

Operating Manual

Read instructions before operating

Model 21-070 Mini Gas Leak Detector

Model 21-070: 115/230 V, 50/60 Hz

July 2023

Rev. 4

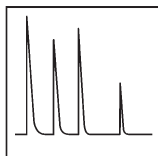


For new instrument right out of the box or one that has not been used for quite some time:

Charge with Power “OFF” for 1 - 2 hours before operating.

If the “Power Light” Flashes after power up See Manual Section 9-0.

This Indicates a Low Battery and will be fully charged after 6 - 7 hours.



GOW-MAC[®]
INSTRUMENT CO.

Contents

1-0	Model 21-070 Mini Gas Leak Detector	5
2-0	Specifications	5
3-0	Instrument Operation	6
3-1	Front Panel - Display/Controls.....	6
3-2	Back Panel	7
3-3	Operation	8
4-0	Leak Checking Procedure.....	8
5-0	Instrument Setting Descriptions	9
6-0	Moving About the Menu	11
7-0	Example: Changing the Alarm Mode from On to Off.....	12
8-0	Troubleshooting.....	13
9-0	Charging the Battery / AC Operation	14
10-0	Sensitivity.....	14
11-0	Replacement Parts List.....	17

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The warranties made by GOW-MAC® Instrument Co. with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual.

Please protect yourself and your employees by following these operating instructions. We encourage our customers to write or call for any additional information relative to the use or repair of this instrument.

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1-0 Model 21-070 Mini Gas Leak Detector

- 1-1 The GOW-MAC® Model 21-070 Gas Leak Detector is supplied with a 3-1/2' sampling probe and a 6' power cord.
- 1-2 The instrument contains a thermistor-type thermal conductivity detector (TCD), vibrator-type pump, and a printed circuit board containing all silicon type solid state devices.
- 1-3 The Model 21-070 operates on 115/230 volts, 50/60 Hz or on a single internal rechargeable Ni-MH battery. An audible tone generator is incorporated with a speaker output. The audio signal permits the technician to test for leaks without visually scanning the meter.

2-0 Specifications

Detector	Thermal Conductivity Cell
Visual Readout	LED Bar Graph featuring adjustable brightness Peak hold with settable duration
Pump	Diaphragm type
Line Voltage	115/230 Volts, 50/60 Hz
Battery	Rechargeable Ni-MH – 3.6 V / 1650 mAh
Battery Life	Approximately 15 hours
Ranges	Low: x1 High: x100 Adjustable span per range
Zero	Manual with drift elimination
Audio Signal	Audible Alarm with adjustable set point and volume
Dimensions	3.25" W x 1.81" H x 5.25" L (20.955 x 4.5974 x 13.335 cm)
Weight	Instrument: 1.05 lbs (476 grams) Charger: 0.61 lbs (277 grams)
Features	Low battery alarm Very low battery shutdown Flash memory for saving settings Microprocessor controlled
Operating Temp. Range	70 °F ± 20 °F (21 °C ± 11 °C)



THE GOW-MAC GAS LEAK DETECTOR IS *NOT* DESIGNED TO BE USED TO DETERMINE LEAKS OF COMBUSTIBLE GASES. IT IS DESIGNED TO DETERMINE LOW LEVEL LEAKS OF ANY GAS HAVING A DIFFERENT THERMAL CONDUCTIVITY THAN AIR. UTILIZING THIS PROPERTY, IT IS THEREFORE NOT SPECIFIC TO ANY GAS OR VAPOR. A COMBUSTIBLE GAS LEAK DETECTOR SHOULD BE USED FOR THE DETERMINATION OF COMBUSTIBLE GAS LEAKS IN POSSIBLE HAZARDOUS CONDITIONS.

3-0 Instrument Operation

3-1 Front Panel - Display /Controls

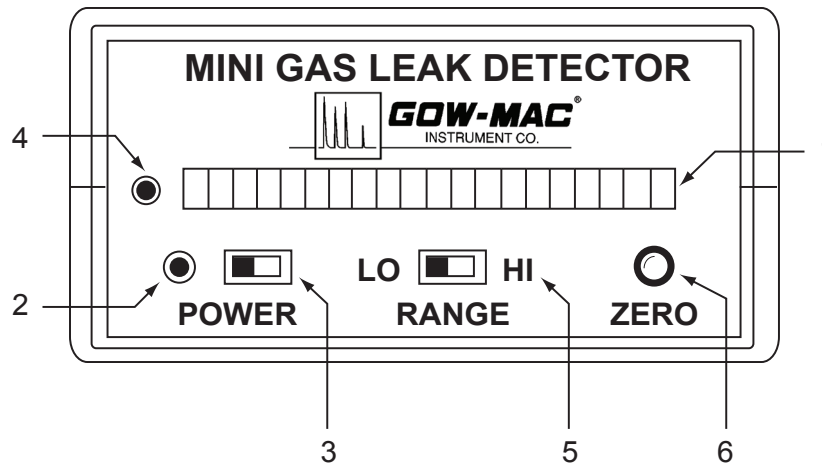


Figure 3-1

3-1-1 Dual Function LED Display

Leak detection indicator and instrument programming/status indication.

3-1-2 Power Indicator

Illuminates when Mini-Leak Detector is "ready" to locate leaks. Flashes "on" and "off" when the internal battery is need of charging.

3-1-3 Power Switch

Off/On – Switch from standby to normal operating mode

3-1-4 Polarity Indicator

LED “on” in the presence of air or the presence of any noncorrosive gas with a relative thermal conductivity greater than 1.00 (air).

LED “off” in the presence of any noncorrosive gas with a relative thermal conductivity less than 1.00 (air).

3-1-5 Range Switch

Lo/Hi Sensitivity – “Lo” for quickly locating larger gas leaks

“Hi” position for locating lower level gas leaks

Cursor Direction Dictator: used within programming mode

3-1-6 Zero Button

Initiate “Zero” function – adjusts measurement baseline for current environmental operating conditions.

Use to enter programming mode, save programmed settings, exit, and move programming cursor. Refer to section 6.0.

3-2 Back Panel

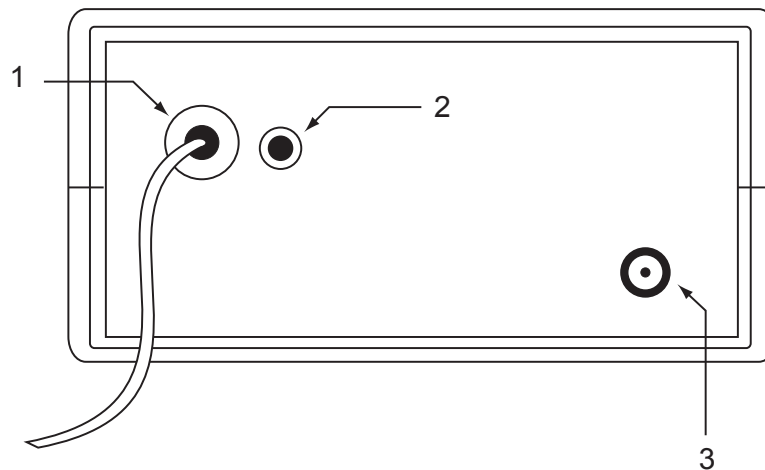


Figure 3-2

3-2-1 Sample Probe Inlet

3-2-2 Reference Inlet

3-2-3 Power Adapter Connector

3-3 Operation

- 3-3-1 With power switch “ON” and power indicator illuminated, allow instrument to stabilize. Longer stabilization periods maybe needed depending upon operating conditions or environment.
- 3-3-2 Select Lo/Hi Range as appropriate for the level of leak gas to be located.
- 3-3-3 While holding measurement probe, set Instrument “Zero” level by pressing the front panel button until a single beep is heard. The instrument in now ready to locate leaks.
- 3-3-4 Move the probe slowly toward the area to be checked for leaks, making sure not exhale on or near the measurement probe or instrument itself. For locating very small leaks, on “HI” range it may be necessary to isolate your hand from the probe by use of a non-permeable glove.
- 3-3-5 Monitor the instrument front panel; the display will illuminate an increasing number of indicators when gas is detected relative to the “Zero” level.

4-0 Leak Checking Procedure



**EXTREME CARE SHOULD BE EXERCISED
WHEN THE PROBE IS USED AROUND
ELECTRICAL HEATERS, SWITCHES, ETC.**

- 4-1 Care must be exercised to avoid exhaling of breath near the probe or instrument housing itself. The carbon dioxide (CO₂) exhaled can be drawn into the PROBE or REF (reference) chamber of the leak detector causing a deflection of the LEDs.
- 4-2 If helium (He) is being checked, a leak will cause the LEDs to illuminate to the right with the *Polarity Indicator* in the ON position, while most other gases or vapors will deflect the LEDs to the right with the *Polarity Indicator* in the OFF position.
- 4-3 When checking for leaks, it is **IMPERATIVE** that fittings or suspected leak areas are **DRY**. If the area has previously been checked with a water based bubble type solution and **HAS NOT BEEN DRIED**, low readings, as well as possible detector contamination, will occur. The thermal conductivity of water vapor will counteract the signal from helium leaks. The net effect will be relatively no LED or audio signal output.



**DO NOT ALLOW MOISTURE TO BE DRAWN
INTO THE PROBE!**

- 4-4 Using the probe, carefully move the tip around and over suspected joints, seals, seams, or other areas where leaks occur. The probe must be moved slowly to detect small leaks. The net effect will be no, or low display readings.
- 4-6 A leak is indicated if deflection of the LEDs is seen or an audible signal is heard.

Remove the probe from the area, allow the LED indicators to settle to zero (rezero if necessary), and return probe to the suspected location to verify the leak.
- 4-7 For more detailed information on leak detector sensitivity, refer Section 10-0 Sensitivity.

5-0 Instrument Setting Descriptions

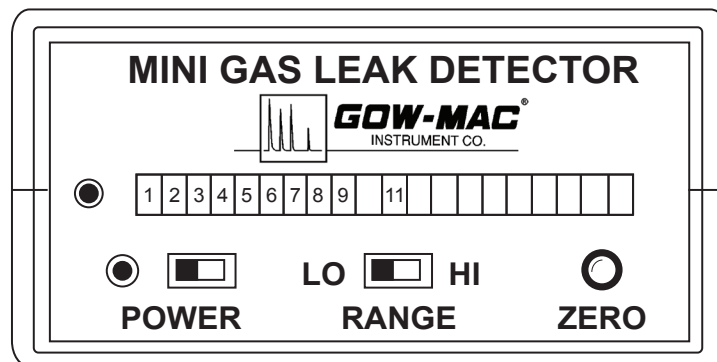


Figure 5-1

- 5-1 **Alarm Set point (LED# 1)**
Sets the LED that will trip the alarm.
- 5-2 **Peak Hold Delay (LED# 2)**
Sets the number of seconds for the peak hold. Example: LED number is equal to the number of "hold" seconds; therefore, an LED setting of "3" will set the hold at "3" seconds.
- 5-3 **LED Brightness (LED# 3)**
Set the LED brightness. Brightness changes in relation to the LED number, i.e., the lower the LED setting, the greater the brightness, the higher the LED setting, the less bright the LED becomes.
- 5-4 **Buzzer Volume (LED# 4)**
Sets the buzzer volume. Volume changes in relation to the LED setting, i.e., the higher the LED setting, the louder the buzzer becomes; the lower the LED setting, the quieter the buzzer becomes.
- 5-5 **LO Range Sensitivity (LED# 5)**
Sensitivity changes in relation to the LED number, i.e., the lower the LED setting, the more sensitive the instrument becomes; the higher the setting the less sensitive the leak detector becomes.

5-6 **HI Range Sensitivity (LED# 6)**

Sensitivity changes in relation to the LED setting, i.e., the lower the LED number setting, the more sensitive the instrument becomes; the higher the setting the less sensitive the leak detector becomes.

5-7 **Alarm Mode (LED# 7)**

Sets the alarm mode.

- 1 = OFF
- 2 = ON (Audio only)
- 3 = N/A
- 4 = N/A

5-8 **Time Constant / Averages (LED# 8)**

Sets the number of measurement samples averaged before a reading is displayed. The higher the setting, the more measurement samples are averaged.

5-9 **Drift Elimination (LED# 9)**

Acts as a "slow auto zero". It is only active when < 3 LEDs are on. The higher the LED setting, the faster the "slow auto zero" reacts. At the lowest setting, the fastest the "slow auto zero" will react is 90 seconds. At the highest setting, the fastest it will react is 14 seconds.

5-10 **Pump Speed (LED# 11)**

The higher the LED setting, the faster the pump motor runs and is an adjustment of flow through the instrument.

5-11 **Software Revision (LED# 19)**

Indicated the current software revision.

5-12 **Instrument Settings — Factory Defaults**

<u>LED#</u>	<u>Setting</u>	<u>Description</u>
LED 1	20	Alarm "Set point" set on 20 "maximum"
LED 2	1	LED "peak hold delay", set on 1 "minimum"
LED 3	6	LED Brightness set on 6 "brightest" (1-6)
LED 4	3	Buzzer volume, set on 3 (1 "off" to 7 "loudest")
LED 5	1	Lo range sensitivity, set on 1 (1 "most" sensitive to 20 "least")
LED 6	10	Hi range sensitivity, set on 10 (1 "most" sensitive to 20 "least")
LED 7	2	Alarm mode, set on 2 (1 to 4), (sound after "full" range)
LED 8	20	TC filter/average, set on 20 (1 "least" averaging 20 "most")
LED 9	11	Drift elimination, set on 11 (1-20)
LED 11	15	Motor speed, set on 15 (1 "slowest" to 20 "fastest")
LED 19	9	Software Rev., LED 2 (Latest revision "9")

6-0 Moving About the Menu

6-1 To Enter *Program Mode*

Press and hold the **Zero** button until you hear a double beep (approximately 6 seconds). The first LED will be illuminated signifying the first category.

6-2 To Change Category

To move to a higher category, place the **Range** switch in the “HI” position and momentarily press the **Zero** button. The next higher LED will illuminate.

To move to a lower category, place the **Range** switch in the “LO” range and press the **Zero** button. The next lower LED will illuminate.

6-3 To Enter a Category

Press and hold the **Zero** button until you hear a second beep (approximately 3 seconds). The current setting for that particular category will be displayed on the LED bar graph.

6-4 To Change the Value of a Category

To move to a higher value, place the **Range** switch in the “HI” position and momentarily press the **Zero** button. The next higher LED will illuminate.

To move to a lower value, place the **Range** switch in the “LO” position and momentarily press the **Zero** button. The next lower LED will illuminate.

You may now save the value to memory or exit without saving. If you exit without saving, the new value will remain in use until the unit is powered off. The next time power is turned on the old value will be used.

6-5 To Save the Value to Memory

Press and hold the **Zero** button until you hear a second beep (approximately 3 seconds). The new value for that category will be saved to flash. The category will be exited and the category number will be displayed on the LED bar graph. You may now change to a different category or exit the *Program Mode*.

6-6 To Exit Program Mode

Press and hold the **Zero** button until you hear a double beep (approximately 6 seconds). The power indicator will illuminate, the instrument is now ready for normal operation.

7-0 Example: Changing the Alarm Mode from On to Off

7-1 Enter Program Modes

Press and hold the **Zero** button until you hear the double beep (approximately 6 seconds) and then release. The instrument is now in *Program Mode* and the first category LED will be illuminated.

7-2 Change the category

With the **Range** switch to the right, momentarily press the **Zero** button until the 7th LED illuminates (Alarm Mode Category).

7-3 Enter Categories

Press and hold the **Zero** button until you hear the second beep (approximately 3 seconds) and then release. The instrument has entered the *Alarm Mode* category. The current setting of the Alarm Mode will now be displayed on the LEDs (“ON” = LED 2).

7-4 Change Setting of the Category

Put the **Range** switch to the left to go down in value when pressing the **Zero** button. Momentarily press the **Zero** button to change the setting to the first LED. The *Alarm Mode* is now “OFF”.

7-5 Save to Memory and Exit Category

Press and hold the **Zero** button until you hear a single beep (approximately 3 seconds) and then release. The new value has been saved to flash and you have exited the *Alarm Mode* category. The instrument is still in *Program Mode* and the category 7 LED will be lit. You can now go to another category and enter it or you can exit *Program Mode*.

7-6 Exit Program Mode

Press and hold the **Zero** button until you hear the double beep (approximately 6 seconds) and then release. You are now out of *Program Mode* and the leak detector will be under normal operation.

8-0 Troubleshooting



REMOVE POWER CORD/ADAPTOR FROM OUTLET.

- 8-1 Instrument will not zero
 - 8-1-1 Check for clogged probe or obstructed reference inlet.
 - 8-1-2 Check instrument settings. Reset to factory defaults if necessary.
- 8-2 Response time has increased
 - 8-2-1 Diaphragm on pump is leaking. Replace diaphragm.
 - 8-2-2 Sample line (probe) has become punctured. Replace probe assembly.
- 8-3 Sensitivity has decreased
 - 8-3-1 Sample line (probe) has been punctured. Replace probe assembly.
 - 8-3-2 Probe assembly leaking. Replace probe assembly.
 - 8-3-3 Pump operating improperly. Replace pump.
 - 8-3-4 Check instrument settings. Reset to factory defaults if necessary.
- 8-4 If repair service is needed, the instrument should be returned to the factory for repair. Before returning the instrument, contact our repair department to obtain a Return Material Authorization number (RMA) and a Health and Safety Declaration form. Instruments returned without these items will not be allowed to enter our facilities. Note: the Health and Safety form may be found at the back of this manual or on our web site at: <http://www.gow-mac.com/ServiceSupport/TechnicalAssistance/Instruments.aspx>

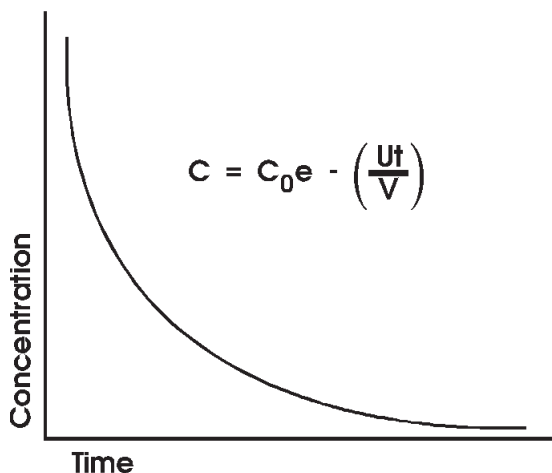
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9-0 Charging the Battery / AC Operation

- 9-1 The Model 21-070 Mini Leak Detector operates off an internal battery. When the battery is discharged, the *Power Indicator* will begin flashing. The instrument may continue to be run while the light is flashing, however the unit will shut down automatically when the battery is discharged to a point that it will no longer operate correctly. When using the supplied +9 Volt AC adaptor, the instrument will operate and slowly recharge the battery. To fully charge the battery, switch the instrument power "off" and allow to charge for a approximately 6 to 7 hours.

10-0 Sensitivity

- 10-1 Before a definition of sensitivity can be resolved, it is necessary to consider the various parameters involved. Sensitivity of an instrument is associated with its ability to detect gaseous mixtures from a filled system maintained at constant concentration.
- 10-2 The Leak Detector is capable of detecting leaks as small as 10^{-5} atm. cc/sec. Detecting a leak of this magnitude requires a skilled operator. In many applications, the escape rate is so low that the sample drawn into the detector is diluted because the sample rate is too high. Consider the case of a filled system with definitive volume. Here, if the sample is removed from the volume, it must be replaced if pressure is to remain the same. A tank filled with Helium-Air will change in concentration if a sample is with drawn at constant pressure. The change in concentration usually follows an exponential curve:



where

- V = volume of flask (cc.)
- U = flow rate (cc./sec.)
- t = time (sec.)
- C_0 = initial Concentration (t = 0)
- C = concentration at any time, t

Above time curve is from Williams and Winefordner, *Journal of Gas Chromatography*, July, 271, (1966).

10-3 The method described in the cited paper, as well as certified mixes, is used in determining the sensitivity of the Leak Detector. If a leak from a gas filled system into the atmosphere occurs at ambient temperatures and pressures, it is extremely important it be detected as close to the leak point as possible. The escape rate, if lower than the sampling rate, will be reflected by a deflection of the indicating device, followed by a reverse deflection as dilution occurs. In the case of such a leak, the sample drawn through the probe and the rate of flow in the tube must be considered. The sampling rate must be low enough so dilution will be negligible, yet high enough to insure reasonable speed of response. The probe must come close enough to the source of the leak to contact the maximum available sample. If the probe is moved slowly around the suspected area and covers all possible sources of leaks and the display or indicator is carefully observed during the entire time, it is possible to locate very minute leaks.

The location of the display's indicator is not important. A leak is usually noted by deflection of the indicator. The indication will be to the right with the polarity indicator being ON or OFF depending on the gas located. The suspect area should be reprobod after a short time to insure a leak was picked up and not some extraneous effect. The indication of leaks requires careful probing and rechecking of the area when indications are noted.

10-4 Sensitivity

Minimum leak rate required to produce 10% deflection of full scale.		
Helium (He)	1.0×10^{-5} cc/sec	0.012 cu ft/yr
Argon (Ar)	1.0×10^{-4} cc/sec	0.110 cu ft/yr
Carbon Dioxide (CO ₂)	1.0×10^{-4} cc/sec	0.123 cu ft/yr
Refrigerant	1.1×10^{-4} cc/sec	0.123 cu ft/yr
40% H ₂ , 60% He (fuel mixture)	1.0×10^{-5} cc/sec	0.012 cu ft/yr

11-0 Replacement Parts List

Part No.	Description
021-5-SS	Thermal Conductivity Detector Cell
021-9-1	Probe Assembly, Mini Leak Detector, Complete
133-124	Pump, Vacuum Micro Assembly, 3 V dc
119-120	Battery, 3.6 V / 1650 mAh
118-100	A/C power adapter/charger, 115 V ac / 9 V dc & 230 V ac / 9 V dc

Warranty

ALL INSTRUMENTS SOLD BY GOW-MAC® INSTRUMENT CO. ARE WARRANTED FOR A PERIOD OF ONE YEAR AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP. THE TERMS OF THIS WARRANTY ARE AS FOLLOWS:

1. The warranty period begins with the shipping date of the equipment to the original purchaser.
2. Certain parts such as batteries, fuses, glass accessories, septa, columns, etc., are expendable in normal use, and their service life is unpredictable. Such items are not covered by this warranty.
3. Filaments of thermal conductivity detectors are not covered by this warranty.
4. Hydrogen Palladium Tubes are not covered by this warranty.
5. All requests for service or repair under this warranty must be received within the warranty period by GOW-MAC® or its authorized representative. All repairs are made at GOW-MAC plants or at the office of authorized representatives.
6. All repairs, adjustments, and other services under this warranty shall be performed free of charge to the purchaser. However, warranty service and repairs shall be limited to equipment malfunctions which, in the opinion of GOW-MAC®, are due or traceable to defects in original materials or workmanship. Instrument malfunctions caused by abuse or neglect of the equipment are expressly not covered by this warranty.
7. Instrument parts which have been repaired or replaced during the warranty period are themselves warranted only for the remaining unexpired portion of the original one-year warranty.
8. Repairs, adjustments, and service performed after expiration of the one-year warranty period shall be charged to the purchaser at the then current prices for parts, labor, and transportation.
9. This warranty attaches to the equipment itself and is not limited to the original purchaser. Unexpired portions of the warranty are thus transferable to subsequent owners.
10. GOW-MAC® expressly disclaims any liability to users of its products for consequential damages of any kind arising out of or connected with the use of its products.
11. Except as stated in Sections 1 through 8 above, GOW-MAC® makes no warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated in Sections 1 through 8 above, GOW-MAC® shall have no liability under any warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise.
12. Statements made by any person, including representatives of GOW-MAC® which are inconsistent or in conflict with the terms of this warranty shall not be binding upon GOW-MAC® unless reduced to writing and approved by an officer of the Company.
13. This warranty shall be governed by the laws of the Commonwealth of Pennsylvania.

7/5/23
kj

Health and Safety Declaration for the Return of GOW-MAC Instrument Co. Equipment

In order to protect our employees from exposure to various hazards, the following statements and/or questions **MUST** be answered by you. Fill out this document in its entirety and either fax or e-mail it to GOW-MAC Instrument Co., Attn: Repair Dept, **BEFORE** returning the product.

The instrument/part being returned **will not** be accepted into GOW-MAC's facility until we receive this completed document, along with a **PO or Credit Card**. Once approved for return by our Chemical Safety Officer, a **Return Materials Authorization (RMA) number** and shipping instructions will be issued. *All applicable regulations should be followed when returning instrumentation, and/or parts.*

Customer to Record the Following:

Model # / Part # _____

Serial #: _____

Service Technician spoken to: _____

Today's Date: _____

IF THIS FORM IS NOT APPROVED BY OUR CHEMICAL SAFETY OFFICER, THE INSTRUMENT/PART WILL NOT BE PERMITTED INTO OUR FACILITY FOR SERVICING!

- A] Brief explanation of issue: _____
- B] Briefly list the application(s) for which the instrument/part was used, as well as any and all chemicals, gases, and/or materials analyzed and their concentrations. **(Must be filled in):** _____
- C] Is there the possibility of internal or external contamination on or in this instrument/part?
 Yes – see below No – proceed to D.

Please check the appropriate box.

- Chemicals or Substances That Are Hazardous to Health
- Blood, Body Fluids, (e.g. Urine, Secretions), Pathological Specimens
- Regulated Medical Wastes
- Infectious Substances or other Bio-Agents (e.g. Protein, Enzymes, Antibodies)
- Radioactive Isotopes used in the area. Detail type (ECD, Isotopic Labels, etc) and Activity in Micro Curies
- Biodegradable Material That Could Become Hazardous
- Other Hazards _____

If any of the above boxes are checked the following statements and/or questions must be answered.

1. Specifically describe where (on or in) the instrument/part there could be any residual contamination (for example: blood spill on the surface). _____
2. Provide details of these hazards. Include names, Material Safety Data Sheets (MSDS), and concentration of contaminants, where possible. _____
3. Describe the method of decontamination used. Attach Procedure. _____

- D] I declare that the above information is true and complete to the best of my knowledge. I acknowledge that any inconsistencies between the condition of the instrument and the statements made on this form will delay the repair process.

Authorized signature _____ Date: _____

Name (Printed) _____ Phone number: _____

Company name: _____ Fax number: _____

Shipping address: _____

City: _____ State/Country: _____ Zip: _____

E-mail address: _____

BEFORE item can be shipped, fax completed form to: (610) 954-0599 or e-mail it to: repairs@gow-mac.com

For GOW-MAC Use Only:	Signed: _____	Date ____/____/____
<input type="checkbox"/> Passed Safety Inspection. OK to proceed to Repair Dept.	Chemical Safety Officer	Comments: () None
<input type="checkbox"/> Failed safety Inspection. DO NOT proceed to Repair Dept.	RMA No: _____	() On Back >>>>



