

**ENMET Corporation**  
PO Box 979  
Ann Arbor, MI 48106-0979

**Formaldemeter *hTV***  
**Formaldehyde Monitor**  
**Operation Manual**

**Manual Part Number**  
**80012-017**  
**MCN-388, 10/25/07**

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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

The **PPM Formaldemeter™ htV** is an easy-to-use, hand held direct reading instrument designed for the rapid measurement of airborne formaldehyde levels.

Please read these instructions carefully and familiarize yourself with the instrument before use. This operating manual will provide you with all the necessary information for the correct use of your **Formaldemeter™ htV**.

**CAUTION:** Do Not use a **Formaldemeter™ htV** with serial number of 5200 and above with an AMS-2 serial number 527 and below. Also Do Not use the combination of **Formaldemeter™ htV** serial number of 5153 and below with an AMS-2 serial number 258 and above.

**These are incompatible, and would result in damage to both instruments.**

<b>Formaldemeter™ htV</b> serial number of 5200 and above and AMS-2 serial number 527 and below
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<b>Formaldemeter™ htV</b> serial number of 5153 and below and AMS-2 serial number 258 and above
---

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

### 1.1 Unpack

Unpack the **Formaldemeter™ htV** 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 Check Order

Check, the contents of the shipment against the purchase order. Verify that the **Formaldemeter™ htV** is received as ordered. 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.

### 1.3 Serial Numbers

Each **Formaldemeter™ htV** is serialized. These numbers are on tags on the equipment and are on record in an **ENMET** database.

## 2.0 Formaldemeter *htV* Features

Unlike other formaldehyde monitoring devices such as color stain tubes and badges, the **Formaldemeter**™ *htV* is capable of measuring many samples consecutively without the need for inconvenient ancillary equipment. Being ultra compact and battery operated, the instrument is truly field portable. The **Formaldemeter**™ *htV* is extremely simple to use and provides immediate, semi-quantitative readings of atmospheric formaldehyde concentration displayed on a digital read-out.

The instrument is designed to measure the concentration of formaldehyde in snatch (discrete) samples of air and should be employed primarily as a screening device.









### 2.1 Important Points

It is important that you are aware of the following points when using the instrument

- The **Formaldemeter**™ *htV* is temperature compensated to operate most accurately in the range 5 – 40°C.
- The results obtained with the **Formaldemeter**™ *htV* are instantaneous spot readings. A single reading is not necessarily representative of long term personal exposure. A series of readings taken at short intervals is preferable to infrequent tests.
- Avoid smoking in the environment to be analyzed – tobacco smoke contains formaldehyde.
- Care must be taken to ensure that fluid or dust is not drawn into the instrument. This could permanently damage the sensor.
- The **Formaldemeter**™ *htV* has been designed to be sufficiently robust for everyday field use. However, should the unit sustain a severe physical shock, the operation and calibration of the instrument should be checked using the supplied formaldehyde calibration standard.

### 2.2 Instrument Features

See Figure 1 for location of each feature

Feature	Description
<b>Sampling Port</b>	The brass sampling port is the inlet through which the sample is drawn into sensor.
<b>Display</b>	The liquid crystal display (LCD) shows the formaldehyde concentration of the sample in 0.01 ppm increments. The display also shows text messages during certain operations.
<b>Display Key</b>	 <i>sensor recovering</i>
	 <i>sensor ready</i>
	 <i>sampling</i>
	 <i>taking calibration sample</i>
	 <i>set calibration level</i>
	 <i>replace battery</i>
	 <i>instrument not calibrated</i>
<b>Keypad</b>	The instrument is operated by four buttons, some of which have multiple functions. The button switches are located beneath the membrane and are operated by pressing firmly where indicated.
<b>Battery Compartment</b>	The battery compartment is located beneath a cover at the bottom rear of the instrument. To gain access to the battery, simply remove the cover by unscrewing the two screws.  A low battery is indicated by  on the display. See section 5.1 for guidance on battery replacement.
<b>Serial Port</b>	This socket can be used for connecting your <b>Formaldemeter</b> ™ <i>htV</i> to the PPM Base Unit or PC for automated continuous monitoring applications.

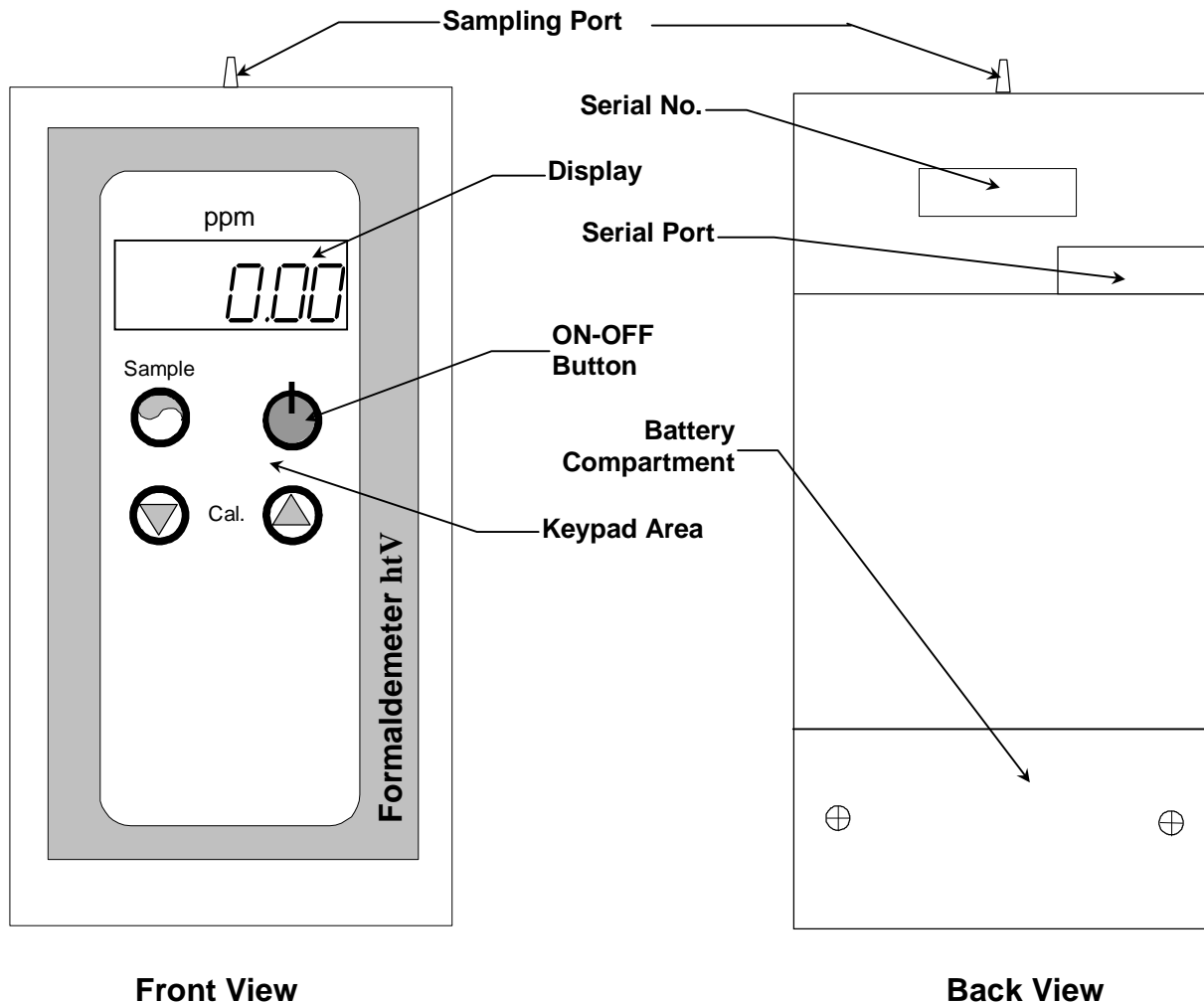


Figure 1: Features of the Formaldemeter™ htV

### 3.0 Technical Information

#### 3.1 Principle of Operation

##### Electrochemical formaldehyde sensor

The Formaldemeter™ htV uses proven electrochemical sensing technology for determining the concentration of formaldehyde in air samples. The instrument contains an electrochemical formaldehyde sensor comprising two noble metal electrodes and a suitable electrolyte.

When air is drawn into the sensor by means of the internal sampling system, a small voltage is generated which is directly proportional in magnitude to the concentration of formaldehyde in the sample.

This voltage is produced as a result of the electrooxidation of formaldehyde at one of the catalytically active electrodes.

The signal is fed to a precision electronic amplifier and output on the instrument's display, when calibrated, as formaldehyde concentration in ppm (parts-per-million by volume).

All the electronic systems are based on modern, integrated circuitry employing the latest surface mount technology to ensure that the Formaldemeter™ htV is an exceptionally robust and reliable instrument.

## 3.2 Interferants

### 3.2.1 Phenol & Resorcinol

The presence of phenol in the air can give a reading on the **Formaldemeter™ *htV***. When monitoring formaldehyde in situations where phenolic resins are used, the phenol filters provided should be used. These fit on to the sampling port of the instrument. The filters will completely remove phenols from the sample even at concentrations in excess of 1000 ppm without affecting the formaldehyde reading.

### 3.2.2 Phenol filter life

Each filter should be used no more than five times and then discarded. Partially used filters should not be stored in the vial with unused filters. Replacement filters can be ordered from through your local distributor.

### 3.2.3 Alcohols & Aldehydes

As is found with other portable detection equipment, the meter is not totally specific to formaldehyde alone, being susceptible to a degree of interference from a small range of other chemicals. Other aldehydes and alcohols such as methanol and ethanol in the atmosphere can cause cross-interference effects.

**Table 1: Relative Response of the Formaldemeter™ *htV* to Various Compounds in the Vapor Phase**

Compound	Concentration Required to Give Reading of 1 PPM	Comments
Acetone		No response
Acetaldehyde	8 – 12	Linear response similar to that for Ethanol
Acetic Acid		No response
Ammonia	71000	Response only at very high concentration
Butanol		Very little interference (See note)
Carbon Monoxide	100	Linear response
Ethylene	160	
Ethanol	12 – 20	Linear response
Formaldehyde	1.0	
Glutaraldehyde	7100 at 25°C	
Methanol	50	Linear response
Phenol	5	Can be completely removed with filter provided
Propanol		Very little interference(See note)
Resorcinol	5	Can be completely removed with filter provided

NOTE: Propanol and Butanol are only likely to interfere at high temperature (greater than 60°C) and high concentration (higher than 20 ppm).

## 3.3 Sensor Background Reading


Due to the high sensitivity of the sensor and the widespread occurrence of formaldehyde in the indoor environment, a background reading of up to 0.05 ppm can often be produced, even when sampling in an atmosphere considered to be free of formaldehyde or other contaminants.


## 4.0 Operation of the PPM FORMALDEMETER™ *htV*

### 4.1 Taking a Sample

#### Power on

Press the ON-OFF button once.


The instrument will display:  flashing for 3 seconds as the instrument checks the sensor,

followed by:  Indicating that the instrument is ready to take a sample.

#### Sampling


Hold the instrument in the atmosphere to be sampled.

Press and release the SAMPLE button.


The display will show  and the internal pump should be heard running for almost two seconds as it samples the air.

#### Display reading

As the sample is analyzed:

The display will show  flashing for 10 seconds. The displayed will then show a flashing, increasing value as the sample is analyzed. After 60 seconds, the display will show a non-flashing value, which is held until the instrument is switched off. This indicates the formaldehyde concentration in ppm.

#### Power off

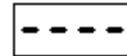
To Switch the instrument off press and **Hold** the ON-OFF button for a few seconds, until the display reads  followed by a click and the instrument will turn off.

If you forget to switch the instrument off after a test, the **Formaldemeter™ *htV*** will automatically switch itself off after 5 minutes.

### 4.2 Sensor Recovery Period

#### Sensor clearing

Between samples, the instrument should be left switched off for a few minutes to allow the sensor to clear of any residual formaldehyde. Generally, the higher the reading obtained, the longer it takes the sensor to clear. If the instrument is switched on before the sensor has cleared, the display will show:



Flashing and the sampling pump will not operate.

The cell is clear only when the display shows:



For a minimum of 3 seconds after power on.

The instrument is now ready to take the next sample.

## 5.0 Maintenance

**WARNING:** Please read this section thoroughly before attempting to check or adjust calibration. Users are strongly advised to familiarize themselves with the instrument before attempting to adjust the calibration and should follow the instructions carefully.

### 5.1 General Information

#### Check calibration regularly

Sensor sensitivity can change very gradually with time, periodic recalibration may be required. It is advisable to check calibration regularly to ensure that the instrument is functioning correctly.

A quick calibration check can be carried out by drawing a formaldehyde vapor sample of known concentration into the instrument's sensor and noting whether the displayed reading agrees with the expected concentration value.

The **Formaldemeter™ htV** is supplied complete with a formaldehyde calibration standard and a thermometer, which are essential components for checking and adjusting calibration.

### 5.2 The Formaldemeter™ htV Calibration Standard

The **Formaldemeter™ htV** Formaldehyde Calibration Standard consists of formaldehyde absorbed on a solid substrate in a glass tube from which a headspace vapor sample can be drawn. Each standard is carefully manufactured to a high tolerance.

#### 5.2.1 Effect of temperature

The concentration of formaldehyde vapor generated in the calibration tube varies with temperature and for this reason, a thermometer and temperature/concentration table is supplied.

**Handle the calibration standard as little as possible, and only by the yellow end caps to avoid heating the tube.**

#### 5.2.2 Temperature equilibration

Before using the standards, they should always be allowed to stabilize within the recommended temperature range of 15 – 29°C for at least 1 hour.

#### 5.2.3 Standard life

Each standard has a capacity for 100 samples or a life of six months (whichever occurs sooner) and it must not be used after the indicated expiry date. New calibration standards can be ordered from your local distributor.

### 5.3 Calibration Check Procedure

#### 5.3.1 Temperature equilibration

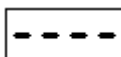
Place the instrument, thermometer and calibration standard together in a place where the temperature is stable for at least one hour before commencing the calibration check procedure to allow thermal equilibration.

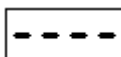
#### 5.3.2 Sensor check

Before carrying out a calibration check, the sensor must be clear of formaldehyde vapor from any previous samples. When the sensor is clear, the display will show:



3 seconds after power on.





If the display shows flashing  for longer than 5 seconds, then the sensor is not ready to take a sample. Switch the instrument off and allow it to recover for a few minutes.



### 5.3.3 Procedure

1. Place the standard with the thermometer on a work surface. Handle the calibration standard as little as possible to avoid heating the tube, holding it by the yellow end caps. Remove both end plugs.
2. Switch the instrument on by pressing the ON-OFF button once. Wait for the display to show:



3. Place the instrument on the work surface and insert the nozzle into the sampling end of the tube (as indicated by the black arrow). Ensure a good seal around the instrument nozzle by pushing the standard tube firmly against the instrument when taking a sample.
4. Press the SAMPLE button and wait until the internal sampling pump stops before removing the standard from the instrument. Replace the end plugs securely.
5. The display will initially show: flashing  and  for 10 seconds and then a flashing, increasing value as the sample is analyzed. Observe the final non-flashing reading displayed (after approximately 60 seconds).
6. Note the reading obtained and temperature
7. Refer to the Temperature/Concentration look-up table on the standard tube. If the reading is within 10% of the value shown in the table, then no recalibration is required.

If recalibration is required, follow the procedure in Section 5.4.

Leave the instrument switched off for approximately 5 minutes to recover before commencing another atmospheric analysis or calibration adjustment.

## 5.4 Calibration Adjustment Procedure

**WARNING:** Please read this section thoroughly before attempting to adjust calibration. Users are strongly advised to familiarize themselves with the instrument before attempting to adjust the calibration and should follow the instructions carefully.

Under normal operating conditions, instrument calibration should require only minimal periodic adjustment. To see whether a full recalibration is required, perform a calibration check first as described in section 5.3.

### 5.4.1 Temperature equilibration


Leave the instrument and calibration standard in a room where the temperature is constant for at least one hour before calibrating to allow thermal equilibration.


### 5.4.2 Procedure

1. Place the standard with the thermometer on a work surface. Handle the calibration standard as little as possible to avoid heating the tube, holding it only by the yellow end caps.
2. Read the temperature on the thermometer and determine the required concentration reading from the lookup table on the calibration tube.



*For Example: Temperature: 23°C Reading: 3.2 ppm*

3. Remove the yellow plugs from both ends of the calibration standard tube.
4. Press the ON-OFF button once to switch the instrument on.



5. Wait for the display to show  000
6. Insert the instrument nozzle into the sampling end of the calibration standard (indicated by the black arrow). To maintain airtight contact between the nozzle and the standard, push the standard firmly against the instrument.
7. Simultaneously depress and release both Cal ▲ and ▼ buttons.

8.  CAL Will appear on the LCD, followed by the sound of the pump drawing a vapor sample from the tube.
9. When the pump stops, remove the calibration tube and replace both yellow end plugs.

10. As the instrument analyses the sample:  
The display will show an increasing, then flashing value for 60 seconds, followed by:

 5.6 alternating with  1.75

11. Now use the Cal ▲ and ▼ buttons to adjust the display reading to the required concentration.
12. Press the SAMPLE button to store this calibration value. The display will show:

 CAL followed by  End

The **Formaldemeter™ htV** will then switch off automatically.


The instrument has now been recalibrated.

## 5.5 Instrument Battery

With the exception of the battery, your **Formaldemeter™ htV** has no user-serviceable components. It is important that no attempt is made to open the instrument other than to replace the battery. Any evidence of tampering with the instrument will invalidate the warranty.

If you find that your instrument requires service or repair, please return it to the factory or an authorized PPM Service Center.

### 5.5.1 Low battery indicator

If  appears on the display when the instrument is switched on, then the battery voltage is too low and needs replacing

### 5.5.2 Battery Replacement

The instrument requires a 9V PP3 / MN1604 / 6LR61 type alkaline battery.

To replace the battery:

- Remove the battery compartment cover at the bottom rear of the instrument by unscrewing the two screws.
- Attach a new battery to the connector and place the battery in the compartment.
- Secure the cover in place again with the two screws.

## 5.6 Cleaning the Instrument

### Take care during cleaning


On no account should the **Formaldemeter™ htV** be immersed in liquid. Any fluid entering the instrument will destroy the sensor and the electronic circuitry.


If the instrument's enclosure requires cleaning, it should be wiped with a damp cloth. Never use abrasive or solvent based cleaning agents.

## 5.7 Storage

When not in use, your **Formaldemeter™ htV** should be stored in the supplied carrying case in a clean, dry environment and away from extremes of temperature.




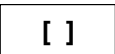
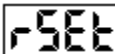

## 5.8 Trouble Shooting

If display reads  and will not change after 3 minutes.

The gain/amplification of the signal from the sensor is so high that the signal never falls below a certain 'threshold' to enable it to give the ready  display.

To remedy the problem a reset is needed on the instrument to erase the previous calibration.

This is achieved as follows:

- Switch instrument OFF.
- Hold both Cal buttons and at the same time switch the instrument ON.
- The display will read  followed by .
- Press the Cal Up button to make the display read  and then press the Sample button.  
The display will then flash  and then  and then show .
- Turn the instrument OFF and then back ON again to complete the Reset.

*The instrument is no longer calibrated and will require recalibration.*

Ensure that you follow the calibration procedure in section 5.4 carefully. Ensuring that the standard has equilibrated at a stable temperature for at least 1 hour before calibrating and that the tube is not warmed excessively through handling.

## 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

80012-017

August 2004

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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 \$30 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.



# 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:**

\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Your Phone:** \_\_\_\_\_

**Your PO/Reference Number:** \_\_\_\_\_

**Your FAX:** \_\_\_\_\_

**Payment Terms:**     **COD**

(Check one)  **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:** \$ \_\_\_\_\_