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Agilent Technologies

Eyesys Mini-B/A Gauge Controller

INSTRUCTION MANUAL

Manual No. 699908205
Revision H
November 2002

Eyesys Mini-B/A Gauge Controller

Preface

Warranty

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

Warranty Replacement and Adjustment

All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller's determination with regard thereto shall be final.

If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may be made on Products so returned.

3/1/00

Hazard and Safety Information

This manual uses the following standard safety protocols:

WARNING

The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.

CAUTION

The caution messages are displayed before procedures, which if not followed, could cause damage to the equipment.

NOTE

The notes contain important information.

Operators and service personnel must be aware of all hazards associated with this equipment. They must know how to recognize hazardous and potentially hazardous conditions, and know how to avoid them. The consequences of unskilled, improper, or careless operation of the equipment can be serious. This product must only be operated and maintained by trained personnel. Every operator or service person must read and thoroughly understand operation/maintenance manuals and any additional information provided by Varian Vacuum Technologies. All warning and cautions should be read carefully and strictly observed. Consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Varian Vacuum Technologies office.

EMC Warnings

EN 55022 Class A Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

NOTE

The equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generated, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is also likely to cause harmful radio communications interference in which case the user will be required to correct the interference at his own expense.

Installation Requirements

To maintain compliance with both the FCC Part 15 rules and the European Union's EMI directives, the user must use a shielded cable constructed of a braided shield and metal or metalized plastic backshells directly connected to the cable shield at the 15 pos D-Sub connector of the Eyesys Mini-BA. The shield must be connected to ground at the user's equipment. Failure to install the equipment in this way may result in the unit no longer meeting the requirements for radiated emissions and susceptibility.

Use with Combustibles and Mixtures

WARNING

As with all ionization gauges, this device is not intrinsically safe. Exercise extreme care when using this vacuum gauge while pumping or backfilling a system or in any other system condition which contains combustible gases or mixtures. The filament, the end of a hot filament ion gauge and the high voltage discharge of a cold cathode gauge can be ignition sources.

When such a gas or mixture is present, do not turn on any such vacuum gauge.

Failure to follow this instruction could result in serious injury to personnel and damage to equipment.

Vacuum Equipment and Cleanliness

Cleanliness is vital when servicing any vacuum equipment.

CAUTION

Do not use silicone oil or silicone grease.

Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.

Do not clean any aluminum parts with Alconox® . Alconox is not compatible with aluminum and will cause damage.

NOTE

Normally, it is unnecessary to use vacuum grease. However, if it must be used, do not use silicone types, and use it sparingly. Apiezon® L grease is recommended (Varian Part Number 695400004).

Contacting Varian Vacuum Technologies

In the United States, you can contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

Internet users:

- Send email to Customer Service & Technical Support at vpl.customer.support@varianinc.com
- Visit our web site at www.varianinc.com/vacuum
- Order on line at www.evarian.com

See the back cover of this manual for a listing of our sales and service offices.

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Declaración de Conformidad
Verklaring de Overeenstemming
Dichiarazione di Conformità
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Eyesys Mini-B/A Gauge Controller

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a cui se rifersce questa dichiarazione è conforme alla/e sequente/I norma/o documento/I normativo/i.

EN 55011 – 1991 . . . . . Group 1 Class A ISM emission requirements
EN 50082-2 – 1995 . . . . . EMC heavy industrial generic immunity standard
EN 61010-1 – 1993 . . . . . Safety requirements for electrical equipment for measurement, control, and laboratory use incorporating Amendments Nos 1 and 2.

Frederick C. Campbell

CE

Frederick C. Campbell
Operations Manager
Varian Vacuum Technologies
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October 2002

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Eyesys Mini-B/A Gauge Controller

Description

The Eyesys Mini-BA is a vacuum measuring system of miniature Bayard-Alpert design. The transducer tube is of all metal design with internal grounding, requiring no special grounding from the Mini-BA to the chamber.

Specifications

Table 1 Eyesys Mini-B/A Gauge Controller Specifications

Units	Pascal, mbar or Torr, preset at factory
Pressure Range	1.3 Pa ($1.3x10^{-2}$ mbar, $1x 0^{-2}$ Torr) to $2.7x10^{-7}$ Pa ($2.7x10^{-9}$ mbar, $2x10^{-9}$ Torr)
Input Power Supply Required	24 VDC ±10%, at 0.500A
Output Signal	1-9V, 1V/Decade, Logarithmic
Output Impedance	100 Ohms
Minimum Load Impedance	1 Ohms
Temperature Range	0-50 °C operating, –15 to 70 °C storage
Setpoint Relays	2 N.O. SPST relays, rating 40 VDC, 100mA
Degas	E-beam at 4 Watts for fifteen minutes
Size	3 31/44" H (from flange face) x 3 11/42" W x 3 11/42" D
I/O Connection	15-pin D-subminiature
Overpressure	$1x10^{-2}$ Torr
Overpressure Limit	130k Pa/1.3 bar/1000 Torr
Cleaning	External surfaces may be cleaned with a slightly damp soft cloth
Environmental	0-50 °C, 80% RH non-condensing
Installation	Indoor use, Installation Category II, Pollution Degree 2
Altitude	2000 meters

Options

The Eyesys Mini-BA is available with many options for front panel pressure display, serial communication and transducer fittings. See the catalog or brochure for ordering information.

Table 2 Eyesys Mini-BA Options

Displays	Serial Communication	Fittings
None	RS-232	NW16 KF
Bargraph	RS-422	NW25
Digital Numeric	RS-485	1.33" CFF

Installation

Electrical

Pinouts for the 15-pin D-subminiature connector are listed in Table 3.

Table 3 Standard Mini-BA and RS-232 Option

Standard Mini-BA		RS-232 Option	
1	Degas ON/OFF control	1	Degas ON/OFF control
2	Degas Status output	2	Degas Status output
3	Emission Status output	3	Emission Status output
4	Setpoint 1 contact	4	Setpoint 1 contact
5	Setpoint 2 contact	5	Setpoint 2 contact
6	+24V Power	6	+24V Power
7	Power and Status Ground	7	Power and Status Ground
8	[reserved]	8	RS-232 Tx
9	Pressure Signal Output	9	Pressure Signal Output
10	Signal Ground	10	Signal Ground
11	Emission ON/OFF	11	Emission ON/OFF
12	Setpoint 1 contact	12	Setpoint 1 contact
13	Emission control, pulse	13	Emission control, pulse
14	[reserved]	14	RS-232 Rx
15	Setpoint 2 contact	15	Setpoint 2 contact

Table 4 RS-422 and RS-485 Options

RS-422 Option		RS-485 Option	
1	Degas ON/OFF control	1	Degas ON/OFF control
2	Degas Status output	2	Degas Status output
3	Emission Status output	3	Emission Status output
4	Setpoint 1 contact	4	Setpoint 1 contact
5	Setpoint 2 contact	5	Setpoint 2 contact
6	+24V Power	6	+24V Power
7	Power and Status Ground	7	Power and Status Ground
8	RS-422 Tx–	8	RS-485 T–
9	RS-422 Rx–	9	Pressure Signal Output
10	RS-422 Rx+	10	Signal Ground
11	Emission ON/OFF	11	Emission ON/OFF
12	Setpoint 1 contact	12	Setpoint 1 contact
13	Emission control, pulse	13	Emission control, pulse
14	RS-422 Tx+	14	RS-485 T+
15	Setpoint 2 contact	15	Setpoint 2 contact

- ❑ At minimum, +24V power and Power Ground connections are required. Pin 7, “Power and Status Ground” is required for safe operation of the system. Shielded cable is required for CE and FCC compliance. See “EMC Warnings”, Page ii.
- ❑ Setpoint contacts are Normally Open contact closures.
- ❑ See “Remote Control Lines” on page 10, for usage of status and control pins.

Mounting

Viton O-rings are recommended for KF fittings for most applications. For highly reactive or corrosive applications, consult O-ring manufacturer.

Ensure adequate ventilation by making sure that there is approximately 1 inch (25 mm) of free air space around the ventilation openings and that air flow is not blocked.

Mini-BA Tube Replacement Procedure

1. Loosen 5x #4 PHMS from front and rear of case (Figure 1).

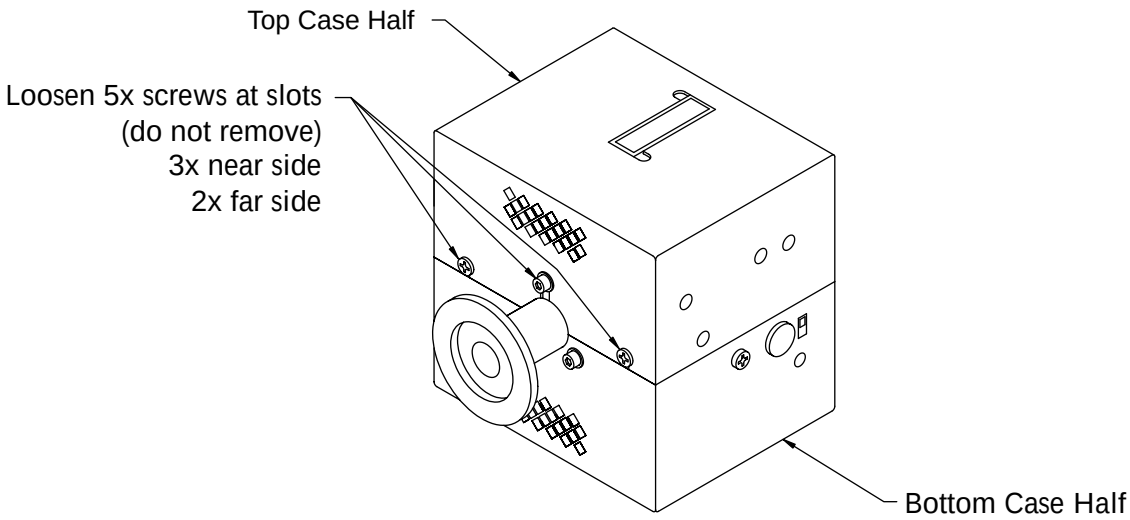

Figure 1 Loosening 5x #4 PHMS from Front and Rear of Case

2. Remove top half of case assembly and place next to bottom case half assembly as shown in Figure 2.

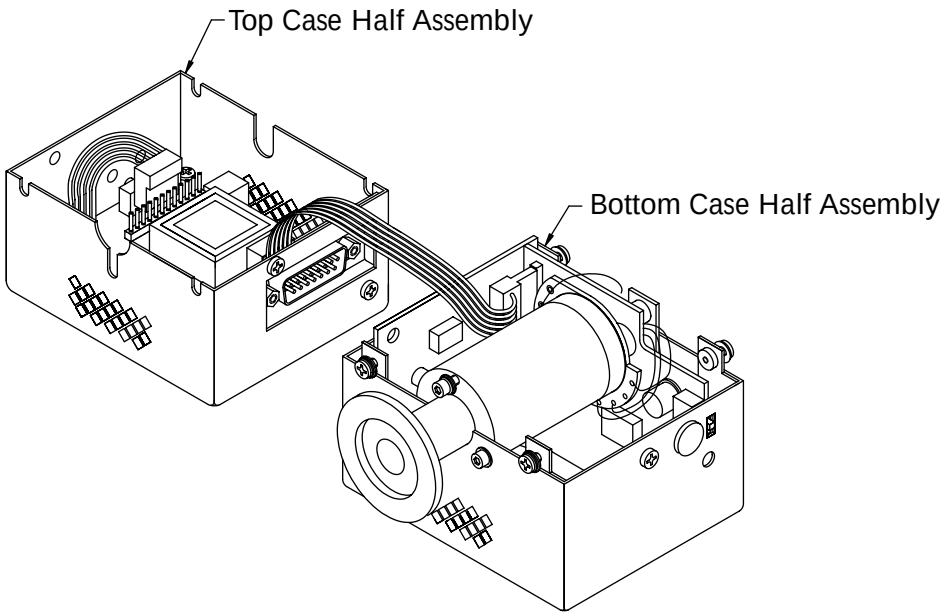

Figure 2 Removal and Placement of Top Half Case Assembly

3. Remove 3x socket head cap screws and lockwashers as shown in Figure 3, and save for re-use.

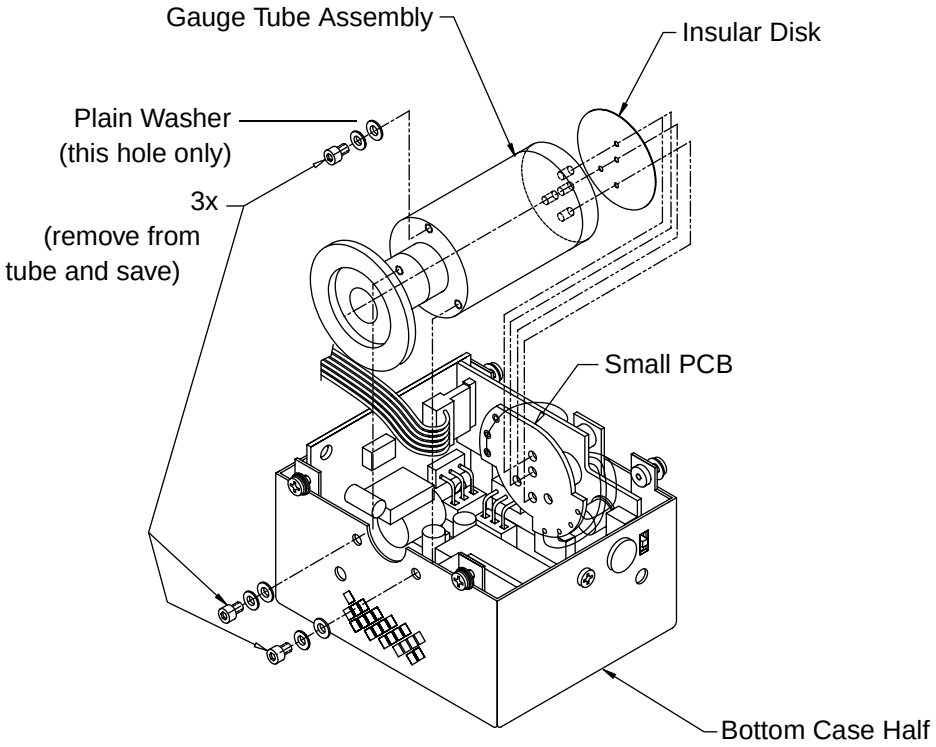

Figure 3 Removal of Socket Head Cap Screws and Lockwashers

4. Slowly raise and remove tube from lower box half while disengaging (sliding out) pins of tube from small PCB. Discard old tube and insulator disc.
5. Using new gauge tube assembly and insulator disc supplied, plug pins of tube into small PCB and slowly lower into the bottom case half using reverse process of step 4.

   Caution should be taken to not bend/stress pins during re-assembly. Note proper alignment of tube pins/receptacles while re-inserting tube and make sure tube pins are fully engaged in small PCB receptacles.
6. Re-install 3x (allen) socket head cap screws and lockwashers, as shown in Figure 4. Align and tighten tube assembly to bottom case half.
7. Fold over top case assembly onto bottom case and tighten 5x screws.

Dimensional Diagram

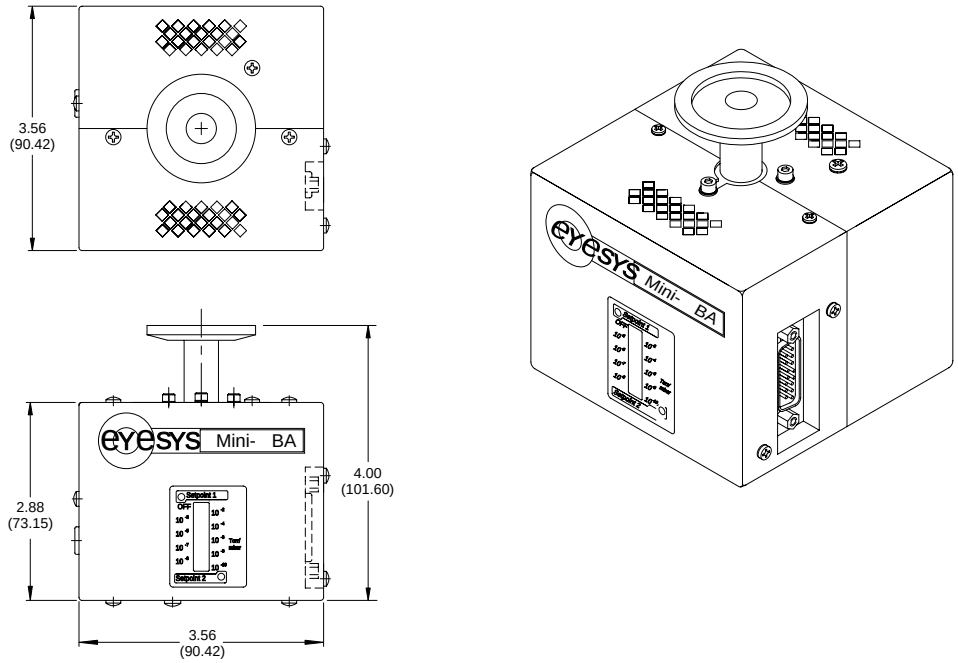

Figure 4 Dimensional Diagram

Display

The LED bargraph display provides an indication of pressure level throughout the operating range of the gauge. When the filament is OFF, the topmost LED is illuminated. When the filament is ON, the illuminated LED indicates the decade range of the current pressure reading. LED indications other than a single LED have special meanings. Table 5 lists the error conditions and their descriptions.

Table 5 Bargraph Display Indicators

LED Bargraph Display	Indicates
Single flashing LED at top of scale	Emission OFF
Single flashing LED throughout the range	Degas activated (see Controls, Degas)
Five flashing LEDs	Error 5
Six flashing LEDs	Error 6
Eight flashing LEDs	Error 8
Nine flashing LEDs	Error 9
Single led flashing at bottom of scale	EEPROM Checksum Error

Digital Display Option

The optional digital display mode reads pressure directly, for example, $7.8x10^{-2}$ Pa reads “7.8-2”, $1.3x10^{-6}$ Torr reads “1.3-6”. Error readings are also read directly, example, “E06”.

Front Panel Controls

The following controls are active only in Local Control (see Serial Communications Option for Remote Control).

Emission ON/OFF Button

If the display shows a single flashing LED at the top of the scale, emission is off. Pressing the Emission ON/OFF button turns emission ON, and pressure readings commence after a five second delay for stabilization.

At any time during pressure readings, emission may be turned OFF by pressing the Emission ON/OFF button.

Errors 5, 6 and 9 must be cleared by pressing the Emission ON/OFF button before commencing further readings (see Error Conditions).

System Reset

A system reset can be accomplished by holding pressed the Emission ON/OFF button while powering up the system. System reset resets the Gas Correction value to 1.0 and sets the gauge to Local Control (see Serial Communication Option).

Emission High/Low Switch

Emission current is selectable at any time by use of this switch. For better gauge performance, it is recommended that Low Emission be used if the Mini-BA is used to measure higher pressures for extended periods.

The switch setting is overridden during Degas, at which time the Emission current is always High. At the conclusion of the Degas cycle, emission returns to the switch setting level.

Low Emission Current: 0.1 mA
High Emission Current: 1.0 mA

Degas ON/OFF Button

At operating pressures below 1.3E-2 Pa/1.3 E-5 mbar/1E-05 Torr, Degas may be activated to degas electrodes. Above this pressure, the system will not respond to the Degas button.

To activate Degas, press the Degas button until the pressure LED flashes. Degas lasts for fifteen minutes - expect a slight rise in pressure during initial stages of degassing. Once Degas is activated, the system can be used to measure any pressure in the normal operating range. The display will indicate pressure as usual, but with a flashing LED to indicate Degas cycle.

After fifteen minutes, Degas automatically terminates, the LED stops flashing, and normal pressure readings continue.

If Degas is to be terminated before the automatic termination, press the Degas button.

Stopping emission, either by the Emission ON/OFF button or remotely, terminates Degas. Any error that stops emission – Errors 5, 6, 8 and 9, terminates Degas.

Setpoint 1 and Setpoint 2 Switches

Setpoints are easily selected by turning a digital rotary switch to one of sixteen settings. Switch positions are labeled in groups of decades. For example, selecting 5 in the –4 group selects $5x10^{-4}$ for a setpoint.

Setpoint 1 covers from 5 Pa to 5E-5 Pa/50 to 5E-7 mbar/50 to 5E-7 Torr. The Setpoint 1 LED illuminates and Relay 1 closes (pins 4 and 12 of J1) when pressure falls below Setpoint 1 level.

Setpoint 2 covers from 5E-2 to 5E-7 Pa/5E-4 to 5E-9 mbar/5E-4T to 5E-9T. The Setpoint 2 LED illuminates and Relay 2 closes (pins 5 and 15 of J1) when pressure falls below Setpoint 2 level.

For positive relay operation, setpoints clear when pressure rises 20% above the setpoint level, rather than immediately above. For example, the $5x10^{-8}$ setpoint triggers when pressure falls below $5x10^{-8}$, and clears when pressure rises above $6x10^{-8}$.

The Serial Communications Option is capable of setting setpoints to any level. Setpoint ON/OFF status is also able to be polled by Serial Communication. See Appendix A “Serial Communications Option” for details.

Remote Control Lines

Available at the 15-pin connection are control inputs and status outputs (Table 6) for emission (filament) and degas.

Table 6 15-Pin Inputs and Outputs

Inputs	Outputs
Degas ON/OFF	Degas Status
Emission ON/OFF	Emission Status
Emission Control, Pulse	

Inputs

The Degas ON/OFF and Emission ON/OFF inputs are TTL level controls, normally high (with “weak” internal pull-ups), with High representing OFF and Low representing ON. If Emission or Degas is turned off automatically (for example, error condition or Degas timeout) the control line should be brought to the OFF state before attempting an ON. This action with the Emission control line clears the errors (see error conditions).

The “Emission Control, Pulse” input is functionally equivalent to the Emission push button. Like the button, it is intended to be momentary, and is activated by grounding for a duration of at least 100ms but not to exceed several seconds. See the corresponding button description in “Front Panel Controls” on page 7 for operation details.

Serial Communication Option: As with the control buttons, control inputs are available only in Local mode.

Outputs

Status outputs are TTL, with high representing ON, and low OFF.

Error Conditions

The following error conditions are indicated on the LED display by flashing the number of LEDs equal to the error number (see "Display" on page 7) and on the Serial Communication Option by outputting the error number (see Appendix A "Serial Communications Option"). Errors 5, 6, 8 and 9 are indicated on the output voltage by 10 V (see Voltage Output section below).

For Errors 5, 6 and 9, emission is immediately turned off. To clear these errors, press the Emission ON/OFF button – the top single flashing LED will be displayed, indicating emission OFF and system at startup ready.

E05	Open filament: Tube replacement usually required. Follow Tube Replacement Procedure. Once removed, a continuity check can be made on the filament. Filament pins are the two pins nearest the circumference of the tube.
E06	Grid voltage low: If caused by temporary glow discharge, restarting emission will result in a functioning gauge. If permanent, grid power supply requires factory inspection.
E08	Inter-board communication error: Main CPU board has failed to receive communication from daughter board five consecutive times. If emission is ON, it will be shut off. Only resumption of inter-board communication will clear this error.
E09	Overpressure: Gauge has detected pressure higher than 1.0×10^{-2} and has shut down emission.

NOTE

Venting (high vacuum to atmosphere) must last more than five seconds for this error to take effect.)

Checksum	A rapidly flashing LED at the bottom of a bar graph scale, a slowly flashing digital display or a Data Invalid Status (serial communications option), indicates an internal EEPROM (non-volatile memory) checksum error. If the error signal clears with repeated power-ups, no further action is required. If the error signal persists, then a factory calibration factor has been reset and although the unit can be used at slightly reduced accuracy, it should be returned to the factory for re-calibration.
Serial Communications units	If the checksum error indicator is present, any prior remote control settings set by serial communication (for example, setpoint settings) will be lost – the local switch settings are in effect. Remote settings can be re-established, but will not be stored. The presence of a checksum error can be determined by polling the Data Invalid Status.

Voltage Output

Pressure signal analog voltage is available between the Signal Out line (pin 9) and Signal Ground line (pin 10) of J1. The voltage is a 1V/decade output representing the Log of the pressure, offset to a range between 1 and 9 VDC (Table 7).

Table 7 Voltage Outputs

Voltages greater than	But less than	Indicate pressures in this range
1	2	$1.33x10^{-7}$ Pa, $1x10^{-9}$ Torr, $1.33x10^{-9}$ mbar
2	3	$1.33x10^{-6}$ Pa, $1x10^{-8}$ Torr, $1.33x10^{-8}$ mbar
3	4	$1.33x10^{-5}$ Pa, $1x10^{-7}$ Torr, $1.33x10^{-7}$ mbar
4	5	$1.33x10^{-4}$ Pa, $1x10^{-6}$ Torr, $1.33x10^{-6}$ mbar
5	6	$1.33x10^{-3}$ Pa, $1x10^{-5}$ Torr, $1.33x10^{-5}$ mbar
6	7	$1.33x10^{-2}$ Pa, $1x10^{-4}$ Torr, $1.33x10^{-4}$ mbar
7	8	$1.33x10^{-1}$ Pa, $1x10^{-3}$ Torr, $1.33x10^{-3}$ mbar
8	9	1.33x100 Pa, $1x10^{-2}$ Torr, $1.33x10^{-2}$ mbar

0.5 V output indicates pressure below operating range of the Eyesys Mini-BA

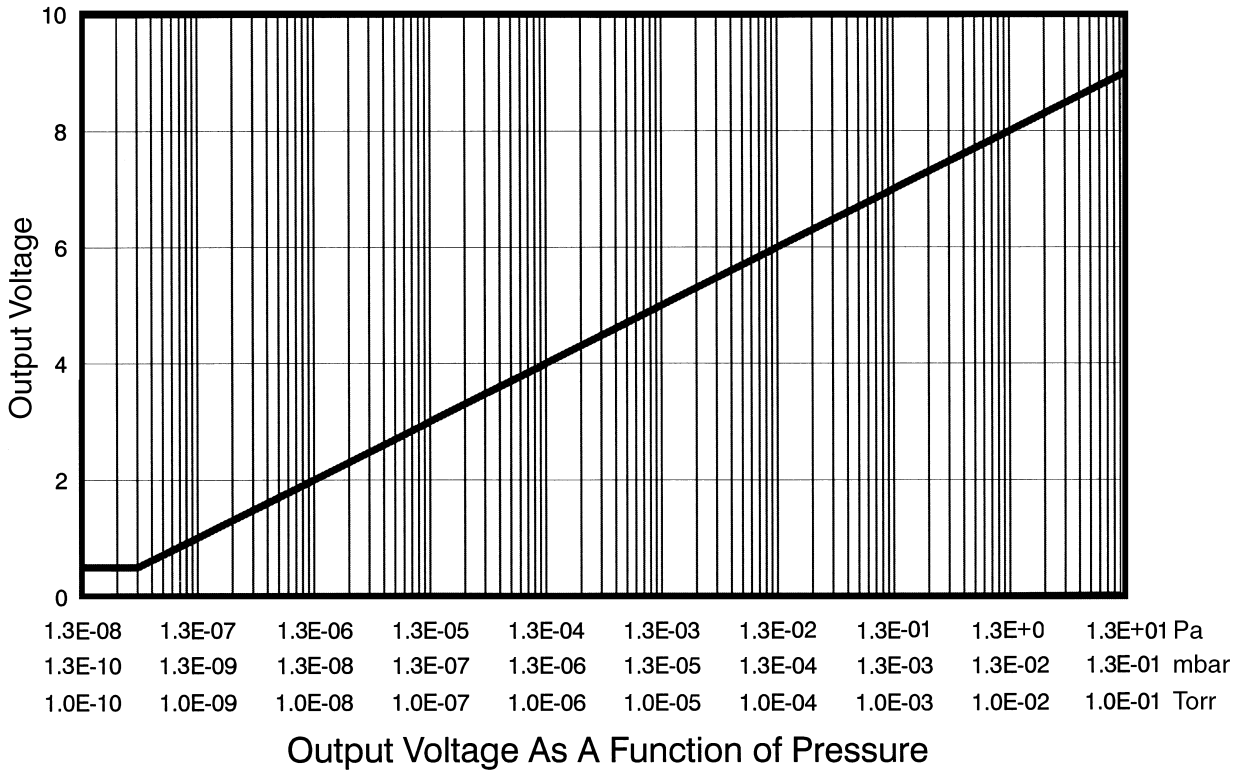

Figure 5 Output Voltage as a Function of Pressure

To calculate pressure, given volts: Pressure = $10^{(Volts-8)}$x1.33 for Pascal

$10^{(Volts-10)}$ for Torr

$10^{(Volts-10)}$x1.33 for mbar

The following chart is derived from the above formula. Output voltage is pegged to the extremes under the following conditions (see “Error Conditions” on page 11):

Condition	Volts
Under pressure	0.5 V
Emission OFF	10 V
Error 5, 6, 8 or 9	10 V

NOTE *Pressure voltage is not available with the RS422 option.*

Gas Correction

Gas Correction Factor Table

For manual use of the table, divide the pressure reading by the gas correction factor. Gas correction factor tables are only reproduced for the convenience of the user and do not imply that use with other gases will be safe with hot filament gauge controllers. Table 8 on page 14 lists relative gauge gas correction factors for various gases. The values are derived by empirical methods substantiated by measurements reported in literature. This table was compiled and published by Robert L. Summers of Lewis Research Center, NASA Technical Note TND-5285, National Aeronautics and Space Administration, Washington, DC, June 1969.

To automatically convert readings of the Mini-BA gauge, enter the relative gas correction constant via the appropriate Serial Communication command (see Serial Communication option). The current gas correction factor can be polled from the gauge by use of a separate command. The gauge will divide the result by the gas correction constant:

Corrected Pressure = Raw Pressure / Gas Correction Constant

The adjusted value is applied to the display, signal output and serial communication pressure outputs.

Table 8 Gas Correction Factors

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Acetaldehyde	C_2H_4O	2.6
Acetone	$(CH_3)_2CO$	3.6 4.0 3.6
Acetylene	C_2H_2	1.9 2.0
Air		1.0 0.98
Ammonia	NH_3	1.3 1.2 1.3
Amylene: ISO· cyclo·	 ISO·C_5H_{10} CY·C_5H_{10}	 5.9 5.8
Argon	Ar	1.3 1.1 1.2 0.9
Benzene	C_6H_6	5.9 5.8 5.7 5.9 6.0
Benzoic Acid	C_6H_5COOH	5.5
Bromine	Br	3.8
Bromomethane	CH_3Br	3.7
Butane: n· ISO·	 n·C_4H_{10} ISO·C_4H_{10}	 4.9 4.7 4.6 4.9
Cadmium	Cd	2.3 3.4
Carbon Dioxide	CO_2	1.4 1.4 1.5 1.5 1.4
Carbon Disulfide	CS_2	5.0 4.7 4.8
Carbon Monoxide	CO	1.05 1.05 1.1
Carbon Tetrachloride	CCl_4	6.0 6.3
Cesium	Cs	4.3 2.0 4.8
Chlorine	Cl_2	0.68 2.6 1.6
Chlorobenzene	C_6H_5Cl	7.0
Chloroethane	C_2H_5Cl	4.0
Chloroform	$CHCl_3$	4.7 4.8 4.8
Chloromethane	CH_3Cl	2.6 3.2 3.1
Cyanogen	$(CN)_2$	2.8 3.6 2.7
Cyclohexylene	C_6H_{12}	7.9 6.4
Deuterium	D_2	0.35 0.38
Dichlorodifloromethane	CCl_2F_2	2.7 4.1
Dichloromethane	CH_2Cl_2	3.7
Dinitrobenzene o· m· p·	$C_6H_4(NO_2)_2$ 	 7.8 7.8 7.6
Ethane	C_2H_6	2.6 2.8 2.5
Ethanol	C_2H_5OH	3.6 2.9
Ethyl Acetate	$CH_3COOC_2H_5$	5.0

Table 7 Gas Correction Factors, continued

Substance	Formula	Relative Ionization Gauge Gas Correction F5tor
Ethyl ether	$(C_2H_5)_2O$	5.1 5.1
Ethylene	C_2H_4	2.3 2.4 2.2 2.2 to 2.5
Ethylene oxide	$(CH_2)_2O$	2.5
Helium	He	0.18 0.15 0.13 0.12
Heptane	C_7H_{16}	8.6
Hexadiene: 1.5· cyclo·	 1.5·C_5H_{10} CY·C_6H_{10}	 6.4 6.0
Hexane	C_6H_{14}	6.6
Hexene: 1· cyclo	 1·C_6H_{12} CY·C_6H_{10}	 5.9 6.4
Hydrogen	H_2	0.46 0.38 0.41 0.45 0.44
Hydrogen Bromide	HBr	2.0
Hydrogen Chloride	HCl	1.5 1.6 2.0 1.5
Hydrogen Cyanide	HCN	1.5 1.6
Hydrogen Floride	HF	1.4
Hydrogen Iodide	HI	3.1
Hydrogen Sulfide	H_2S	2.2 2.2 2.3 2.1
Iodine	I_2	5.4
Iodomethane	CH_3I	4.2
Isoamyl Alcohol	$C_5H_{11}OH$	2.9
Isobutylene	C_4H_8	3.6
Krypton	Kr	1.9 1.7 1.7
Lithium	Li	1.9
Mercury	Hg	3.6
Methane	CH_4	1.4 1.5 1.6 1.4 to 1.8 1.5 1.5
Methanol	CH_3OH	1.8 1.9
Mehtyl Acetate	CH_3COOCH_3	4.0
Mythyl ether	$(CH_3)_2O$	3.0 3.0

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Naphthalene	$C_{10}H_8$	9.7
Neon	Ne	0.30 0.31
Nitrobenzene	$C_6H_5NO_2$	7.2
Nitrogen	N_2	1.0
Nitrotoluene (o·, m·, p·)	$C_6H_4CH_3NO_2$	8.5
Nitric Oxide	NO	1.3 1.2 1.0
Nitrous Oxide	N_2O	1.5 1.7 1.7 1.3 to 2.1
Oxygen	O_2	1.0 1.1 0.9 0.9
Pentane n· ISO· neo·	 n·C_5H_{17} ISO·C_5H_{17} $(CH_3)_4C$	 6.2 6.0 5.7 6.0 5.7
Phenol	C_6H_5OH	6.2
Phosphine	PH_3	2.6
Potassium	K	3.6
Propane	C_3H_8	4.2 3.7 3.7 to 3.9 3.6
Propene oxide	C_3H_6O	3.9
Propene: n· cyclo·	 n·C_3H_6 cy·C_3H_6	 3.3 3.2 to 3.7 3.6
Rubidum	Rb	4.3
Silver perchlorate	$AgClO_4$	3.6
Sodium	Na	3.0
Stannic iodide	SnI_4	6.7
Sulphur Dioxide	SO_2	2.1 2.3
Sulphur Hexafloride	SF_6	2.3 2.8
Toluene	$C_6H_5CH_3$	6.8
Trinitrobenzene	$C_6H_3(NO_2)_3$	9.0
Water	H_2O	1.1 1.0 0.8
Xenon	Xe	2.9 2.2 2.4
Xylene: o· p·	 o·$C_6H_4(CH_3)_2$ p·$C_6H_4(CH_3)_2$	 7.8 7.9

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Appendix A. Serial Communications Option

Eyesys serial communications option allows remote status checking and remote control of calibration and setpoint. The Eyesys can be checked for the status of any parameter whether it has been set to Local or Remote Control, but it must be placed in Remote Control to be commanded to change settings.

Communication Setup

Baud Rate	9600
Stop Bits	1
Parity	None
Flow Control	None

It is suggested that communication be initially established and tested using Microsoft® Terminal, Hyperterminal or equivalent before connecting to an untested command device.

Switching from Local to Remote

- When remote commands put Eyesys in remote control, the local controls and setpoint switches are inoperative
- Each setpoint remains at the last local switch setting until changed by a remote setpoint command

Switching from Remote to Local

- Upon selecting Local Control, the setpoints are immediately changed to the local switch settings
- Setpoints respond only to the controls on the Eyesys box.

Local/Remote Status

Eyesys will power up in whatever Local/Remote status the system was in when last powered down.

Remote Reset

A remote reset can take place whether in Local or Remote control. As with a power-up reset, remote reset resets the following parameters:

Gas Correction to 1.000

Sensitivity to 15.0

Remote reset however, leaves the Remote/Local Control status untouched, whereas a power-up reset will reset to Local Control.

Command/Response Format

The command format is: "#" {Gauge address} {command} {data} {carriage return}

The response is: ">" {optional data} {carriage return}

Command Set

All lower-case characters are place holders and must be replaced as follows:

aa = two character listener address (00 for RS232)

x = "1".."9" data value

{cr} = message terminator character (carriage return)

Table A-1 Command Set

	Command	Response
Read AG Type	#aa01{cr}	>21FEFEFEFE{cr}
Read Pressure	#aa02I1{cr}	>x.xxxE-xx{cr}
Read Setpoint State	#aa03{cr}	>000x{cr} where x Relay1 Relay2 0 OFF OFF 1 ON OFF 2 OFF ON 3 ON ON

Table A-1 Command Set (Continued)

	Command	Response
Read Software Version	#aa05{cr}	>xxxx{cr} where the revision is xx.xx
Reset	#aa06{cr}	>{cr}
Set LOCAL Control	#aa20{cr}	>{cr}
Set REMOTE Control	#aa21{cr}	>{cr}
Read Local/Remote Status	#aa22{cr}	>xx{cr} where: xx = 00 for LOCAL xx = 01 for REMOTE
Set Emission OFF	#aa30I1{cr}	>{cr}
Set Emission ON	#aa31I1{cr}	>{cr}
Read Emission Status	#aa32I1{cr}	>xx{cr} where xx = 00 for OFF xx = 01 for ON *
Set Degas OFF (Mini-B/A only)	#aa40I1{cr}	>{cr}
Set Degas ON (Mini-B/A only)	#aa41I1{cr}	>{cr}
Read Degas Status (Mini-B/A only)	#aa42I1{cr}	>xx{cr} where xx = 00 for OFF xx = 01 for ON *
Read Emission Current	#aa52I1{cr}	>x.xx {cr} where x.x = 0.10 for Low x.x = 1.00 for High *

Set Emission Current	#aa53I1x.xx {cr}
	#where
	x.xx = 0.10 is Low
	1.00 is High
		>{cr}

Read Gas Correction	#aa50I1{cr}	>x.xxx {cr}
Set Gas Correction	#aa51I1x.xxx {cr} where x.xxx ranges from 0.100 to 9.990	>{cr}
Set Sensitivity (Note: will override factory calibration setting)	#aa55I1xx.x{cr}	>{cr}

Table A-1 Command Set (Continued)

	Command	Response
Read Sensitivity	#aa54I1{cr}	>xx.x {cr}
Set Setpoint Pressure Level	#aa6hI1x.xxxE–xx{cr} where range is from 1.000E-8 to 1.000E-01 Pa or 1.000E-10 to 1.000E-03 Torr or mbar and h is Setpoint No. and = 1 or 2	>{cr}
Read Setpoint Pressure Level	#aa8h{cr} where h is Setpoint No. and = 1 or 2	>x.xxxE-xx{cr}
Reading Valid Status	#aa CØ{cr}	>01 if DATA VALID >00 if DATA INVALID (indicates clearing of factory calibration)

* Current system status, and not necessarily the last remote command sent.

Error Messages

Eyesys indicates error conditions or responds to incorrect commands with the messages listed in Table A-2.

Table A-2 Eyesys Error Messages

?FF	❑ Command does not follow one of the above formats, the command or data is invalid, or the command length is incorrect. There will be no response to a wrong address, parity error or lack of termination character.
?Local	❑ A “Set” (i.e., “Set Setpoint Pressure Level” or “Set Emission Off”) command was received by Eyesys when in Local Control
0.000E-00 (in response to Read Pressure Command)	❑ Emission not on.
3.000 E-10 (approx.)	❑ Pressure below range of Mini-BA
E05, E06, E09 (in response to Read Pressure command)	❑ See Error Conditions section of manual

Recommended Cabling

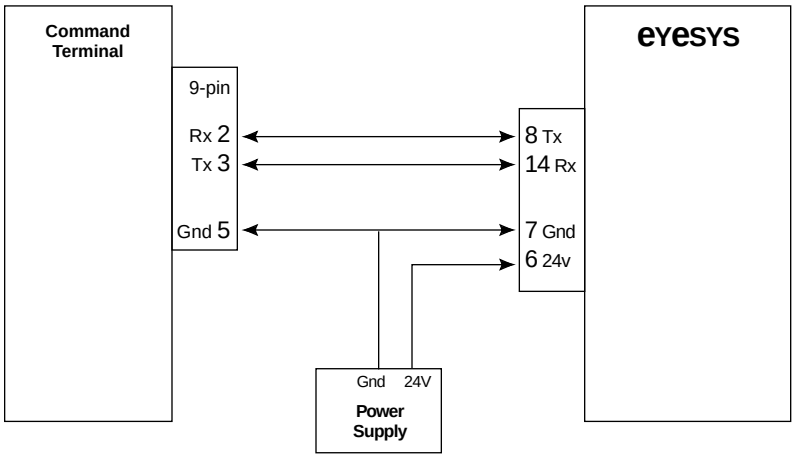

Figure A-1 RS232 Cabling

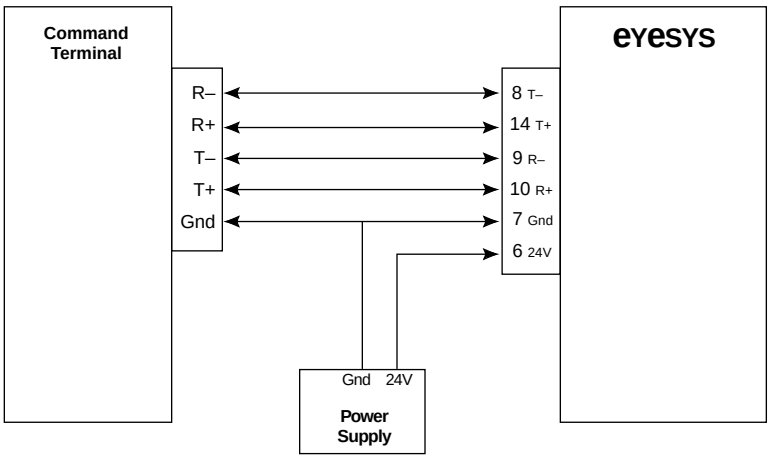

Figure A-2 RS422 Cabling

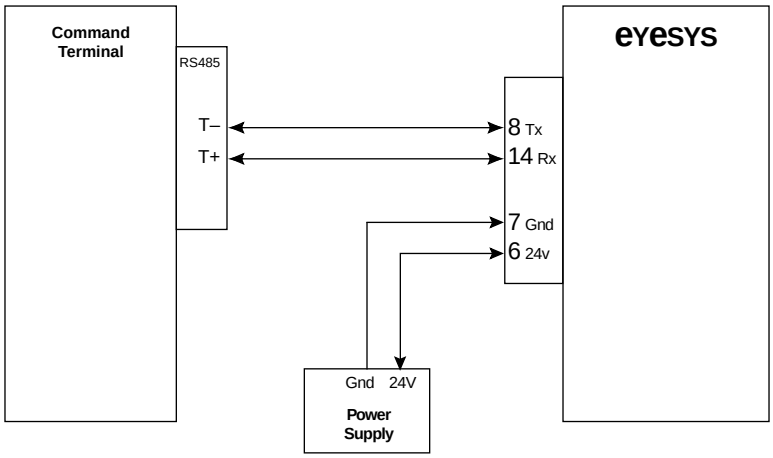

Figure A-3 RS485 Cabling

Address Selection

Each RS485 listener must have a separate address. To select the Eyesys address, select 0 through 7 on the rotary switch marked “Address.”

Any commands sent to Eyesys must be prefixed with the corresponding address 00 through 07. See “aa” of the Command Set.

VARIAN

Request for Return
Health and Safety Certification

ISO 9001 REGISTERED

1. Return authorization numbers (RA#) **will not** be issued for any product until this Certificate is completed and returned to a Varian Customer Service Representative.
2. Pack goods appropriately and drain all oil from rotary vane and diffusion pumps (for exchanges please use the packing material from the replacement unit), making sure shipment documentation and package label clearly shows assigned Return Authorization Number (RA#). VVT cannot accept any return without such reference.
3. Return product(s) to the nearest location:

North and South America	**Europe and Middle East**	**Asia and ROW**
Varian Vacuum Technologies 121 Hartwell Ave. Lexington, MA 02421 Fax: (781) 860-9252	Varian S.p.A. Via F.lli Varian, 54 10040 Leini (TO) – ITALY Fax: (39) 011 997 9350	Varian Vacuum Technologies Local Office

For a complete list of phone/fax numbers see www.varianinc.com/vacuum

4. If a product is received at Varian in a contaminated condition, **the customer is held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Varian employees occurring as a result of exposure to toxic or hazardous materials present in the product.

CUSTOMER INFORMATION

Company name: ……

Contact person: Name: …… Tel: ……

Fax: …… E-mail: ……

Ship Method: …… Shipping Collect #: …… P.O.#:……

Europe only: VAT Reg. Number: …… *USA only*: ❒ Taxable ❒ Non-taxable

Customer Ship To: …… Customer Bill To: ……

……

……

……

……

PRODUCT IDENTIFICATION

Product Description	Varian P/N	Varian S/N

TYPE OF RETURN *(check appropriate box)*

❒ Paid Exchange ❒ Paid Repair ❒ Warranty Exchange ❒ Warranty Repair ❒ Loaner Return
❒ Credit ❒ Shipping Error ❒ Evaluation Return ❒ Calibration ❒ Other ……..

HEALTH and SAFETY CERTIFICATION

VARIAN VACUUM TECHNOLOGIES CANNOT ACCEPT ANY BIOLOGICAL HAZARDS, RADIOACTIVE MATERIAL, ORGANIC METALS, OR MERCURY AT ITS FACILITY. CHECK ONE OF THE FOLLOWING:

❒ I confirm that the above product(s) has (have) **NOT** pumped or been exposed to any toxic or dangerous materials in a quantity harmful for human contact.

❒ I declare that the above product(s) has (have) pumped or been exposed to the following toxic or dangerous materials in a quantity harmful for human contact (Must be filled in):

……

Print Name: …… Signature: …… Date: ……/……/……

PLEASE FILL IN *THE FAILURE REPORT SECTION* ON THE NEXT PAGE

Do not write below this line

Notification (RA)#: …… Customer ID#: …… Equipment #: ……

VARIAN

Request for Return
Health and Safety Certification

ISO 9001 REGISTERED

FAILURE REPORT (Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

TURBO PUMPS and TURBOCONTROLLERS

CLAIMED DEFECT		POSITION	PARAMETERS	
❒ Does not start	❒ Noise	❒ Vertical	Power:	Rotational Speed:
❒ Does not spin freely	❒ Vibrations	❒ Horizontal	Current:	Inlet Pressure:
❒ Does not reach full speed	❒ Leak	❒ Upside-down	Temp 1:	Foreline Pressure:
❒ Mechanical Contact	❒ Overtemperature	❒ Other:	Temp 2:	Purge flow:
❒ Cooling defective	❒ Clogging	……	OPERATION TIME:	
Describe Failure :				
TURBOCONTROLLER ERROR MESSAGE:				

ION PUMPS/CONTROLLERS

❒ Bad feedthrough	❒ Poor vacuum
❒ Vacuum leak	❒ High voltage problem
❒ Error code on display	❒ Other
Describe failure:	
Customer application:	

VALVES/COMPONENTS

❒ Main seal leak	❒ Bellows leak
❒ Solenoid failure	❒ Damaged flange
❒ Damaged sealing area	❒ Other
Describe failure:	
Customer application:	

LEAK DETECTORS

❒ Cannot calibrate	❒ No zero/high background
❒ Vacuum system unstable	❒ Cannot reach test mode
❒ Failed to start	❒ Other
Describe failure:	
Customer application:	

INSTRUMENTS

❒ Gauge tube not working	❒ Display problem
❒ Communication failure	❒ Degas not working
❒ Error code on display	❒ Other
Describe failure:	
Customer application:	

ALL OTHER VARIAN PUMPS

❒ Pump doesn't start	❒ Noisy pump (describe)
❒ Doesn't reach vacuum	❒ Overtemperature
❒ Pump seized	❒ Other
Describe failure:	
Customer application:	

DIFFUSION PUMPS

❒ Heater failure	❒ Electrical problem
❒ Doesn't reach vacuum	❒ Cooling coil damage
❒ Vacuum leak	❒ Other
Describe failure:	
Customer application:	

varian

vacuum products

VPD Service Operation

Returned Material Report

This report must accompany all products returned for repair, replacement, or warranty evaluation. Full information regarding reasons for return of the product will expedite repair or adjustment. Please fill in all blanks below and furnish any other information which will help identify the nature and cause of failure.

Reason for Return (check appropriate box)

- ☐ Paid Repair
- ☐ Advance Exchange
- ☐ Shipping Error
- ☐ Credit
- ☐ Warranty Evaluation
- ☐ Loaner Return
- ☐ Shipping Damage

Product Information (use separate forms if more than one model no.)

Varian Model No. _____ Serial No. _____ Quantity _____

Part Description _____

Purchase Information (if product is being returned for warranty evaluation, show your original purchase order number and date purchased)

Varian Sales Order No. (if available) _____ Machine # _____

Original Purchase Order No. _____ Purchase Order Date _____

Company Name _____ **Contact** _____

Address _____

City _____ **State** _____ **Zip** _____

Telephone _____

Failure Report (describe in detail suspected cause or nature of malfunction)

_____

_____

_____

_____

_____

Returned Products

All products returned to Varian/VPD Service Operation for warranty evaluation must be sent **prepaid** and customer must comply with the **warranty replacement and adjustment** provision set forth in the warranty.

Ship directly to: Varian Vacuum Products
Vacuum Products Service Center
121 Hartwell Avenue
Lexington, MA 02421

All products sold by Varian and returned by customer are subject to Varian Vacuum Products standard terms and conditions of sale including, but not limited to, the warranty and damages and liability provisions set forth in the warranty.

November 1995

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1428 Buenos Aires
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Fax: (61) 395607950

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vpl.customer.support@varianinc.com

Worldwide Web Site:
www.varianinc.com/vacuum

Order On-line:
www.evarian.com

Representatives in most countries

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