

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

Model IR-6000
Hydrocarbon
Sensor/Transmitter
Manual

Manual Part Number
80003-090
MCN-427, 11/03/10

Table of Contents

1.0 INTRODUCTION	1
1.1 Unpack.....	1
1.2 Check Order	1
1.3 Serial Numbers	1
2.0 INFRARED DETECTION TECHNOLOGY	2
3.0 INSTALLATION	4
4.0 OPERATION	5
4.1 Normal Operation.....	5
5.0 MAINTENANCE	5
Clean Environment, Operation Utilizing MX-Series Controllers or Similar System Devices	5
Dirty or Dusty Environment	5
6.0 ZERO CALIBRATION	6
6.1 Clean Environment.....	6
6.2 Dirty or Dusty Environment	6
6.3 Normal Calibration.....	6
7.0 SPECIFICATIONS	6
8.0 WARRANTY	7

List of Illustrations

CHART 1: INFRARED ABSORPTION SPECTRUM FOR METHANE	2
DIAGRAM 1: CUTAWAY VIEW OF THE <i>IR-6000</i>	2
FIGURE 1: WIRING DIAGRAM <i>IR-6000</i> SENSOR/TRANSMITTER	3
TABLE 1: WIRING CONNECTIONS	4
TABLE 2: CURRENT OUTPUT AND CORRESPONDING GAS CONCENTRATION	5

NOTE: [important information about use of instrument]

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 **IR-6000** Infrared hydrocarbon Sensor/Transmitter (S/T) is a microprocessor based intelligent gas detector that continuously monitors combustible hydrocarbon gases and vapors in the % Lower Explosive Limit (LEL) or % by Volume ranges, depending on instrument configuration.

The **IR-6000** is ideally suited for use in harsh environments and where the cost of required maintenance for conventional catalytic detectors is prohibitive. The **IR-6000** Infrared gas detector will perform reliably in the presence of silicone and other catalytic poisoning agents and can also operate in oxygen free environments or where high background gas levels are present.

The **IR-6000** can operate from a 24 VDC power source and produce a continuous 4–20 mA output or it can be connected to various MX Series controllers available from **ENMET**.

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

1.1 Unpack

Unpack the **IR-6000** 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 **IR-6000** 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.

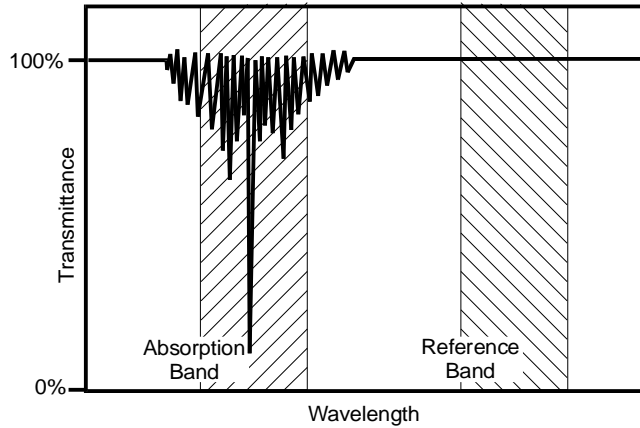
1.3 Serial Numbers

Each **IR-6000** is serialized. These numbers are on tags on the equipment and are on record in an **ENMET** database.

2.0 Infrared Detection Technology

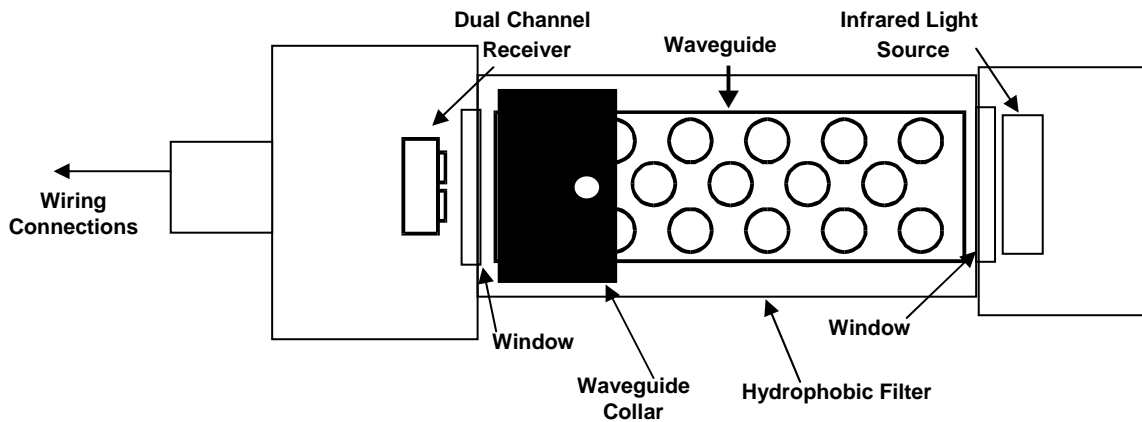
The **IR-6000** Infrared gas detector uses infrared absorption technology for detecting combustible hydrocarbon gases. Gases absorb infrared light only at certain wavelengths. The concentration of a gas can be measured by the difference of two channels (wavelengths), a reference and a measurement channel. The **IR-6000** uses a collimated infrared light source that passes through a waveguide, at the end of the waveguide is a dual channel receiver. The dual channel receiver measures the intensity of two specific wavelengths, one at an absorption wavelength and another outside of the absorption wavelength. The gas concentration is determined by a comparison of these two values.

Chart 1: Infrared Absorption Spectrum for Methane



The dual channel receiver is a single wafer, double filtered, dual receiver with an internal optical barrier. The elements are perfectly matched resulting in overall stability and superior performance throughout the entire temperature range.

Diagram 1: Cutaway view of the IR-6000



Using a dual channel receiver there is no need to use any special lenses or beam splitters to achieve the different measurement bands.

The **IR-6000** utilizes a unique patent pending feature, the AutoAC™ circuit. The AutoAC™ circuit is an automatic analog control circuit, which allows the **IR-6000** to be calibrated for any combustible hydrocarbon, provided that a calibration quality level of the gas is available. This eliminates setting dipswitches or changing out sensors for different types of hydrocarbons, simply zero calibrate the unit with a calibration gas of the specific gas to be detected.

The optics can be easily disassembled for cleaning. This does not require powering the unit down and does not compromise the units' explosion proof rating.

There are no consumable components contained in this product.

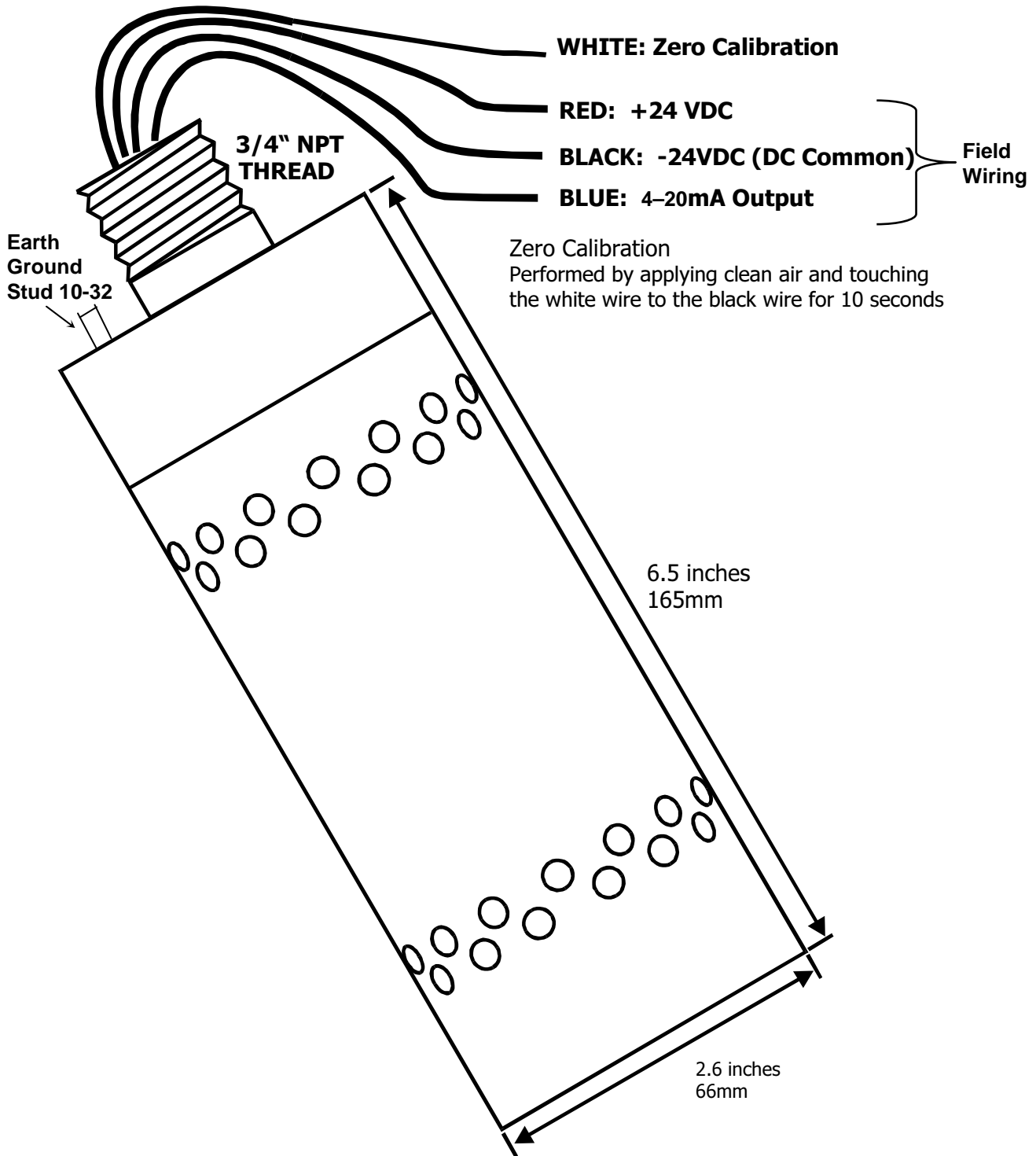


Figure 1: Wiring Diagram IR-6000 Sensor/Transmitter

3.0 Installation

WARNING: The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

NOTE: The **IR-6000** transmitters are zeroed and have their response to the target gas verified prior to shipment. It is recommended that following installation that a zero and sensor response test be preformed to insure that no damage to the transmitter occurred during shipment and that proper installation has been preformed.

The first step in the installation process is to establish a mounting location for the **IR-6000**. Select a location that is typical of the atmosphere to be monitored or close to the anticipated source of a dangerous gas.


It is very important that the **IR-6000** be properly located to enable it to provide maximum protection. The most effective number and placement of sensors vary depending on the conditions of the application. When determining where to locate sensors the following factors should be considered

- What are the characteristics of the gas that is to be detected? Is it lighter or heavier than air? If it is lighter than air the sensor should be placed above the potential gas leak. Place the sensor close to the floor for gases that are heavier than air or for vapors resulting from flammable liquid spills. Note that air currents can cause a gas that is heavier than air to rise. In addition, if the temperature of the gas is hotter than ambient air or mixed with gases that are lighter than air, it could also rise.
- How rapidly will the gas diffuse into the ambient air? Select a location for the sensor that is close to the anticipated source of a gas leak.
- Wind or ventilation characteristics of the immediate area must also be considered. Movement of air may cause gas to accumulate more heavily in one area than in another. The detector should be placed in the areas where the most concentrated accumulation of gas is anticipated. For outdoor applications with strong wind conditions, it may require the sensors to be mounted closer together and on the down wind side, to the anticipated area of a gas leak. Also, take into consideration for indoor applications, the fact that many ventilation systems do not operate continuously.
- The sensor should be accessible for maintenance.
- Excessive heat or vibration can cause premature failure of any electronic device and should be avoided if possible.
- Follow all national and local installation codes and practices.

The **IR-6000** has a 3/4" NPT threaded connector for mounting the detector to a junction box.

A user-supplied junction box can be used providing it has the appropriate sized NPT conduit entries. The junction box must be suitable for use in the application and location in which it is being installed. After the device has been installed, a zero calibration is required. Refer to the Zero Calibration section of this manual.

Table 1: Wiring connections

Wire	Description
Red wire:	18 to 32 VDC 
Black wire:	DC Common
Blue wire:	4–20 mA output
White wire:	Zero Calibration Data Wire
Earth Ground:	Male 10-32 Stud on IR-6000 cap, See Figure 1

WIRE SIZING:

Shielded cable is recommended. Wiring should be installed in metal conduit with no other cabling in the same conduit.

- 0 to 500 feet, recommended wire gauge size 16 AWG
- 501 to 1000 feet, recommended wire gauge size 14 AWG

4.0 Operation

4.1 Normal Operation

Clean Environment Using MX-Series Controller:

After power is applied, the **IR-6000** enters an initial one (1) minute warm-up period before the normal operation begins.

A 4–20 mA signal corresponds to the detected gas concentration. See **Table 2**.

The 4–20 mA output of the **IR-6000** is a non-isolated current source.

Table 2: Current Output and Corresponding Gas Concentration

Current Output	Status
0.0 mA	Unit Fault (-25%)
0.2 mA	Reference Channel Fault (-23.75%)
0.4 mA	Analytical Channel Fault (-22.50%)
0.8 mA	Unit warm-up (-20%)
1.0 mA	Optics Fault (-18.75%)
1.2 mA	Zero Drift Fault (-17.50%)
1.6 mA	Calibration Fault (-15%)
2.0 mA	Unit Spanning (-12.50%)
2.2 mA	Unit Zeroing (-11.25%)
4.0 mA	Zero gas level (0%LEL) or 0% by Vol.
5.6 mA	(10%LEL) or 10% by Vol.
8.0 mA	(25%LEL) or 25% by Vol.
12 mA	(50%LEL) or 50% by Vol.
16 mA	(75%LEL) or 75% by Vol.
20 mA	Full scale (100% LEL) or 100% by Vol.
20.1- 23 mA	Over-range

5.0 Maintenance

◆ Clean Environment, Operation Utilizing MX-Series Controllers or Similar System Devices

The **IR-6000** does not normally require cleaning of the optics.

◆ Dirty or Dusty Environment

If the unit is operating in a very dirty or dusty environment, the optical path might become obscured. If the obscuration is severe enough to affect the unit's accuracy, the unit will activate an "Optics Fault". This fault would typically be indicated by a fault relay activation on a control panel and possibly a negative reading on a display, $-\square\square\square$. To clear an Optics Fault, first try a zero calibration. If the zero calibration does not correct the fault condition, try to clean the optics.

CAUTION: Cleaning the optics should be preformed by qualified personal

The outer barrel (tube with two sets of holes) can be removed (unscrewed) to inspect the cleanliness of the hydrophobic filter. The hydrophobic filter is a Teflon coated stainless steel mesh that keeps moisture and particulates out of the optical path. A set screw holds the filter to the **IR-6000** housing. Once the hydrophobic filter is removed, the internal waveguide tube should be inspected for cleanliness. The waveguide and waveguide collar can be removed by inserting rigid instruments such as Allen wrenches into one hole of the waveguide and one hole of the collar. Turning the two instruments in opposite directions will loosen the waveguide allowing the collar to be screwed down on to the waveguide until it can be removed from the **IR-6000** housing. This will allow the windows of the **IR-6000** to be cleaned. Dust can be removed using compressed air. Hard or oily deposits can be removed using Isopropyl alcohol and cotton tipped swabs. Wipe any film or residue or film left by the alcohol on the windows with a clean dry cotton swab. The internal electro polished wave-guide tube can be cleaned the same way. Be careful not to leave any particles of the cleaning swab in the waveguide. The waveguide holes can collect pieces of the cleaning swab. After reassembling the unit (the waveguide and collar should be very tight to both ends of the **IR-6000** housing after installation). Once the unit is completely reassembled and power is reapplied, the **IR-6000** must be calibrated. Refer to the zero calibration section of this manual.

6.0 Zero Calibration

NOTE: Unlike most gas detector transmitters an IR transmitter only requires that a zero calibration be preformed. Application of a target gas is a performance “check” only.

6.1 Clean Environment

The **IR-6000** is factory zeroed and spanned. Unlike catalytic sensors, the **IR-6000** typically does not require routine field span gas calibration to ensure proper operation.

In a relatively clean environment, zero and performance check should done once every 6 months. To check the performance, expose the **IR-6000** to a known level of the target gas and verify that the reading is adequately close to the known level.

6.2 Dirty or Dusty Environment

When the application is a dirty dusty environment, the **IR-6000** should be checked more frequently.

The **IR-6000** can be calibrated for almost any hydrocarbon using a calibration gas of the hydrocarbon that is to be detected (target gas). The **IR-6000** is required to be spanned with gas only one time with the target gas. Typically, this is done at the factory, but it is possible to field span the device by connecting the **IR-6000** to a computer and using the software package option. Contact **ENMET** for availability.

6.3 Normal Calibration

It is recommended that a cylinder of “clean air” be used to reform the zero calibration. Cylinder 20.9 air is **ENMET** part number 03296-209. If the sensor is located in an area that is known to be free of the hydrocarbon gases then ambient air can be used as a zero reference.

If a cylinder is used for the zero calibration, there is a calibration port on the bottom of the sensor for a 1/8” ID tubing connection.

If the Monitor is reading slightly up scale and it is known that no combustible gas is in the area, the **IR-6000** can be zeroed by touching the white wire to the black wire for 10 seconds.

7.0 Specifications

Detection Method	Diffusion
Output (analog)	4–20 mA (Source type), max. 1000 Ohm load at 24 VDC supply voltage
Response Time	T50 < 5 seconds T90 < 10 seconds
Construction	Sensor housing is nickel-plated aluminum and stainless steel. Optional stainless steel model available.
Ingress rating	IP54
Accuracy	+/- 3% LEL, 0 to 50% LEL (Lower Explosive Limit) +/- 5% LEL, 51 to 100% LEL
Operating Temperature Rating	-40° to +70°C at 0 to 99% RH (non-condensing)
Operating Voltage	24 VDC, Operating range: 18 to 32 VDC measured at the detector head
Power Consumption	5 Watts Max.
Max. Current Draw(at 24 VDC)	Average: 210 mA, Peak: 400 mA
Approvals	CSA, Class 1, Division 1, Groups B, C and D

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

8.0 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 is 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
80003-090
MCN-331, 04/22/05
MCN-341, 08/02/06
MCN-427, 11/03/10

Notes:



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.



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: \$ _____