VARIAN

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Turbo-V 70 Controller

Model 969-9507

MANUALE DI ISTRUZIONI

BEDIENUNGSHANDBUCH

NOTICE DE MODE D'EMPLOI

MANUAL DE ISTRUCCIONES

MANUAL DE ISTRUÇÕES

BEDRIJFSHANDLEIDING

ISTRUKSTIONSBOG

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INSTRUKSJON MANUAL

OHJEKÄSIKIRJA

ΟΔΗΓΙΕΣ ΧΡΗΣΕΩΣ

FELHASZNÁLÓI KÉZIKÖNYV

PODRECZNIK INSTRUKCJI

NÁVOD K POUŽITÍ

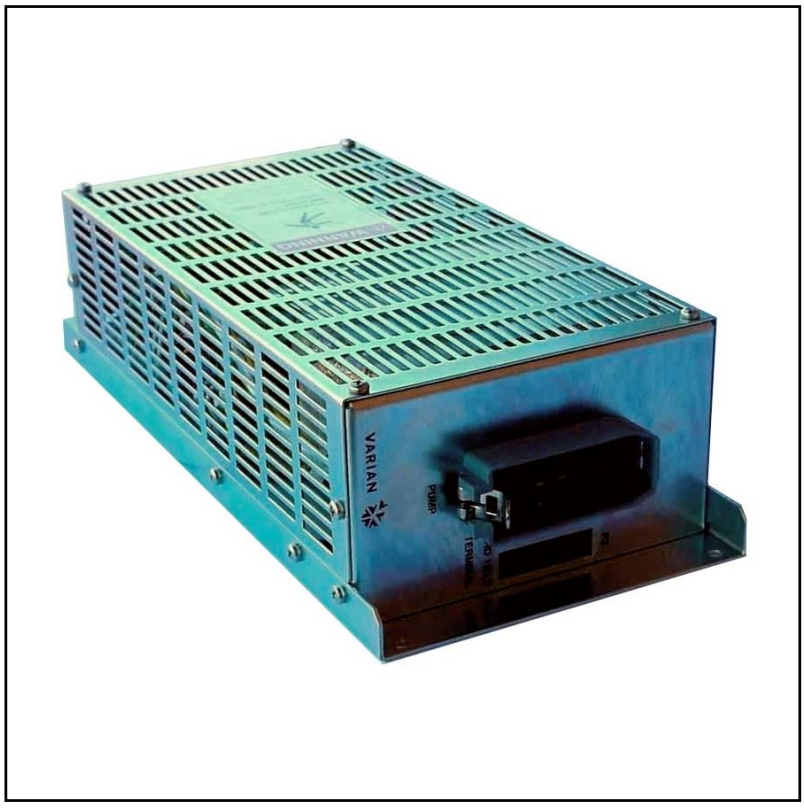
NÁVOD NA OBSLUHU

PRIROČNIK ZA NAVODILA

INSTRUCTION MANUAL

87-900-869-01 (D)
MAY 2005

Turbo-V 70 Controller



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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.)

VARIAN

SPLOŠNE INFORMACIJE

Naprava je namenjena samo za strokovno rabo. Uporabnik mora temeljito prebrati priročnik in pri tem upoštevati vsako dodatno informacijo, ki jo nudi Varian. Varian ne odgovarja v slučaju celotnega ali delnega nespoštovanja navodil, pri nepravilni uporabi s strani nestrokovnega osebja, v slučaju nedovoljenih posegov ali pri zanemarjenju specifičnih nacionalnih meril. Controller serije Turbo-V 250 je frekvenčni pretvornik, na katerega nadzor ima mikrokrmilnik, sestavljen iz solidnih delov za katere so značilne lastnosti avtodiagnoze in avtozaščite.
Controller krmi črpalke serije Turbo-V 70 (s 10-faznim postopkom) med pogonom in nadzoruje napetost ter električni tok v sorazmerju s hitrostjo, ki jo doseže črpalka. Controller vsebuje celotno električno vezje, ki je potrebno za avtomatično delovanje črpalke serije Turbo-V 70.
Preko pomočnega konektorja so na razpolago komande za pogon in zaustavitev črpalke (ki se regulira s daljinskim upravljanjem) komande ki pokažejo operativno stanje črpalke, komande za zagon zaustavitev črpalke predhodnega črpanja, komande za blokiranje (za stikala na pritisk, nadzorna stikala vodnega toka, itn.).
V naslednjih odstavkih so navedene vse informacije, ki so potrebne za zagotavljanje sigurnosti uporabnika med rokovanjem s to napravo. Podrobnejše informacije najdete v priponki "Technical Information".

V tem priročniku so varnostne informacije razvrščene v dva razreda:

SVARILO!

Znak svarila opozarja uporabnika, da mora pri določenem postopku ali pri posebnem delovanju paziti. Kršitev svarila lahko privede do lažjih ali hudih telesnih poškodb.

POZOR

Znak ‘pozor’ se pojavi pred postopke, ki če jih uporabnik zanemari, lahko napravo poškoduje.

OPOMBA

V opombah so vsebovane vse najbolj pomembne informacije iz besedila.

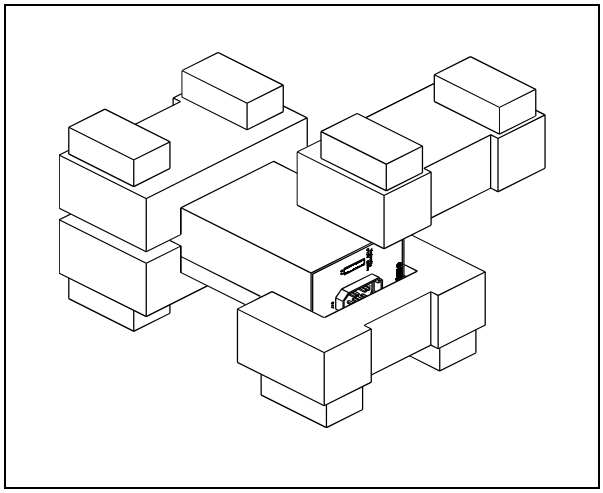
SKLADIŠČENJE

Med prevozom in skladiščenjem controller-jev morate poskrbeti, da bodo zagotovljeni naslednji pogoji okolice:

- temperatura: od-20 °C do +70 °C
- relativna vlaga: 0 - 95% (ne kondenzna).

PRIPRAVA ZA MONTAŽO

Controller dobite v posebni zaščitni embalaži; če so na embalaži znaki poškodbe, ki naj bi nastale med transportom obrnite se krejavnemu prodajalnemu biroju. Pri odstranitvi embalaže morate še posebno paziti, da controller ne pade na tla ali da ne podlegne udarcem. Ne zavrzite embalaže v okolico. Material lahko v celoti reciklirate in ustreza direktivi CEE 85/399 za zaščito okolja.



Embalaža controllera 969-9507

Vsak Controller Varian je napravljen za določeno gonilno napetost:

- model 969-9507 za 120 Vac.

MONTAŽA

SVARILO!

Controller ima napajalni vod s tremi žicami (gledaj tudi preglednico delov, ki lahko naročiš) in mednarodno priznan vtikač za varnost uporabnika. Uporabljajte vedno ta napajalni kabel in vtaknite vtikač v vtičnico z ustreznim masovnim vezanjem, ker drugače vas lahko strese električni tok in da se tako pridržite ES meril.
Znotraj controller-jev se stvori visoka napetost, ki lahko človeku povzroči hude poškodbe ali celo smrt.
Preden bi nadaljevali s katerokoli dejavnostjo montaže ali pa vzdrževanja, izklopite controller iz vtičnice.

OPOMBA

Controller lahko montirate na mizo ali pa vgradite znotraj ustreznega rack-a. V vsakem slučaju poskrbite, da voda za hlajenje prosto kroži po napravi. Controller-a ne smete vgraditi in/ali uporabiti v okolicah, ki so ogrožene s klimatskimi dejavniki kot so dež, led, sneg, s agresivnimi plini, ali v okolici kjer obstaja nevarnost vnetja ali požara.

Med delovanjem morate zagotoviti naslednje pogoje okolice:

- temperatura: od 0 °C do +40 °C
- relativna vlaga: 0 - 95% (ne-kondenzna).

Za priključitev controller-a in črpalke uporabiti ustrezni kabel, ki spada k črpalki.

OPOMBA

Model controllera 969-9507 dobite brez priključnega kabla za črpalke. Kabel lahko naročite kot dodatek pri firmi Varian; podrobnejše informacije najdete v odstavku "Accessories and spare parts" v dodatku "Technical Information". Kabel morate priključiti na eni strani konektorja J16 in na drugi strani na ustreznem konektorju črpalke. Konektorji, ki se nahajajo na obeh koncih kabla imajo tako obliko, da omogačajo da se kabel točno priključi.

Za ostale priključke in montažo drugih dodatkov oglejte si paragraf "Technical Information".

UPORABA

V tem odsatvku so navedeni glavni operativni postopki. Za podrobnejše informacije in postopke, ki se nanašajo na priključitve ali posamezne opcije ogledajte si paragraf "Use" v dodatku "Technical Information". Nekaj od naslednjih navodil velja za model 969-9507, samo če je pri tem priključen dodatek "Hand held terminal". Predno vključite controller, morate izvesti vse električne in pnevmatske priključke; pri tem morate upoštevati priročnik črpalke.

SVARILO!

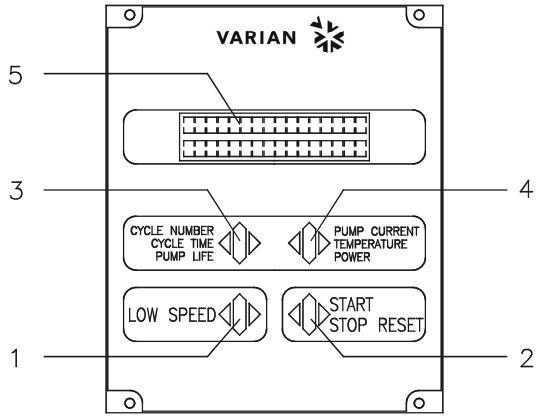
Da bi se izognili poškodbam bodisi oseb kot naprave, morate poskrbeti, da bo črpalka stabilno vgrajena (če monitrana na mizo). Črpalka ne sme delovati, če ni vhodna prirobnica priključena k sistemu ali če ni zaprta z ustrezno zapiralno prirobnico.

OPOMBA

Zapiralni konektor J1 mora ostati prikljčuen k svojemu mostičku, če niste izvršili nikakršne druge zunanje priključitve. Črpalko predhodnega *črpanja in črpalko Turbo-V lahko istočasno vklopite.*

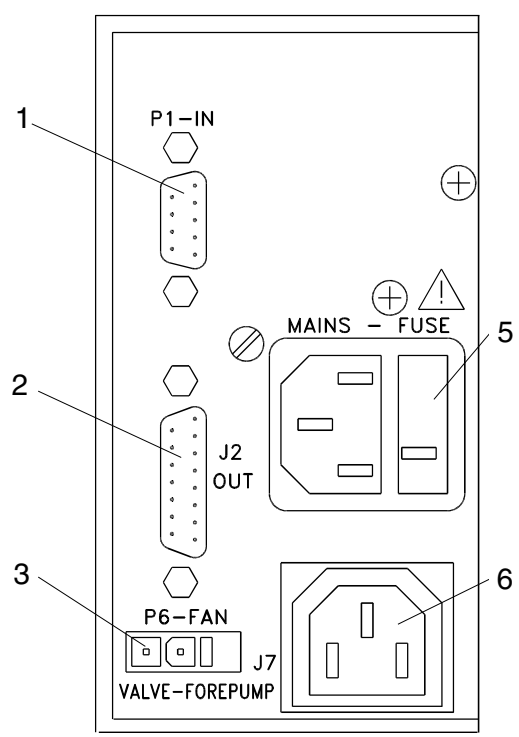
Komande, indikatorji, konektorji Controllera

Od spodaj prikaz plošče hand held terminala in interkonektorska plošča.
Podrobnejše informacije najdete v oddelku "Technical Information".

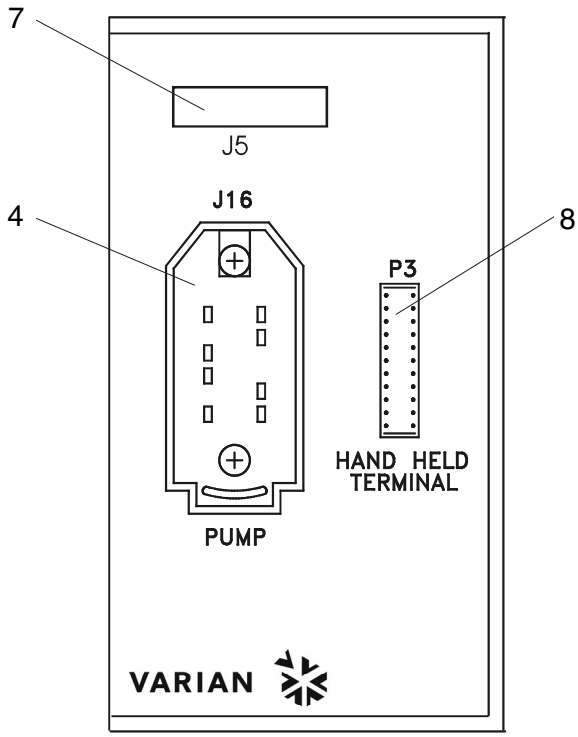


1. Tipka za LOW SPEED modus. Tipka ja aktivna, samo nato, ko ste nastavili način komande na prednji plošči. Če enkrat pritisnite tipko, se črpalka vrti za 2/3 nominalne hitrosti. Če še enkrat pritisnite gumb, izključite LOW SPEED modus.
2. Tipka za zagon komand START, STOP ali RESET. Tipka je aktivna nato, ko ste to komando nastavili na prednji plošči. Če enkrat gumb pritisnete, boste črpalko pognali, če še enkrat pritisnite gumb se bo črpalka zaustavila. Če se črpalka zaradi okvare sama zaustavi, morate to tipko še enkrat pritisniti, da bi controller resetirali in še drugič, za ponoven zagon črpalko.
3. Tipka za preklic na zaslonu parametrov cycle number, cycle time in pump life.
4. Tipka za preklic na zaslonu parametrov pump current, pump temperature, pump power in rotational speed. Tipka je vedno aktivna, neodvisno od načina delovanja, ki ste ga izbrali. Če istočasno pritisnete tipki 3 in 4 za vsaj 2 sekundi, boste aktivirali program s katerim lahko nastavite nekaj operativnih parametrov.
5. Alfaštevilčni zaslon iz tekočih kristalov: prebijalo bodov, 2 linije x 16 znakov.

Prednja plošča Hand Held Terminala



Leva plošča



Desna plošča

1. Izhodni konektor logičnih signalov (spajalni konektor s zapiralnim mostičkom).
2. Izhodni konektor logičnih in nadzornih signalov toka črpalke.
3. Izhodni močni konektor (24 Vcc za hladilni ventilator črpalke).
4. Konektor za priključitev kabla črpalke.
5. Vhodni modul napajanja controllera. Vsebuje zaščitno varovalko, menjalca napetosti, močno napajlno vtičnico in filter EMC.
6. Izhodna močna vtičnica (120 Vac) za napajanje dodatnih naprav (vent device, releji za aktiviranje primarne črpalke, itd.
7. Odprtina za konektor komunikacijskih serijskih vrat RS 232 (kot opcija).
8. Konektor za priključitev 'Hand Held Terminala.

Desna in leva plošča Controllera 969-9507

POSTOPEK UPORABE

Vklopitev Controller-a

Vklopite controller tako, da vtaknete napajalni kabel v omrežno vtičnico.

Zagon črpalke

Zagon črpalke počne, ko pritisnete na gumb START, ki se nahaja v “hand held terminalu".

Zaustavitev črpalke

Zaustavite črpalko s tipko STOP, ki se nahaja 'v "hand held terminalu".

VZDRŽEVANJE

Controllerji serije Turbo-V 70 ne potrebujejo vzdrževanja. Samo pooblaščeno osebje lahko rokuje s to napravo.

V slučaju okvare, se lahko obrnite servisu Varian ali "Varian advance exchange service", ki Vam stavlja na razpolago obnavljenega controller-a.

SVARILO!

Pred katerikoli posegom, izključite napajalni kabel iz controllera.

Controller zavrzite kot industrijski odpadek v skladu z državnimi predpisi.

OBVESTILO O NAPAKI

V nekaterih slučajih kvara pokaže električno vezje avtodiagnoze controller-a nekaj obvestil o napakah kot so opisane v spodnji tabeli.

OPOMBA

Za model controllera 969-9507 se pojavi obvestilo o napaki samo če je nastavljena opcija "hand held terminal".

OBVESTILO	OPIS	POPRAVA
CHECK CONNECTION TO PUMP	Napaka v priključitvi črpalke in controller-a.	Preverite, da je priključni kabel med črpalko in controllerjem na obeh koncih trdno pričvrščen in da ni prekinjen. Dvakrat pritisnite tipko START za ponoven zagon črpalke.
PUMP WAITING INTERLOCK	Znak interlock-a je aktiven in navzoč na konektorju P1 zaradi prekinitve kratkega stika med pinom 3 in pinom 8 konektorja J1, ali ker se je odprl signal zunanjega interlock-a.	Vnovič nastavite kratki stik med pinom 3 in pinom 8 konektorja J1, ali zaprite zunanji signal interlocka.
FAULT: OVERTIME SX	Med zagonom črpalke v modusu "soft start", črpalka ni dosegla predvideno hitrost v obdobju 15 minut pri vsakem koraku. (X ima lahko vrednost od 0 do 9 in pokaže ne preseženi korak).	Preverite, da ni prišlo do izgub v sistemu. Pritisnite dvakrat tipko START za ponoven zagon črpalke
FAULT: PUMP OVERTEMP.	Temperatura gornjega ležišča ali črpalke je presegla i 60 °C.	Počakajte, da se temperatura vrne pod normalnim vrednostnim pragom. Pritisnite dvakrat tipko START za ponoven zagon črpalke.
FAULT: CONTROLLER OVERTEMPERATURE	Temperatura transformatorja controllera je presegla 90 °C.	Počakajte, da se temperatura vrne pod normalnim vrednostnim pragom. Dvakrat pritisnite tipko START za ponoven zagon črpalke.
FAULT: TOO HIGH L0AD	Med navadnim delovanjem (po zagonu) je tok, ki ga črpalka črpa večji od nastavljenega (1,5 A).	Preverite, da lahko rotor črpalke prosto vrti. Dvakrat pritisnite tipko START za ponoven zagon črpalke.
FAULT: SHORT CIRCUIT	Med navadnim delovanjem (po zagonu) je priklopitev na izhodu v kratkem stiku (tok na izhodu večji od 2,2 A).	Preverite priključke črpalke in controllera. Dvakrat pritisnite tipko START za ponoven zagon črpalke.
SYSTEM OVERRIDE	Delovanje črpalke je zaustavil znak zasilnosti iz oddaljenega kontakta.	Izklopite napajalni kabel controllera in popravite napako, ki se je pojavila s signalom nevarnosti. Ponovno priključite napajalni kabel in pritisnite dvakrat tipko start za ponoven zagon črpalke.
OVERVOLTAGE	Kvar v oddelku za napajanje controllera, ali je controller dobil nepristen znak.	Dvakrat pritisnite tipko START za ponoven zagon črpalke. Če se to obvestilo spet pojavi, obrnite se Varian za pravilno vzdrževanje.
CONTROLLER FAILURE	Prekinitev varovalke na močnem sekundarnem navitju.	Obrnite se Varian za pravilno vzdrževanje.

GENERAL INFORMATION

This equipment is destined for use by professionals. The user should read this instruction manual and any other additional information supplied by Varian before operating the equipment. Varian will not be held responsible for any events occurring due to non-compliance, even partial, with these instructions, improper use by untrained persons, non-authorised interference with the equipment or any action contrary to that provided for by specific national standards. The Turbo-V 70 serie controller is microprocessor-controlled, solid-state, frequency converters with self-diagnostic and self-protection features.
The controller drives (within ten steps) the Turbo-V 70 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-V 70 pump series. Remote start/stop, pump status signals, forepump start/stop, interlock control (for pressure switch, water flow switch, etc.) capability, are provided via auxiliary connectors.
The following paragraphs contain all the information necessary to guarantee the safety of the operator when using the equipment. Detailed information is supplied in the appendix "Technical Information".

This manual uses the following standard protocol:

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 taken from the text.

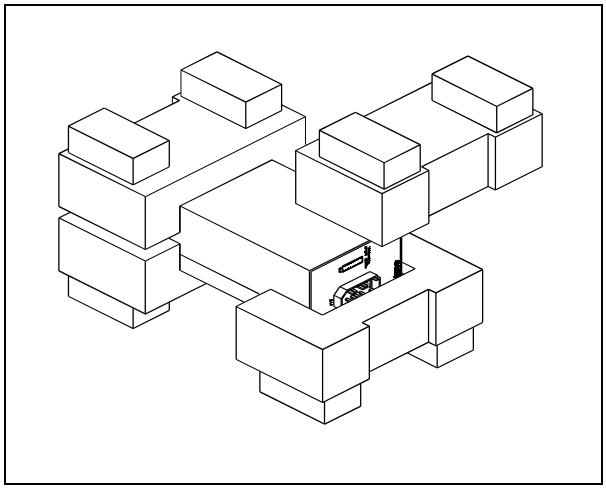
STORAGE

When transporting and storing the controllers, the following environmental requirements should be satisfied:

- temperature: from -20 °C to + 70 °C
- relative humidity: 0 - 95%
  (without condensation)

PREPARATION FOR INSTALLATION

The controller is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local sales office. When unpacking the controller, ensure that it is not dropped or subjected to any form of impact. Do not dispose of the packing materials in an unauthorized manner. The material is 100% recyclable and complies with EEC Directive 85/399.



Controller Packing 969-9507

Each controller is factory set for a specific power supply:

- model 969-9507 is factory set for 120 Vac operation

INSTALLATION

WARNING!

The Turbo-V controller must be powered with 3-wire power cord (see orderable parts table) and plug (internationally approved) for user's safety. Use this power cord and plug in conjunction with a properly grounded power socket to avoid electrical shock and to satisfy CE requirements . High voltage developed in the controller can cause severe injury or death. Before servicing the unit, disconnect the input power cable.

NOTE

The Turbo-V controller can be used as a bench unit or a rack module, but it must be positioned so that free air can flow through the holes. Do not install or use the controller in an environment exposed to atmospheric agents (rain, snow, ice), dust, aggressive gases, or in explosive environments or those with a high fire risk.

During operation, the following environmental conditions must be respected:

- temperature: from 0 °C to +40 °C
- relative humidity: 0 - 95% (without condensation)

To connect the controller to the pump use the specific cable supplied with the controller.

NOTE

The controller model 969-9507 is not equipped with the pump cable. It can be requested as an accessory; detailed information is supplied in the paragraph "Accessories and Spare Parts" of the appendix "Technical Information". It must be connected between the controller connector J16 and the pump connector. The two connectors at the two cable extremity cannot be connected in a wrong way.

See the appendix "Technical Information" for detailed information about the above mentioned and the other connections, and about the options installation.

USE

This paragraph describes the fundamental operating procedures. Detailed information and operating procedures that involve optional connections or options are supplied in the paragraph "USE" of the appendix "Technical Information".
Some procedures can be executed with controller 969-9507 only when the accessory "Hand held terminal" is available. Make all vacuum manifold and electrical connections and refer to Turbo-V pump instruction manual prior to operating the Turbo-V controller.

WARNING!

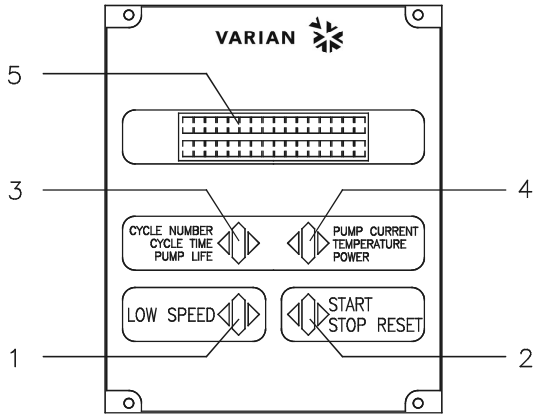
To avoid injury to personnel and damage to the equipment, if the pump is laying on a table make sure it is steady. Never operate the Turbo-V pump if the pump inlet is not connected to the system or blanked off.

NOTE

The input signal J1 connector should be left in position including the shipping links if no external connections are made. The forepump and the Turbo-V pump can be switched on at the same time.

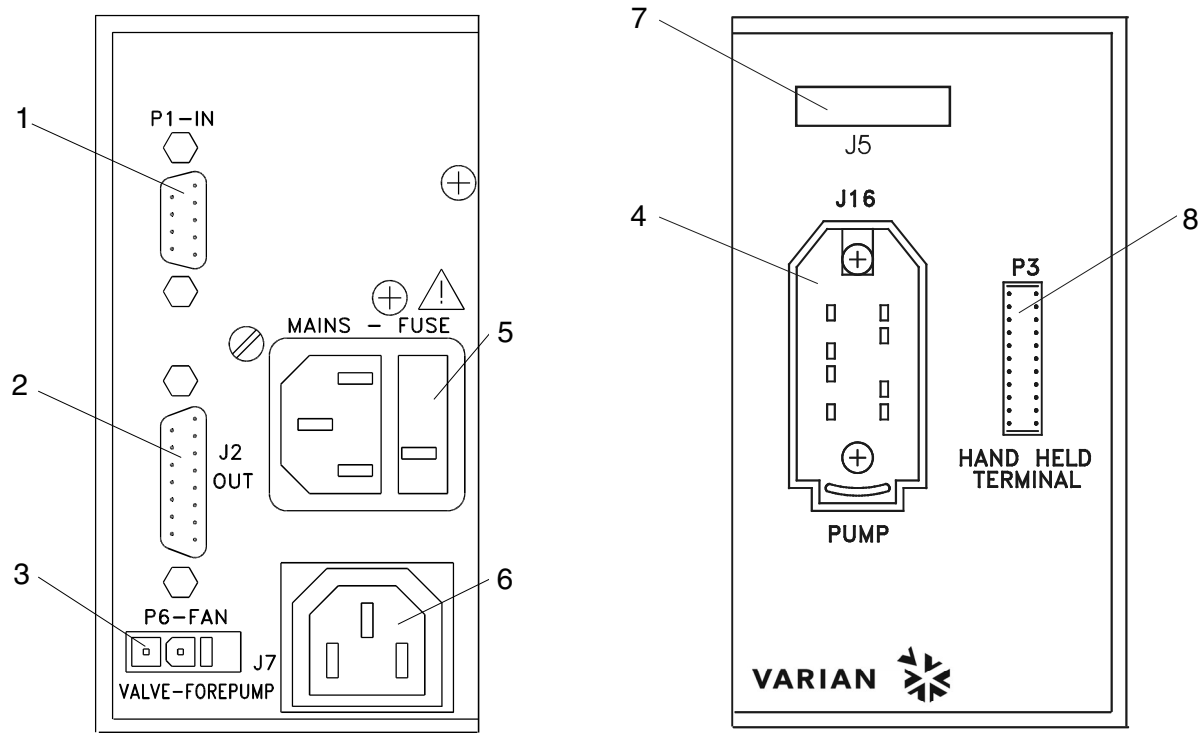
Controller controls, indicators and connectors

The following paragraph illustrates the Controller hand held terminal and interconnection panel. More details are contained in the appendix "Technical Information".



1. Keyboard push-button for LOW SPEED mode selection. It is active only when the front panel operation has been selected. Pressed once, the pump runs at about 2/3 of the nominal speed. To unselect the mode, press the push-button again.
2. Keyboard push-button for START, STOP, RESET mode selection. It is active only when the front panel operation has been selected. By pressing once the starting phase begins; if pressed again it stops the pump. If the pump has been stopped automatically by a fault, this push-button must be pressed once to reset the controller and a second time to restart the pump.
3. Keyboard push-button to recall on the display the cycle number, cycle time and pump life.
4. Keyboard push-button to recall on the display the pump current, pump temperature, pump power and rotational speed. It is always active regardless of the operating mode selected. Push-buttons 3 and 4, if pressed together for at least 2 seconds, put the controller in a routine where it is possible to program some operation parameters.
5. LCD back-lighted alphanumeric display: dot matrix 2 lines x 16 characters.

Hand Held Terminal
Front Panel



Left Panel *Right Panel*

1. Logic input signals connectors (mating connector supplied with link).
2. Logic output signals connector and pump current monitor.
3. Power output connector (24 Vdc for pump cooling fan).
4. Connector to the pump cable.
5. Controller power entry module consisting of mains fuses, voltage change over, mains socket and EMC filter.
6. Power output connector (120 Vac) for vent device, forepump contactor coils, etc.
7. Provision for RS232 communication port connector (provided as an option).
8. Hand Held Terminal link connector.

Controller 969-9507 Right and Left Panels

USE PROCEDURE

Controller Startup

To startup the controller plug the power cable into a suitable power source.

Starting the Pump

To start the pump press the START pushbutton on the hand held terminal.

Pump Shutdown

To shutdown the pump press the STOP pushbutton on the hand held terminal.

MAINTENANCE

The Turbo-V 70 series controller does not require any maintenance. Any work performed on the controller must be carried out by authorized personnel.

When a fault has occurred it is possible to use the Varian repair service. Replacement controllers are available on an advance exchange basis through Varian.

WARNING!

Before carrying out any work on the controller, disconnect it from the supply.

If a pump is to be scrapped, it must be disposed of in accordance with the specific national standards.

ERROR MESSAGES

For a certain type of failure, the controller will self-diagnose the error and the messages described in the following table are displayed.

NOTE

For controller model 969-9507 the error messages are displayed only when the option hand held terminal is available.

MESSAGE	DESCRIPTION	REPAIR ACTION
CHECK CONNECTION TO PUMP	Wrong connection between the pump and the controller.	Check connection between controller and pump. Press the START push-button twice to start the pump.
PUMP WAITING INTERLOCK	The interlock signal of P1 connector is activated by an interruption of the link between pin 3 and 8 of J1 connector, or because the external interlock signal is open.	Reset the short circuit between pin 3 and pin 8 of J1 connector, or close the external interlock signal.
FAULT: OVERTIME SX	Within each step of the soft start mode the rotational speed of the pump does not reach the planned value within 15 minutes. (X) is the step number from 0 to 9 indicating the step number not passed).	Verify that system has no leaks. Press the START pushbutton twice to start the pump.
FAULT: PUMP OVERTEMP.	The upper bearing/pump temperature exceeds 60 °C.	Wait until the temperature decrease below threshold value. Press the START push-button twice to start the pump.
FAULT: CONTROLLER OVERTEMPERATURE	The controller transformer temperature exceeds 90 °C.	Wait until the temperature decrease below threshold value. Press the START push-button twice to start the pump.
FAULT: TOO HIGH L0AD	In normal operation (after the starting phase) the current drawn by the pump is higher than programmed (1.5 A)	Check that the pump rotor is free to rotate. Press the START push-button twice to start the pump.
FAULT: SHORT CIRCUIT	After the starting phase the output connection is shorted (output current higher than 2.2 A).	Check connections and shortages between pump and controller. Press the START push-button twice to start the pump.
SYSTEM OVERRIDE	The pump is stopped by an emergency stop signal provided via a remote contact.	Remove the controller power cable and check the emergency condition. Then reconnect the power cable and press the START push-button twice to start the pump.
OVERVOLTAGE	Controller power supply circuitry is faulty, or the Controller received a spike.	Press the START push-button twice to start the pump. Should the message still be present, call the Varian service.
CONTROLLER FAILURE	Fuse blown on the power supply secondary of the transformer.	Contact Varian for Maintenance.

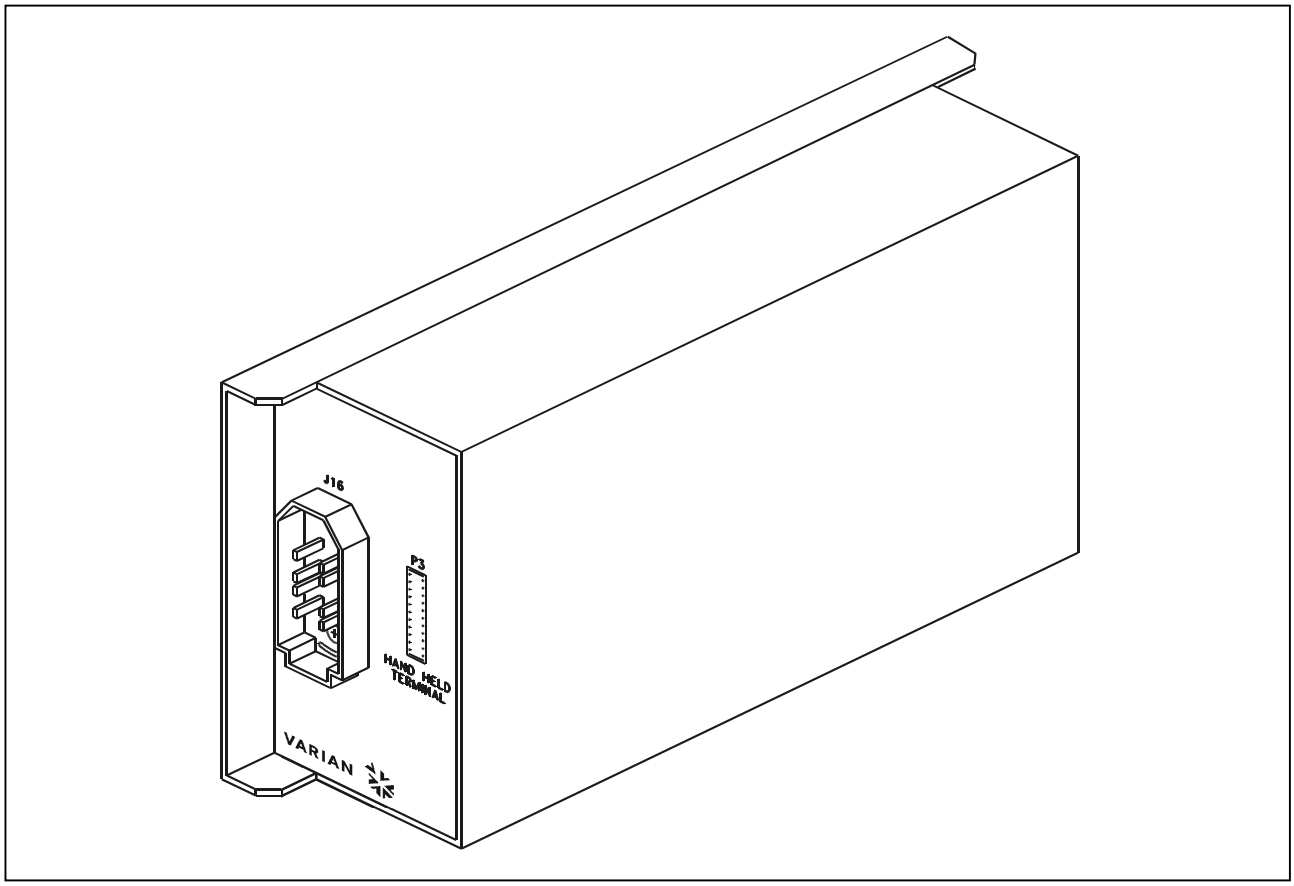
TURBO-V 70 CONTROLLER DESCRIPTION

The controller, factory set for 120 Vac, 50-60 Hz input voltage, is a solid-state frequency converter which is driven by a single chip microcomputer and is composed of:

- Power transformer
- Left panel with input/output connector, mains socket, forepump and vent coil output, fan connector
- Right panel with pump connector and hand-held terminal connector.
- PCB including: power supply and 3-phase output, analog and input/output section, microprocessor and digital section, display and keyboard circuits.

The power supply 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 signals from sensors, input/output connection information to be displayed on the hand-held terminal, and gives outputs 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.
The controller can be operated by remote signals via the left panel connector and may be monitore/reprogrammed using the optional hand-held terminal via the right panel connector.



Turbo-V 70 Controller

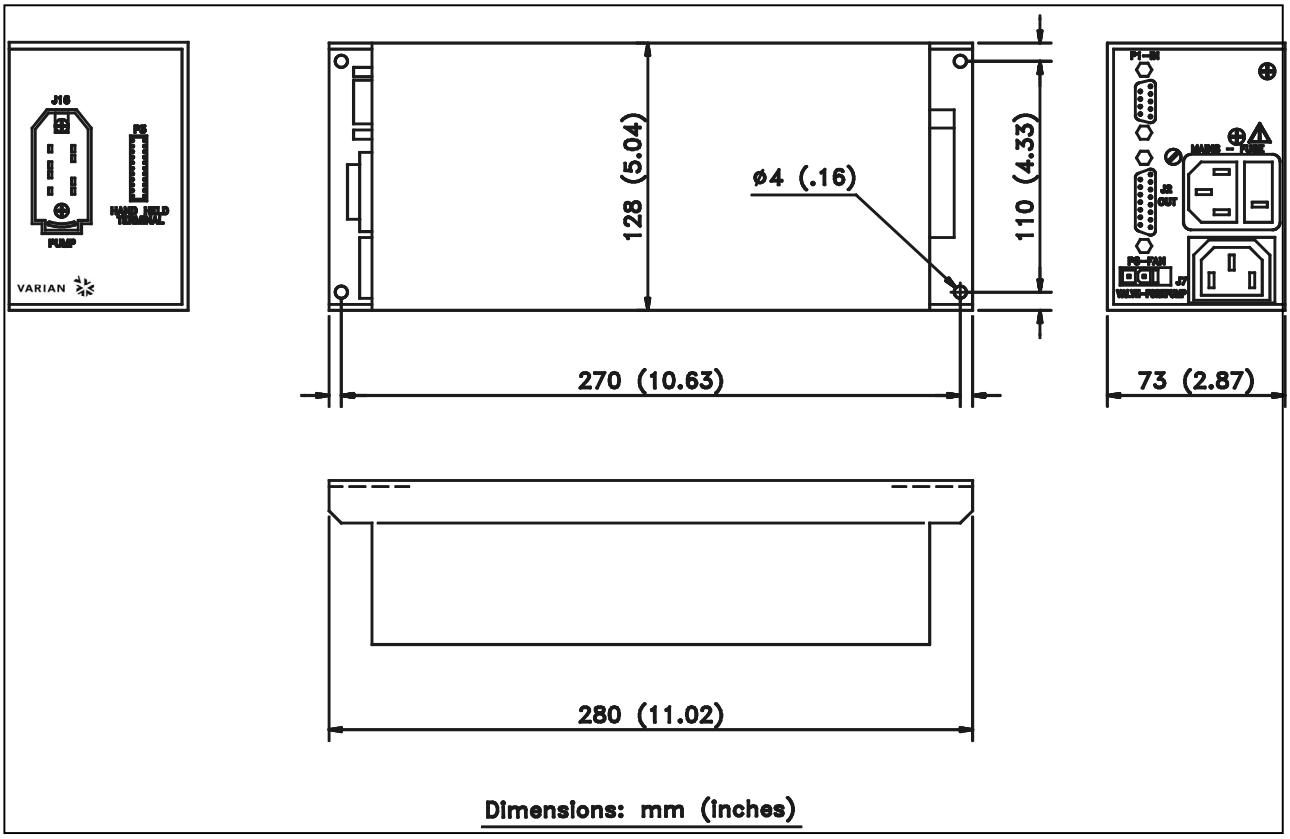
CONTROLLER SPECIFICATIONS

Input:	
Voltage	100, 120, 220, 240 Vac ±10%,
Frequency	1-phase
Power	47 to 63 Hz
	350 VA maximum
Output:	
Voltage	54 Vac nominal ±10%, 3-phase
Frequency	1250 Hz, ±2%
Power	150 W maximum
Operating temperature	0 °C to +40 °C
Storage temperature	-20 °C to +70 °C
Fuse (mains)	2 x T3.15 A (slow blow) disregarding the mains

Radio interference suppression	EN 55011 class A group 1 EN 61010-1 IEC1000-4-2, 1000-4-3, 1000 4-4
Weight:	3.8 Kg (8.4 lbs)

CONTROLLER OUTLINE

The outline dimensions for the Turbo-V 70 controllers are shown in the following figure.



Controller outline

Inspect the controller for any shipping damage.

The Turbo-V 70 controller model is 969-9507 is factory-set for 120 Vac operation.

WARNING!

The Turbo-V controller is equipped with a 3-wire power cord and plug (internationally approved) for user's safety. Use this power cord and plug in conjunction with a properly grounded power socket to avoid electrical shock.
High voltage developed in the controller can cause severe injury or death. Before servicing the unit, disconnect the input power cable.

NOTE

The Turbo-V controller can be used as a bench unit or as a rack module, but it must be positioned so that free air can flow through the holes.

Line Voltage Change Over

If a change in line voltage operation is desired, proceed as follows:

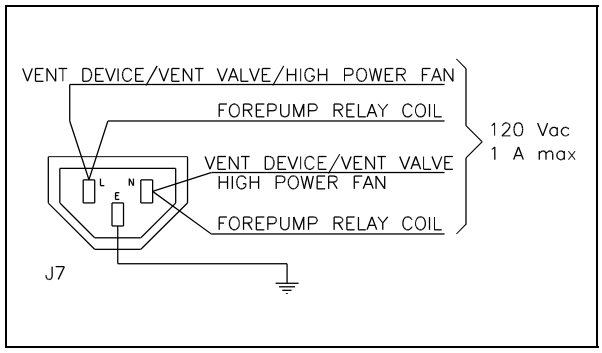
- Disconnect the power cord from the controller socket.
- On power entry module, check back door for voltage selector set.
- Using a small screw driver, pull out the voltage selector and fuses.
- Select the operating voltage, then firmly insert the voltage selector and fuses in place.
- Check voltage selector window for correct set and connect the power cord.

POWER INTERCONNECTIONS

Connection J7 - 120 Vac Connector

The 120 Vac, 1 A maximum (independent of line voltage) output voltage is present after START pushbutton is pressed and will remain present until a fault condition is displayed on the front panel display or the turbopump is stopped.

To make connections, remove the plug and wire the pins (maximum wire size 18 AWG, 1 mm^2) as indicated in the following figure to obtain the desired capability.



J7 connector output power

CAUTION!

On the J7 outlet the output voltage is 120 Vac with the maximum current of 1 A.
If more than one device is connected, be sure to draw not more than 120 VA to avoid controller damage. Use a relay coil with a maximum surge power of 65 VA.

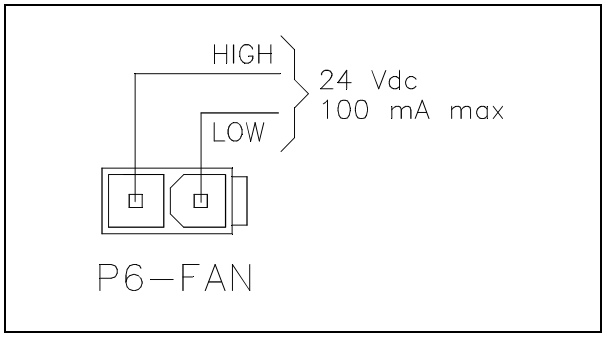
NOTE

Forepump relay coil is an independent, user supplied item.

Connection P6 - 24 Vdc Connector

The 24 Vdc, 100 mA maximum output voltage is present after START pushbutton is pressed and will remain present until a fault condition is displayed on front panel display or the turbopump is stopped. This is a dedicated output for the optional Turbo-V 70 pump cooling fan.

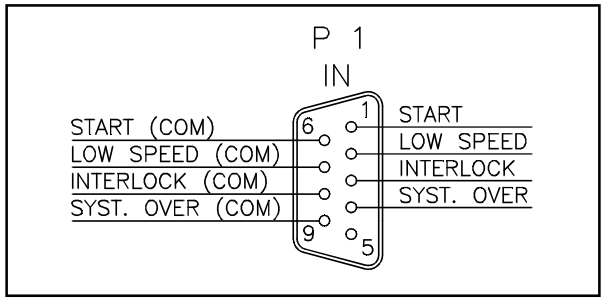
The mating connector and cable are provided assembled with the air cooling kit.



Fan Connector

LOGIC INTERCONNECTIONS

Connection P1 - Logic Input Interconnections



P1 input connector

All the logic input to the controller **must** be connected at J1 mating connector.
With the provided J1 mating connector (shipped with pin 3 and pin 8 shorted) make the connections with AWG 24, (0.24 mm^2) or smaller wire to the pins indicated in the figure to obtain the desired capability.

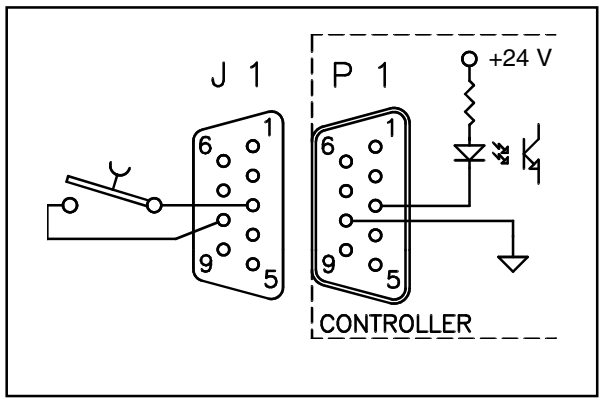
The following table describes the signals available on the connector.

PIN	DESCRIPTION
1-6	Remote START/STOP optically isolated from the internal circuit, requires a permanently closed contact (relay contact. transistor, etc.). When the contact closes, the turbopump starts, and when the contact opens, the turbopump is stopped. With the remote mode operation selected, the front panel push-button is inoperative.
2-7	Remote LOW SPEED optically isolated from the internal circuit, requires a permanently closed contact (relay contact, transistor. etc.). When the contact closes, the turbopump runs at low speed and when the contact opens, the turbopump reverts to high speed mode. With the remote mode operation selected, the front panel push-button is inoperative.
3-8	INTERLOCK optically isolated from the internal circuit, this signal can be used to delay the starting of the turbopump. It requires a permanent closed contact before starting the turbopump.
4-9	SYSTEM OVERRIDE optically isolated from the internal circuit, this signal is used to stop the pump in emergency condition, requires a closed contact. When the contact is closed, the turbopump and the interconnected devices are stopped.

NOTE

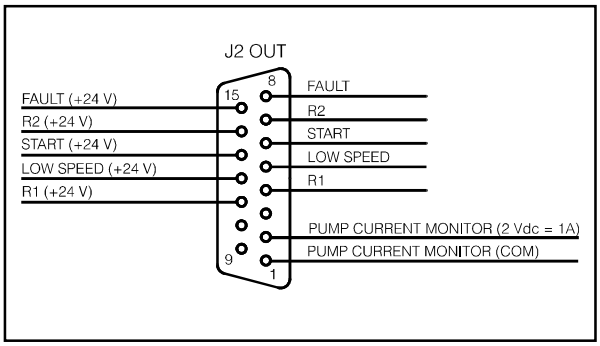
Pin 3-8 must be shorted to allow the Turbo-V 70 PCB pump to start if no interlock contact is connected. If, after starting the pump, the interlock contact opens, it has no effect on the operation and the pump continues to turn.

The following figure shows a typical contact logic input connection and the related simplified circuit of the controller.



Typical logic input connection

Connection J2 - Logic Output Interconnections

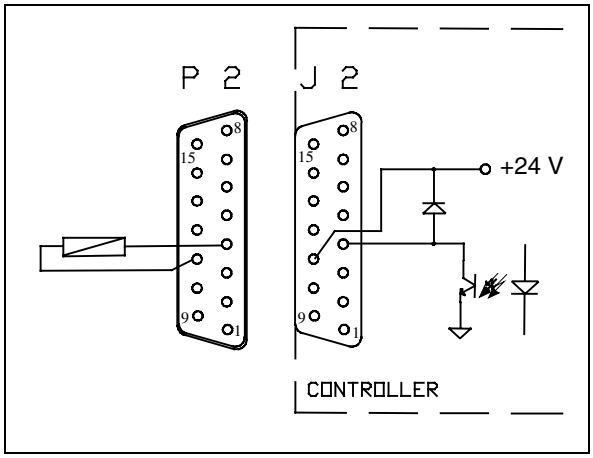


Logic output connector

All the logic output from the controller must be connected at P2 mating connector.
With the optional P2 mating connector make the connection with AWG 24 (0.25 mm^2) or smaller wire to the pins indicated in the figure to obtain the desired capability. The following table describes the signals available on the connector.

PIN	DESCRIPTION
1-2	Analog output Voltage of DC power drawn by the turbopump (pin 2 positive, pin 1 negative). 2 Vdc ≡ 1 A.
4-11	R1 signal 24 V, 60 mA, optically isolated output (pin 11 positive, pin 4 negative). The output voltage will be present when the rotational speed of the pump is higher than the selected speed threshold. Default value = 67 KRPM
5-12	LOW SPEED signal, 24 V, 60 mA, optically isolated output (pin 12 positive, pin 5 negative). The output voltage will be present when the low speed mode is selected, either through the front panel, the remote signal or RS 232.
6-13	START signal 24 V, 60 mA, optically isolated output (pin 13 positive, pin 6 negative). The output voltage will be present when the START push-button on front panel is pressed, or the remote start is present, or the function has been requested by RS 232, until NORMAL operation is reached.
7-14	R2 signal 24 V, 60 mA, optically isolated output (pin 14 positive, pin 7 negative). The output Voltage will be present upon the programmed condition delay YES or delay NO (see the cycle diagram in the following pages). If YES is selected, R2 is off and the output is zero over all run up time, then: a) If running speed > speed threshold R2 = OFF b) If running speed < speed threshold R2 = ON If NO is selected: a) If running speed > speed threshold R2 = OFF b) If running speed < speed threshold R2 = ON
8-15	FAULT signal 24 V, 60 mA, optically isolated output (pin 15 positive pin 8 negative). The output Voltage will be present when a fault condition is displayed on the front panel display.

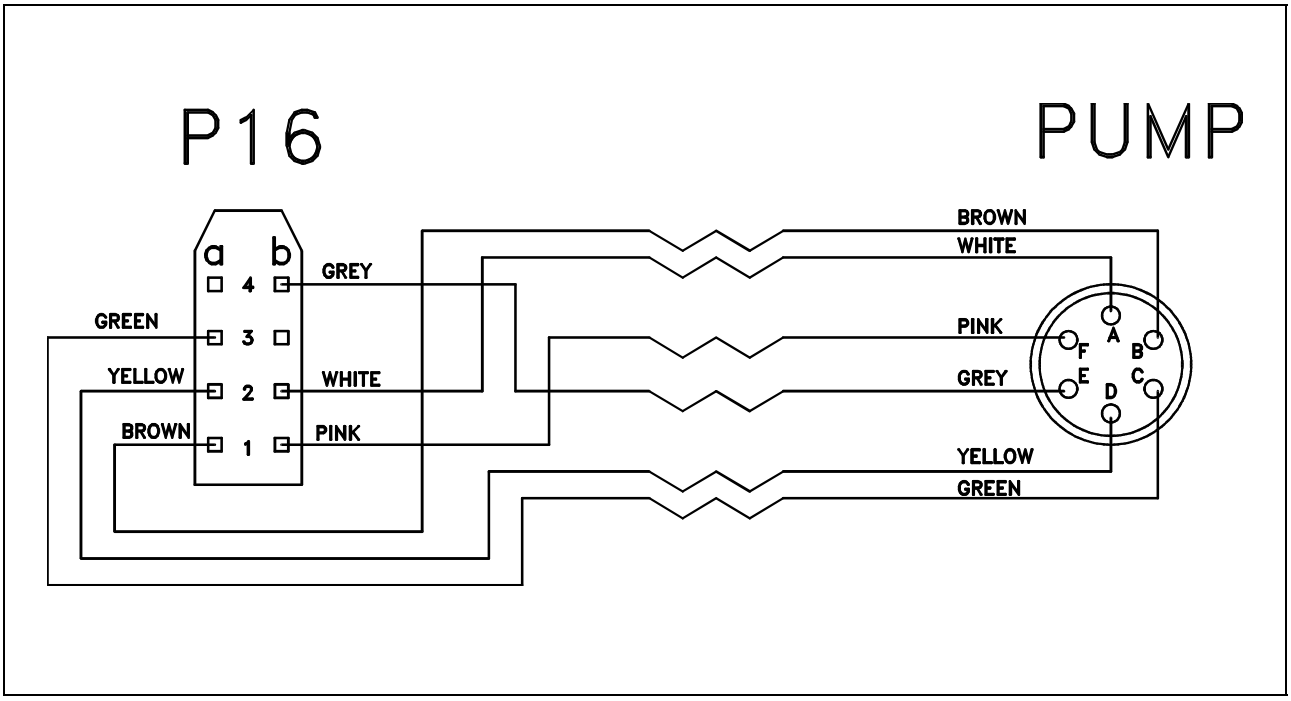
The following figure shows a typical logic output connection (relay coil) but any other device may be connected e.g. a LED, a computer, etc., and the related simplified circuit of the controller.



Typical output connection

Controller-to-Pump Connection

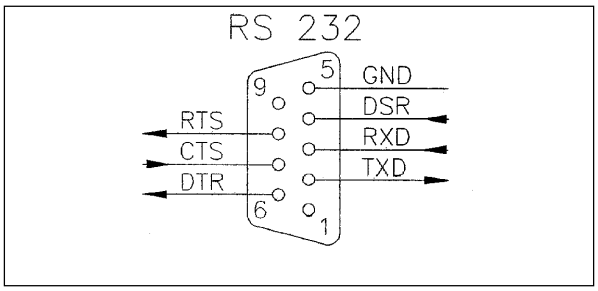
The pin configuration of the cable that connects the controller to the pump using a 0.5 mm^2 (AWG 20) wires is shown in the following figure.



Controller-to-pump cable

RS 232 Communication Port

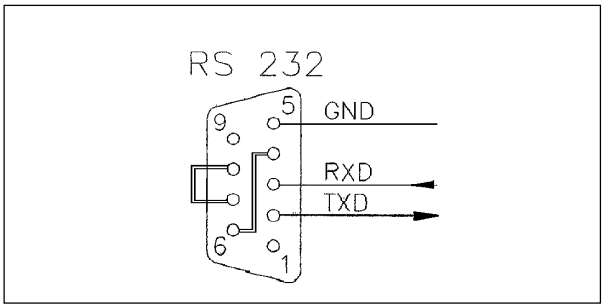
If the optional RS 232 communication port is installed, refer to the following figures for pin connection and the minimum connection configuration.



Communication serial port connections

The communication port mating connector is supplied with the RS 232 PCB (AMP/Cannon or equivalent 15-pin "D" type male connector).

The external cable (not supplied) between the host computer and the controller doesn't require any crossed wires so that the signal are connected correctly.



Minimum connection configuration

For example, the Transmit data signal from controller (pin 2) must be connected to the host computer's Receive data line (pin 3) and vice versa. Consult the host computer's instruction manual for its serial port connections.

NOTE

Varian cannot guarantee compliance with FCC regulations for radiated emissions unless all external wiring is shielded, with the shield being terminated to the metal shroud on the 0-subconnector. The cable should be secured to the connector with screws.

RS 232 Communication Descriptions

Communication format:

- 8 data bit
- no parity
- 2 stop bit
- The baud rate is programmable via front panel from 600 to 9600 baud. The controller is factory-set for 9600 baud operation.

NOTE

When a baud rate of 2400, 4800, 9600 baud is used, the requested information from Host to controller must be sent with a minimum interval of 1 second to avoid the controller hang-up.

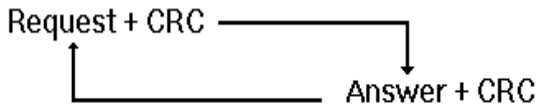
Communication protocol:

Host = Master

Turbo-V 70 Controller = Slave

The communication is performed in the following way:

Host Turbo-V 70 Controller



Request is an ASCII character identifying the action that must be performed by the controller or the requested information.

Allowed ASCII characters:

- "A" = START
- "B" = STOP
- "C" = Low Speed ON
- "D" = Low Speed OFF
- "E" = Request for operational parameters
- "F" = Pump times zeroing
- "G" = Parameters reading
- "H" = Parameters writing
- "I" = Request for operating status
- "J" = Request for numerical reading
- "K" = Request for counters reading.

CRC corresponds to the sum (with inverted sign) of all the preceding bytes.

e.g., the START command "A" in ASCII code = 41; inverted it will be: FF + 1 - 41 = BF.

CHARACTER	ASCII	CONVERTED ASCII FOR CRC CALCULATION
"A"	41h	-
CRC	-	BFh
"B"	42h	-
CRC	-	BEh
"C"	43h	-
CRC	-	BDh
"D"	44h	-
CRC	-	BCh
"E"	45h	-
CRC	-	BBh
"F"	46h	-
CRC	-	BAh
"G"	47h	-
CRC	-	B9h
"H"	48h	-
"I "	49h	-
CRC	-	B7h
"J"	4Ah	-
CRC	-	B6h
"K"	4Bh	-
CRC	-	B5h
"ACK"	06h	-
CRC	-	FAh
"NACK"	15h	-
CRC	-	EBh

Answer = after a request from the host, the Turbo-V 70 controller will answer in one of the following ways:

- ACK
- NACK
- Message

When the Request is "A, "B", "C", "D", "F", the Turbo-V 70 controller will Answer the ACK or NACK.

When the Request is "E, the **Answer** will contain the complete set of the following parameters:

BYTES	MEANING
1 MSB LSB ---- X X X X	0 = STOP 1 = WAITING INTERLOCK 2 = STARTING 3 = NORMAL OPERATION 4, 5 = HIGH LOAD 6 = FAILURE 7 = APPROACHING LOW SPEED
2÷5	Cycle Time
6÷9	Pump Life
10÷11	Pump Temperature
12	Current*
13	Voltage*
14÷17	Frequency
18÷19	Cycle #
20	R1 Status
21	R2 Status
22	CRC

*The values for current and voltage are given as numbers, scaled from 0 to 255, where 0 corresponds to 0 V and 255 to the full scale voltage (75 V) or current (2,5 A).

When the ***Request*** is "G", the ***Answer*** will contain a string of 11 characters with the following parameters:

BYTES	MEANING
1-2	Pump cycles number (integer coded in 2 bytes)
3	Speed threshold
4-7	Run up time in seconds (long coded in 4 bytes)
8	Deat time (0 = NO 1 = YES)
9	Soft Start mode (0 = NO 1=YES)
10	Water cooling (0 = NO 1=YES)
11	CRC

When the configuration parameters have to be changed, send a ***Request*** string a string with 9 characters of the following type:

"H" + ... data .... + CRC

The following parameters can be changed:

BYTES	MEANING
1	Speed threshold
2-5	Run up time in seconds (long coded in 4 bytes)
6	Deat time (0 = NO 1 = YES)
7	Controller OFF when R2 OFF (0 = NO 1 =YES)
8	Soft Start mode (0 = YES 1 = NO)
9	CRC

When the ***Request*** is "I" (Status readings), the ***Answer*** will contain a string of 2 characters with the following parameters:

BYTES	MEANING
1 MSB LSB - - X X X X X X	0 = STOP 1 = WAITING INTERLOCK 2 = STARTING 3 = NORMAL OPERATION 4, 5 = HIGH LOAD 6 = FAILURE 7 = APPROACHING LOW SPEED R2 status 0 = OFF 1 = ON R1 status 0 = OFF 1 = ON
2	CRC

When the ***Request*** is "J" (Numerical readings), the ***Answer*** will contain a string of 5 characters with the following parameters:

BYTES	MEANING
1	Current (0-255 scaled)
2	Voltage (0-255 scaled)
3	Rotational speed KRPM
4	Pump temperature °C (0-254 temperature reading, 255 = fail)
5	CRC

When the ***Request*** is "K" (Counters readings), the ***Answer*** will contain a string of 11 characters with the following parameters:

BYTES	MEANING
1-4	Cycle time
5-8	Pump life
9-10	Cycle number
11	CRC

On request a sample program in QBasic language is available by Varian.

USE

General

Make all vacuum manifold and electrical connections and refer to Turbo-V pump instruction manual before 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 is factory-set to operate via remote signals with a Soft Start mode that allows the pump to rump-up to Normal speed slowly. The minimum ramp-up time is 75 seconds and the maximum is about 45 minutes. Differents default selection has been made as per customer demans.

To modify the default values and to program the controller, connect the hand-held terminal to the Turbo-V controller.

NOTE

When the Turbo-V 70 pump is baked by a membrane pump, the Soft Start mode should be deselected.

NOTE

The input signal P1 connector should be left in position including the shipping links if no external connections are made. The forepump and the Turbo-V pump can be switched on at the same time.

If the Turbo-V pump is operated via remote signal is shown in the following paragraph.

If the hand-held terminal is used to monitor the pump operating conditions, follow para. 3-2; if reprogramming or trouble shooting is required, follow para. 3-3 and the following paragraphs.

Startup

- Plug the controller power cable into a suitable power source.
- The display lights, and shows:

R	E	A	D	Y		F	O	R		L	O	C	A	L	
S	O	F	T			S	T	A	R	T					

The controller with the Soft Start mode 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.
The Soft Start mode is always operative as default mode. If it is necessary to deselect this mode refer to the following paragraph.
If the Soft Start mode is deselected, the ramp-up will be done within 75 seconds and the display changes as follows:

P	U	M	P		R	E	A	D	Y	:		P	U	S	H
	S	T	A	R	T		B	U	T	T	O	N			

NOTE

If the pump is not connected, the display will be as follows:

C	H	E	C	K		C	O	N	N	E	C	T	I	O	N
			T	O		P	U	M	P						

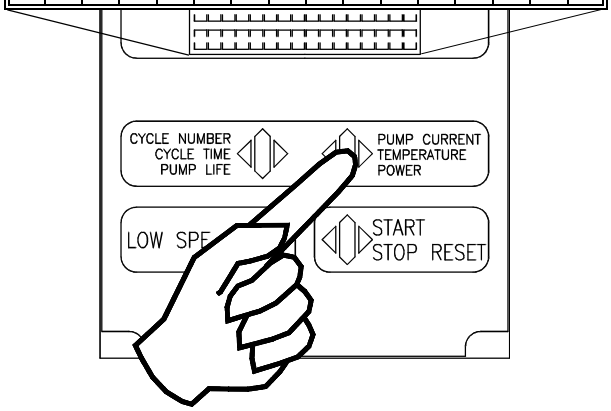
NOTE

After pressing the START push-button, if the P1 connector is not in place with the link or the external interlock connections are open, the display will be as shown in the following figure. Unplug the controller power cable and verify the P1 connection according to the previous Section.

P	U	M	P		W	A	I	T	I	N	G			
I	N	T	E	R	L	O	C	K						

- By pressing the CURRENT push-button and the display shows:

I	=	0	.	0	0	A				P	=			0	W
X			.	.		K	R	P	M		X	X	°	C	



where:

- **I** = is the DC current drawn by the pump range (0.00 to 9.99 Ampere)
- **P** = is the DC power drawn by the pump (range 0 to 999 Watt)
- **KRPM** = is the theoretical rotational speed of the pump as a function of the controller output frequency (range 9 to 75 KRPM)
- °**C** = is the temperature of the outer ring of the upper bearing (range 00 to 99 °C)
- **X** = during operation a selected set point condition (1 or 2 contrast inverted) appears when the programmed threshold speed value is not reached.

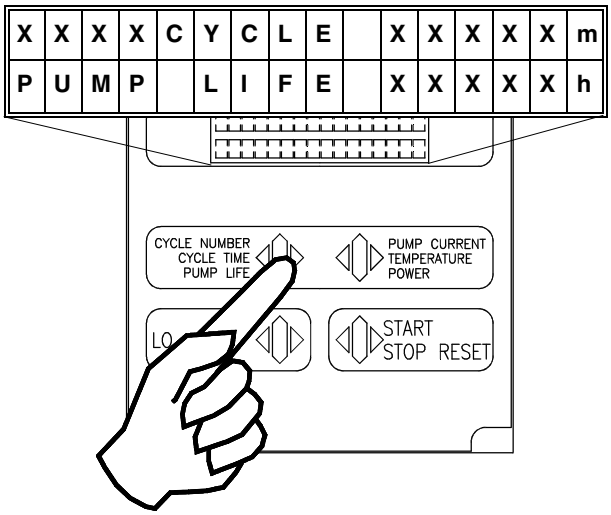
- Press the CYCLE NUMBER once and the display shows:

R	E	A	D	Y		F	O	R		L	O	C	A	L	
S	O	F	T			S	T	A	R	T					

P	U	M	P		R	E	A	D	Y	:		P	U	S	H
	S	T	A	R	T		B	U	T	T	O	N			

- Press the CYCLE NUMBER twice and the display shows:

X	X	X	X	C	Y	C	L	E		X	X	X	X	X	m
P	U	M	P		L	I	F	E		X	X	X	X	X	h



where:

- **CYCLE** = are the cycles performed (range 0 to 9999)
- **m** = is the elapsed time related to the cycle number displayed (range 0 to 99999 minutes)
- **PUMP LIFE** = is the total operation time of the pump (range 0 to 99999 hours).

FRONT / REMOTE/ 232 Selection

- Press CYCLE NUMBER and PUMP CURRENT push-buttons together for at least 2 seconds and the processor enters in a routine where it is possible to program the controller.
  In this routine, the CYCLE push-button is used for choosing/changing the value or condition; the PUMP CURRENT push-button is used to enter and confirm the value. At any time it is possible to exit this routine by pressing the CYCLE and PUMP CURRENT push-buttons at the same time for at least 2 seconds.
  The display shows:

S	O	F	T		S	T	A	R	T		M	O	D	E	
S	E	L	E	C	T	I	O	N	:		X	X	X		

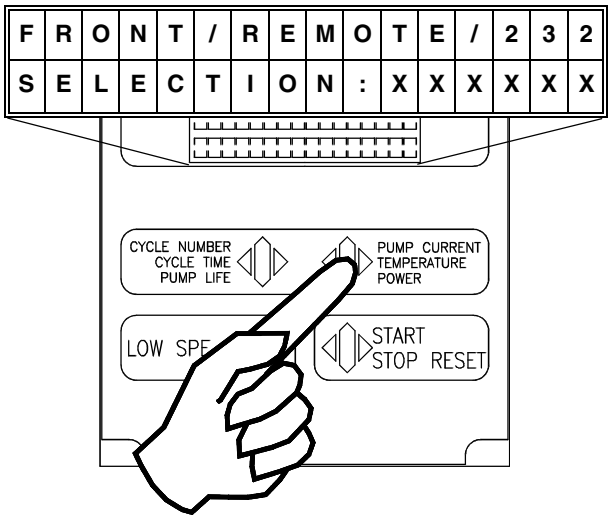
where: **XXX** = YES or NO.

If YES is selected, the Soft Start mode allows the pump to ramp-up the Normal speed within ten steps.
When NO is selected, the Soft Start mode is deselected and the ramp-up of the pump will be done within 75 seconds.
The controller is factory set to YES.

NOTE

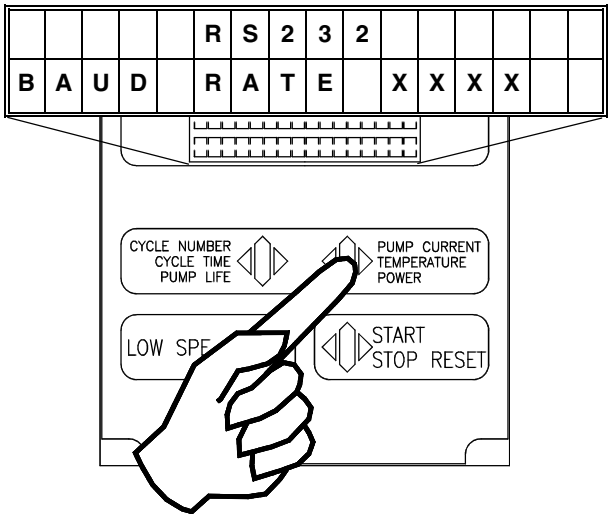
The Soft Start mode may be deselected/selected only when the pump is stopped.

If necessary press CYCLE NUMBER to select YES or NO, then enter the selection by pressing the PUMP CURRENT push-button. The display shows:



where: **XXXXXX** = means the word FRONT or REMOTE, or RS 232 depending on the last selection.
The controller is factory-set for FRONT panel operation.

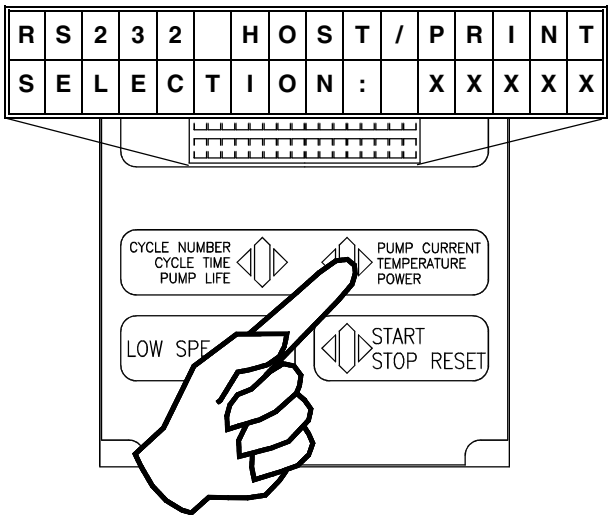
After choosing the desired selection by pressing the CYCLE push-button, press the PUMP CURRENT push-button to enter the value.
The display shows:



where: **XXXX** = means 600, 1200, 2400, 4800, 9600 baud rate for the host computer or printer communication. The controller is factory-set for 9600 baud rate operation.

If necessary, select the desired value by pressing the CYCLE NUMBER, then enter the value by pressing the PUMP CURRENT push-button.

The display shows:



where: **XXXX** == means HOST or PRINT.

Select HOST or PRINT by pressing the CYCLE push-button.

With the RS 232 connected, a bidirectional communication is established by selecting HOST. Data are sent to an external computer every time the external computer asks for the values.

The data available are:

- Pump/controller operating condition
- Cycle time
- Pump life
- Pump temperature
- Pump current
- Pump voltage
- Controller output frequency
- Cycle number
- R1 condition
- R2 condition
- Life time and cycle # zeroing
- Configuration parameter readings
- Configuration parameter setting

If PRINT is selected and a printer is connected on RS 232 line, a unidirectional communication is established and every minute the data are sent to the printer, even if the pump is not running.

The set of data available are:

- Pump speed KRPM
- Pump temperature
- Pump current A
- Pump power W
- R1 condition
- R2 condition

The controller is factory-set to HOST.

- Confirm the selection by pressing the PUMP CURRENT push-button.

The display will be as shown in the following figure.

Monitor Relay Programming

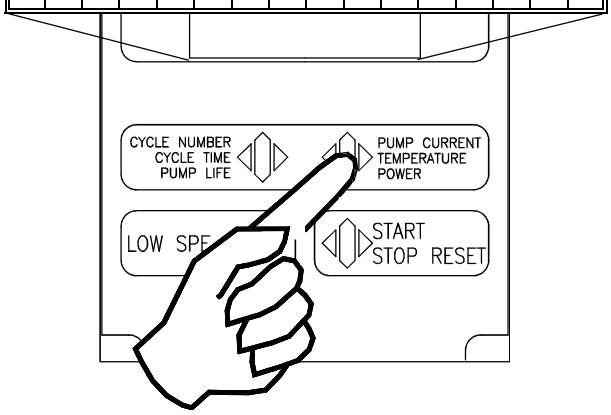
- The display shows:

S	**P**	**E**	**E**	**D**		**T**	**H**	**R**	**E**	**S**	**H**	**O**	**L**	**D**	
S	**E**	**L**	**E**	**C**	**T**	**I**	**O**	**N**	**:**	**X**	**X**	**K**	**R**	**P**	**M**

where: **XXKRPM** = is the switch point of relay R1 at the preset turbopump speed, adjustable from 00 to 99 KRPM.
The speed threshold will condition the R1 and R2 operation (see the following cycle diagram) and it is factory-set to 67 KRPM.

The speed threshold will condition the R1 and R2 operation and it is factory-set to 67 KRPM.
Select the first number by pressing the CYCLE NUMBER push-button, then enter the value by pressing the PUMP CURRENT push-button.
Do the same for the second number. After pressing the PUMP CURRENT the second time, the display will be as shown in the following figure.

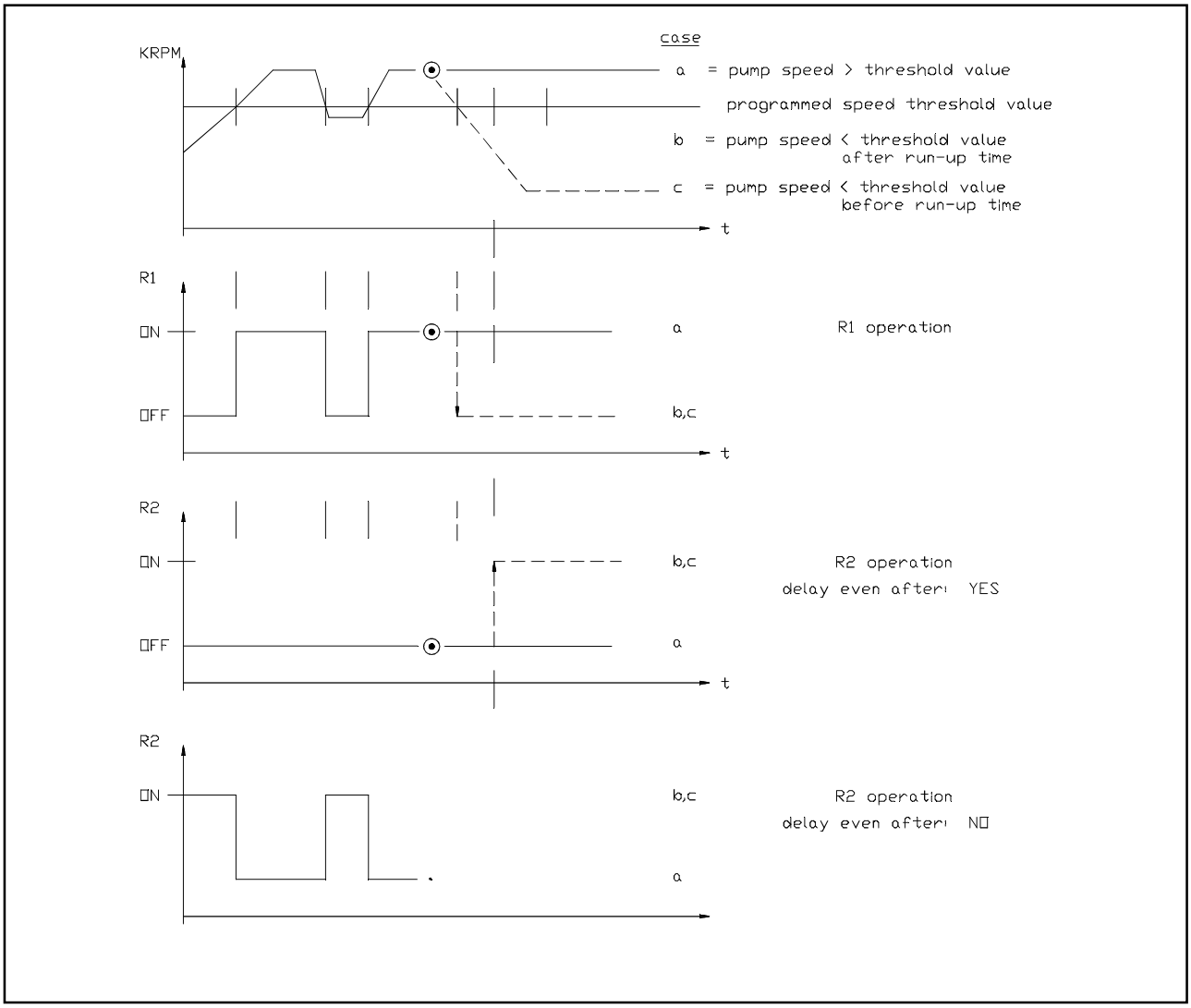
R	**U**	**N**	**-**	**U**	**P**		**T**	**I**	**M**	**E**					
S	**E**	**L**	**:**		**X**	**X**	**h**		**X**	**X**	**m**		**X**	**X**	**s**



where: **RUN-UP TIME** = is the interval time from start to speed threshold value in hours, minutes, seconds. Select from 00 to 99 hours, and from 00 to 59 minutes or seconds.

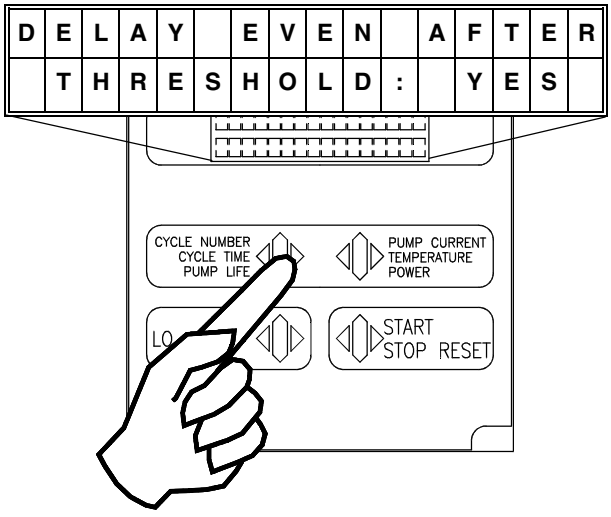
Select the run-up time according to the chamber volume and/or operating cycle feature by pressing the CYCLE NUMBER push-button to select the desired number, then press the PUMP CURRENT push-button to enter the data.

The run up time is factory-set to:
00h 08m 00s.



Cycle diagram

When the last digit is entered, the display will be as shown in the following figure.



where:

XXX = YES or NO.

By pressing the CYCLE NUMBER push-button, select YES if relay R2 must operate only after the run-up time or select NO when the R2 operation is needed right from start of the turbopump and after the rotational speed of the turbopump exceeds for the first time the speed threshold value.

This function is factory-set to YES.

After selection, press PUMP CURRENT to confirm; the display will be as shown in the following figure.

Reset Command

- The display shows:

P	U	M	P		L	I	F	E		X	X	X	X	X	h
			R	E	S	E	T	?		X	X	X			

where:

- **PUMP LIFE** = is the elapsed operating time range 000 to 99999 hours.
- **RESET XXX** = YES or NO.

If YES is selected, the pump life shall be reset to 000. After selecting YES, press the PUMP CURRENT push-button to enter the command and the display shows as follows.

The controller is factory-set to NO.

NOTE

When PUMP LIFE is reset to 000, the CYCLE number is also reset to 000.

Starting the Pump with the Hand Held Terminal

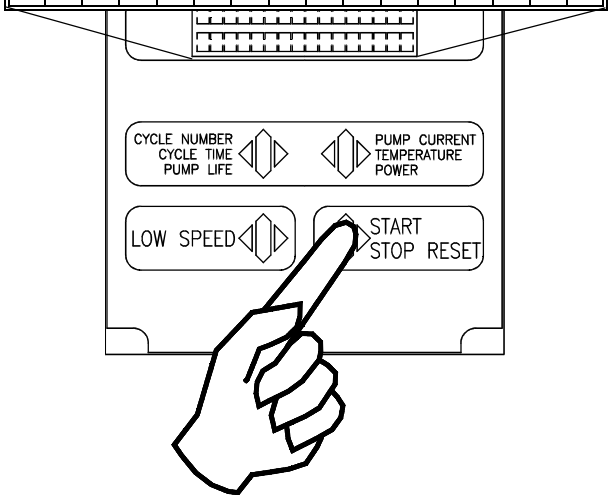
If the forepump and vent device are not operated by the controller, close the vent valve and switch on the forepump.

NOTE

With the FRONT panel operation selected, the REMOTE and RS 232 operations are inoperative; conversely, the CYCLE NUMBER and PUMP CURRENT push-buttons are always active, even when the operating mode selected is REMOTE or RS 232.

- Press the START push-button (or use the remote or RS 232 start signal), and the display shows:

S	O	F	T		S	T	A	R	T		O	N		
		[	.	.	.	.	.	.	.	.	.	]		



Where the sign minus (-) become a square (▯) when the pump finish the ramp-up step. The active step is indicated by a flashing square (▯).

- As the ten steps are fully covered, the pump will reach the Normal operation. If during the Soft Start mode the current drawn by the pump exceed 1.4 A the speed of the pump is decreased to maintain the maximum power allowable (1.4 A).

  If within each step of the Soft Start mode the rotational speed of the pump do not rech the planned value within 15 minutes the display shows:

F	A	U	L	T	:									
O	V	E	R	T	I	M	E	:	S	X				

where **X** = the step number from 0 to 9 indicating the step number not passed.
When this message is displayed the pump is stopped.
Reset the controller by pressing twice the STOP push-button to start the pump.

- If the Soft Start mode has been deselected the display will change and shows:

P	**U**	**M**	**P**		**I**	**S**		**S**	**T**	**A**	**R**	**T**	**I**	**N**	**G**
1	**2**			**X**	**X**		**K**	**R**	**P**	**M**					

where:

1 2 = contrast inverted identifies the set point condition:
- **1** is displayed when relay R1 is de-energized and the related output is zero voltage.
- **2** is displayed when relay R2 is energized.

XX KRPM = indicates the actual theoretical rotational speed of the pump as a function of the controller output frequency (range 9 to 75 KRPM).

- After START command, frequency output will be at the maximum level, then the frequency will decrease to a value proportional to the pump rotational speed (about 9 KRPM if the pump is completely stopped).

  The pump will accelerate to its normal rotational speed and when this speed is reached, the display will be as follows, even if any previous display selection was made, and the normal condition has been reached.

N	**O**	**R**	**M**	**A**	**L**		**O**	**P**	**E**	**R**	**A**	**T**	**I**	**O**	**N**
				X	**X**		**K**	**R**	**P**	**M**					

where: **XX** =indicates the rotational speed (75 KRPM for high speed, or 50 KRPM for low speed).

During acceleration of the pump or during any operating condition, it is always possible to select the other parameters to be displayed (PUMP CURRENT or CYCLE NUMBER push-buttons).
If this is the case when the pump reaches the normal speed, the display reverts to the previous figure.

Operating the Pump

After the starting period, if the system has a vacuum leak or the pressure in the pump/chamber is high (from 1 mbar to atmosphere), the pump continues to operate indefinitely.
If the gas load at the turbopump inlet flange continues to stay high, the power drawn by the turbopump increases up to the maximum value. Than the Turbo-V pump is slowed down in proportion to the gas load at least until it reaches about 9 KRPM.

This will occur either in NORMAL operation or with the LOW SPEED selected.
As soon as the gas load decreases, the pump will automatically accelerate to reach normal operation.
The pump can be stopped at any rotational speed and can be restarted at any rotational speed from either the front panel buttons or the remote connections.
The controller automatically synchronizes the output to the rotational speed of the pump and then accelerates linearly up to the nominal speed or within steps if the Soft Start has been selected.

Low Speed Operation

NOTE

With the FRONT panel operation selected, the remote and RS 232 operations are inoperative; conversely, the CYCLE NUMBER and PUMP CURRENT pushbuttons are always active, even when the operating mode selected is REMOTE or RS 232.

This feature is provided for operating the pump at moderate high pressure with high gas throughput. To operate in this low speed mode, engage the LOW SPEED push-button once if the display shows:

P	**U**	**M**	**P**		**W**	**A**	**I**	**T**	**I**	**N**	**G**				
I	**N**	**T**	**E**	**R**	**L**	**O**	**C**	**K**							

or twice if the display shows other parameters, either before starting the pump or after it is operating.
If LOW SPEED is selected before starting the pump, the display shows:

R	**E**	**A**	**D**	**Y**		**F**	**O**	**R**		**L**	**O**	**C**	**A**	**L**	
S	**O**	**F**	**T**		**S**	**T**	**A**	**R**	**T**					**L**	**S**

The pump reaches the Normal high speed, then decrease the speed to the low speed value and the display shows:

A	P	P	R	O	A	C	H	I	N	G		L	S	
				X	X		K	R	P	M				L	S

If the Soft Start has been deselected the display shows:

P	U	M	P		R	E	A	D	Y	:		P	U	S	H
	S	T	A	R	T		B	U	T	T	O	N		L	S

where: **LS** = means low speed mode is selected.

After starting, a **LS** appears on the right bottom corner of the following displays:

S	O	F	T		S	T	A	R	T		O	N			
		[	-	-	-	-	-	-	-	-	-	]	L	S

P	U	M	P		I	S		S	T	A	R	T	I	N	G
1	2			X	X		K	R	P	M				L	S

N	O	R	M	A	L		O	P	E	R	A	T	I	O	N
				X	X		K	R	P	M				L	S

With normal LOW SPEED operation, the pump will run at about 2/3 of its nominal speed and achieves a base pressure somewhat higher than the standard specifications. If the gas load becomes higher, the controller output frequency and voltage start to decrease automatically, and the Turbo-V pump is slowed down in proportion to the gas load until it reaches about 9 KRPM.

If the LOW SPEED mode is selected after normal operating condition is reached, the display shows:

A	P	P	R	O	A	C	H	I	N	G			L	S	
				X	X		K	R	P	M				L	S

while approaching the low speed value.

When the low speed mode is deselected, the pump starts to accelerate to its rotational speed.
The display shows:

N	O	R	M	A	L		O	P	E	R	A	T	I	O	N
				X	X		K	R	P	M					

Pump Shutdown

Press the front panel STOP pushbutton or remove the remote signal; the power from the turbopump will be removed and the pump will begin to slow down.

An emergency stop signal is provided via a remote contact. This signal is active in any of the three operation selections: FRONT, REMOTE, RS 232; when activated, the display will be as shown in the following figure.

				S	Y	S	T	E	M					
			O	V	E	R	R	I	D	E				

Power Failure

In the event of a power failure (momentary or long term), the Turbo-V controller will stop the turbopump and all the interconnected pumps/devices. The Turbo-V vent valve device, if used, will vent the turbopump only if the power failure is longer than the preset delay time. When power is restored, the Turbo-V controller automatically restarts the interconnected devices and the turbopump in the proper sequence.

The display shows:

P	U	M	P		I	S		S	T	A	R	T	I	N	G
1	2			X	X		K	R	P	M					

until normal operation achieved.

Remote Control Mode Operation

If remote signals are used to operate the controller, it must be programmed for remote operation (see paragraph "FRONT/REMOTE/232 Selection") and when ready to start, the display shows as in the following figure.

R	E	A	D	Y		F	O	R		R	E	M	O	T	E
S	O	F	T		S	T	A	R	T						

If the Soft Start has been deselected the display shows:

P	U	M	P		R	E	A	D	Y	:		U	S	E	
	R	E	M	O	T	E		S	T	A	R	T			

With or wihout Soft Start mode selected the START/STOP and LOW SPEED front panel pushbuttons are inoperative, while the CYCLE NUMBER and PUMP CURRENT pushbuttons are always active.

RS 232 Control Mode Operation

If the RS 232 option is installed and the controller has been programmed for RS 232 operation, the controller may be driven by a computer and when ready to operate, the display shows:

R	E	A	D	Y		F	O	R		R	S	2	3	2	
S	O	F	T		S	T	A	R	T						

If the Soft Start has been deselected the display shows:

P	U	M	P		R	E	A	D	Y	:		U	S	E	
R	S	2	3	2		L	I	N	E						

With or wihout Soft Start mode selected the START/STOP, LOW SPEED functions are under computer control, while the CYCLE NUMBER and PUMP CURRENT front panel pushbuttons are always active.

ERROR MESSAGES

For a certain type of failure, the controller will self-diagnose the error and the following messages will be displayed if the hand-held terminal is connected.

NOTE

If the pump is not connected, the display will be as shown in the following figure.

C	H	E	C	K		C	O	N	N	E	C	T	I	O	N
			T	O		P	U	M	P						

Check connection between controller and pump, then press STOP push-button twice to start the pump.

NOTE

If the P1 input connector is not in position with the link or the external interlock connections are open, when the START pushbutton is pressed the display will be as shown in the following figure.

P	U	M	P		W	A	I	T	I	N	G				
I	N	T	E	R	L	O	C	K							

Disconnect connector P1 and check the link or the external interlock according to section II, then install the connector to start the pump.

NOTE

If within each step of the soft start mode the rotational speed of the pump do not reach the planned value within 15 minutes the display will be as shown in the following figure.

F	A	U	L	T	:									
O	V	E	R	T	I	M	E	:	S	X				

Verify that systems has no leaks than press STOP RESET pushbutton twice to start the pump.

NOTE

If the upper bearing/pump temperature exceeds 60 °C, the pump is shut off, and the display will be as shown in the following figure.

F	A	U	L	T	:			P	U	M	P			
	O	V	E	R	T	E	M	P	.					

The message will stay on until the temperature decreases below threshold value. Press the STOP RESET pushbutton twice to start the pump.

NOTE

If the controller transformer temperature exceeds 90°C, the pump is shut off, and the display will be as shown in the following figure.

F	A	U	L	T	:	C	O	N	T	R	O	L	L	E	R
	O	V	E	R	T	E	M	P	E	R	A	T	U	R	E

The message will stay on until the temperature decreases below threshold value. Press the STOP RESET pushbutton twice to start the pump.

NOTE

If in normal operation (after the starting phase) the current drawn by the pump is higher than programmed (1.5 A), the pump and the inter-connected devices are switched off and the display will be as shown in the following figure.

F	A	U	L	T	:									
T	O	O		H	I	G	H		L	O	A	D		

Check that pump rotor is free to rotate then press the STOP RESET pushbutton twice to start the pump.

NOTE

After the starting phase if the output connection is shorted (output current higher than 2.2 A), the display will be as shown in the following figure.

F	**A**	**U**	**L**	**T**	**:**									
S	**H**	**O**	**R**	**T**		**C**	**I**	**R**	**C**	**U**	**I**	**T**		

Check connections and shortages between pump and controller, then press the STOP RESET pushbutton twice to start the pump.

NOTE

If the pump is stopped by an emergency stop signal provided via a remote contact, the display will be as shown in the following figure.

				S	**Y**	**S**	**T**	**E**	**M**					
			O	**V**	**E**	**R**	**R**	**I**	**D**	**E**				

Remove the controller power cable and check the emergency condition.

Then reconnect the power cable and press the START pushbutton to start the pump.

The following message is displayed if the fuse of the transformer secondary blows:

			C	**O**	**N**	**T**	**R**	**O**	**L**	**L**	**E**	**R**		
				F	**A**	**I**	**L**	**U**	**R**	**E**				

Since no operation can be carried out, contact VARIAN.

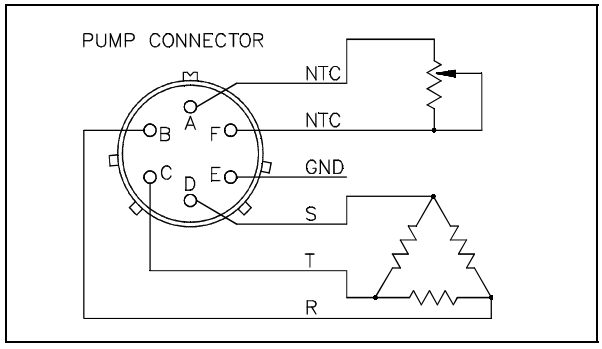
CONTROLLER TEST

a) Equipment required

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

b) Test set up

- Remove the power cable.
- Disconnect the Turbo-V controller.
- Remove the cover from the Turbo-V controller.
- Set potentiometer to 30 KΩ and connect it as directed in the following figure.
- Check the line voltage selector and connect the power cable to the appropriate socket.



Dummy load connections

Power Supply Test

a) DC voltage test

Check the DC voltages referring to test points indicated in the following figure. The meter should read:

- + 5Vdc ±5%
- ±12 Vdc ±5%
- Ground reference = case of Q3

On the controller front panel, push the START pushbutton and check:

- 54 Vdc ±10% between TP3(-) and TP5(+)
- 24 Vdc ±15% on the fan connector.

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 1 Vac is tolerable between phase and phase.

c) Front panel check

On the controller front panel, press the CURRENT pushbutton and check:

- Current 0.00 A
- Power 0.00 W
- Speed 75 KRPM
- Temperature 25 °C ±2 °C

On controller front panel, press STOP and remove the power cable.

Test with Dummy Load

- Connect the 48Ω or the 78Ω dummy loads to the pump connector pins B, C, D, as shown in the previous figure.

- Disconnect the potentiometer, set it to 10 KΩ, and then reconnect it.
- Connect the power cable.
- On the controller front panel push the START and CURRENT pushbuttons and check the front panel display as shown in the 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%	1.4 A	0.6 A	1.3 A	0.45 A
Power ±10%	80 W	40 W	70 W	24 W
Speed ±4 KRPM	34	75	9	75
Temperature ±2 °C	52 °C	52 °C	52 °C	52 °C

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

On the controller front panel, press the STOP pushbutton and remove the power cable.

Pump over-Temperature Test

- Disconnect the potentiometer, set it to 5KΩ, and then reconnect it.
- Disconnect the dummy loads.
- Connect the power cable.
- On the controller front panel push the START pushbutton.
  The display should be as shown in the previous figure and by pressing the CURRENT pushbutton the temperature reading should be 71 °C ±2 °C. All the other values should be zero.
- Check the 3-phase ac output voltage. It should be zero.
- On the controller front panel, press STOP and remove the power cable.

Functional Test

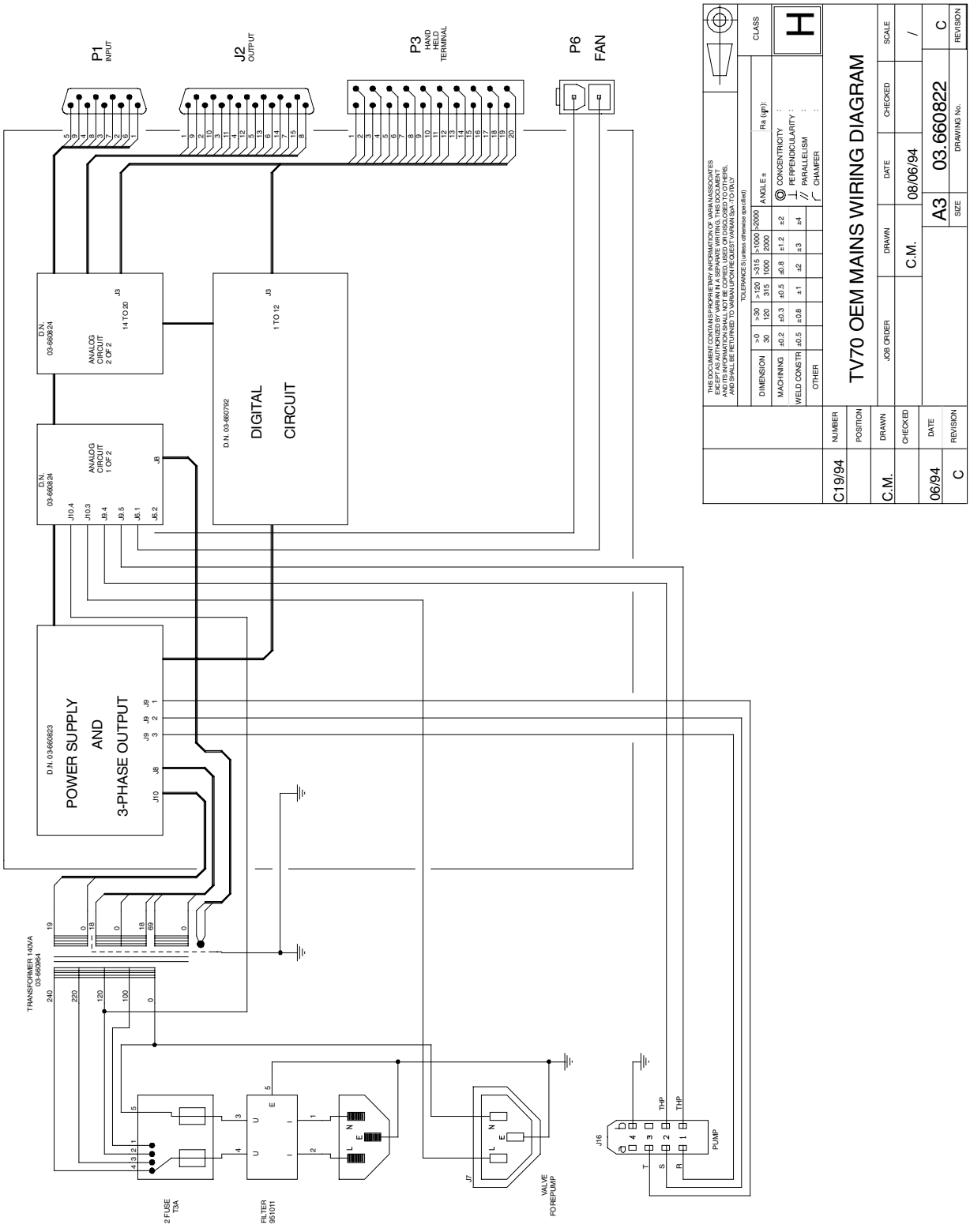
Perform the functional test with the turbopump, taking care to check the ramp sequence and start up time.

ACCESSORIES AND SPARE PARTS

DESCRIPTION	PART NUMBER
J1 input mating connector	969-9853
P7 mating plug	969-9854
Mains cable (European plug, 3 m long)	969-9957
Mains cable (American plug, 120 V, 3 m long)	969-9958

OPTIONS

DESCRIPTION	PART NUMBER
RS 232 kit	969-9851
P2 output mating connector	969-9852
Controller to pump extension cable (5 m extension)	969-9950



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TOLERANCES (unless otherwise specified)

DIMENSION	>0 30	>30 120	>120 315	>315 1000	>1000 2000	>2000	ANGLE ±	Ra (µm):
MACHINING	±0.2	±0.3	±0.5	±0.8	±1.2	±2	◎ CONCENTRICITY	:
WELD CONSTR	±0.5	±0.8	±1	±2	±3	±4	⊥ PERPENDICULARITY	:
OTHER							// PARALLELISM	:
							⌒ CHAMFER	:

CLASS: H

NUMBER	C19/94
POSITION	
DRAWN	C.M.
CHECKED	
DATE	06/94
REVISION	C

TV70 OEM MAINS WIRING DIAGRAM

JOB ORDER	DRAWN	DATE	CHECKED
	C.M.	08/06/94	

SCALE	/		
SIZE	DRAWING No.		REVISION
A3	03.660822		C

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.

North and South America	**Europe and Middle East**	**Asia and ROW**
Varian Vacuum Technologies 121 Hartwell Ave Lexington, MA 02421 Phone : +1 781 8617200 Fax: +1 781 8609252	Varian SpA Via Flli Varian 54 10040 Leini (TO) – ITALY Phone: +39 011 9979111 Fax: +39 011 9979330	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

☐ 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.
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