so they can be restored later on a computer.

The Histograms function in the COM2100 software program can be used to output values and events stored by **MX-2100** during its operating period to a computer. Resetting of the data contained in the histogram memory can only be performed with a computer. Turning off the **MX-2100** has no effect on stored data.

Operating principle:
To make the best possible use of the data output when histograms are printed, you must understand the operating principle of data storage.

Items Stored

The **MX-2100** stores sets of data when it is turned on and then as it cycles measurements in normal operation mode. Each of these data sets has the same structure and contains the following:

- The average measurement of concentrations on each sensor in operation over a preprogrammed duration (one sampling operation per second);

- The events on each channel:
    - resetting,
    - fault,
    - instantaneous or average alarms,
    - types of maintenance requested (programming, calibration, sensor replacement),
    - date and time,
    - battery in discharged state,
    - auto-adjustment request,
    - maintenance function request.

Memory Capacity:

As the physical memory of the **MX-2100** is limited, the number of measurements that can be stored is also limited and, therefore, so is the operating time.

If the quantity of data to be stored exceeds the **MX-2100** storage capacity, the oldest data are lost. In other words, the memory freed is used to store new data. First in – First out.

Readable items

The instrument calculates a mean value over a one-minute period for each channel in service and for each second. These averaged data are stored in memory. The **MX-2100** serial port can be used to connect:

- A PC type computer to read the measurement mean values.

Data Storage Time

The data stored by the **MX-2100** are stored even if the instrument is not used for a long time (out of service).

3.7 Optional Functions Via COM 2100 Software

This software is used to supervise and maintain the **MX-2100**:
- display, in uncoded mode, of measurements and parameters on channels,
- diagnostic assistance in case of failure,
- programming of the instrument and measuring channels,
- management of options,
- calibration of channels by automated dropdown menu,
- output of status and check sheet,
- management, display and printout of events and measurements stored,
- protection by password. See Section 5.0

The **MX-2100** can be connected to a computer via a cable equipped with an infrared port that is plugged into the charger module.

3.7.1 Printing Data

The data stored in memory can be printed on a printer connected to a computer.

MX-2100 connected directly to a computer by a cord equipped with an infrared link: a "charger or pumping" module can be used to hold the infrared system on the instrument.

3.7.2 Location Function

If the instrument is equipped with optional "Location" function, a list of names can be preprogrammed using the COM 2100 software and it can be consulted manually via the pushbutton switches.

In the list of parameters, when displaying Current location and the name used, you can then confirm another name, as follows:
- Current location / name,
- Enter,
- Scrolling through preprogrammed list downwards or upwards with Audio and Backlight switches:
- Enter (to confirm the new name),
- Acknowledge (to return to normal mode).

3.8 Remote Sampling

The **MX-2100** can be equipped with a sampling system to measure gas concentrations either in normally inaccessible locations or before entering places which may be contaminated by gas (such as tanks, sewers or tunnels).

The "manual" or "electric" sampling systems can be equipped with a sampling wand or hose.

**BP2100
Inlet Port**

3.8.1 Electric pumping system BP2100
The snap-in pump unit is fitted to the top of the instrument, see **Figure 4**.

3.8.2 Manual pumping system
By using the charge unit equipped with an air inlet, it is also possible to connect up a manual pumping system (tube/bulb/probe).

The hand actuated "Squeeze bulb" type is not recommended for some reactive gases.

MX-2100

Figure 4: Electric Pumping System BP2100

3.9 Charging the MX-2100

The **MX-2100** is power-supplied by a rechargeable battery pack (NiMH) or non-rechargeable AAA alkaline batteries.

Under normal operating conditions, battery life varies according to the configuration (sensors) and the power supply (rechargeable or non-rechargeable batteries) typical battery life is approximately 14 hours.

The **MX-2100** has been approved for intrinsic safety, when equipped with batteries as recommended by the manufacturer.

3.9.1 Recharging the battery pack
The **MX-2100** is supplied with an intelligent battery charger.
The average charge time is about 2 hours 30 minutes.

- Connect the charge base to the top of the instrument as shown in the photo in **Figure 5** and plug in the charger. Charge for at least 2 hours 30 minutes for completely discharged batteries.
- This charge base can be supplied with power by 110 VAC using an adapter unit or with DC power (12 to 30 VDC).
- Average charging time = 3 hours maximum.

**Charge Jack to plug
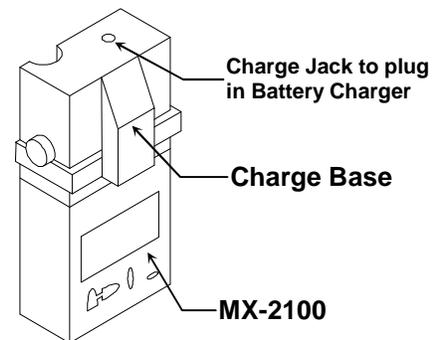in Battery Charger**

Charge Base

MX-2100

Figure 5: MX-2100 Charger adapter

3.9.2 Memory
A second lithium battery ensures the storage of the **MX-2100** specific data, such as when the main battery set is completely discharged. This lithium battery has an average service life of five years.

4.0 Maintenance

*WARNING***:** The **MX-2100** is a safety instrument and, therefore, it must be calibrated quarterly

These operations, explained in this section, must be performed by authorized, qualified personnel only as they could adversely affect detection safety.

The **MX-2100** maintenance menus that are accessed by pressing the MENU switch and entering a valid access code. The access code is set at the factory and may be changed by following the access code menu.

4.1 Maintenance Menus

With the instrument in normal operation mode, menus can be accessed in the following manner:

Scroll through the parameters using the Backlight switch until a request for an access code appears. The access code is in four digits.

Advance to each digit with the Backlight switch

Select the digit with the Audio Switch and then confirm the access code (1270) with the ENTER switch.

The list of available menus is then displayed:

Menu	Function
Programming	Turn the channel on or off, choose alarm points
Calibration	Select Calibration gas, check zero reading, apply calibration gas, confirm calibration
Auto-Zero	Set Clean Air for all channels *CAUTION*: this menu must be used in a 'Clean Air' environment *Only*.
Date And Time	Set time and date to regional area
Exit	Return to Operational Mode

4.2 Programming Menus

With the **MX-2100** turned on:

- Press the backlight switch 8 times, this will place the instrument at the Maintenance Access Code window.
- The factory default access code is 1270.
  Press the Audio switch to increment the digit then press the Backlight switch to move the cursor to the next position.
  Continue this process until the access code is displayed and then press the Enter switch.
  If the code is correct the Menu window will display.
- The program menu will be highlighted.
  Press the Enter switch.
- If necessary use Audio and Backlight switches to highlight desired information.
  When highlighted information is correct press Enter switch.
- To exit the Maintenance Menu highlight the Exit Menu and press the Enter switch.

The display will return to the Normal Operational Mode.

4.3 Calibration of the MX-2100

The process to calibrate any channel regardless of the type of sensor is the same.

Charge the instrument over night before calibration.

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.**

The combustible sensor requires additional steps. See section 4.2.2 for combustible sensor calibration for these steps.

CAUTION: Do Not leave the calibration cover attached to the instrument when not in use. Doing so may cause damage to sensors.

4.3.1 Calibration for Toxic and Oxygen Gases

With the **MX-2100** turned on:

- Press the BACKLIGHT switch 8 times, this will place the instrument at the Maintenance Access Code window.

- The factory default access code is 1270.
  Press the AUDIO switch to increment the digit then press the BACKLIGHT switch to move the cursor to the next position.
  Continue this process until the access code is displayed and then press the ENTER switch.
  If the code is correct the Menu window will display.

- Use the AUDIO switch to highlight the Calibration menu and press the ENTER switch.
  The display will indicate the sensors installed in the **MX-2100**.

- Press the AUDIO switch to choose the sensor for calibration and press the ENTER switch.
  The display will indicate the last concentration of calibration gas used.

  ❑ If this matches the calibration gas available to be used press the ENTER switch.

  ❑ If this does not match the calibration gas available to be used, press the AUDIO to change the digit and the BACKLIGHT switch to move the cursor until the display matches the calibration gas available.

NOTE: If the level of calibration gas is outside the preset parameters for calibration gas the **MX-2100** will not accept the value.

- When the level of the calibration gas that is available matches the display press the ENTER switch.

- The display will indicate the Zero reading, Press the ENTER switch

- When GAS is highlighted,
  Attach the calibration cover to the **MX-2100**
  Attach the regulator to the cylinder of calibration gas and plug the hose into the calibration cover
  Open valve, wait for the numerical readout to stabilize, then press the ENTER switch.

If the Zero reading and Gas reading are within preset parameters the display will change to CONFIRM, YES/NO. Use the AUDIO switch to highlight the YES and press the ENTER switch.

  ❑ The display will return to the Maintenance Menu window.

  ❑ If the display indicates CELL USED or ZERO DRIFT/CELL USED press the ENTER switch. The display will change to CONFIRM, YES/NO. Highlight the NO and press the ENTER switch. The display will return to the Maintenance Menu window.

  CELL USED: Indicates improper calibration gas was used. Verify that the NO is highlighted and press the ENTER Switch. Verify that the calibration gas applied matches the calibration gas requested.
  If they match attempt a calibration again. If the calibration fails again then the sensor must be replaced.

  ZERO DRIFT/CELL USED: Indicates the Zero(clear air) reading was to high prior to applying calibration gas.

NOTE: Following calibration with the **MX-2100** display in Normal Operational Mode if the readout indicates a – number the Zero reading during calibration was not a zero.

- To continue with another calibration highlight the Calibration Menu and follow the same steps as above.
- To exit the Maintenance Menu highlight the Exit Menu and press the ENTER switch.
  The display will return to the Normal Operational Mode.

4.3.2 Calibration for (Standard) Combustible Gases

The process to calibrate any channel regardless of the type of sensor is the same.

The combustible sensor requires additional steps.

With the **MX-2100** turned on:

- Press the Backlight switch 8 times, this will place the instrument at the Maintenance Access Code window.

- The factory default access code is 1270.
  Press the AUDIO switch to increment the digit then press the Backlight switch to move the cursor to the next position.
  Continue this process until the access code is displayed and then press the ENTER switch.
  If the code is correct the Menu window will display.

- Use the AUDIO switch to highlight the Calibration menu and press the ENTER switch.
  The display will indicate the sensors installed in the **MX-2100**.

- Press the AUDIO switch to highlight the combustible sensor (factory default is Methane LEL)

- Press the ENTER switch. The display will list the available types of gases. (factory default is Methane LEL)

- Press the AUDIO switch to choose the type of gas for calibration and press the ENTER switch.
  The display will indicate the last concentration of calibration gas used.

    ❏ If this matches the calibration gas available to be used press enter.

    ❏ If this does not match the calibration gas available to be used, press the AUDIO switch to change the digit and the Backlight switch to move the cursor until the display matches the calibration gas available.

NOTE: If the level of calibration gas is outside the preset parameters for calibration gas the **MX-2100** will not accept the value.

- When the level of the calibration gas that is available matches the display press the ENTER switch.

- The display will indicate the Zero reading and PLEASE WAIT.
  When the PLEASE WAIT disperses the numerical number must be 0 before proceeding.
  Press the ENTER switch

- GAS is highlighted with PLEASE WAIT, when the PLEASE WAIT disperses,
  Attach the calibration cover to the **MX-2100**
  Attach the regulator to the cylinder of calibration gas and plug the hose into the calibration cover
  Open valve, and wait for the numerical readout to stabilize, then press the ENTER switch.

If the Zero reading and Gas reading are within preset parameters the display will change to CONFIRM, YES/NO. Use the AUDIO switch to highlight the YES and press the ENTER switch.

    ❏ The display will return to the Maintenance Menu window.

    ❏ If the display indicates CELL USED or ZERO DRIFT/CELL USED press the Enter switch. The display will change to CONFIRM, YES/NO. Highlight the NO and press the ENTER switch. The display will return to the Maintenance Menu window.

    CELL USED: Indicates improper calibration gas was used. Verify that the NO is highlighted and press the ENTER Switch. Verify that the calibration gas applied matches the calibration gas requested.
    If they match attempt a calibration again. If the calibration fails again then the sensor must be replaced.

    ZERO DRIFT/CELL USED: Indicates the Zero(clear air) reading was to high prior to applying calibration gas.

NOTE: Following calibration with the **MX-2100** display in Normal Operational Mode if the readout indicates a – number the Zero reading during calibration was not a zero.

- To continue with another calibration highlight the Calibration Menu and fallow the same steps as above.

- To exit the Maintenance Menu highlight the Exit Menu and press the ENTER switch.

The display will return to the Normal Operational Mode.

If the combustible sensor is set to display a gas other then methane it is recommended to use that gas for calibration if a suitable concentration is available.

***WARNING*:** **If methane is a combustion hazard in addition to the other combustible gases then methane must be used as the calibration gas. The instrument will automatically compensate gas sensitivity coefficients.**

4.4 Coefficients and Gas Range Tables

Table 2: Sensitivity Coefficients For MX-2100 "Other Gases" Channel

Gas	Chemical Formula	LEL	UEL	Vapor Density	Coefficients CH$_4$	Coefficients All Gas	Recommended Calibration Gas
Ethyl Acetate	$C_4H_8O_2$	2,1 %	11,5 %	3,0	**1,70**	1,06	Butane/Propane
Acetone	C_3H_6O	2,15 %	13 %	2,1	1,92	1,20	Butane/Propane
Acetylene	C_2H_2	1,5 %	100 %	0,9	1,36	0,85	Butane/Propane
Butadiene	C_4H_6	1,4 %	16,3 %	1,85	1,55	0,97	Butane/Propane
Butane	C_4H_{10}	1,5 %	8,5 %	2,0	**1,91**	1,19	Butane/Propane
MEK (Butanone)	C_4H_8O	1,8 %	11,5 %	2,5	2,17	1,36	Butane/Propane
Dimethyl Ether	C_2H_6O	3,0 %	27,0 %	1,6	1,92	1,20	Butane/Propane
Gasoline	Mixture	1,1 %	~ 6 %	3 à 4	**3,15**	1,97	Butane/Propane
Ethanol	C_2H_6O	3,3 %	19,0 %	1,6	**1,66**	1,04	Butane/Propane
Ethylene	C_2H_4	2,7 %	34,0 %	0,98	1,24	0,78	Butane/Propane
Gesahol	Mixture	0,6 %	~ 6,0 %	> 4	6,20	3,88	Butane/Propane
Natural Gas	CH$_4$	5,0 %	15,0 %	0,55	**1,05**	**1,05**	CH$_4$
Hexane	C_6H_{14}	1,2 %	7,4 %	3,0	2,23	1,40	Butane/Propane
Hydrogen	H_2	4,0 %	75,6 %	0,069	**1,10**	0,69	Butane/Propane
Isobutane	C_4H_{10}	1,5 %	~ 15 %	2,0	1,98	1,24	Butane/Propane
Isopropyl Alcohol(IPA)	C_3H_8O	2,15 %	13,5 %	2,1	**2,26**	1,41	Butane/Propane
Kerosene (JP4)	$C_{10} - C_{16}$	0,7 %	5,0 %	> 4	5,00	3,13	Butane/Propane
Methane	CH$_4$	5,0 %	15,0 %	0,55	**1,00**	**1,00**	CH$_4$
Methanol	CH_3OH	5,5 %	44,0 %	1,1	**1,60**	1,00	Butane/Propane
Methylamine	CH_3NH_2	4,9 %	20,7 %	1,1	**2,00**	1,25	CH$_4$
Octane	C_8H_{18}	1,0 %	6,0 %	3,9	**2,46**	1,54	Butane/Propane
Propylene Oxide	C_3H_6O	2,3 %	?	2,0	2,48	1,55	Butane/Propane
Ethylene Oxide	C_2H_4O	2,6 %	100 %	1,5	2,60	1,63	Butane/Propane
Pentane	C_5H_{12}	1,4 %	8,0 %	2,5	**2,10**	1,31	Butane/Propane
Propane	C_3H_8	2,0 %	9,5 %	1,6	**1,57**	0,98	Butane/Propane
Propylene	C_3H_6	2,0 %	11,7 %	1,5	1,49	0,93	Butane/Propane
Toluene	C_7H_8	1,2 %	7,0 %	3,1	**2,47**	1,54	Butane/Propane
Stodderd Solvent	Mixture	1,1 %	6,5 %	> 2	5,00	3,13	Butane/Propane
Xylene	C_8H_{10}	1,0 %	7,6 %	3,7	3,00	1,88	Butane/Propane

Table 3 contains the coefficients for gases which do not have their coefficients entered in the instrument on a standard basis.

These coefficients, to be programmed for the "Other gases" channel, are calculated with respect to methane, as the instrument systematically recalculates the values of sensitivity coefficients with respect to that gas.

Table 3: Supplementary sensitivity coefficients to be programmed for MX-2100 "other gases" channel

Gas	Empirical Formula	LEL	UEL	Vapor density	Coefficient/CH4
Benzene	C_6H_6	1.2%	8.0%	2.7	2.2
Cyclohexanone	$(CH_2)5CO$	1.3%	9.4%	3.4	3.2
Premium petrol	Mixture	1.3%	6.0%	>2	2.1
Ethane	C_2H_6	3.0%	15.5%	1.04	1.0
LPG	Butane/Propane	1.65%	~9.0%	1.85	1.48
Methylamine	CH_3NH_2	4.9%	20.7%	1.1	1.05
Styrene	C_8H_{12}	1.1%	8.0%	3.6	2.5
Octane				> 2	3.0

Example of use: Detection of Benzene with an **MX-2100** instrument:
- Select "Other gas" on the combustible channel.
- Program the coefficient = 2.2.
- Select the standard gas. If it is mineral spirit, select "Other" as the standard gas.
- Calibrate the instrument in the normal way, specifying the content for the standard gas used.

Table 4: Gas Range and Alarm Points

Gas & Unit of Measurement	Low Alarm	High Alarm	TWA Alarm	TWA Duration	STEL Alarm	STEL Duration	Range
Carbon monoxide, CO, ppm	35 ppm	100 ppm	25 ppm	480 minutes	200 ppm	15 minutes	1000 ppm
Hydrogen sulfide, H_2S, ppm	10 ppm	15 ppm	10 ppm	480 minutes	15 ppm	15 minutes	100 ppm
Oxygen, O_2, % by Vol.	19.5%V	23.5%V	------------	------------	-----------	------------	30.0%V
Combustible Gas, % LEL	10% LEL	50% LEL	------------	------------	-----------	------------	100%LEL
Chlorine, Cl_2, ppm	0.5 ppm	1 ppm	0.5 ppm	480 minutes	1 ppm	15 minutes	10.0 ppm
Hydrogen cyanide, HCN, ppm	4.7 ppm	10 ppm	4.7 ppm	480 minutes	4.7 ppm	15 minutes	30.0 ppm
Hydrogen chloride, HCl, ppm	5 ppm	10 ppm	5 ppm	480 minutes	5 ppm	15 minutes	30.0 ppm
Sulfur dioxide, SO_2, ppm	2 ppm	5 ppm	2 ppm	480 minutes	5 ppm	15 minutes	30.0 ppm
Hydrogen fluoride, HF, ppm	2 ppm	4 ppm	3 ppm	480 minutes	3 ppm	15 minutes	10.0 ppm
Ozone, O_3, ppm	0.1 ppm	0.2 ppm	0.05 ppm	480 minutes	0.2 ppm	15 minutes	1.00 ppm
Carbon dioxide, CO_2, % by Vol.	0.5%V	1.0%V	0.5%V	480 minutes	3%V	15 minutes	5.0%V
Hydrogen, H_2, ppm	200 ppm	2000 ppm	------------	------------	-----------	------------	2000 ppm
Nitrogen dioxide, NO_2, ppm	2 ppm	4 ppm	3 ppm	480 minutes	5 ppm	15 minutes	30.0 pm
Nitric oxide, NO, ppm	25 ppm	50 ppm	25 ppm	480 minutes	25 ppm	15 minutes	300 ppm
CO/H_2S Combo Sensor							
Ammonia, NH_3, ppm	25 ppm	50 ppm	25 ppm	480 minutes	35 ppm	15 minutes	100 ppm
Arsine, AsH_3, ppm	0.05 ppm	0.1 ppm	0.05 ppm	480 minutes	0.1 ppm	15 minutes	1.00 ppm
Silane, SiH_4, ppm	10 ppm	20 ppm	5 ppm	480 minutes	15 ppm	15 minutes	50 ppm

4.5 MX-2100 Sensor Replacement

Sensors – Instrument can hold at the same time:
- 1 – Combustible Sensor
- 1 – Large Sensor

and up to
- 2 – Small Sensors

These are smart, plug-in, precalibrated and interchangeable sensors. See section 4.6 for *ENMET* part numbers.

Turn instrument off.

CAUTION: Failure to turn instrument off prior to replacing sensors may cause damage to the instruments programming.

- Remove the four screws that hold the sensor corner in place and remove the cover.
- Remove the sensor, by pulling it straight out.
- Replace with new sensor.

NOTE: Sensor can only go in one direction. Do Not force into place.

- Replace the cover and screws.
- Turn the instrument on and verify that the new sensor is programmed correctly for you application.
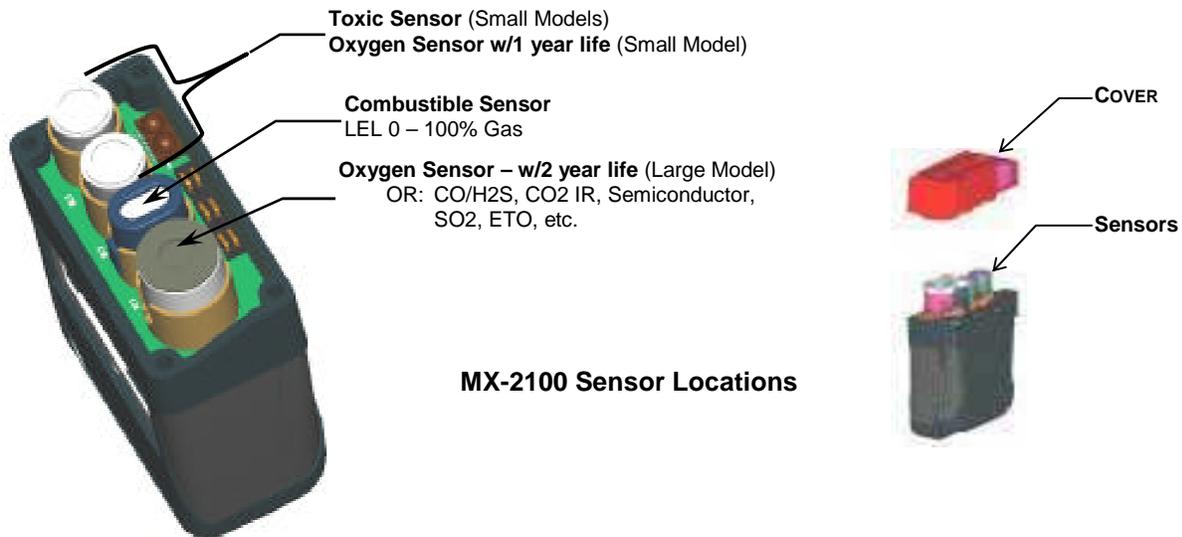- See sections 4.3 and 4.4 for calibration.

Toxic Sensor (Small Models)
Oxygen Sensor w/1 year life (Small Model)

Combustible Sensor
LEL 0 – 100% Gas

Oxygen Sensor – w/2 year life (Large Model)
OR: CO/H2S, CO2 IR, Semiconductor,
SO2, ETO, etc.

COVER

Sensors

MX-2100 Sensor Locations

Figure 6: MX-2100 Sensor Replacement

4.6 Replacement Part Numbers

ENMET replacement part numbers: **Sensors** – Instrument can hold at the same time:
1 – Combustible Sensor (-E), 1 – Large Sensor (-B) and up to 2 – Small Sensors (-S)

Description	Part Number
Small Sensor for Carbon monoxide, CO	02613-1200-S (3)
Small Sensor for Hydrogen sulfide, H2S	02613-0200-S (3)
Small Sensor for Oxygen, O2	02613-1100-S
Large Sensor for Oxygen, O2 extended life	02613-1100-B (3)
Combustible Sensor for LEL	02613-001-E (3)
Large Sensor for Carbon dioxide, CO2	02613-1350-B
Large Sensor for Carbon monoxide/Hydrogen sulfide, CO/H2S	02613-2200-B
Large Sensor for Sulfur dioxide, SO2	02613-0500-B
Small Sensor for Ammonia, NH3	02613-2400-S
Small Sensor for Hydrogen, H2	02613-1500-S
Small Sensor for Chlorine, Cl2	02613-0100-S (1)
Small Sensor for Hydrogen cyanide, HCN	02613-0300-S
Small Sensor for Hydrogen chloride, HCl	02613-0400-S (1)
Small Sensor for Hydrogen fluoride, HF	02613-0700-S (2)
Small Sensor for Ozone, O3	02613-0800-S (2)
Small Sensor for Nitrogen dioxide, NO2	02613-1700-S
Small Sensor for Nitric oxide, NO	02613-1750-S
Small Sensor for Arsine, AsH3	02613-4001-S (1)
Small Sensor for Silane, SiH4	02613-4003-S

Note: (1) For best performance, it is recommended that a sample pump be used for monitoring these gases
(2) A sample pump is required for monitoring these gases
(3) these are the replacement sensors for the standard instrument package P/N 02610-000
Warranty for the instrument package, including CO, H2S, LEL and O2 (-1100-B) sensors is 18 months from date of shipment.
Warranty for all other sensor and accessories is 12 months from date of shipment.

ENMET replacement part numbers: Calibration equipment & replacement parts

Description	Part Number
Charger Interface (one supplied with instrument)	02612-002
Calibration Cover (one supplied with instrument)	02612-003
Gas Regulator Assembly for 34 liter cylinder	02506-002
Gas Regulator Assembly for 17 liter cylinder	02506-004
Gas Regulator Assembly, Flow Demand, for 17 liter cylinder	03510-001
Gas Regulator Assembly, Flow Demand, for 34 liter cylinder	03510-002
Calibration Equipment Case, small	73083-000
Calibration Equipment Case, large	73083-002
Instrument Manual	80006-002
Power Supply 110 VAC	67051-046
Power Supply 220 VAC	67051-047
Battery Pack, NimH	02613-002

*ENMET* replacement part numbers: **MX-2100** Accessories

Description	Part Number
Protective Cover with Harness	02612-005
Protective Cover without Harness	02612-006
Sampling Pump (Also order p/n 03700-018 wand probe or p/n 03700-031 hose or both)	02612-010
Wand, 22in. probe with 2 ft. hose	03700-018
Hose 20 ft. with connector	03700-031
Hand Aspirator with 12 ft. hose	02602-011
Hand Aspirator with 27 in. probe and 3 ft. hose	02602-010
Transit Case	73083-006
Software Kit, COM2100, with IR/Serial Cable	02612-012
Charger Adapter, 12 VDC	66014-002

5.0 COM 2100 Software

COM2100 software ensures the instrument's supervision and maintenance:

- display, in uncoded mode, of measurements and parameters on channels,
- diagnostic assistance in case of failure,
- programming of instrument and measuring channels,
- management of options,
- calibration of channels using automated scrolling menu,
- output of status and check sheets,
- management, display and printout of stored events and measurements,
- protection by password.

The link between the **MX-2100** and the PC is made by an infrared port (cord assembly), as shown here:
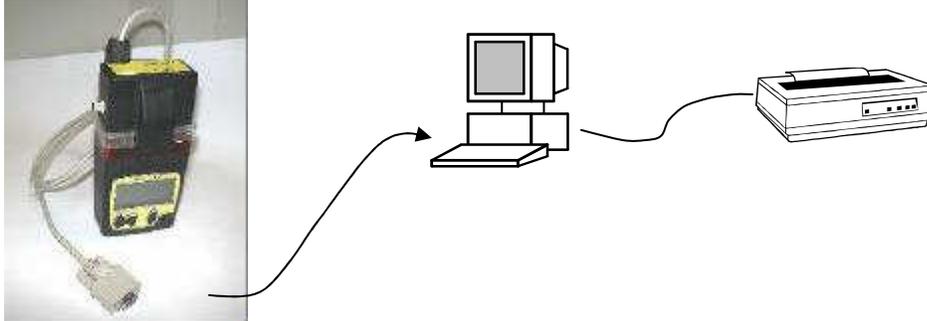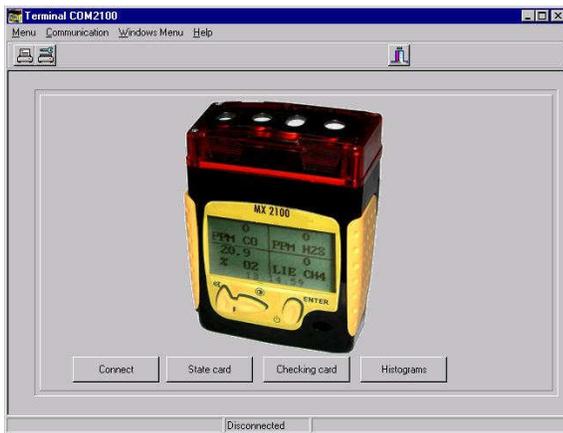

A charger or sampling unit can be used to mechanically hold the IR cord on the instrument.

When the installation has been completed and the components are in operation, your working conditions are user friendly.

Example of a few "windows"

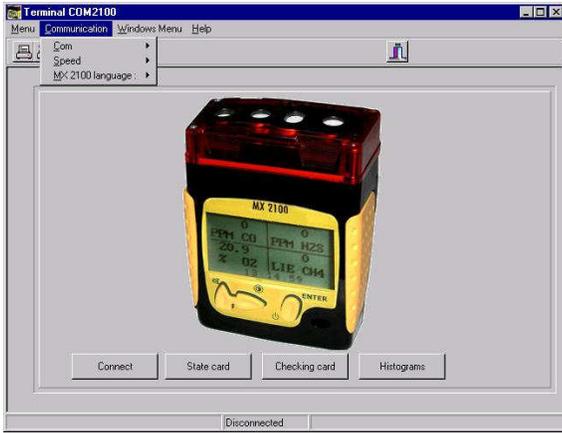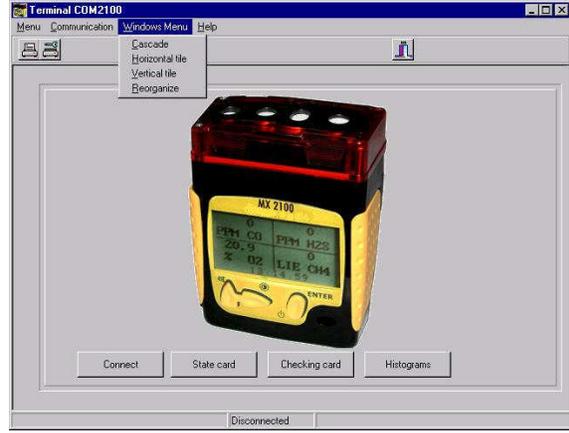<div align="center">Opening Window   Menu Window</div>

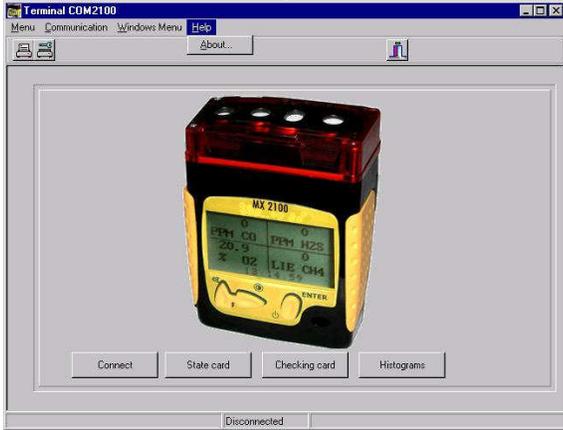From the menu window, you can open saved files, check & status sheets and histograms on the computer

Communication Window

This window is used to select the port, communication speed and language used.
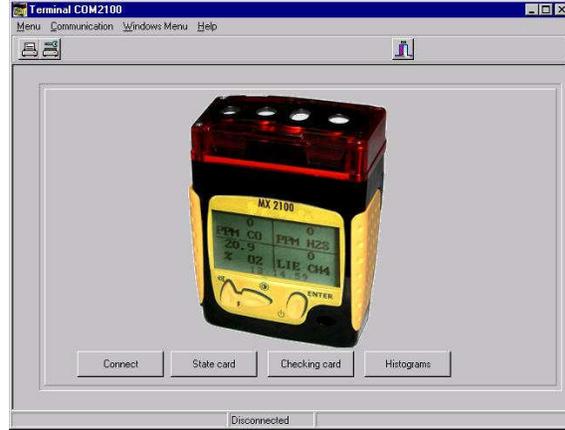
Windows Window

This is used to select the type of window

Help Window

This provides help in the event of problems with operation, consultation or display

MX-2100 Connection Window

When the **MX-2100** is correctly connected to a computer by an infrared cord, this window can be used to confirm communication by looking in the Connect window

- Status sheet: to view and save the configuration of the **MX-2100** connected.

- Check sheet: to view and save the status of the connected **MX-2100**, after test and adjustments.

- Histories: to view and save measurements made and stored in memory by the **MX-2100**.

6.0 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/FedEx Ground. 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 are Return for Repair Instructions and Form on the last pages of this manual. This Form can be copied or used as needed.

Manual Part Number
80006-002
November 2004
MCN-326, 02/24/05
MCN-338, 08/31/05
MCN-343, 02/03/06
MCN-407, 09/30/08

Notes:

ENMET
CORPORATION

PO Box 979
680 Fairfield Court
Ann Arbor, Michigan 48106-0979
734.761.1270 Fax 734.761.3220

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 evaluation fee, even if returned unrepaired. 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.

ENMET CORPORATION

Repair Return Form

Mailing Address:
    ENMET Corporation
    PO Box 979
    Ann Arbor, Michigan 48106

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

Phone Number: 734.761.1270
FAX Number: 734.761.3220

Your Mailing Address:

_____

_____

_____

_____

Your Shipping Address:

_____

_____

_____

_____

Contact Name: _____   **Your Phone:** _____

Your PO/Reference Number: _____   **Your FAX:**   _____

Payment Terms: ❑ *COD*
  (Check one) ❑ *VISA / MasterCard*_____   _____   _____
                            Card number   Expiration   Card Code
             ❑ *American Express*_____   _____   _____
                            Card number   Expiration   Card Code
         *Name as it appears on the credit card*_____

Return Shipping Method:
  ❑ UPS: ❑ Ground   ❑ 3 Day Select   ❑ Next Day Air ❑ ND Air Saver ❑ 2-Day Air
  ❑ UPS Account number: _____

  ❑ 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:** $_____