VARIAN

vacuum technologies

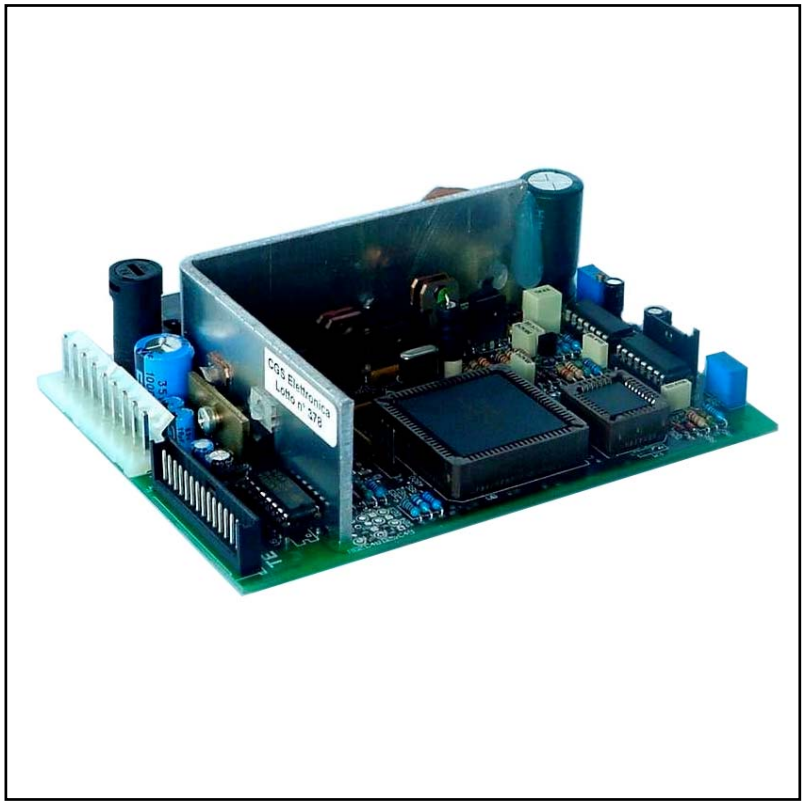
Turbo-V70 PCB 24 Vdc controller

Model 969-9515

(GB) INSTRUCTION MANUAL

87-900-880-01 (B)
JULY 2006

Turbo-V 70 PCB 24 Vdc Controller



VARIAN

vacuum technologies

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.lli Varian, 54 - 10040 Leinì (Torino) - Italy

E-MAIL : marco.marzio@varianinc.com

NAME	COMPANY	FUNCTION
_____	_____	_____

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 LOG N° _____
(by VARIAN VTT)

_____

XXXX = Code for dialing Italy from your country (es. 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

Infomation to aid the operatr in obtaining the best performance from the equipment.

1-1 General

The Turbo-V70 PCB controller is a microprocessor-controlled, solid-state, frequency converter with self-diagnosis and protection features.

The controller drives the Turbo V-70 pump series by controllling the voltage and current respect to the speed reached by pump.

It incorporates all the facilities required for the operation of the Turbo-V70 pump series: pump start/stop, digital current and speed control, analog signals for external indicators.

The power is externally supplied.

All the input/output connections are performed on three connectors (J2, J3 and J4).

The controller is also designed to be controlled by a host computer via an RS-232 connection (connector J5).

1-2 Turbo-V70 PCB 24 Vdc controller description

The controller is a solid-state frequency converter which is driven by a single chip microcomputer and is composed of a PCB which includes all the circuitry necessary for its operation.

The microcomputer generates the variable output voltage according to the software and the gas load condition of the pump.

Moreover, it manages signals from sensors, input/output connection information, and gives output for a fully automatic operation.

The controller can be operated via remote signals through an RS-232 connection. The RS-232 signals are available on J5 connector.
The controller can be operated in local mode through suitable switches connected between the input pins of J4 connector and ground (see para. 2-4 for a detailed description of the input signal present on J4 connector).

1-3 Controller specifications

Imput: - Voltage - Power	20.4 to 32.2 Vdc with 2 Vpp max ripple 60 W min.
Output: - Voltage - Frequency - Power	42 Vac nominal ±10%, 3-phase 1250 Hz, ±2% 54 W maximum
Operating temperaure	0°C to + 40 °C
Storage temperature	-20°C to + 70°C
Weight	0.5 Kg (1.1 lbs)

1-4 Controller outline

The outline dimension for the controller are shown in Fig. 1-1.

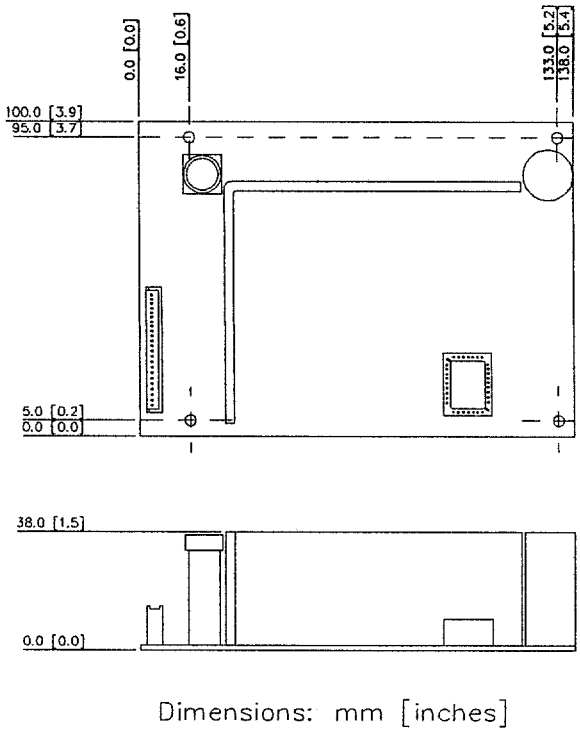


Figure 1-1 Controller outline

2-1 General

Inspect the controller for any shipping damage.

The controller is designed to be installed into a rack.

All the connections are fitted to J2, J3, J4 and J5 connectors.

Should the controller be connected to a host computer via the-RS-232 interface, a suitable cable must be prepared.

In the following paragraphs are detailed the input/output signals.

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 J2 connector

The signals of J2 connector are the following:

- **Pins 1/2** Power supply 24. Vdc (20 to 32 Vdc) (pin 2 positive).
- **Pins 4/3** Kl relay contacts. The relay switches when the output frequency overrides the set threshold (800 Hz). The threshold overriding is indicated also on pin 6 of J4 connector.

2-3 J3 connector

The signals of J3 connector are the following:

- **Pin 1** 42 Vac 3-phase output to pump motor stator (phase T).
- **Pin 2** 42 Vac 3-phase output to. pump motor stator (phase S).
- **Pin 3** 42 Vac 3-phase output to pump motor stator (phase R).
- **Pins 5/4** Pump temperature sensor.

2-4 J4 connector

The signals of J4 connector are the following:

- **Pin 3** Failure. When a fault condition is detected, the pump is stopped and a signal is present on this pin.
- **Pin 5** Low Speed mode activated. When the Low Speed mode is activated a signal is present on this pin.
- **Pin 6** When the output frequency is less than 800 Hz, a signal is present on this pin.
- **Pin 7** Analog output. A voltage from 0 to 10 Vdc proportional to the supply current (from 0 to 2.5 A).
- **Pin 8** Analog output. A voltage from 0 to 10 Vdc proportional to the output pump motor driving frequency (from 0 to 1250 Hz).
- **Pin 11** Error reset command. Should an operation fault be detected (presence of signal on pin 3 of J4), the pump is stopped. To reset the fault you must connect pin I I to ground (pin 15 of J4) for at least I sec.
- **Pin 12** ON/OFF pump. To stop the pump you must connect pin 12 to ground (pin 15 of J4); to start the pump you must remove the contact between pin 12 and ground.
- **Pin 13** Low Speed mode activation. When the contact between pin 13 and ground (pin 15 of J4) closes, the turbopump runs at low speed and when the contact opens, the turbopump reverts to high speed mode. When the Low Speed mode is activated an output signal is present on pin 5 of J4. The Low Speed frequency is 830 Hz.

2-5 J5 RS-232 interface connector

The signal of J5, the RS-232 interface connector, are the following:

- **Pin 1** Ground.
- **Pin 2** RXD. Received data.
- **Pin 3** TXD. Transmitted data.

2-6 RS-232 communicafion description

Communication format:

- 8 data bit
- no parity
- stop bit
- The baud rate is programmable via a set of jumper between 4800 and 9600 baud. The controller is factory-set for 9600 baud operation.

Communication protocol

The communication protocol is of the masterslave type, where:

- Host = Master
- Eurocard controller = slave

NOTE

To send *a* command by the serial interface, the controller must be set to "REMOTE OFF" of operation, otherwise *it is* only possible to read the data.

The master send to the slave a word according to the following format:

slave address	parameter number	data field lenght	data	check-sum	CR

where:

- **Slave Address:** controller number requested by the master. In RS-232 version the address is set equal to "001";
- **Parameter Number:** it points out to the controller about which parameter the master wants to operate, and about the kind of operation (read/write). It consists of:

1	2	3	4	5
0= parameter reading 1 = parameter writing	always 0	000 to 299 = commands 300 to 699 = status 700 to 999 = parameter		

- **Data Field Lenght:** it points out the next field lenght in characters. In this protocol the possible combinations are:
  02 = parameter reading request
  06 = parameter, writing
- **Data:** in this controller it can be:
  "=?": in the case of parameter reading request
  "000000" or **"111111":** in the case of YES/NO command or parameter writing
  a six numeric character string 0 to 9
  pointing out the value of a configuration parameter or an analogic measure
  a six character string pointing out an error
- **Checksum:** it is the sum of the string ASCII values up to the first character of the checksum with a 8 bit cutting-off and a conversion to a decimal number.
- **CR:** < OxD>

All the fields are set on the right with the "O" character used as filling character.

When a string with an address number equal to the card one (001 in this case) is received, the controller answers as detailed in the following:

- in the case of a parameter request with a string having the same size described before, but the first character of the "Parameter Number" field set to 1.

  Example for a low speed status request:

  Master to Controller:
  0010000202= ?097< OxD >

  Controller to Master:
  0011000206111111016< OxD >
  where " 111111" is for low speed status ON

- in the case of a parameter writing, with a string including the parameter value that has been set out. Example for a low speed status ON writing:

  Master to Controller:
  0011000206111111016< OxD >

  Controller to Master:
  0011000206111111016< OxD >

- in the case of a string with a lenght greater than 40 characters, with:

			N	**A**	**K**	**CR**
Controller address						

- in the case of a wrong checksum, with:

			N	**A**	**K**	**CR**
Controller address						

- in the case of a parameter number not present, with:

			1	**0**				**0**	**6**	**N**	**O**	**-**	**D**	**E**	**F**			
contoll. address					param. address											check-sum		CR

- in the case of an out-limit value, with:

			1	**0**				**0**	**6**	**-**	**R**	**A**	**N**	**G**	**E**			
contoll. address					param. address											check-sum		CR

- in the case of an attempt of writing a logic parameter with a value not equal to " 000000" or " I I I I I 1", or when the parameter is a read only one, with:.

			1	**0**				**0**	**6**	**-**	**L**	**O**	**G**	**I**	**C**			
contoll. address					param. address											check-sum		CR

- in the case of a time between two characters greater than 1 second, with:

			N	**A**	**K**	**CR**
Controller address						

Information obtained by the serial interface are listed in the following table where the column "TYPE" points out a logic variable with “D” (allowed values "000000" or "111111") and a numeric variable with "N".

Variables with the first character of "Parameter Number" equal to X can be either written or read. Variables with that character equal to “0” can be only read, equal to "1" can be only written.

PARAMETER NUMBER	TYPE	DESCRIPTION
X0002	D	Low speed ON/OFF
X0003	D	Pump ON/OFF
X0008	D	Remote ON/OFF
10009	D	Error acknowledgment: error status clearing
00302	D	K1 status
00303	N	Error code: error code displaying (see the following table)
00306	D	Normal YES/NO
00307	D	Starting YES/NO
00309	N	Output frequency (Hz)
00310	N	Pump current * 100 (A)
00311	N	Temperature (°C)
00312	N	Software version The controller sends "QExxxx" where "xxxx” is the CRC16 of EPROM
00313	N	Power (W)
00314	N	Pump life (hours)
00315	N	Number of cycles
00316	N	Last cycle time (minutes)
00317	N	Software version. The controller sends “Paxxxx” where "xxxx" is the CRC16 of EEPROM
00700	N	Run up time (minutes)
X0701	N	Threshold (Hz)
X0702	D	Soft-start YES/NO
X0703	D	Reduced output power (YES) Full output power (NO)

Error Code Table

CODE	DESCRIPTION
00E000	No error
OOEOO1	Output current > 15 A
0OE002	Not connected pump
0OE003	Output current > 1.5 A for 15 sec.
0OE004	Bearing temperature > 60 °C
0OE005	Heat exchanger temperature > 60 °C
0OE006	Normal not reached at run up time
0OE007	Input voltage < 16 V for 5 sec.
00EOOS	Operating voltage < 10 V for 5 sec.
0OE009	Vp voltage 8V lower than no~ for 5 sec.
OOE010	Soft start ramp not ended within the expected time

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.

3-2 Switching on/off the pump

To switch on the pump is necessary to remove the connection between pin 12 of J4 connector and pin 15 (ground) of the same connector.

To switch off the pump is necessary to connect pin 12 of J4 connector to pin IS (ground) of the same connector.

3-3 Low speed activation/deactivation

To activate the Low Speed status it is necessary to connect pin 13 of J4 connector to pin 15 (ground) of the same connector.

To deactivate the Low Speed status it is necessary to disconnect pin 13 of J4 connector from pin 15 (ground) of the same connector.

The low speed status is available on pin 5 of the same connector.

The low speed frequency is equal to 830 Hz.

3-4 Error reset

If the controller identifies an error, the pump is switched off. After the error cause has been removed, the pump does not automatically run up. It is necessary to reset the error status: this is performed connecting pin 11 of J4 connector to pin 15 (ground) of the same connector for at least I second.

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.

WARNING

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

4-2 Error messages

For a certain type of failure, the controller will self-diagnose the error and the following messages will be displayed.

The controller signals the error occurred by means of a diagnostic LED located on the board, and on the RS 232 port.

The LED blinks in a coded mode:
it flashes a number of time equal to the error
code (see the following table) and then stays off, and so on.

Error Code Table

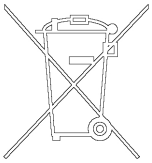
LED BLINKING NUMBER	DESCRIPTION
0	No error
1	Output current> 15 A
2	Not connected pump
3	Output current > 1.5 A for 15 sec.
4	Bearing temperature > 60 °C
5	Heat exchanger temperature > 60 °C
6	Normal not reached at run up time
7	Input voltage < 16 V for 5 sec.
8	Operating voltage < 10 V for 5 sec.
9	Vp voltage 8V lower than nominal for 5 sec.
10	Soft start ramp not ended within the expected time

4-3 Accessories and spare parts

DESCRIPTION	PART NUMBER
Cable 60 cm long with connector	969-9868

DISPOSAL

Meaning of the "WEEE" logo found in labels
The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment) Directive.
This symbol (**valid only in countries of the European Community**) indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system.
The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.



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Request for Return

ISO 9001 REGISTERED

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.

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Asia and ROW
Varian Vacuum Technologies
Local Office

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	Purchase Reference

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 #: ……

VARIAN

Request for Return

ISO 9001 REGISTERED

FAILURE REPORT

TURBO PUMPS and TURBOCONTROLLERS

		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		……	OPERATION TIME:	

TURBOCONTROLLER ERROR MESSAGE:

ION PUMPS/CONTROLLERS

☐ Bad feedthrough	☐ Poor vacuum
☐ Vacuum leak	☐ High voltage problem
☐ Error code on display	☐ Other

Customer application:

VALVES/COMPONENTS

☐ Main seal leak	☐ Bellows leak
☐ Solenoid failure	☐ Damaged flange
☐ Damaged sealing area	☐ Other

Customer application:

LEAK DETECTORS

☐ Cannot calibrate	☐ No zero/high backround
☐ Vacuum system unstable	☐ Cannot reach test mode
☐ Failed to start	☐ Other

Customer application:

INSTRUMENTS

☐ Gauge tube not working	☐ Display problem
☐ Communication failure	☐ Degas not working
☐ Error code on display	☐ Other

Customer application:

PRIMARY PUMPS

☐ Pump doesn't start	☐ Noisy pump (describe)
☐ Doesn't reach vacuum	☐ Over temperature
☐ Pump seized	☐ Other

Customer application:

DIFFUSION PUMPS

☐ Heater failure	☐ Electrical problem
☐ Doesn't reach vacuum	☐ Cooling coil damage
☐ Vacuum leak	☐ Other

Customer application:

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 Aufrage ist diese Unterlage auch auf Deutsch, Italienisch und Französisch erhältlich.

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