VARIAN

vacuum technologies

Turbo-V60 Leak Detector PCB Controller

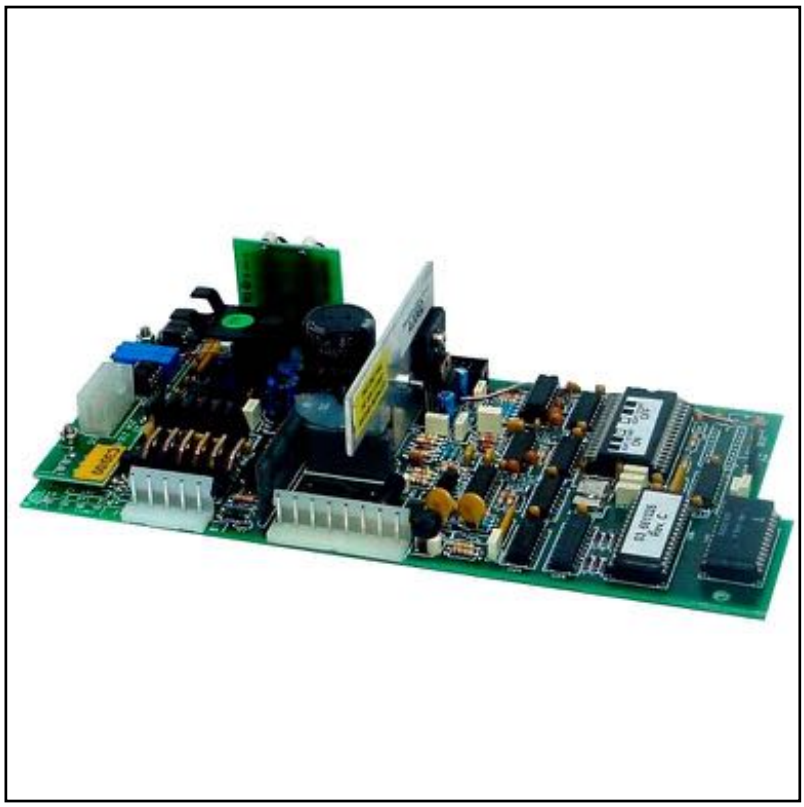
Model 969-9840

INSTRUCTION MANUAL

87-900-865-01 (A)
APRIL 2002

Turbo-V 60 Leak Detector

PCB 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 (by VARIAN VTT) LOG N°

XXXX = Code for dialing Italy from your country (es. 01139 from USA; 00139 from Japan, etc.)

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TABLE OF CONTENTS

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 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

Input: Voltage Frequency Power	 Two ranges selectables on a three pin connector on the transformer primary: - 120 Vac±20%, - 220 Vac±20%, 1-phase 47 to 63 Hz 350 VA maximum
Output: Voltage Frequency Power	 54 Vac nominal ±10%, 3-phase 1167 Hz, ±2% 150 W maximum
Operating temperaure	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.

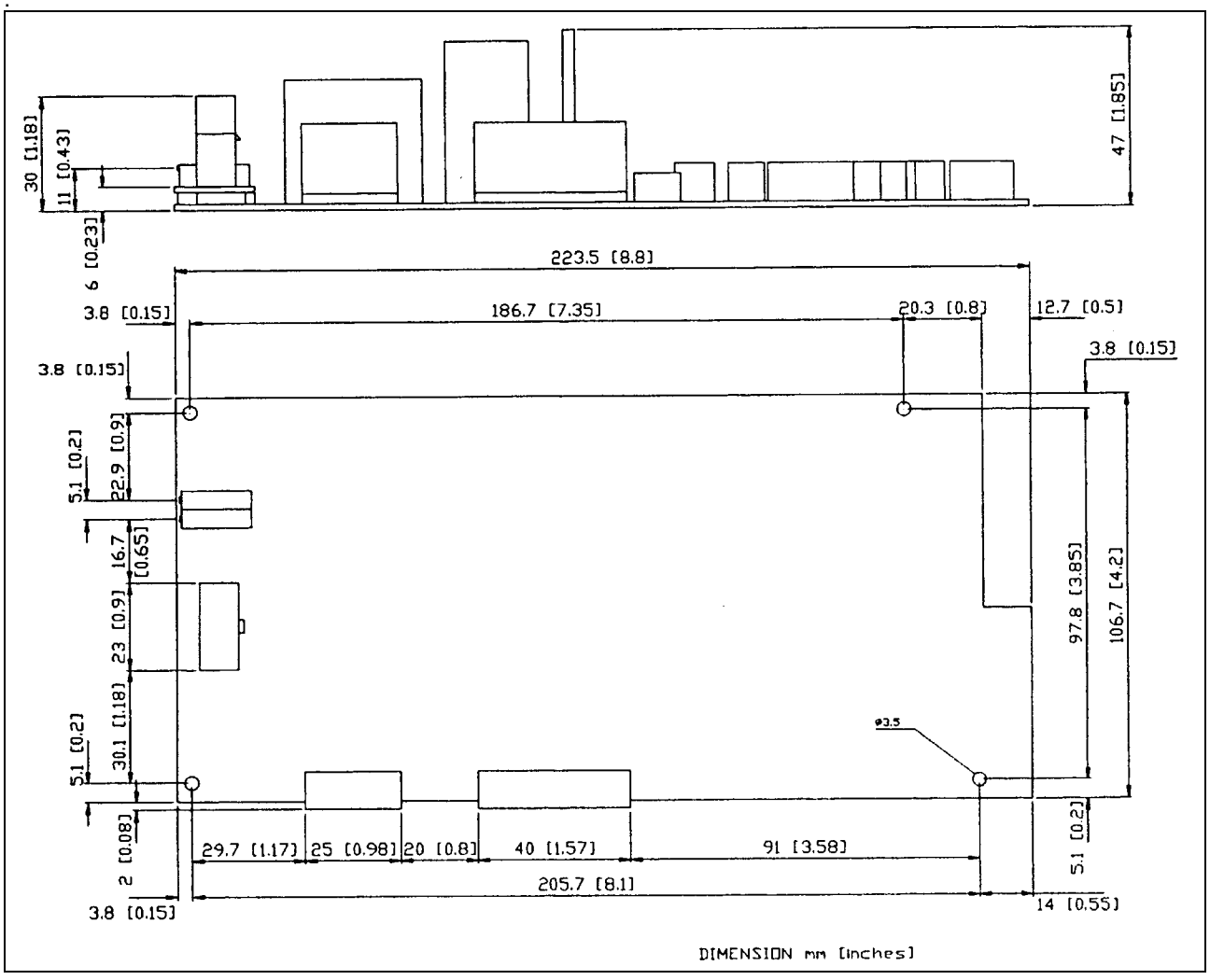


Figure 1-1 – Controller outline

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 operates 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.

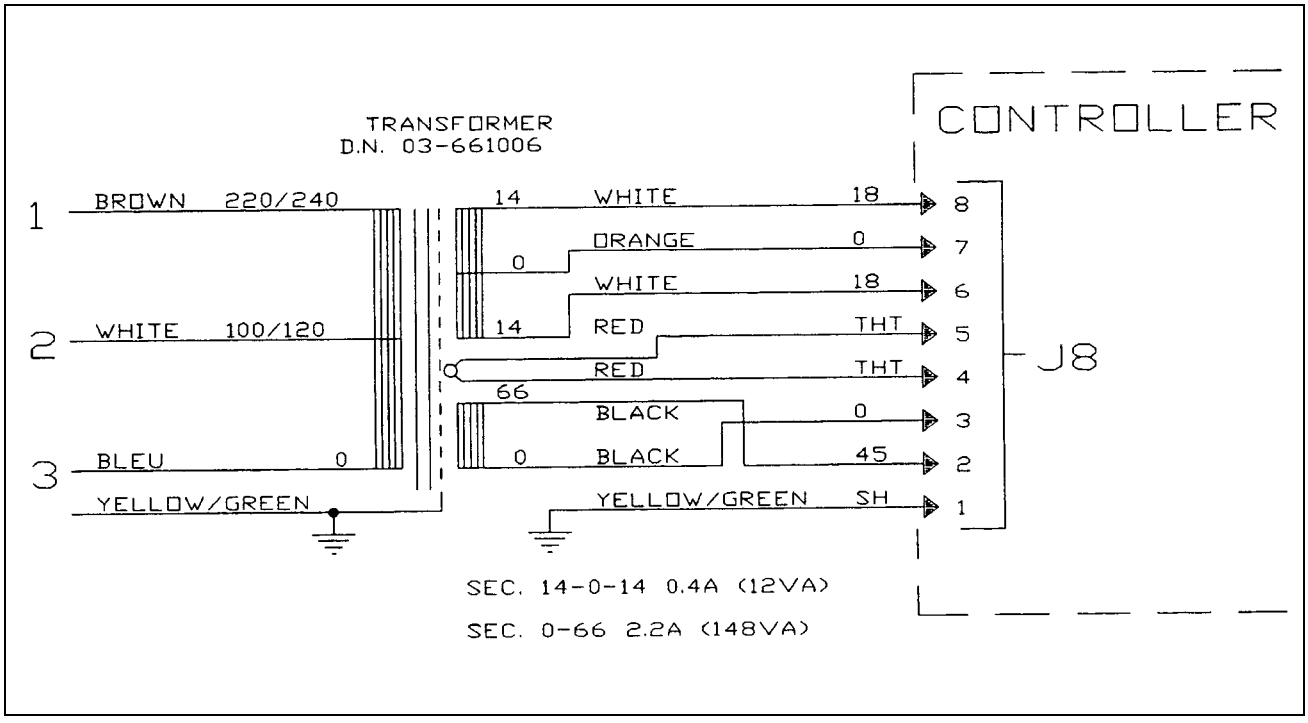


Figure 2-1 - J8 connector interconnections

2-4 Input/Output interconnections

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

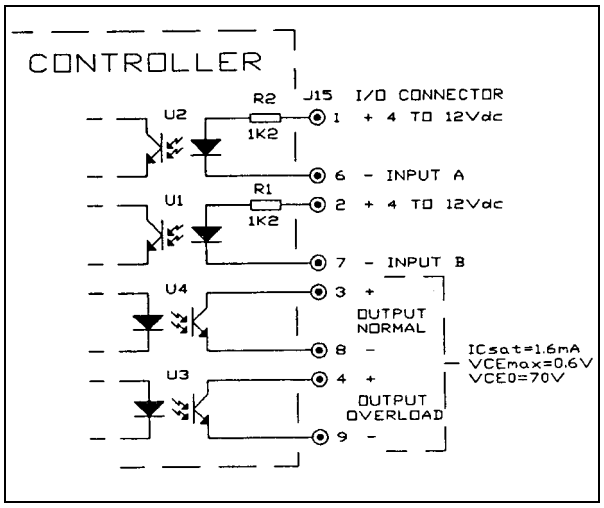


Figure 2-2 – Input/Output connector

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.

INPUT SIGNAL LOGIC LEVEL		CONTROL UNIT CONDITION
A	**B**	
LOW	LOW	LOW FREQUENCY
LOW	HIGH	HIGH FREQUENCY
HIGH	LOW	HIGH FREQUENCY
HIGH	HIGH	LOW FREQUENCY

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.

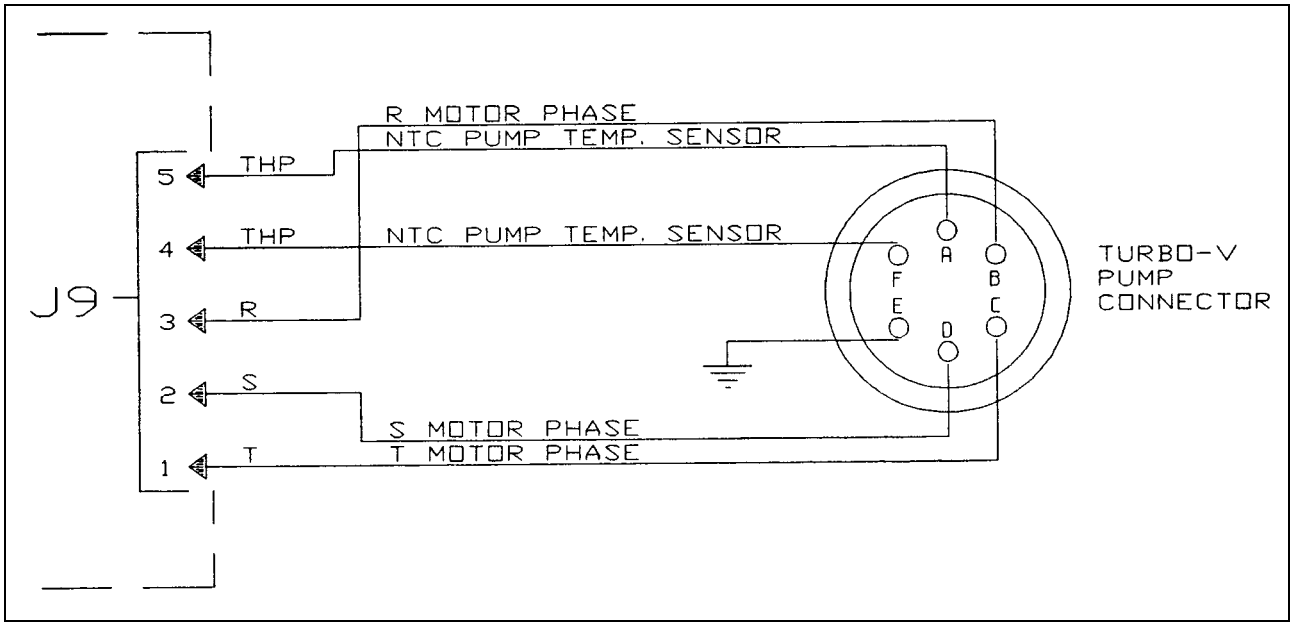


Figure 2-3 – Turbo-V pump connector

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 deselct 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.

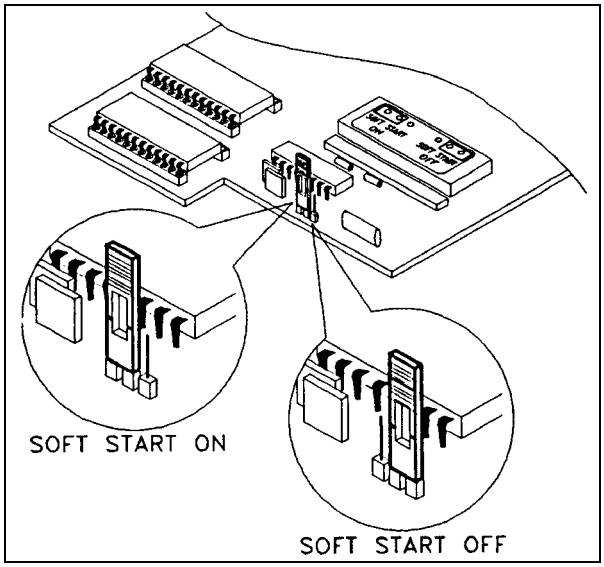


Figure 3-1- Soft Start jumper

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.

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 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, $^1/_4$W 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.

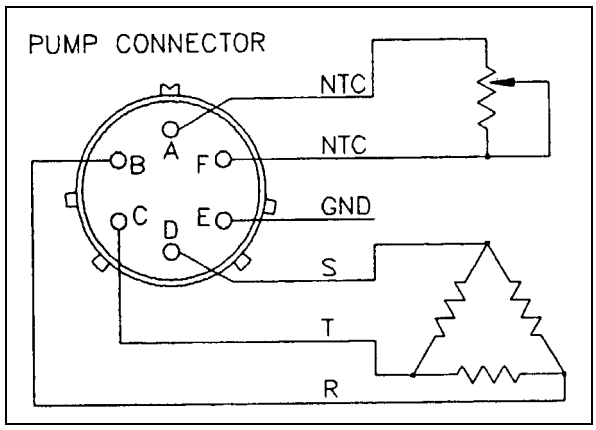


Figure 4-1 – Dummy load connections

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 he following table.

	During start-up without Soft Start mode		**After start-up**	
	With 48Ω dummy load	With 78Ω dummy load	With 48Ω dummy load	With 78Ω dummy load
Current ±10%	1.62 A	1.1 A	1 A	1 A
Power ±10%	80 W	58 W	30 W	48 W
Speed ±4KRPM	17	70	40	63
Temperature ±2°C	52° C	52° C	52° C	52° C

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

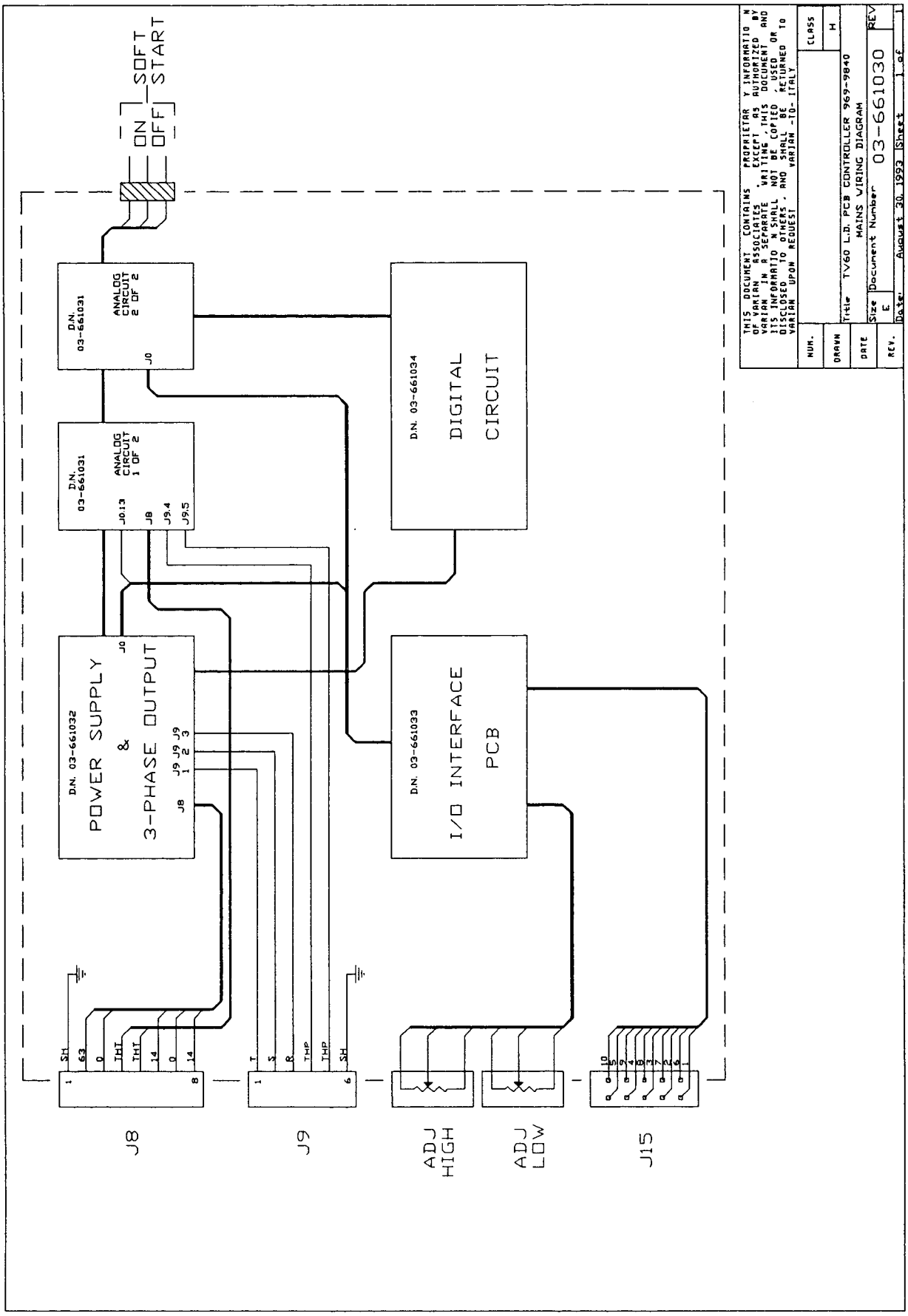
Switch off the controller and remove the power cable.

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.


ON
OFF
SOFT START
D.N. 03-661031
ANALOG CIRCUIT 2 OF 2
J0
D.N. 03-661031
ANALOG CIRCUIT 1 OF 2
J0.13
J8
J9.4
J9.5
D.N. 03-661034
DIGITAL CIRCUIT
D.N. 03-661032
POWER SUPPLY
&
3-PHASE OUTPUT
J0
J8
J9 J9 J9
1 2 3
D.N. 03-661033
I/O INTERFACE PCB
J8
J9
ADJ HIGH
ADJ LOW
J15
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Title TV60 L.D. PCB CONTROLLER 969-9840
MAINS WIRING DIAGRAM
Size E
Document Number 03-661030
REV
Date: August 30, 1993 Sheet 1 of 1

Figure 4-1

VARIAN

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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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

☐ Does not start	☐ Noise	POSITION	PARAMETERS		
☐ Does not spin freely	☐ Vibrations	☐ Vertical	Power:		Rotational Speed:
☐ Does not reach full speed	☐ Leak	☐ Horizontal	Current:		Inlet Pressure:
☐ Mechanical Contact	☐ Overtemperature	☐ Upside-down	Temp 1:		Foreline Pressure:
☐ Cooling defective		☐ Other:	Temp 2:		Purge flow:
		……	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.
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