Connectors

i) Supply: connect via the amphenol 97 series socket supplied with the unit as follows:

L Live. N Neutral. ≑ Earth.

For 198 - 264V supplies 0.75mm^2 (6A) 3 core connector cable is suitable, for 98 - 132V supplies 1.25mm^2 (13A) 3 core cable should be used.

Ensure that a reliable earth connection is made via the supply connector cable.

ii) Pump: The earth braid cable should always be used to avoid relying on the pump cable screen. The braid should be connected to the two earthing posts provided on the back of the unit and a suitable point on the pump.

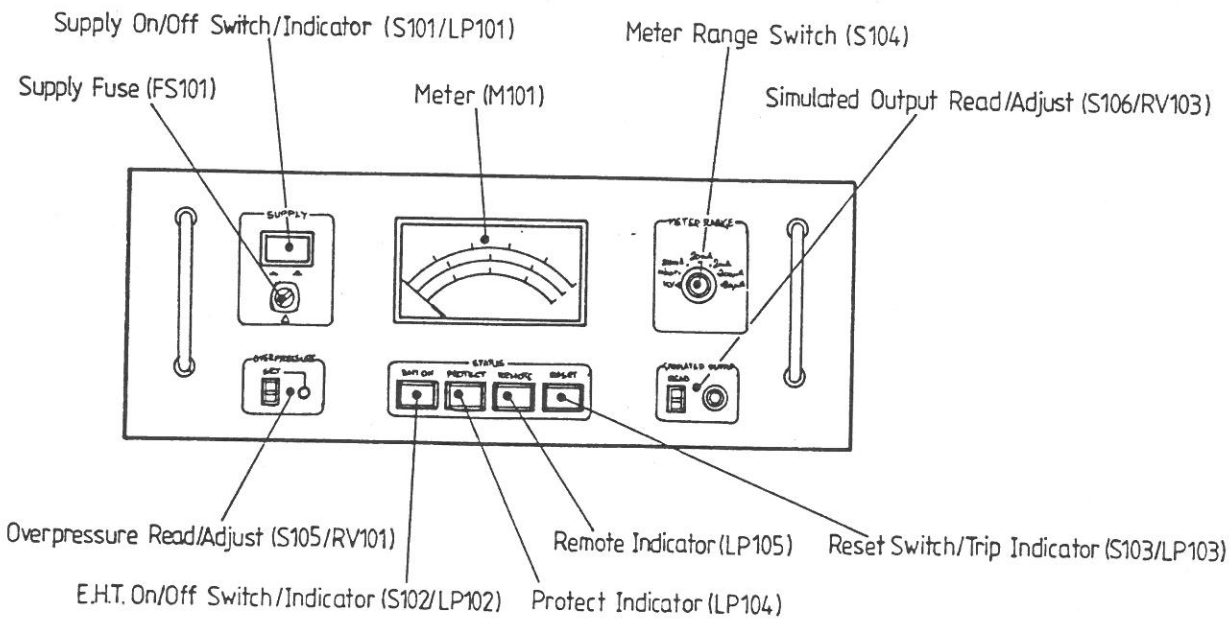
Connect the pump supply lead between the VPS120A and the pump ensuring that the spring provided is installed in the pump body before inserting the connector.

WARNING WHEN CONNECTING OR DISCONNECTING THE PUMP SUPPLY CABLE THE E.H.T. MUST BE TURNED OFF.

This completes the initial setting up procedure, the unit is ready for operation.

4. OPERATING INSTRUCTIONS

4:1 Front Panel Controls and Indicators



i) Supply on/off switch and indicator: Connects the supply to the internal electronics. Supply presence is indicated by an integral filament lamp. The lamp will extinguish if fuse FS101 fails.

ii) E.H.T. on/off switch and indicator: Connects the supply to the E.H.T. transformer via a 'soft start' circuit. The integral indicator shows the pump supply is on in remote (switch is disabled in this mode) and local. This switch should always be used to turn the pump supply on/off rather than the incoming supply switch. If the pump is to be disconnected from the supply, turn the E.H.T. off, select KV on the meter range switch and observe the residual charge on the output capacitors. Wait until this has fallen to zero before turning off the supply and disconnecting the pump lead.

iii) Reset switch and tripped indicator: When conditions in the vacuum system cause the supply to trip out the reset switch indicator illuminates. The supply can be reset (except when in remote) by operating the momentory action reset switch, provided the trip condition has cleared. Operation of any one of the four separate protection circuits will cause the supply to trip. These are described below, for a more detailed explanation refer to the circuit description.

a) Pressure: Once in the 'protect mode', i.e. system pressure is below 10^{-5} mbar an increase on system pressure above the preset overpressure limit will trip the supply. The limit can be varied over a narrow range by a front panel control. Once reset the supply will return to its 'start mode' until the pressure falls once more to less than 10^{-5} mbar.

b) Time: An internal timer sets the supply into its protect mode if after approximately 40 minutes the system pressure is still above 10^{-5} mbar. The supply will then trip if the system pressure is greater than the preset trip level or continue in the protect mode if the pressure is between 10^{-5} mbar and the preset pressure trip level.

c) Thermal: A thermal sensor fitted to the transformer trips the supply off if a preset temperature is exceeded. This is to protect the transformer insulation. Although the supply can be reset by means of the front panel switch, it will trip again when the switch is released until such times as the transformer has cooled sufficiently.

d) Flashover: Flashovers occuring during the 'start period' will trip the supply, 'prolonged arcing' in the protect mode will trip the supply either via the flashover circuit or via the pressure trip due to the increase in current.

iv) Protect Indicator: When illuminated indicates the supply is operating in its 'protect mode', i.e. the log scale indicates the pressure is less than 10^{-5} mbar.

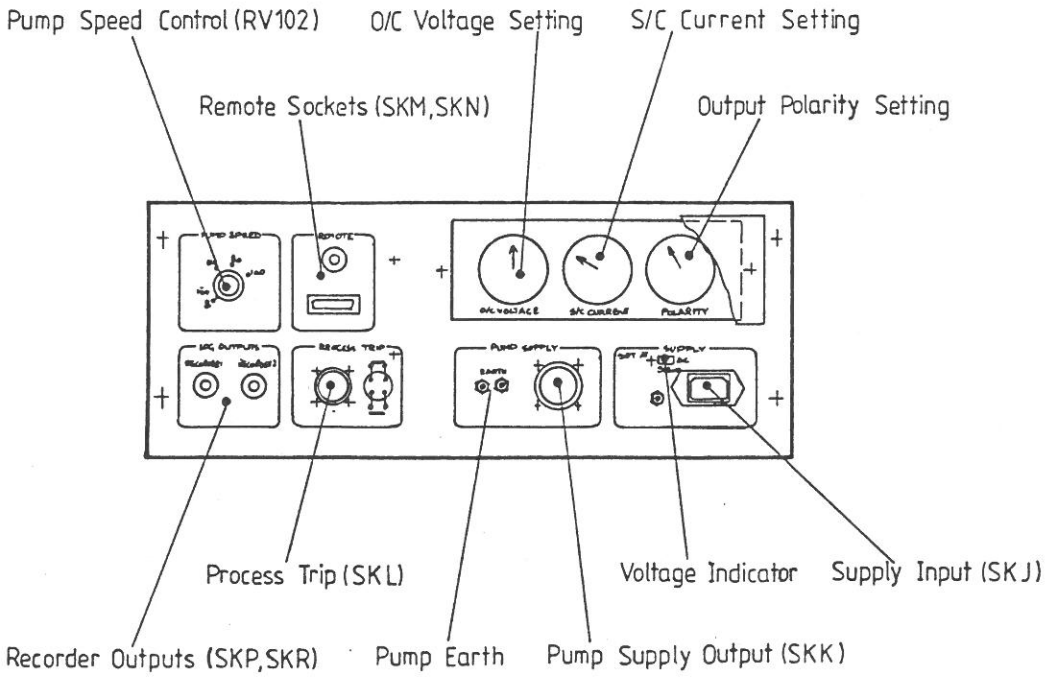
v) Remote indicator: When illuminated indicates that the supply is being controlled via the rear panel D type connector. In this condition the front panel E.H.T. on/off and reset switches are inoperative.

vi) Meter Range Switch: This seven position rotary switch connects the meter to the pump voltage pressure and current measuring circuits. There are five current ranges 20μA to 200mA F.S. in decade steps, the meter is overload protected if the incorrect range is selected. The five decades of current are presented on the log pressure scale when the mbar range is selected, the scale is compensated for differing pump speeds by adjusting the calibrated rear panel potentiometer. Note that with the E.H.T. off or the pump disconnected the meter will read less than 10^{-9} mbar, i.e. off scale, since 10^{-9} mbar indicates 2μA of current. The voltage scale is from 0 to 8KV F.S. and indicates the voltage across the pump.

vii) Set and Read Overpressure: When the lever switch is depressed the meter indicates the overpressure trip point. This is adjustable with the aid of a small screwdriver in the range 3×10^{-5} mbar to 10^{-4} mbar, thus giving a degree of flexibility when the supply is used as part of a process control system.

viii) Simulated Output: Is selected by the lever switch indicated on the meter and adjusted by the front panel control potentiometer. This output is available at both recorder sockets and is useful aid when setting up for example a process control system.

4:2 Rear Panel Controls and Connections



i) Pump Speed: Calibrated 8 to 140 l/sec it should be set to the speed of the pump the supply is driving. It is used to compensate the log pressure scale and recorder outputs.

ii) Supply: See the initial setting up procedure section 3:3 for supply and pump connections, setting of output voltage, short circuit current and output polarity.

iii) Process Trips: The Amphenol 97 series 4 pole connector provides one set of N.O. and one set of N.C. contacts with a current rating of 10A. They both changeover when the E.H.T. supply to the pump is on. The mating connector required is an Amphenol straight plug type 97-3106A-14 S-2S.
Connections are A-D N.C. contact, B-C N.O. contact.

iv) Recorder Outputs: Two separate buffered log pressure scale outputs are provided, 0V corresponding to 10^{-9} mbar and 10V to 10^{-4} mbar, i.e. 2 volts per decade of pressure change. Both have output impedance of 1K and are referenced to ground. 1/4" 2 pole jack connectors are required for interfacing.

v) Remote: Two connectors are provided for remote control use. The 1/4" 2 pole jack connection enables the pump supply to be turned on or off via a remote pair of isolated contacts, these are required to switch 24V at 5mA. The front panel E.H.T. switch must be on when using this facility. The D type 15 way connector requires a link fitting between pins 7 and 8 to switch the supply from local (front panel) operation to remote operation. Two input and two status output signals are provided. These are fully isolated w.r.t. each other and ground. Section 2:2 of this manual lists the required switching levels and isolation voltages. The connections to the D type are:

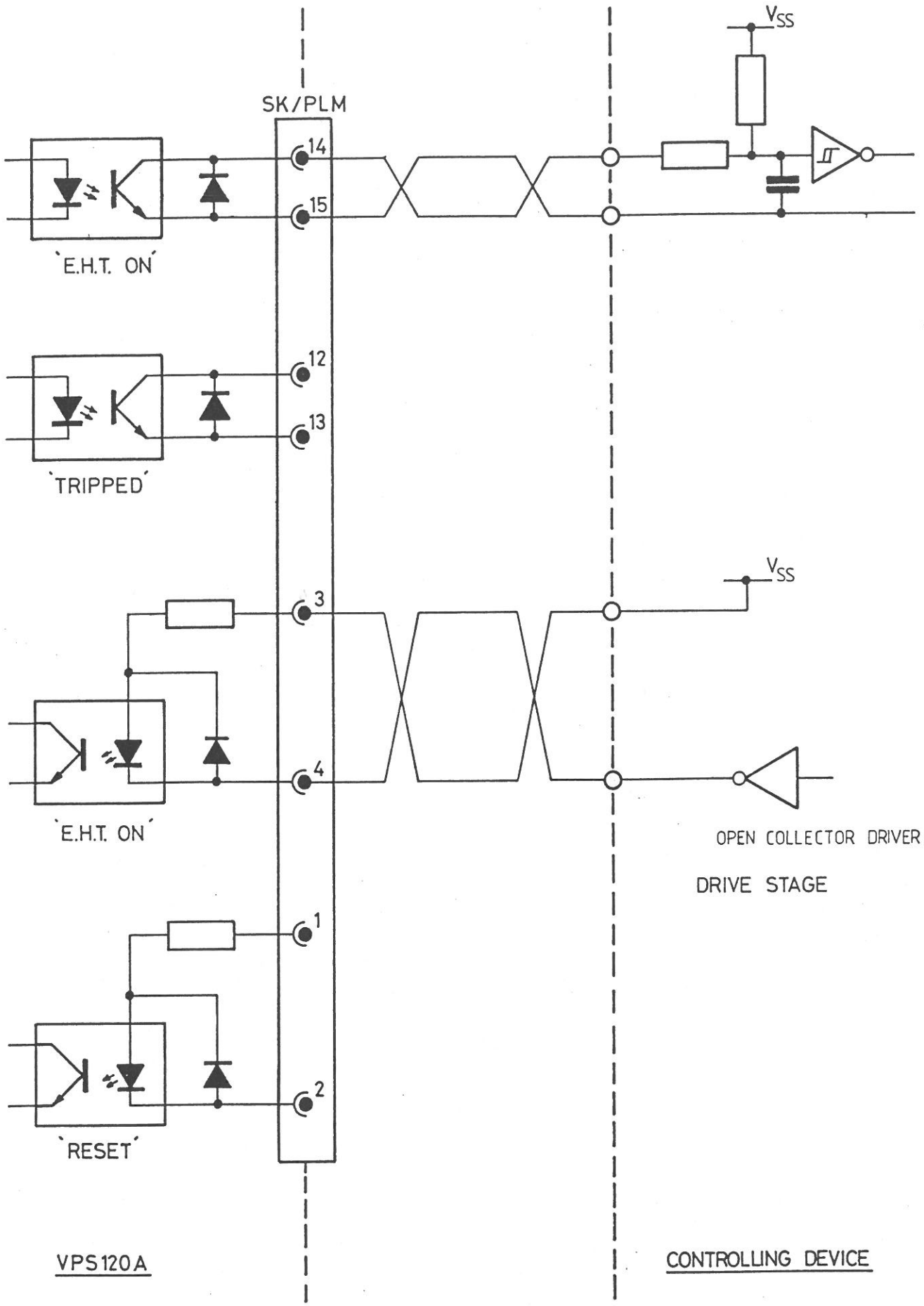
pins 1, 2 pump supply on (pin 2 +ve wrt pin 1).

pins 3,4 reset trip (pin 4 +ve wrt pin 3).

pins 7,8 interlock - link in plug or at other end of jumper lead.

pin 12, 13 unit tripped - pin 12 collector, pin 13 emitter of uncommitted n.p.n. transistor.

pin 14, 15 pump on - pin 14 collector, pin 15 emitter of uncommitted n.p.n. transistor.



TYPICAL REMOTE CONTROL INTERFACE

4:3 Operating Procedures

Ensure as described in section 3:3 of this manual that the supply voltage range is correctly set and that the E.H.T. output parameters are set up for your pump. Connect the earth braid and pump lead as described.

N.B. The system should always be separately earthed via a suitable braid.

WARNING: DO NOT ATTEMPT TO CONNECT OR DISCONNECT THE PUMP WITH THE SUPPLY ON.

The pump should have been previously baked out properly and no contaminents should be present in the system. The pump can either be started isolated from the system in which case a rapid start should be obtained or open to the system. The procedure for recognising faults such as high voltage leakage which may be encountered when the pump is running is outlined at the end of this manual in Section 7. To start the pump with it open to the system proceed as follows:

Turn on the roughing pump and open the roughing valve.

Pump the system with the roughing pump down to 1×10^{-2} mbar or less. A more rapid start will be obtained with less risk of overheating if the roughing pressure is reduced to 1×10^{-3} mbar.

Select K.V. on the VPS120A meter range switch. Switch on the supply and the E.H.T. switch. An intense blue glow discharge will appear in the pump.

Note the voltage indication on the meter - it should be 300 to 500 volts.

Wait for the pump to start. Depending on the roughing pressure and the cleanliness of the system this may occur within a few seconds, minutes or longer. The pump starting will be indicated by a flickering of the KV meter followed by a slow increase in voltage across the pump. When the KV meter reads above 600V it may be assumed that the pump has started.

When the voltage reaches 1.5 to 2KV isolate the roughing pump to prevent backstreaming of contaminents from the roughing pump.

By selection of KV, current or mbar scales the operation of the pump may be monitored.

Note: When starting the pump, care should be exercised to avoid overheating, this generally occurs when the surface temperature of the pump exceeds 100°C. The supply should minimise the risk of overheating with prolonged operation in the glow discharge state if the correct short circuit current is chosen for size of pump.

When the pressure has fallen to 10^{-5} mbar the protect indicator will illuminate indicating that the supply is in its protect mode, i.e. the overpressure trip is operating.

To shut down the supply turn off the pump E.H.T. supply and then the incoming supply.

WARNING: WHEN DISCONNECTING THE PUMP LEADS SELECT KV ON THE METER SWITCH, TURN OFF THE PUMP E.H.T. AND WAIT UNTIL THE E.H.T. HAS FALLEN TO ZERO, WHICH TAKES APPROXIMATELY 10 SECONDS.

5. CIRCUIT DESCRIPTION

5:1 Supply Input Circuit

Referring to circuit diagram A458-500 in Appendix B the incoming supply via front panel switch S101 and fuse FS101 is connected to TB102, one of the voltage selector panels. A458-500 shows TB101-TB102 set for 240V operation. From TB102 the supply is routed via cover safety switches S107, S108 and thermal fuse FT101 to transformer T102 which is used to power the control p.c.b. A458-501 and E.H.T. supply contactor CON101. Therefore, should one of the covers not be in place or the thermal fuse rupture the E.H.T. supply is turned off. CON101 is fitted with a set of time delay contacts to provide a 'soft start' when the E.H.T. is turned on by initially connecting the supply through surge limiting resistor R101 to T101 primary. After a preset delay contacts 58-57 close bypassing R101 connecting the supply directly to T101 primary.

The input supply voltage range is selected by links on TB102 which connects T102 tapped primaries in series or parallel for 240V/120V operation. TB101 is linked in an identical manner for input voltage selection to T101.

5:2 E.H.T. Power Output

The E.H.T. circuit has a voltage doubler/bridge configuration; i.e. it acts as a voltage doubler when the load current is low and a bridge when the load current is high. This is considered to give the best compromise between high voltage capacitor size and cost and a degree of conformity to the ideal constant power characteristic. Note that for the same output short circuit current a straight voltage doubler draws twice the reactive current from the supply making it less practical for high current supplies.

The programme plugs each have six pins in a moulded body, three voltage tappings on the high voltage secondary winding to control the open circuit voltage. S./C. current selects the short circuit current limiting reactance provided by C1 and C2. There are three possibilities according to whether the reactance is due to a single capacitor (medium current) both in series (low current) or both in parallel (high current). Of course the actual short circuit current is also a function of the voltage setting. Polarity selects either positive or negative output polarity by reversing the bridge rectifier connections to the voltage double capacitors.

C101 and C102 are purpose designed high voltage capacitors, C101 a double capacitor being suitable for continuous A.C. rating and C102 another double capacitor being a D.C. type suitable for high levels of ripple. R102 is a power wire wound resistor to limit the instaneous short circuit current resulting from a suddenly applied output short circuit. The nominal values of open circuit voltage and short circuit current are shown in the specification section of this manual. Note the currents shown will be 20% higher for 60Hz operation.

R106 consists of four 24 Mohm resistors wired in a series parallel combination . They are used for voltage measurement purposes and as a bleed resistor for output capacitors C102.

The frame and electrostatic screen of the power transformer are isolated from the chassis (T101 is mounted with insulating plastic bushes) and are connected to the low voltage side of the voltage doubler. The current measuring circuit is connected between this point and the chassis (pump return), with a result that d.c. leakage current from the transformer secondary winding to screen and frame flows in a loop external to the measuring circuit and thus does not cause an error. This avoids the need for special insulation to reduce transformer leakage current, which significantly reduces the size, weight and cost of the transformer.

Under surge conditions the voltage excursions of this low voltage mode is clamped by a surge limiting device consisting of BR101 and D106. Capacitor C103 provides an a.c. ground for the transformer at high frequencies.

5:3 Control P.C. Board

i) General: The low level circuitry associated with monitoring and control facilities are located on a single printed circuit board, circuit number A458-501. The board is mounted on the right hand side of the instrument and can be unplugged and removed if necessary to facilitate service.

The 17V-0-17V provided by T102 is rectified by BR5 connected so as to provide a full wave rectified positive and negative supply, smoothing being provided by C24 and C25 respectively. The supplies are then stabilised by IC18 and IC19 three terminal regulators, which provide a +15V and -15V rail respectively.

The 24 volt winding on T102 is rectified and smoothed on the p.c.b. by BR4 and C23 respectively. This voltage via D38 zener diode is then used to supply the front panel indicator lamps and current shunt control relays. T102 24 volt winding is also used to supply the contactor operating coil and is switched on the board by the optically coupled a.c. switch consisting of BR3, SCR1 and IC16. It should be noted that all links between the circuit powered by the ± 15V rails and those powered by the 24V rail are through optocouplers to minimise the risk of noise picked up onleads external to the unit being injected into the trip circuits.

ii) Voltage Measurement: The current from the 24 Mohm resistor chain R106 is rectified on the board by bridge BR2 to make the following circuit polarity insensitive, D6 providing a voltage clamp, 8KV, i.e. full scale, develops 600mV across R4 the sense resistor. IC2a, b, c, three parts of a quad. op. amp. type LM348 form a differential high input impedance amplifier to raise this level to 10V referenced to the 0V line. This is then scaled by R11 to give full scale deflection on M101 via the meter range switch.

iii) Linear Current Measurement: The pump supply current is rectified by BR1 to overcome the polarity change problem and flows via the log

diode D2 and through current shunt resistors R28-R32. All five resistors are in parallel on the 200mA range and are progressively switched out via relays RLA-RLD as the current range is decreased until on the 20μA range only R32 is used. At F.S. 600mV is developed across the selected shunt, this voltage is clamped by D3-D5 should the incorrect range be selected, 1C4 a,b,c three parts of quad op. amp type LM348 form a differential amplifier to raise the level to 10V referenced to the O.V. line. This is then scaled by R39 to give F.S. D. on M101 via the meter range switch.

iv) Log Current measurement: Since the log current diode is of necessity incorporated in the current rectifying bridge, it is subject to common mode d.c. voltage (of either polarity) and common mode a.c. ripple voltage of larger amplitude than the p.d. across it which we wish to measure. This unwanted common mode voltage is eliminated by means of a bridge amplifier using three amplifiers in the quad op. amp. 1C3. 1C3 input components R13, R14, C4, C5 and C6 provide long time constant series mode filtering and short time constant common mode filtering. Two amplifiers are connected as voltage followers for input buffering and the actual bridge amplifier utilizes the third amplifier in conjunction with bridge resistors R15-R18. RV1 is adjusted to give maximum cancellation of common mode inputs by balancing the bridge precisely. Since the amplifier has unity gain, its output at TP1 is a positive going voltage referred to O.V. and equal to the series voltage drop across the log diode. The fourth amplifer of the quad performs the actual log amplifier junction. Resistor R2 improves the log conformity at high currents. The log amplifier input is further filtered by R19/C7. D7 is the log compensation diode with a constant current bias via R21. The diode voltage is amplified to a sensitivity of 2V/decade defined by R22/R23 and adjusted on test by means of RV2. The output of the log amplifier covers the range 0 to +10V representing a pressure range of 10^{-9} to 10^{-4} mbar, and in order to achieve this scaling an offset current is fed into the output potential divider RV2, R22 and R23 via R25. This current is made variable by means of the pump speed control potentiometer, which compensates the log amplifier for different pump speeds. RV3 provides an offset current trim facility for setting up purposes. Capacitor C8 bypasses the d.c. feedback network to reduce the high frequency gain of the amplifier. The output drives the meter via scaling resistors R24 and the meter range selection switch.

v) Recorder Outputs: Two buffered recorder outputs are provided by means of voltage followers 1C2d and 1C4d. Their inputs are normally connected to the log amplifier output but can be switched via S106b to the simulated output pot RV103. R44 and R45 define the output impedance and provide protection for the output buffers.

vi) E.H.T. Switching and Remote Circuit: The 24V a.c. coil of CON101, the E.H.T. transformer supply contactor is controlled via the optically coupled a.c. switch consisting of BR3, SCR1 and optocoupler 1C16. Emitter follower TR7 supplies current drive to 1C16 and to 1C17 which provides an isolated 'status output' at the rear panel D type connector SKM.

Comparators 1C14a and 1C14b are used as buffers between the remote facility optocouplers or local front panel switches and the reset and E.H.T. on/off circuits. A high degree of noise immunity is obtained by biasing

their non inverting inputs as approximately ½ Vcc i.e. +7.5V derived from potential divider R103, R104 and filtering the inverting inputs used for control by low pass circuits consisting of R97, C21 and R101, C22. When TR9 is biased on, i.e. no remote link is fitted, the front panel E.H.T. on/off switch S102 (via the remote jack connector opto-coupler 1C12) and the reset switch S103 pull the non-inverting inputs of 1C14d and 1C14a respectively below ½Vcc thus switching the comparators. Hysterisis is provided by means of resistor R100 on reset comparator 1C14a and R106 on 1C14d. When a remote enable link is fitted between pins 7 and 8 on SKM, TR9 is biased off which disables S102 and S103. Optocoupler 1C15 which drives the front panel remote indicator is then biased on via the link and opto couplers 1C11 and 1C13 enabled to provide the remote operation facility. Input voltages in the range 5.0 to 30V allow satisfactory operation of 1C11 and 1C13, current limiting being provided by R93 and R95 respectively. Protection for 1C11 and 1C13 against reverse polarity of the applied control signal is provided by D30 and D31.

vii) Protection System: The three protection circuit outputs, pressure, flashover and transformer overtemperature are 'OR' connected via D22, D28 and D29 respectively to the trip latch which consists of op. amps 1C6c and 1C6d cross coupled via potential dividers R71, R73 and R69, R70. When set by a positive going signal from one of the three protection circuits via R72, C15, TP9 goes high clamping the base of TR7, (the contactor a.c. switch driver). The trip latch turns on optocouplers 1C9 and 1C10 via TR5, 1C10 drives the front panel trip indicator and 1C9 provides a 'flag' signal at the rear panel remote socket SKM. The trip latch can be reset by 1C14a via R68 from the front panel or via SKM as described in the previous section. The overpressure circuit which drives the latch 1C6c,d has its nominal trip level set by means of front panel control RV101 in the range 3×10^{-5} mbar to 10^{-4} mbar, this preset level can be read on meter M101 by operating S105 which connects RV101 output to the meter via scaling resistor R103. The change from 'start' to 'protect' occurs at 10^{-5} mbar, this level as well as the trip level are determined by potential divider chain R46, RV101, R47, RV4 and R48. (RV4 providing a small amount of adjustment of the 'protect' mode switch level to allow for tolerances in the power supply voltage and resistor values). 1C5a is the overpressure trip comparator and 1C5b the 'start/protect' level comparator. Their non inverting inputs are connected to RV101 and RV4 respectively and inverting inputs both connected via R33 to the log amplifier output, C13 initialises both comparators in the 'start mode' at switch on. The comparator outputs are joined i.e. 'AND' connected. As the pressure falls 1C5a output goes 'high' but is clamped by 1C5b, as the pressure continues to fall 1C5b output goes high setting the 'start/protect' latch (1C6a, b) via R15 and C14 time delay components.

The 'start/protect' latch 1C6a, b functions in the same manner as the trip latch 1C6c,d previously described. When set 1C6b output is high, which raises the reference level of 1C5b, (via R54, D18) to above that of 1C5a the overpressure trip. LP104 the 'protect' front panel indicator is now illuminated via optocoupler 1C8. Initially TP4, the output of the overpressure trip circuit, is held low by the start protect latch via D20. When the latch is set TP4 continues to be clamped to 0.V by the start/

protect level comparators via TR2 and D21. Should the pressure rise above the preset trip level 1C5a output goes low causing TP4 to go high (via TR2) setting the trip latch via D22 as described. The change to protect can also be triggered by the delay timer 1C7. 1C7 is a C.M.O.S. logic device having a clock oscillator and multiple stage binary divider. The counter is initially reset by C17, the oscillator then runs and the counter begins to count up. The output is taken from the 22nd binary dividing stage and via D25 sets the start/protect latch to protect when the counter output goes high(35 minutes). The counter is then reset by the start/protect comparator via D16 if the pressure is between the trip and protect levels. If the pressure is still above the trip level the supply is tripped and the counter reset via D17. If the system pumps down normally and the change from start to protect occurs at 10^{-5} mbar then the counter is reset via D16, in the same manner as described and held in the reset state.

Prolonged operation at high currents can overheat the E.H.T. transformer which is not rated for continuous operation at full output, since this normally only occurs for a short period during pump starting. Therefore, a temperature sensing circuit is incorporated which will trip the supply at a preset temperature which is a safe margin below that of the maximum temperature rating of the insulation of the transformer. A negative coefficient thermistor is attached to the transformer to detect the temperature of the windings, the voltage appearing at the junction of the thermistor with R86 is compared by 1C5d with a reference voltage at the junction of R88 and R89. If this reference voltage is exceeded by the voltage at the junction of R89 and the thermistor, due to a fall in resistance of the thermistor because of a temperature rise, 1C5d output will go high setting the trip latch via D29.

Protection is also provided against flashovers occurring in the pump or lead. This is achieved by detecting the high current pulses that occur in the diode chain D2, D3, D4 and D5 during flashovers. Optocoupler 1C1 is used as a threshold and isolation device to detect these pulses. Its output is connected to a diode pump circuit consisting of C18, D26, D27 and C19. The output of this pump is compared by 1C5c with a reference voltage defined by R80, R81 and R85. Arcing causes the output of the pump to ramp up until the reference voltage is exceeded, 1C5c output then goes high setting the trip latch via D28. During operation the setting of the 'start/protect' latch to 'protect' increases the reference voltage, via R85 thus reducing the circuits sensitivity. Only prolonged arcing will then cause a trip either via the flashover circuit or the pressure trip due to the apparent increase in pressure due to increased current.

6. SETTING PRESET ADJUSTMENTS

6:1 Initial Procedure

Ensure that the incoming supply is disconnected. Remove the top cover and supply voltage selection cover as described in section 3:3. Then remove the link on TB101 connecting tag 7 to tag 1 if the instrument is set for 240V operation. TB101 is the rear one of the two connector

blocks under the supply voltage selection cover. If the instrument is set for a supply of other than 240V then remove the link between 220V tag 7 to tag 2, 120V tag 7 to tag 4 or 100V tag 7 to tag 5. The E.H.T. transformer is then disconnected whilst adjustments are made.

Remove PLA from the circuit board located on the right hand side of the instrument. To set RV1, RV2, RV3 or RV4 requires an isolated current source with an open circuit output voltage of approximately 10 volts. The source could for instance consist of a fixed supply and suitable variable current limit resistor in series with its output. The output current of the source needs to cover the range 10µA to 100mA, it should also be possible to reverse the output polarity by means of a two pole changeover switch if RV1 requires resetting. Connect the source between pins 1 and 2 on PLA on the board, Pin 1 is indicated on the socket unplugged from the board. Finally set the pump speed compensation control on the VPS120A rear panel to 80 $1/sec^{-1}$. It should be left in this position for all the following adjustments.

6:2 Differential Log Amplifier Balance (RV1)

Having followed section 6:1 connect the supply to the unit and lock the cover safety switch down. Turn on the supply and set the current source to 1mA. If no means of monitoring the current is available switch to the 2mA current range on the VPS120A and use this scale to set up 1mA.

Select mbar and observe the meter reading on M101. Operate the polarity change switch on the current source and note the change in meter reading on M101. Now adjust RV1 for a minimum change in M101 reading, when the current source polarity is repeatedly changed.

6:3 Log Amplifier Sensitivity (RV2)

Having followed the section 6:1 connect the supply to the unit and lock the cover safety switch down. Turn on the supply and set the current source to 10mA. If no means of monitoring the current is available switch to the 20mA range on the VPS120A and use this scale to set up 10mA. Observe the meter reading on M101 and now reset the current source to 100µA and note the new reading on M101. RV2 should be adjusted until a two decade change in reading is obtained on M101 for a current change of 100µA to 10mA or 10mA to 100µA.

6:4 Log Amplifier Offset (RV3)

Having followed section 6:1 connect the supply to the unit and lock the cover safety switch down. Check the log amplifier sensitivity by following section 6:3. Now reset the current to 10mA if necessary and adjust RV3 until the meter reads 10^{-5} mbar on the log scale.

6:5 Protect Level Setting (RV4)

Having followed section 6:1 connect the supply to the unit and lock the cover safety switch down. Set RV4 fully clockwise and set the current

source to 10mA using the VPS120A 20mA current range if necessary. Switch on the VPS120A EHT, the contactor will operate but no E.H.T. will be present since the link to the transformer has been removed from TB101. Slowly adjust RV4 until the 'protect indicator' illuminates, leave set at this level. Repeat the adjustment if necessary by backing off RV4 slightly, reset the internal latch by turning the E.H.T. off and then on again and slowly readjusting RV4 until the protect indicator illuminates.

To check the operation of the overpressure trip increase the source current to 100mA with the protect indicator on, after a delay of about one second the unit will trip.

7. FAULT FINDING GUIDE

OBSERVE HIGH VOLTAGE PRECAUTIONS WHEN CARRYING OUT ANY TESTS