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.
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.
Declaration of Conformity
Konformitätserklärung
Déclaration de Conformité
Declaración de Conformidad
Verklaring de Overeenstemming
Dichiarazione di Conformità

Varian Vacuum Technologies
121 Hartwell Avenue
Lexington, MA, 02421-3133 USA

We/Wir/Nous/Nosotros/Wij/Noi: Varian, Inc.

declare under our sole responsibility that the product,
erklären, in alleniniger Verantwortung, daß dieses Produkt,
déclarons sous notre seule responsabilité que le produit,
declamamos, bajo nuestra sola responsabilidad, que el producto,
verklaaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilità, che il prodotto,

to which this declaration relates is in conformity with the following standard(s) or other normative documents.
auf das sich diese Erklärung bezieht, mit der/den flogenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).
waarnaar deze verklaring verwijst, aan de volgende norm(en) of richtlijn(en) beantwoordt.
a cui si riferisce questa dichiarazione è conforme alla/e sequente/l norma/o documento/o normativo/i.

FCC 47 CFR Part 15 Class A . . . . . . Emissions requirements (USA)
EN 55011:1991 Group 1 Class B . . . . . . . . ISM emissions requirements (EU)
EN 50082-1:1992 . . . . . . . . . . . . . . . . EMC residential, commercial and light industrial generic immunity standard
EN 61010-1 . . . . . . . . . . . . . . . . . . . . . Safety requirements for electrical equipment for measurement, control, and
laboratory use, incorporating Amendments Nos. 1 and 2.

Frederick C. Campbell
Operations Manager
Varian Vacuum Technologies
Lexington, Massachusetts, USA

October 2002
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Table of Contents

Preface .......................................................................................................................................................... iii
  Warranty .................................................................................................................................................... iii
  Warranty Replacement and Adjustment ............................................................................................... iii
Hazard and Safety Information ................................................................................................................ iv
EMC Warnings ......................................................................................................................................... v
  EN 55022 Class A Warning ...................................................................................................................... v
  FCC ............................................................................................................................................................. v
Installation Requirements ........................................................................................................................ v

Declaration of Conformity ........................................................................................................................ vii

Overview ................................................................................................................................................... 1
  Options .................................................................................................................................................... 2
  Specifications .......................................................................................................................................... 3
  Electrical Connections .............................................................................................................................. 4
    Fuse Replacement Procedure .............................................................................................................. 5
  Operation .................................................................................................................................................. 6
    Pressure Reading ................................................................................................................................. 6
    Calibration .......................................................................................................................................... 7
    Set Atmosphere Value ......................................................................................................................... 8
    Reset ................................................................................................................................................... 10
  Output Voltage ....................................................................................................................................... 11

Serial Communications Options ........................................................................................................... 13
  Changing to Remote Control .................................................................................................................... 13
  Changing to Local Control ......................................................................................................................... 13
  Local/Remote Status ............................................................................................................................... 13
  Reset ....................................................................................................................................................... 13
  Command/Response Format ..................................................................................................................... 14
  Command Set ..................................................................................................................................... 14
  Error Messages ................................................................................................................................... 15
  RS485 Address Selection ......................................................................................................................... 16
  Recommended Cabling ............................................................................................................................. 17

Request for Return Health and Safety Certification ................................................................................. 19

Returned Materials Report ...................................................................................................................... 21
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List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Caption</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PanelVac ConvecTorr</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Rear Panel</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Front Panel</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Output Voltage as a Function of Pressure Log Output</td>
<td>12</td>
</tr>
<tr>
<td>A-1</td>
<td>RS232 Cabling</td>
<td>17</td>
</tr>
<tr>
<td>A-2</td>
<td>RS485 Cabling</td>
<td>17</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PanelVac ConvecTorr Specifications</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Fine Adjustment of Log Output Voltage</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>ConvecTorr Output Voltage Versus Pressure</td>
<td>11</td>
</tr>
<tr>
<td>A-1</td>
<td>Error Messages</td>
<td>15</td>
</tr>
<tr>
<td>A-2</td>
<td>Address Selection</td>
<td>16</td>
</tr>
</tbody>
</table>
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Overview

The PanelVac ConvecTorr is a compact, 1⅛ DIN size controller for the Varian ConvecTorr™ vacuum gauge. The ConvecTorr gauge (purchased separately) is capable of fast response pressure measurement from atmosphere to less than 1 milliTorr.

The PanelVac ConvecTorr provides an easy-to-read analog needle pressure indication in addition to a logarithmically-scaled output voltage and digital pressure information via optional serial communication.

Figure 1  PanelVac ConvecTorr
Options

The PanelVac ConvecTorr is available with several options for front panel pressure display, setpoints, and serial communications. In addition, the PanelVac is capable of operating ConvecTorr gauges with the standard platinel filament or optional E-type filament. For ordering information on the PanelVac and the ConvecTorr transducer, see your Varian Vacuum Products catalog or brochure. Varian’s Technical Support group can assist you with selecting the appropriate instruments for your application.

<table>
<thead>
<tr>
<th>Pressure Units</th>
<th>Setpoints</th>
<th>Serial Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torr</td>
<td>None</td>
<td>RS-232</td>
</tr>
<tr>
<td>Pascal</td>
<td>Dual Setpoints</td>
<td>RS-485</td>
</tr>
<tr>
<td>M Bar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Power Requirements</strong></td>
<td>100-230 VAC ±10% 50/60 Hz 250 ma/250 V (SLO-BLO) fuse universal power supply (no user adjustment is needed for use with different input voltages.)</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>0 ° to 50 °C</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>3.5” high by 3.4” wide by 6.5” deep</td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td>Pa, mbar or Torr, preset at factory</td>
</tr>
<tr>
<td><strong>Pressure Measurement</strong></td>
<td>Range 100 kPa (1 bar, 760 Torr) to “&lt;.13 Pa” (1 µbar, 1 mTorr)</td>
</tr>
<tr>
<td><strong>Overpressure Capability</strong></td>
<td>Range 200 kPa (2 bar, 1500 Torr)</td>
</tr>
<tr>
<td><strong>Output Signal</strong></td>
<td>1 V/decade log linear</td>
</tr>
<tr>
<td><strong>Set Point</strong></td>
<td>Digital Potentiometer Setting, Form C relay, 100 mA at 40 VDC Range:.5 Pa (5 µbar, 5 mTorr) to 50 kPa (500 mbar, 500 Torr)</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>0-50 °C, 90%-80% non-condensing</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>Indoor use, Installation Category II, Pollution Degree 2</td>
</tr>
<tr>
<td><strong>Cleaning</strong></td>
<td>External surfaces may be cleaned with a slightly damp soft cloth</td>
</tr>
</tbody>
</table>
Electrical Connections

The rear panel of the PanelVac provides access to all electrical power, analog outputs, digital communications, and status indications.

Figure 2 Rear Panel

NOTE Do not attempt a connection to pins labeled "No Connection".

Rear Panel Features and Pin Assignments

Item 1 Setpoint connectors (optional)
Pin Assignments are as labeled on the PanelVac

Item 2 Gauge (sensor) connector – purchase separately Varian cable L91223XXX
(XXX = Length in feet to nearest 5 ft. increment, i.e., 50 ft = 050)

Item 3 Chassis Ground Post
Connect to same ground as ConvecTorr Gauge
Rear Panel Features and Pin Assignments (Continued)

Item 4  Power Supply
The PanelVac features a universal power supply which can be powered with
100-230 VAC 50-60 Hz. The power supply cable is ordered separately. Several
cable models are available to permit worldwide use.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Power Cable Type (10 foot length)</th>
</tr>
</thead>
<tbody>
<tr>
<td>656458203</td>
<td>United States - 110 VAC</td>
</tr>
<tr>
<td>656494210</td>
<td>United Kingdom – 230 VAC</td>
</tr>
<tr>
<td>656494225</td>
<td>Denmark – 220-230 VAC</td>
</tr>
<tr>
<td>656494245</td>
<td>India – 220-230 VAC</td>
</tr>
<tr>
<td>656494230</td>
<td>Israel – 220-230 VAC</td>
</tr>
<tr>
<td>656494215</td>
<td>Italy – 220-230 VAC</td>
</tr>
<tr>
<td>656494220</td>
<td>Continental Europe – 220-230 VAC</td>
</tr>
<tr>
<td>656494240</td>
<td>Japan – 100 VAC</td>
</tr>
<tr>
<td>656494235</td>
<td>Switzerland – 220-230 VAC</td>
</tr>
</tbody>
</table>

Item 5  RS-485 Address Switch
Allows address selection for RS-485 Serial Communications option

Item 6  Input /Output Connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Basic Configuration</th>
<th>With RS-232</th>
<th>With RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>RS-232 Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>No Connection</td>
<td>No Connection</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>Analog Pressure Signal Output</td>
<td>Analog Pressure Signal Output</td>
<td>Analog Pressure Signal Output</td>
</tr>
<tr>
<td>4</td>
<td>Analog Pressure Signal Ground</td>
<td>Analog Pressure Signal Ground</td>
<td>Analog Pressure Signal Ground</td>
</tr>
<tr>
<td>5</td>
<td>No Connection</td>
<td>RS-232 Transmit (TXD)</td>
<td>RS-485 T-</td>
</tr>
<tr>
<td>6</td>
<td>Remote Calibration Ground</td>
<td>Remote Calibration Ground</td>
<td>Remote Calibration Ground</td>
</tr>
<tr>
<td>7</td>
<td>Remote Calibration Input</td>
<td>Remote Calibration Input</td>
<td>Remote Calibration Input</td>
</tr>
<tr>
<td>8</td>
<td>No Connection</td>
<td>RS-232 Receive (RXD)</td>
<td>RS-485 T+</td>
</tr>
<tr>
<td>9</td>
<td>No Connection</td>
<td>No Connection</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

Note: Do not attempt a connection to pins labeled “No Connection.”

Fuse Replacement Procedure
1. Remove fuse tray from power entry module located on rear panel.
2. Lift up the catch which secures the fuse holder.
3. Replace the blown fuse as per rating on rear plate.
4. Install fuse holder.
5. Install fuse tray.
PanelVac ConvecTorr

Operation

Figure 3  Front Panel

Pressure Reading

The gauge operates immediately upon application of power. The ConvecTorr will indicate pressure through the analog output, front panel display and serial communication (optional). Pressure readings below the measuring range of ConvecTorr are indicated by a voltage output of 1 V and a serial communications (optional) reading of 1E-4. Lack of any readings (i.e., disconnected or failed tube) result in an Error 3 condition of “E03” for the serial communications pressure reading, a voltage output of 10 V or more, and a front display reading of maximum.
PanelVac ConvecTorr

Calibration

A calibration switch, labeled “CAL” is located on the front of the PanelVac for manual calibration at vacuum or atmosphere. By pressing the switch, the gauge will automatically calibrate. Similarly there is a remote calibration input on the rear-panel I/O Connector (Pin 7). By remotely sending a low voltage pulsed signal (PLC) or a momentary switch contact closure to this pin, the ConvecTorr will automatically calibrate.

Installation  Install the ConvecTorr gauge in the correct orientation for operation. Connect the gauge to the PanelVac controller and apply power. For best results, allow a 30 minute warmup period for the gauge.

Vacuum  Expose the gauge to a pressure below 1 x 10\(^{-4}\) Torr (as referenced to an ion gauge or other high-vacuum measurement device). Activate calibration via the on-board switch or remote input (rear panel I/O). This adjusts the pressure reading to 1E-4 Torr (1.0VDC output)

Atmosphere  Expose the gauge to ambient atmospheric pressure. Activate calibration via the on-board button or remote input (rear panel I/O). This calibrates the gauge to read 760 Torr (7.88VDC output).

**NOTE**

The atmospheric pressure reading may be adjusted using the procedure outlined below.

1. Calibration values are stored in non-volatile memory on the ConvecTorr. Upon power-up, the calibration will remain at the last calibrated values.

2. The ConvecTorr gauge may be operated in any orientation, however, it must be calibrated in the correct location and orientation for operation.
Set Atmosphere Value

To set atmospheric calibration value to a pressure other than standard 1.0E+5 Pa (1.0E+3 mbar, 760 Torr), use either the serial communication option or the manual adjust method. This allows calibration for differing altitudes. After completion of Atmosphere adjustment, any future atmosphere calibrations set ConvecTorr to the new value.

Serial Communication Option

Use the Set Atmosphere Value command.

Manual Adjust Method

1. Monitor the output voltage or front display.
   If monitoring the output voltage, determine the desired voltage corresponding to the desired atmospheric pressure. For analog output voltages, refer to the formula in “Output Voltage” on page 11, or refer to Table 2.

2. Calibrate at atmosphere using above procedure.

3. When atmospheric calibration is complete, press and hold the calibration button. After approximately five seconds, the atmospheric pressure reading begins to decrease. When the reading reaches the desired value, release the button.
   The sequential pressing and holding of the button will increase or decrease the pressure reading.

4. When the calibration button is released for over ten seconds, the ConvecTorr will terminate adjustment mode and the calibration button resumes its normal function.
Setpoint Setting (Optional Feature)

The set point option offers a means of process control. The set point outputs are Single-Pole Double-Throw (SPDT) Form C relays, allowing contact closures to integrate into a PLC. Set point selection is easily made on the front of the PanelVac by turning a digital switch to one of the sixteen settings:

- 5 mT
- 10 mT
- 20 mT
- 50 mT
- 100 mT
- 200 mT
- 500 mT
- 1 T
- 2 T
- 5 T
- 10 T
- 20 T
- 50 T
- 100 T
- 200 T
- 500 T

**NOTE**

The new Atmosphere Value is stored in non-volatile memory – only a system Reset returns the Atmosphere Value to the default 1.0E+5 Pa (1.0E+3 mbar, 760 T).

### Table 2  Fine Adjustment of Log Output Voltage

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Pascals</th>
<th>millibar</th>
<th>Torr</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.98E+04</td>
<td>798</td>
<td>600</td>
<td></td>
<td>7.778</td>
</tr>
<tr>
<td>8.11E+04</td>
<td>811</td>
<td>610</td>
<td></td>
<td>7.785</td>
</tr>
<tr>
<td>8.25E+04</td>
<td>825</td>
<td>620</td>
<td></td>
<td>7.792</td>
</tr>
<tr>
<td>8.38E+04</td>
<td>838</td>
<td>630</td>
<td></td>
<td>7.799</td>
</tr>
<tr>
<td>8.51E+04</td>
<td>851</td>
<td>640</td>
<td></td>
<td>7.806</td>
</tr>
<tr>
<td>8.65E+04</td>
<td>865</td>
<td>650</td>
<td></td>
<td>7.813</td>
</tr>
<tr>
<td>8.78E+04</td>
<td>878</td>
<td>660</td>
<td></td>
<td>7.820</td>
</tr>
<tr>
<td>8.91E+04</td>
<td>891</td>
<td>670</td>
<td></td>
<td>7.826</td>
</tr>
<tr>
<td>9.04E+04</td>
<td>904</td>
<td>680</td>
<td></td>
<td>7.833</td>
</tr>
<tr>
<td>9.18E+04</td>
<td>918</td>
<td>690</td>
<td></td>
<td>7.839</td>
</tr>
<tr>
<td>9.31E+04</td>
<td>931</td>
<td>700</td>
<td></td>
<td>7.845</td>
</tr>
<tr>
<td>9.44E+04</td>
<td>944</td>
<td>710</td>
<td></td>
<td>7.851</td>
</tr>
<tr>
<td>9.58E+04</td>
<td>958</td>
<td>720</td>
<td></td>
<td>7.857</td>
</tr>
<tr>
<td>9.71E+04</td>
<td>971</td>
<td>730</td>
<td></td>
<td>7.863</td>
</tr>
<tr>
<td>9.84E+04</td>
<td>984</td>
<td>740</td>
<td></td>
<td>7.869</td>
</tr>
<tr>
<td>9.98E+04</td>
<td>998</td>
<td>750</td>
<td></td>
<td>7.875</td>
</tr>
</tbody>
</table>
Set point relays the trigger and the setpoint led illuminates when the pressure falls below the set value. To prevent relay chatter, relays clear at 20% above the set value. For example, if a 5 mT setting is chosen, the relay will close at 5 mT and open again at 6 mT.

Serial Communication Options: Set points can be set at any value by use of a serial command. Set point status (ON or OFF) can also be polled by use of serial commands. Any set points set by serial communication are stored in non-volatile memory. Upon cycling power on the ConvecTorr, the set points will be at their last setting. Please see Appendix A of this manual for more information.

Reset

To reset the calibration values to default values:

1. Turn power OFF.
2. Press the Calibration button.
3. Power up the unit.
4. Press the Calibration button again and hold for five seconds.

Serial Communications Option

System reset removes the unit from remote control. By doing so, the set points default to the set point switch settings.
Output Voltage

The ConvecTorr output voltage versus pressure is given in Table 3. The PanelVac ConvecTorr analog output is a 1 V/decade output which follows the log of the pressure.

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Pressure</th>
<th>Pressure</th>
<th>Log Linear Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pa</td>
<td>mbar</td>
<td>Torr</td>
<td></td>
</tr>
<tr>
<td>VACUUM</td>
<td>VACUUM</td>
<td>VACUUM</td>
<td>1.000</td>
</tr>
<tr>
<td>1.33E-0</td>
<td>1.33E-2</td>
<td>10 mT</td>
<td>3.000</td>
</tr>
<tr>
<td>2.66E-0</td>
<td>2.66E-2</td>
<td>20 mT</td>
<td>3.301</td>
</tr>
<tr>
<td>6.65E-0</td>
<td>6.65E-2</td>
<td>50 mT</td>
<td>3.698</td>
</tr>
<tr>
<td>1.33E+1</td>
<td>1.33E-1</td>
<td>100 mT</td>
<td>4.000</td>
</tr>
<tr>
<td>2.66E+1</td>
<td>2.66E-1</td>
<td>200 mT</td>
<td>4.301</td>
</tr>
<tr>
<td>6.65E+1</td>
<td>6.65E-1</td>
<td>500 mT</td>
<td>4.698</td>
</tr>
<tr>
<td>1.33E+2</td>
<td>1.33E0</td>
<td>1 T</td>
<td>5.000</td>
</tr>
<tr>
<td>2.66E+2</td>
<td>2.66E0</td>
<td>2 T</td>
<td>5.301</td>
</tr>
<tr>
<td>6.65E+2</td>
<td>6.65E0</td>
<td>5 T</td>
<td>5.698</td>
</tr>
<tr>
<td>1.33E+3</td>
<td>1.33E+1</td>
<td>10 T</td>
<td>6.000</td>
</tr>
<tr>
<td>2.66E+3</td>
<td>2.66E+1</td>
<td>20 T</td>
<td>6.301</td>
</tr>
<tr>
<td>6.65E+3</td>
<td>6.65E+1</td>
<td>50 T</td>
<td>6.698</td>
</tr>
<tr>
<td>1.33E+4</td>
<td>1.33E+2</td>
<td>100 T</td>
<td>7.000</td>
</tr>
<tr>
<td>2.66E+4</td>
<td>2.66E+2</td>
<td>200 T</td>
<td>7.301</td>
</tr>
<tr>
<td>6.65E+4</td>
<td>6.65E+2</td>
<td>500 T</td>
<td>7.698</td>
</tr>
<tr>
<td>ATMOSPHERE</td>
<td>ATMOSPHERE</td>
<td>ATMOSPHERE</td>
<td>7.880</td>
</tr>
<tr>
<td>1.20E+5</td>
<td>1.20E+3</td>
<td>900 T</td>
<td>7.954</td>
</tr>
<tr>
<td>1.33E+5</td>
<td>1.33E+3</td>
<td>1000 T</td>
<td>8.000</td>
</tr>
</tbody>
</table>
To determine a voltage given a pressure:

\[
\text{Volts} = \log(\text{Pressure}_{\text{Torr}}) + 5 \\
\log(\text{Pressure}_{\text{mbar}}) + 4.88 \\
\log(\text{Pressure}_{\text{Pa}}) + 2.88
\]

For a given voltage, to find pressure:

\[
\text{Pressure}_{\text{Torr}} = 10^{(\text{Volts} - 5)} \\
\text{Pressure}_{\text{mbar}} = 10^{(\text{Volts} - 4.88)} \\
\text{Pressure}_{\text{Pa}} = 10^{(\text{Volts} - 2.88)}
\]

Figure 4  Output Voltage as a Function of Pressure Log Output
Appendix A. Serial Communications Options

The PanelVac serial communications option allows remote status checking and remote control of calibration and setpoint. The PanelVac 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 setpoint or calibration.

Changing to Remote Control

- When remote commands put PanelVac in remote control, the local setpoint switch and Calibration button are inoperative.
- Setpoint remains at the local switch setting until changed by a remote setpoint command.
- The Calibration command or the Calibration button have the same function and can be initiated at atmospheric pressure or at high vacuum.

Changing to Local Control

- Calibration and Setpoint can be changed by the controls on the front of the PanelVac.
- Upon selecting Local Control, Setpoint is immediately changed to the local switch setting.
- Any remote calibration remains in effect until updated by local calibration.

Local/Remote Status

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

Reset

Remote Reset can be activated in both Local and Remote Control and is similar to Powerup Reset in function. Both Powerup Reset and Remote Reset reset calibration. Powerup Reset always leaves PanelVac in Local Control, while Remote Reset will leave PanelVac in whatever control mode existed before the reset.
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 = “0”...“9” data value

{cr} = message terminator character (carriage return). Note: Carriage Return/Linefeed terminator is accepted, but using CR alone is preferable.
## Error Messages

PanelVac responds to incorrect commands with the following messages.

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Controller Type #aa01{cr}</td>
<td>&gt;43FEFEFEFEFE{cr}</td>
</tr>
<tr>
<td>Read Pressure #aa02T1{cr}</td>
<td>&gt;x.xxxE-xx{cr}</td>
</tr>
<tr>
<td>Read Setpoint State #aa03{cr}</td>
<td>&gt;000x{cr} where</td>
</tr>
<tr>
<td></td>
<td>x Relay1 Relay2</td>
</tr>
<tr>
<td></td>
<td>0 OFF OFF</td>
</tr>
<tr>
<td></td>
<td>1 ON OFF</td>
</tr>
<tr>
<td></td>
<td>2 OFF ON</td>
</tr>
<tr>
<td></td>
<td>3 ON ON</td>
</tr>
<tr>
<td>Read S/W Rev #aa05{cr}</td>
<td>&gt;xxxx{cr} where the revision is xx.xx</td>
</tr>
<tr>
<td>Reset (clears Calibration) #aa06{cr}</td>
<td>&gt;{cr}</td>
</tr>
<tr>
<td>Set LOCAL Control #aa20{cr}</td>
<td>&gt;{cr}</td>
</tr>
<tr>
<td>Set REMOTE Control #aa21{cr}</td>
<td>&gt;{cr}</td>
</tr>
<tr>
<td>Read Local/Remote Status #aa22{cr}</td>
<td>&gt;xx{cr} where</td>
</tr>
<tr>
<td></td>
<td>xx=00 is LOCAL</td>
</tr>
<tr>
<td></td>
<td>xx=01 is REMOTE</td>
</tr>
<tr>
<td>Set Setpoint Pressure Level #aa6hT1x.xxxE-xx{cr} where range is any value from 1.500E–04 to 9.000E+02 and h is Setpoint # and = 1 or = 2 (Dual Set Point Option only)</td>
<td>&gt;{cr}</td>
</tr>
<tr>
<td>Read Setpoint Pressure Level #aa8h{cr} where h is Setpoint No. and = 1 or 2</td>
<td>&gt;x.xxxE-xx{cr} where range is from 1.000E-04 to 1.000E+03</td>
</tr>
<tr>
<td>Calibrate #aaA1T1{cr}</td>
<td>&gt;{cr}</td>
</tr>
</tbody>
</table>
RS485 Address Selection

Each 485 listener must have a separate address. To select the PanelVac address, select 0 = through 7 on the rotary switch on the rear of the PanelVac. See Figure 2 for switch location.

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

Table A-2 Address Selection

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Reasons</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>?FF</td>
<td>The proper address was received, but:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Command does not follow one of the above formats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Command or data is invalid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Command length is incorrect.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There will be no response to a wrong address, or lack of termination character.</td>
<td></td>
</tr>
<tr>
<td>?Local</td>
<td>❑ A “Set Setpoint Pressure Level” command was received by PanelVac when in Local Control.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ A “Calibrate” command was received by PanelVac when in Local Control.</td>
<td></td>
</tr>
</tbody>
</table>
Recommended Cabling

Figure A-1 RS232 Cabling

Figure A-2 RS485 Cabling
Request for Return
Health and Safety Certification

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:

<table>
<thead>
<tr>
<th>North and South America</th>
<th>Europe and Middle East</th>
<th>Asia and ROW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varian Vacuum Technologies</td>
<td>Varian S.p.A.</td>
<td>Varian Vacuum Technologies</td>
</tr>
<tr>
<td>121 Hartwell Ave.</td>
<td>Via F.lli Varian, 54</td>
<td>Local Office</td>
</tr>
<tr>
<td>Lexington, MA 02421</td>
<td>10040 Leini (TO) – ITALY</td>
<td></td>
</tr>
<tr>
<td>Fax: (781) 860-9252</td>
<td>Fax: (39) 011 997 9350</td>
<td></td>
</tr>
<tr>
<td>For a complete list of phone/fax numbers see <a href="http://www.varianinc.com/vacuum">www.varianinc.com/vacuum</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Company name:</th>
<th>Contact person: Name:</th>
<th>Tel:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fax:</th>
<th>E-mail:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ship Method:</th>
<th>Shipping Collect #:</th>
<th>P.O.#:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Europe only: VAT Reg. Number: | USA only: Taxable | Non-taxable

Customer Ship To: | Customer Bill To: |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PRODUCT IDENTIFICATION

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Varian P/N</th>
<th>Varian S/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

TURBO PUMPS and TURBOCONTROLLERS

<table>
<thead>
<tr>
<th>CLAIMED DEFECT</th>
<th>POSITION</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Does not start</td>
<td>☐ Noise</td>
<td>Rotational Speed:</td>
</tr>
<tr>
<td>☐ Does not spin freely</td>
<td>☐ Vibrations</td>
<td>Current:</td>
</tr>
<tr>
<td>☐ Does not reach full speed</td>
<td>☐ Leak</td>
<td>Temp 1:</td>
</tr>
<tr>
<td>☐ Mechanical Contact</td>
<td>☐ Overtemperature</td>
<td>Temp 2:</td>
</tr>
<tr>
<td>☐ Cooling defective</td>
<td>☐ Clogging</td>
<td>Purge flow:</td>
</tr>
</tbody>
</table>

Describe Failure:

TURBOCONTROLLER ERROR MESSAGE:

ION PUMPS/CONTROLLERS

<table>
<thead>
<tr>
<th></th>
<th>VALVES/COMPONENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Bad feedthrough</td>
<td>☐ Main seal leak</td>
</tr>
<tr>
<td>☐ Vacuum leak</td>
<td>☐ Bellows leak</td>
</tr>
<tr>
<td>☐ Error code on display</td>
<td>☐ Solenoid failure</td>
</tr>
</tbody>
</table>

Describe failure:

Customer application:

LEAK DETECTORS

<table>
<thead>
<tr>
<th></th>
<th>INSTRUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Cannot calibrate</td>
<td>☐ Gauge tube not working</td>
</tr>
<tr>
<td>☐ Vacuum system unstable</td>
<td>☐ Communication failure</td>
</tr>
<tr>
<td>☐ Failed to start</td>
<td>☐ Error code on display</td>
</tr>
</tbody>
</table>

Describe failure:

Customer application:

ALL OTHER VARIAN PUMPS

<table>
<thead>
<tr>
<th></th>
<th>DIFFUSION PUMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Pump doesn’t start</td>
<td>☐ Heater failure</td>
</tr>
<tr>
<td>☐ Doesn’t reach vacuum</td>
<td>☐ Electrical problem</td>
</tr>
<tr>
<td>☐ Pump seized</td>
<td>☐ Cooling coil damage</td>
</tr>
</tbody>
</table>

Describe failure:

Customer application:
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
Sales and Service Offices

Argentina
Varian Argentina Ltd.
Sucursal Argentina
Av. Ricardo Balbin 2316
1428 Buenos Aires
Argentina
Tel: (54) 1 783 5306
Fax: (54) 1 786 5172

Australia
Varian Australia Pty Ltd.
679-701 Springvale Road
Mulgrave, Victoria ZZ 3170
Australia
Tel: (61) 395607133
Fax: (61) 395607950

Benelux
Varian Vacuum Technologies
Rijksstraatweg 269 H,
3956 CP Leersum
The Netherlands
Tel: (31) 343 469910
Fax: (31) 343 469961

Brazil
Varian Industria e Comercio Ltda.
Avenida Dr. Cardoso de Mello 1644
Vila Olimpia
Sao Paulo 04548 005
Brazil
Tel: (55) 11 3845 0444
Fax: (55) 11 3845 9350

Canada
Central coordination through:
Varian Vacuum Technologies
121 Hartwell Avenue
Lexington, MA 02421
USA
Tel: (781) 861 7200
Fax: (781) 860 5437
Toll Free: (800) 882 7426

China
Varian Technologies - Beijing
Room 1201, Jinyu Mansion
No. 129A, Xuanwumen Xidajie
Xicheng District
Beijing 100031 P.R. China
Tel: (86) 10 6641 1530
Fax: (86) 10 6641 1534

France and Wallonie
Varian s.a.
7 avenue des Tropiques
Z.A. de Courtaboeuf – B.P. 12
Les Ulis cedex (Orsay) 91941
France
Tel: (33) 1 69 86 38 13
Fax: (33) 1 69 28 23 08

Germany and Austria
Varian Deutschland GmbH
Alsfelder Strasse 6
Postfach 11 14 35
64289 Darmstadt
Germany
Tel: (49) 6151 703 353
Fax: (49) 6151 703 302

India
Varian India Pvt Ltd
101-108, 1st Floor
1010 Competent House
7, Nangal Raya Business Centre
58 Delhi 110 046
India
Tel: (91) 11 5548444
Fax: (91) 11 5548445

Italy
Varian Vacuum Technologies
Via F.lli Varian, 54
10040 Leini, (Torino)
Italy
Tel: (39) 011 997 9111
Fax: (39) 011 997 9350

Japan
Varian Vacuum Technologies
Sumitomo Shibaura Building, 8th Floor
4-16-36 Shibaura
Minato-ku, Tokyo 108
Japan
Tel: (81) 3 5232 1253
Fax: (81) 3 5232 1263

Korea
Varian Technologies Korea, Ltd.
Shinsa 2nd Bldg. 2F
966-5 Daechi-dong
Kangnam-gu, Seoul
Korea 135-280
Tel: (82) 2 3452 2452
Fax: (82) 2 3452 2451

Mexico
Varian S.A.
Concepcion Beistegui No 109
Col Del Valle
C.P. 03100
Mexico, D.F.
Tel: (52) 5 523 9465
Fax: (52) 5 523 9472

Taiwan
Varian Technologies Asia Ltd.
18F-13 No.79, Hsin Tai Wu Road
Sec. 1, Hsi Chih
Taipei Hsien
Taiwan, R.O.C.
Tel: (886) 2 2698 9555
Fax: (886) 2 2698 9678

UK and Ireland
Varian Ltd.
28 Manor Road
Walton-On-Thames
Surrey KT 12 2QF
England
Tel: (44) 1932 89 8000
Fax: (44) 1932 22 8769

United States
Varian Vacuum Technologies
121 Hartwell Avenue
Lexington, MA 02421
USA
Tel: (781) 861 7200
Fax: (781) 860 5437
Toll Free: (800) 882 7426

Other Countries
Varian Vacuum Technologies
Via F.lli Varian, 54
10040 Leini, (Torino)
Italy
Tel: (39) 011 997 9111
Fax: (39) 011 997 9350

Internet Users:
Customer Service & Technical Support:
vpl.customer.support@varianinc.com

Worldwide Web Site:
www.varianinc.com/vacuum

Order On-line:
www.evarian.com

Representatives in most countries