INSTRUCTION MANUAL

Turbo-V60 Leak Detector PCB Controller

Model 969-9840
Turbo-V 60 Leak Detector

PCB Controller
Dear Customer,

Thank you for purchasing a VARIAN vacuum product. At VARIAN Vacuum Technologies we make every effort to ensure that you will be satisfied with the product and/or service you have purchased.

As part of our Continuous Improvement effort, we ask that you report to us any problem you may have had with the purchase or operation of our product. On the back side you find a Corrective Action Request form that you may fill out in the first part and return to us.

This form is intended to supplement normal lines of communications and to resolve problems that existing systems are not addressing in an adequate or timely manner.

Upon receipt of your Corrective Action Request we will determine the Root Cause of the problem and take the necessary actions to eliminate it. You will be contacted by one of our employees who will review the problem with you and update you, with the second part of the same form, on our actions.

Your business is very important to us. Please, take the time and let us know how we can improve.

Sincerely,

Sergio PIRAS  
Vice President and General Manager  
VARIAN Vacuum Technologies

Note: Fax or mail the Customer Request for Action (see backside page) to VARIAN Vacuum Technologies (Torino) - Quality Assurance or to your nearest VARIAN representative for onward transmission to the same address.
CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION

TO: VARIAN VACUUM TECHNOLOGIES TORINO - QUALITY ASSURANCE

FAX N°: XXXX - 011 - 9979350
ADDRESS: VARIAN S.p.A. - Via F.Ili Varian, 54 - 10040 Leini (Torino) - Italy
E-MAIL: marco.marzio@varianinc.com

<table>
<thead>
<tr>
<th>NAME</th>
<th>COMPANY</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADDRESS:

Tel. N°: ___________________ FAX N°: ___________________
E-MAIL: ___________________

PROBLEM / SUGGESTION:

____________________________________________________

REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.):

____________________________________________________

DATE ___________________

CORRECTIVE ACTION PLAN / ACTUATION (by VARIAN VTT)

LOG N° ________________

XXXX = Code for dialing Italy from your country (e.g., 01139 from USA; 00139 from Japan, etc.)
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SAFETY SUMMARY

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. All warnings and cautions should be read carefully and strictly observed. Address any safety, operation, and/or maintenance questions to your nearest Varian office.

The following format is used in this manual to call attention to hazards:

**WARNING!**

Warning are used when failure to observe instructions or precautions could result in injury or death.

**CAUTION!**

Cautions are used when failure to observe instructions could result in damage to equipment, whether Varian supplied or other associated equipment.

**NOTE**

Information to aid the operator in obtaining the best performance from the equipment.
1-1 General

The Turbo-V60 Leak Detector PCB controller is a microprocessor-controlled, solid-state, frequency converter with self-diagnostic and protection features.

The controller drives (within ten steps) the Turbo V-60 pump during the starting phase by controlling the voltage and current respect to the speed reached by the pump.

It incorporates all the facilities required for the automatic operation of the Turbo-V60 pump series. Remote start/stop and output control capability are provided via auxiliary connectors.

1-2 Turbo-V60 controller description

The controller is a solid-state frequency converter which is driven by a single chip microcomputer. The package composition is:

- Power transformer with interconnection cables
- PCB including: power supply and 3-phase output, analog and input/output section, microprocessor and digital section
- Controller to pump interconnection cable.

The power supply and the 3-phase output converts the single phase (50-60 Hz) AC mains supply into a 3-phase, low voltage, medium frequency output which is required to power the Turbo-V pump.

The microcomputer generates the variable output frequency and controls the 3-phase output voltage according to the software and the gas load condition of the pump.

Moreover, it manages input and output signals for a fully automatic operation.

A dedicated non-volatile RAM is used to store pump operating parameters and the input/output programmed information upon failure for a period of 10 years accumulated off time.

Two adjustable trimmers are provided to set the pump rotational speed as follows:
- P1 – High speed trimmer: 50 to 70 KRPM
- P2 – Low speed trimmer: 30 to 50 KRPM

The controller can be operated via remote signals through input/output connector.
1-3 Controller specifications

<table>
<thead>
<tr>
<th>Input:</th>
<th>Two ranges selectable on a three pin connector on the transformer primary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>- 120 Vac±20%, - 220 Vac±20%,</td>
</tr>
<tr>
<td>Frequency</td>
<td>47 to 63 Hz</td>
</tr>
<tr>
<td>Power</td>
<td>350 VA maximum</td>
</tr>
</tbody>
</table>

Output:

| Voltage | 54 Vac nominal ±10%,                                                   |
| Frequency | 1167 Hz, ±2%                                                          |
| Power   | 150 W maximum                                                          |

Operating temperature: 0°C to + 40°C

Storage temperature: -20°C to + 70°C

J2 optoisolator input: 4 to 12 Vdc

J2 optoisolator output:
- ICsat 1.6 mA
- VCE max 0.6 V
- VCEO 70 V

Interconnecting cables:
- Pump cable (5-wire, 55 cm long)

Weight: 0.5 Kg (1.1 lbs)

1-4 Controller outline

The outline dimensions for the Turbo-V60 Leak Detector PCB controller are shown in Fig. 1-1.

Figure 1-1 – Controller outline
2-1 General
Inspect the controller for any shipping damage.

WARNING!
High voltage developed in the controller can cause severe injury or death. Before servicing the unit, disconnect the input power cable.

NOTE
The PCB installed into the customer system must be positioned so that cold air (forced or natural convection) can flow through the PCB components.

2-2 Line voltage selection
The controller can operate with two ranges of input voltage:
- 120 Vac ±20%
- 220 Vac ±20%

The line voltage selection is done on the three pin male connector on the primary wires of the transformer:
- for 120 Vac connect the line wires as follows:
  - 120 Vac to pin 2 (white)
  - 0 V to pin 3 (bleu)
- for 220 Vac connect the line wires as follows:
  - 220 Vac to pin 1 (brown)
  - 0 V to pin 3 (bleu)

NOTE
The mating connector and the female pins are provided.

2-3 Power interconnections
The power supply from the external transformer must be connected to J8 connector.

See Fig. 2-1 for interconnections detail.
2-4 Input/Output interconnections

All the input/output signals to the controller must be connected at J15 mating connector (see Fig. 2-2).

Pin 1-6 Input A optically isolated from the internal circuit.
In conjunction with the Input B determines the controller mode of operation according to the following truth table.

Pin 2-7 Input B optically isolated from the internal circuit.
In conjunction with the Input A determines the controller mode of operation according to the following truth table.

Pin 3-8 Output Normal optically isolated from the internal circuit.
Pin 4-9 Output Overload optically isolated from the internal circuit.

2-5 Turbo-V pump connection

A 55 cm long cable is provided to connect the controller to the pump.

Figure 2-3 shows the pump output connector configuration where pins:

- Pins A-F = pump temperature sensor
- Pins B-C-D = 54 Vac 3-phase output to pump motor stator
- Pin E = ground.
3-1 General

Make all vacuum manifold and electrical connections and refer to Turbo-V pump instruction manual prior to operating the Turbo-V controller.

![WARNING!]

To avoid injury to personnel and damage to the equipment, if the pump is laying on a table make sure it is steady. Never operate the Turbo-V pump if the pump inlet is not connected to the system or blanked off.

The controller operates completely automatically after the remote start command is given.

The only user available commands are two trimmers to set the pump rotational speed: the first one (P1) sets the high speed, the second (P2) sets the low speed.

The two trimmers are factory preset as follows:
- P1 (high speed) to 60 KRPM
- P2 (low speed) to 33 KRPM

To select different rotational speeds, act on the appropriate trimmer. The variation ranges are:
- P1: 50 to 70 KRPM
- P2: 30 to 50 KRPM

3-2 Startup

Plug the controller power cable into a suitable power source.

The controller is factory preset with the Soft Start mode enabled that allows the pump to ramp-up to Normal speed slowly with a minimum ramp-up time of 75 seconds and a maximum of about 45 minutes.

If it is necessary to deselect this mode refer to paragraph 3-3.

If the Soft Start mode is deselected, the ramp-up will be done within 60 seconds.

3-3 Soft Start mode deselection

The Soft Start mode is enabled and disabled by means of a jumper located on the controller PCB.

To deselect the Soft Start mode operate as follows:
- Disconnect the power from the controller.
- Move the red jumper from the actual position to the other according to the label attached over the integrated circuit near the jumper (see Fig. 3-1).
- Connect the power.

![Figure 3-1- Soft Start jumper]

3-4 Starting the pump

To start the pump it is necessary to set the Input A and Input B signals on J15 connector both to low logic level, or one to low and the other to high logic level.

In the first case the output to the pump is at low frequency, in the other case the output is at high frequency.

The time to change the speed from low frequency (33 KRPM) to high frequency (60 KRPM) is 12 sec.

The time to change from high frequency (60 KRPM) to low frequency (33 KRPM) is 3 sec.
3-5 Pump shutdown
To shutdown the pump it is necessary to set the Input A and Input B signals on J15 connector both to high logic level.

3-6 Power failure
In the event of a power failure (momentary or long term), the Turbo-V controller will stop the turbopump.

When power is restored, the Turbo-V controller automatically restarts the turbopump.
SECTION IV - MAINTENANCE

4-1 General
Replacement controllers are available on an advance exchange basis through Varian. If necessary, information is provided to aid the operator in determining malfunctions and corrective steps to be taken.

Voltages developed in the unit are dangerous and may be fatal. Service must be performed by authorized personnel only.

4-2 Controller test

a) Equipment required
- Digital voltmeter (DVM) true RMS.
- Dummy load: 3 x 48Ω, 50W each or 3 x 78Ω, 50W each.
- Potentiometer 50KΩ, 1/4W minimum.

b) Test set up
- Remove the power cable.
- Disconnect the Turbo-V controller.
- Set potentiometer to 30KΩ and connect it as directed in Fig. 4-1.

4-2.1 Power supply test

a) DC voltage test
Check the DC voltages referring to test points indicated in Fig. 4-2. Refer also to Figg. 4-3 and 4-4. The meter should read:
- + 5Vdc ± 5%
- ± 12 Vdc ± 5%
- Ground reference = case of Q3.
Switch on the controller and check:
- 54 Vdc ± 10% between TP3(-) a TP5(+) (Fig. 4-2).

b) AC three-phase output voltage test
On the pump connector connect the DVM in turn between:
- pins B and C, B and D, C and D.
The meter should read 44 Vac ±15%; a different value of 0.4 Vac is tolerable between phase and phase.

4-2.2 Test with dummy load
- Connect the 48Ω or the 78Ω dummy loads to the pump connector pins B, C, D as shown in Fig. 4-1.
- Disconnect the potentiometer, set it to 10KΩ, and then reconnect it.
- Connect the power cable.
- Switch on the controller and check the values as per the following table.

Figure 4-1 – Dummy load connections
4-2.3 Pump over-temperature test
- Disconnect the potentiometer, set it to 5KΩ, and then reconnect it.
- Disconnect the dummy loads.
- Connect the power cable.
- Switch on the controller.
- Check the 3-phase ac output voltage. It should be zero.
- Switch off the controller and remove power cable.

4-2.4 Functional test
Perform the functional test with the turbo-pump, taking care to check the ramp sequence and start up time.

<table>
<thead>
<tr>
<th></th>
<th>During start-up without Soft Start mode</th>
<th>After start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With 48Ω dummy load</td>
<td>With 78Ω dummy load</td>
</tr>
<tr>
<td>Current ±10%</td>
<td>1.62 A</td>
<td>1.1 A</td>
</tr>
<tr>
<td>Power ±10%</td>
<td>80 W</td>
<td>58 W</td>
</tr>
<tr>
<td>Speed ±4KRPM</td>
<td>17</td>
<td>70</td>
</tr>
<tr>
<td>Temperature ±2°C</td>
<td>52° C</td>
<td>52° C</td>
</tr>
</tbody>
</table>

- Check the 3-phase ac output voltage.
  After start up it should be:
  36 Vac with 78Ω dummy load and
  21 Vac with 48Ω dummy load.

Switch off the controller and remove the power cable.
Request for Return

1. A Return Authorization Number (RA#) **WILL NOT** be issued until this Request for Return is completely filled out, signed and returned to Varian Customer Service.

2. Return shipments shall be made in compliance with local and international Shipping Regulations (IATA, DOT, UN).

3. The customer is expected to take the following actions to ensure the Safety of workers at Varian: (a) Drain any oils or other liquids, (b) Purge or flush all gasses, (c) Wipe off any excess residues in or on the equipment, (d) Package the equipment to prevent shipping damage, (for Advance Exchanges please use packing material from replacement unit).

4. Make sure the shipping documents clearly show the RA# and then return the package to the Varian location nearest you.

### 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

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Varian P/N</th>
<th>Varian S/N</th>
<th>Purchase Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<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 CAN NOT ACCEPT any equipment which contains **BIOLOGICAL HAZARDS** or **RADIOACTIVITY**. Call Varian Customer Service to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

- ☐ HAS NOT been exposed to any toxic or hazardous materials

OR

- ☐ HAS been exposed to any toxic or hazardous materials. In case of this selection, check boxes for any materials that equipment was exposed to, check all categories that apply:

  - Toxic
  - Corrosive
  - Reactive
  - Flammable
  - Explosive
  - Biological
  - Radioactive

List all toxic or hazardous materials. Include product name, chemical name and chemical symbol or formula.

- ………………………………………………………………………………………………………………………..

Print Name: …………………………………. Customer Authorized Signature: …………………………………

Print Title: …………………………………. Date: ……../…../……

**NOTE:** If a product is received at Varian which is contaminated with a toxic or hazardous material that was not disclosed, the **customer will be 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 as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

Do not write below this line

Notification (RA)#: ……………………….……….. Customer ID#: …………………. Equipment #: ………………….……
**FAILURE REPORT**

**TURBO PUMPS and TURBOCONTROLLERS**

<table>
<thead>
<tr>
<th>Does not start</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not spin freely</td>
<td>Vibrations</td>
</tr>
<tr>
<td>Does not reach full speed</td>
<td>Leak</td>
</tr>
<tr>
<td>Mechanical Contact</td>
<td>Overtemperature</td>
</tr>
<tr>
<td>Cooling defective</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POSITION</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>Power: Rotational Speed:</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Current: Inlet Pressure:</td>
</tr>
<tr>
<td>Upside-down</td>
<td>Temp 1: Foreline Pressure:</td>
</tr>
<tr>
<td>Other:</td>
<td>Temp 2: Purge flow:</td>
</tr>
</tbody>
</table>

**ION PUMPS/CONTROLLERS**

<table>
<thead>
<tr>
<th>Bad feedthrough</th>
<th>Poor vacuum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum leak</td>
<td>High voltage problem</td>
</tr>
<tr>
<td>Error code on display</td>
<td>Other</td>
</tr>
</tbody>
</table>

**LEAK DETECTORS**

<table>
<thead>
<tr>
<th>Cannot calibrate</th>
<th>No zero/high background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum system unstable</td>
<td>Cannot reach test mode</td>
</tr>
<tr>
<td>Failed to start</td>
<td>Other</td>
</tr>
</tbody>
</table>

**VALVES/COMPONENTS**

<table>
<thead>
<tr>
<th>Main seal leak</th>
<th>Bellows leak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solenoid failure</td>
<td>Damaged flange</td>
</tr>
<tr>
<td>Damaged sealing area</td>
<td>Other</td>
</tr>
</tbody>
</table>

**INSTRUMENTS**

<table>
<thead>
<tr>
<th>Gauge tube not working</th>
<th>Display problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication failure</td>
<td>Degas not working</td>
</tr>
<tr>
<td>Error code on display</td>
<td>Other</td>
</tr>
</tbody>
</table>

**PRIMARY PUMPS**

<table>
<thead>
<tr>
<th>Pump doesn’t start</th>
<th>Noisy pump (describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t reach vacuum</td>
<td>Over temperature</td>
</tr>
<tr>
<td>Pump seized</td>
<td>Other</td>
</tr>
</tbody>
</table>

**DIFFUSION PUMPS**

<table>
<thead>
<tr>
<th>Heater failure</th>
<th>Electrical problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t reach vacuum</td>
<td>Cooling coil damage</td>
</tr>
<tr>
<td>Vacuum leak</td>
<td>Other</td>
</tr>
</tbody>
</table>

**FAILURE DESCRIPTION**

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

---

**NOTA:** Su richiesta questo documento è disponibile anche in Tedesco, Italiano e Francese.

**REMARQUE:** Sur demande ce document est également disponible en allemand, italien et français.

**HINWEIS:** Auf Anfrage ist diese Unterlage auch auf Deutsch, Italienisch und Französisch erhältlich.
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 1000031 P.R. China
Tel: (86) 10 6608 1530
Fax: (86) 10 6608 1534

France and Wallonie
Varian s.a.
7 avenue des Tropiques
Z.A. de Courtabeouf – 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
New 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 2452 2452
Fax: (82) 2 2452 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:
vtt.customer.service@varianinc.com

Worldwide Web Site:
www.varianinc.com/vacuum

Order On-line:
www.evarian.com

Representatives in most countries