varian

vacuum products

installation, operation, and maintenance instructions

956 PORTABLE LEAK DETECTOR

Manual No. 6999-09-725

Revision J

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SECTION IV

OPERATION

4-1 GENERAL

Operation of the 956 leak detector is divided into three levels for ease of use.

Level 1, the operator level, has access and control of those keys which directly control the equipment - Level 1 requires no security. These keys and their functions are described in para. 4-3-1.

Level 2 operation, under security control, includes the use of level 1 and, in addition, access to some of the programmable settings which require changes to fit a specific application. Typical examples of this level of operation are 1) to change the Reject Set Point value, or 2) to set the time and day at which the leak detector will automatically warm up and be ready for use (for example, just before a shift starts). Level 2 operation is described in para. 4-3-2.

Level 3, the highest level of operation available to the customer, is intended for the in-house service technician who may require the use of manual controls to isolate problems such as large leaks in the vacuum system. Level 3 operation is described in para. 4-3-3.

All levels of operation have access to operating control keys. Only the higher security levels allow a greater degree of programmability.

4-2 STARTUP AND SHUTDOWN PROCEDURES

4-2-1 Startup

After unpacking the leak detector, it is good practice to let the instrument remain at room temperature overnight, especially if it has been stored below 40°F (4.4°C) for an extended period of time.

At this point, the leak detector is ready to be powered up as described in the following sequence.

1. Check that the electronics ON/OFF switch on the back of the Basic Module is off and the MAIN POWER switch on the cart power enclosure (if so equipped) is also off.

2. Check that all options (if any) are plugged in to their respective sockets (see Figure 3-2).

3. Plug the leak detector into an appropriate power source.

4. Set the MAIN POWER switch on the cart power enclosure (if equipped) to ON.

5. Set the ON/OFF switch on the back of the basic module to ON.

As soon as power is applied to the electronics, a beep will be heard and the front panel lights will light. The message "System shutdown - press Scram to restart" will appear on the alpha-numeric display. The leak detector will then progress through its programmed sequence as listed in Para. 4-2-2.

If, on startup, the message "Parameter Error, press Scram to restart" appears on the alphanumeric display, proceed as follows. J

1 Verify that the leak detector is sensitive to helium by turning on the calibrated leak. Recalibrate the leak detector if required.

2 If any problem occurs in step 1, it may be necessary to reset the system operating parameters.

Menu 2	Calibration			
	Option 1	Auto Calibrate		
		1	Disable Calib. Key	D
		2	Enable for Int. Leak	
		3	Enable for Ext. Leak	
Menu 6	Xfer to Fine Test			
	Option 1		Hold in Gross Leak	
	Option 2		Xfer to Fine Leak	
Menu 18	Pump Options			
	Option 1		Rough Pump control	
		1	Disable	D
		2	Enable	
		3	Enable for Rough Only	
Menu 22	Manual Controls			
	Option 1		System Calib. Controls	
		1	Ion Voltage	
		2	Repeller Voltage	
		3	Variable Focus	
		4	Emission Current	
		5	Calibration Gain	

4-2-2 Programmed Startup Sequence

MESSAGE	APPROXIMATE TIME AND EXPLANATION
"Roughing out system Software Rev. ___" (level)	10 seconds - evacuates vacuum manifold
"Roughing out spec tube"	This message may not appear if spectrometer tube pressure is already low enough
"DP warm-up"	Maximum of 7 minutes (or less)

(time countdown and DP temperature)

"Starting Ion Source"	Message remains for approximately 20 seconds - Turns on filament of the ion source
"Zeroing"	10 seconds - performs auto zero
"System Ready"	System ready to be used

4-2-3 Shutdown

To shut the leak detector down from all modes except the Program mode, proceed as follows.

1 Press and hold the SCRAM key until the unit displays COOLING DIFF PUMP. This message will remain for five minutes and allows the diffusion pump to cool off. The mechanical pump will shut down and the unit will display SYSTEM SHUT DOWN - PUSH SCRAM TO RESTART.

2 To shut the unit down from any menu or option, proceed as follows.

3 Press the OPTION key to get out of the Menu mode. Press and hold the SCRAM key as described in a previous paragraph.

4 Do not shut off the MAIN POWER switch until SYSTEM SHUT DOWN is displayed.

4-2-4 Moving the Leak Detector

If movement from one location to another requires removing power and disconnecting the leak detector, a short-term loss of sensitivity may be experienced. This loss of sensitivity is due to the temperature change of the diffusion pump.

If the off time will be between 3 and 10 minutes, Varian recommends pressing and holding the SCRAM key for more than 1/2 second which initiates the shutdown mode. Wait 5 minutes until the message "System shut down" appears on the display before removing power to the leak detector. This assures that the temperature of the diffusion pump will be properly controlled.

4-3 LEVELS OF OPERATION

4-3-1 Operation Using Level 1 keys

Level 1 operation is intended for the user who will directly use the leak detector in the most simplistic form - "two-button operation". Under Level 1, no system parameters can be modified except Menu 8, option 2, the key press beep, and Menu 11, option 1, the Sequenced Cycle enable/disable. The following is a list of direct equipment control keys of which the ZERO key (Menu 1, option 1) and the CAL key (Menu 2, option 1, sub option 1) can be disabled if necessary from Level 2.

The following are descriptions of the most often used keys on the panel of the leak detector.

VENT — Message displayed: "System vented"

Pressing the VENT key for more than 1/2 second will vent the test port. Pressing it for less than 1/2 second will place the 956 leak detector in the HOLD mode in which the valves isolate the test port and the test port is not air-released.

START — Messages displayed: "Roughing out test port", "Gross test", or "Fine test"

Pressing the START key will initiate a rough-down sequence of the test port and the leak detector proceeds to test. The crossover to the GROSS TEST mode is made at 700 milliTorr and to FINE TEST at 70 milliTorr unless changed by Menu 22 (described in a later paragraph).

AUDIO— Pressing the AUDIO key will turn on or off the audible tone. Audio ON is indicated by a steadily-lit red indicator next to the AUDIO key.

Volume Up/Volume Down — These two triangular keys to the left of the AUDIO key increase or decrease the volume level of the audible tone. The upper triangular key increases the volume; the lower key decreases the volume.

AUTO/MAN — Pressing the AUTO/MAN key causes the 956 leak detector to switch between auto ranging and manual ranging. Auto ranging is indicated by the AUTO light being lit and ranges to the most sensitive range possible in the TEST mode. Manual ranging is indicated when the MAN light is lit. In the MANUAL mode, the two triangular keys to the left of the AUTO/MAN key are enabled.

Larger/smaller leak — These are the two triangular keys to the left of the AUTO/MAN key and are operable in the MAN mode only. Pressing the upper triangular key will manually range the leak detector to measure larger leaks (smaller absolute exponent value); the lower triangular key will manually range the leak detector to measure smaller leaks (larger absolute exponent value).

The following is a description of the left-half group keys (keys under the cover flap).

ZERO — Message displayed: "Zeroing"

Pressing the ZERO key when the leak detector is in the TEST mode will zero a negative or positive signal in the range shown on the display. This key is otherwise ignored in the TEST mode. The key is inoperative in the AUTO mode if the leak rate is 5×10^{-7} or larger.

CAL — Pressing the CAL key when the leak detector is in the FINE TEST mode will initiate a self-calibration routine to tune and calibrate the leak detector to a known signal. With an internal leak option installed, calibration can be made easy by pressing this key. To calibrate the leak detector without this option, refer to Menu description of Menu 3, Option 1-3 (Calibrate with an external leak). In the GROSS LEAK TEST, or other modes, this key is not operational.

LEAK — Messages displayed: "Roughing std lk" or "Std lk on"

When the leak detector is in the FINE TEST mode, pressing this key will turn the internal

calibrated leak on or off. If the leak option is not installed or when not in the FINE TEST mode, the key press is ignored.

SCALE — Pressing this key selects the leak rate bar graph scale (either log or linear). In the linear mode, the exponent is read with the bar graph mantissa value; in the log mode, the exponent is extinguished and the entire scale is presented on bar graphs in pseudo log fashion.

AUDIO SET PTS — Pressing this key arms or disarms the audio set point whose trip value can be seen in Menu 5 (described in a later paragraph). When armed, the AUDIO light will flash and will be off when disarmed. Exceptions to the audio light indications are described in Menu 5.

GROSS LEAK — Message displayed: "Gross leak only"

If the gross leak option is installed, pressing this key once will prevent the 956 leak detector from entering the FINE TEST mode thus enabling testing in the GROSS LEAK mode only. Pressing this key a second time will allow the 956 to proceed into the FINE TEST mode. This key is not operational if the Gross Leak option is not installed.

OPTION — Message displayed "Master Option Menu"
"1. Zeroing"

Pressing this key the first time forces the leak detector to enter the Program mode and exit the Program mode when pressed the second time. This key is further described in paragraph 4-5-2, step 7.

SCRAM — Messages displayed: "Cooling diff pump" then
"System shut down"
"Press SCRAM key to restart"

Pressing this key for greater than 1/2 second will execute a safe shutdown sequence. If pressed for less than 1/2 second, the key press will be ignored. If the leak detector is in the Program mode, pressing the SCRAM key will back up one menu level only. In this case, the system will not be shut down. This key is further described in paragraph 4-5-2, step 8.

All remaining keys are not operational unless the leak detector is in the Program mode.

4-3-2 Operation Using Level 2 Keys

Level 2 operation is intended for a supervisor who may set up the leak detector in a particular manner and who does not want the operator to change the parameters. Once the supervisor has entered the appropriate password in Menu 20, the 956 leak detector will allow the supervisor to examine and change those system parameters that are designated under Level 2 security. A complete list of those menu options that can be changed under Level 2 operation is listed after Menu 20.

Programming Examples

1 To change the value of Reject Set Point #3 to 5.8 x 10^{-6}, press the keys in the order shown. It is assumed that the leak detector is not in the Program mode at the start.

Key Press	Explanation
Option	To enter the Program mode
#7	Menu number for Reject Set Pts
ENTER	Select the menu
#3	Menu option number for Set Point #3
ENTER	Selects the third choice
#5	
#8	Reject Set Point value. Decimal point is assumed.
ENTER	Accepts the mantissa and advances the cursor to the exponent field.
#6	Exponent value
ENTER	Accepts the value
OPTION	Exits the Program mode. If there are other changes, then there is no need to exit the program mode for each change.

2 To disable the CAL key so that calibration is not performed at the wrong time due to an accidental key press, proceed as follows.

Key Press	Explanation
OPTION	To enter the Program mode
#2	Menu number for the calibration option
ENTER	Select the menu
ENTER	Since the choice is already on Menu, ENTER is sufficient
ENTER	Disable the value for the option; selects the "Disable" choice
OPTION	To exit the Program mode

3 To display all messages in English, show the leak rate during test, and show the test port pressure during the HOLD mode, proceed as follows.

Key Press	Explanation
OPTION	Enter the Program mode
#9	Menu number for display controls
ENTER	Selects the menu
#3	Language menu/option number
ENTER	Selects the option
ENTER	Selects the English language (note that key #1 was not required to be pressed)
#1	Option number for alpha-numeric display control
ENTER	Selects a menu option
#2	Option number for leak rate

ENTER	Selects option choice
#2	Menu option #2 for HOLD mode display
ENTER	Selects the menu
#4	Option #4 for test port pressure
ENTER	Selects choice
OPTION	Exit the Program mode

After the parameters are changed to the satisfaction of the supervisor, security should be reset to Level 1 in Menu 20 to prevent accidental change. Proceed as follows.

Key Press	Explanation
Option	To enter Program mode
#20	Menu number for security control
ENTER	Select the menu
2	Sub level menu number
ENTER	Select menu
1000	Initial password for menu level 1 (see Menu description)
ENTER	Accept value (reduces security to Level 1)
Option	To exit Program mode

4-3-3 Operation Using Level 3 Keys

Level 3 is intended for the service technician who requires manual control of various valves, pumps, and voltages to isolate and correct problems. As in all control equipment, manual override is necessary to isolate problem areas. Therefore, care should be taken when under manual controls.

The 956 leak detector will protect itself from long-term damage. For example, assume the diffusion pump is turned on manually with the fore pump off. Voltage will be applied to the diffusion pump until power is removed or the pump gets too hot. When it gets too hot, power will be removed and the system will recover in time; however, an immediate loss of sensitivity will be noticeable if the leak detector is allowed to proceed into the Test mode.

To enter Level 3 security, the password must be entered into Menu 20, Option 4. The operator must reset the security to Level 1 or 2 when finished.

Example - Manually roughing out the test port

To rough out the test port manually by using the fore pump, proceed as follows.

Key Press	Explanation
OPTION	To enter Program mode
#22	Menu number for manual control
ENTER	Select the menu
#2	Option number for manual control
ENTER	Select Option 2
#2	Sub-option number for fore pump

ENTER	Select Sub-option 2
#2	Option number for ON
ENTER	Select ON

If the fore pump was off, it will turn on as soon as the last ENTER key is pressed.

To select the proper valve state, proceed as follows.

Key Press	Explanation
OPTION	To enter the Program mode
#22	Menu number for manual control
ENTER	Select the menu
#3	Option 3 - valve control
ENTER	Select Option 3
#1	Sub level 1, set valve state
ENTER	Select sub level 1
#3	Sub level 3, rough-down state
ENTER	Select sub level 3
OPTION	To exit Program mode

As soon as the last ENTER key is pressed, the 956 leak detector will set up the valves in the rough-down state. By isolating various valve states or valves, problem areas can be quickly found. Varian recommends that valve states or individual valve controls be manipulated from the shut-down state using the SCRAM key.

All menu items that can be controlled under level 3 are listed under Security Control descriptions.

Calibration procedures for the 956 are described in Section V, paragraph 5-4.

4-4 SYSTEM VALVE OPERATION (See Figure 4-1 and Table 4-1)

4-4-1 Valve Designations and Functions

V1	Roughing valve	V6	Isolation valve
V2	Test valve	V7	Gross leak valve
V3	Vent valve	V11	External rough pump flow split valve (part of option)
V4	Ejector bypass valve		
V5	Calibrated leak valve	V12	Gross leak metering valve (manual adjust) (part of option)

4-4-2 Vacuum Modes

1. HOLD
2. VENT
3. ROUGHING OUT TEST PORT
4. GROSS LEAK TEST
5. FINE LEAK TEST

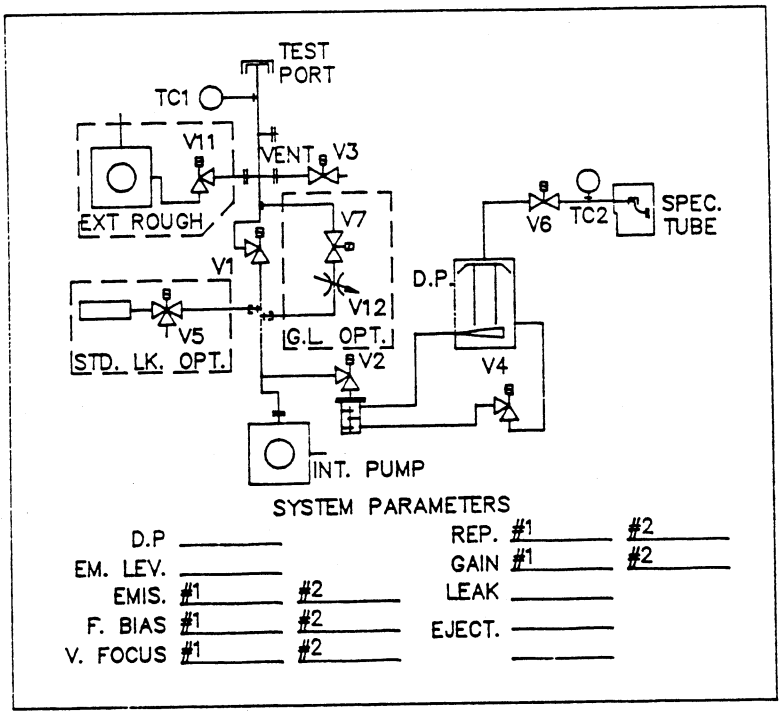


Figure 4-1. Schematic diagram of 956 vacuum system.

In the following descriptions, the valves are considered to be in their final resting positions. It is assumed that valves turn on and off with sufficient delays such that misvalving is not possible.

Table 4-1. Valve Truth Table

VALVE	MODE					
	Hold	Rough down		Gross Leak	Fine Leak	Vent
		Small Pump	Large Pump			
V1 Roughing	C	O	C	C	O	C
V2 Test	O	C	O	O	O	O
V3 Vent	C	C	C	C	C	O
V4 Ejector Bypass	E	E	E	E	O	E
V5 Standard Leak	C	C	C	C	C	C
V6 Isolation	O	O	O	O	O	O
V7 Gross Leak	C	NA	C	O	C	C
V11 Rough Pump	C	NA	O	O	C	C

C = Closed E = Either Open or Closed O = Open

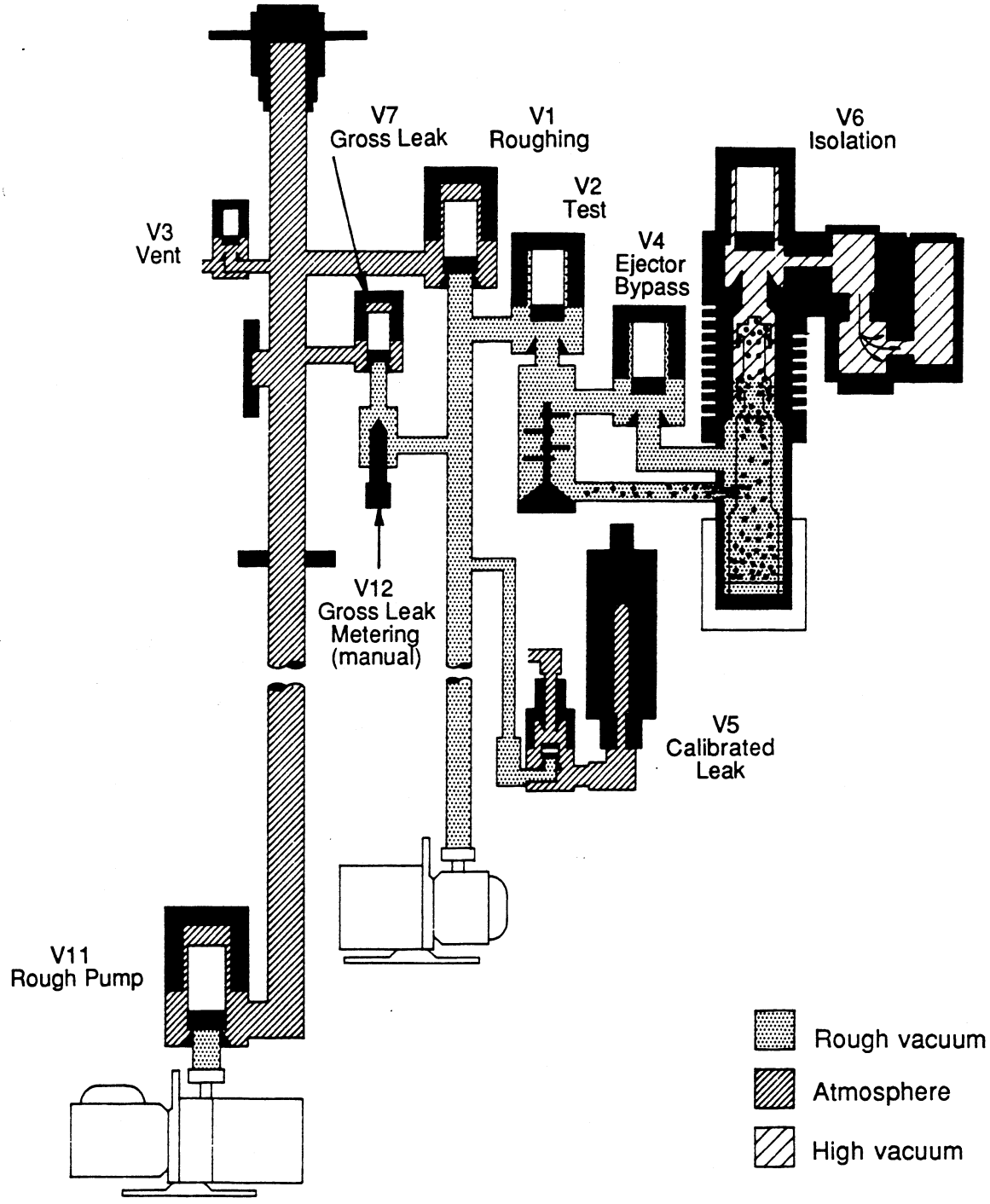


Figure 4-2. Vacuum system in the System Ready - Vent mode.

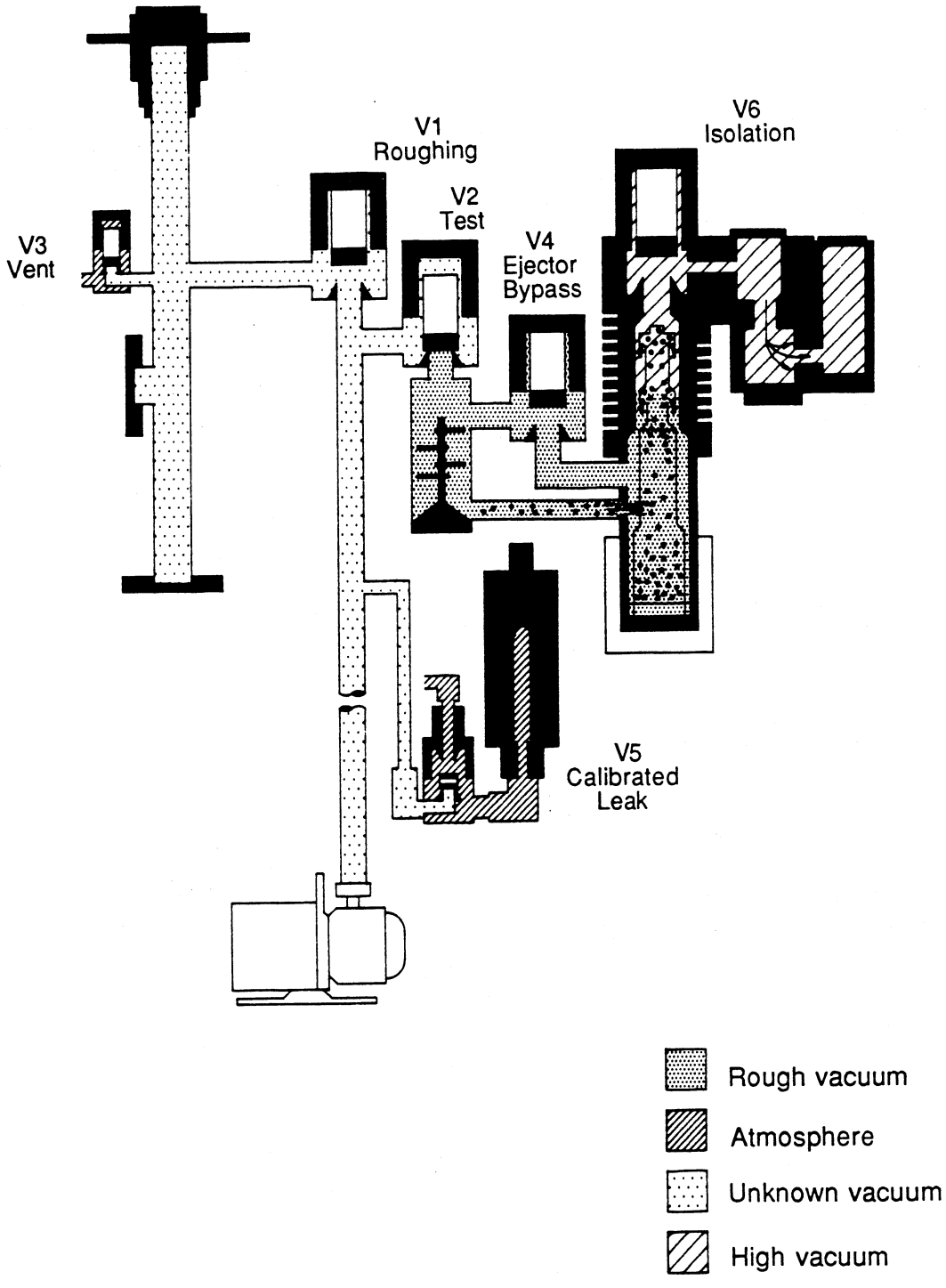


Figure 4-3. Roughing the test port using the internal pump only

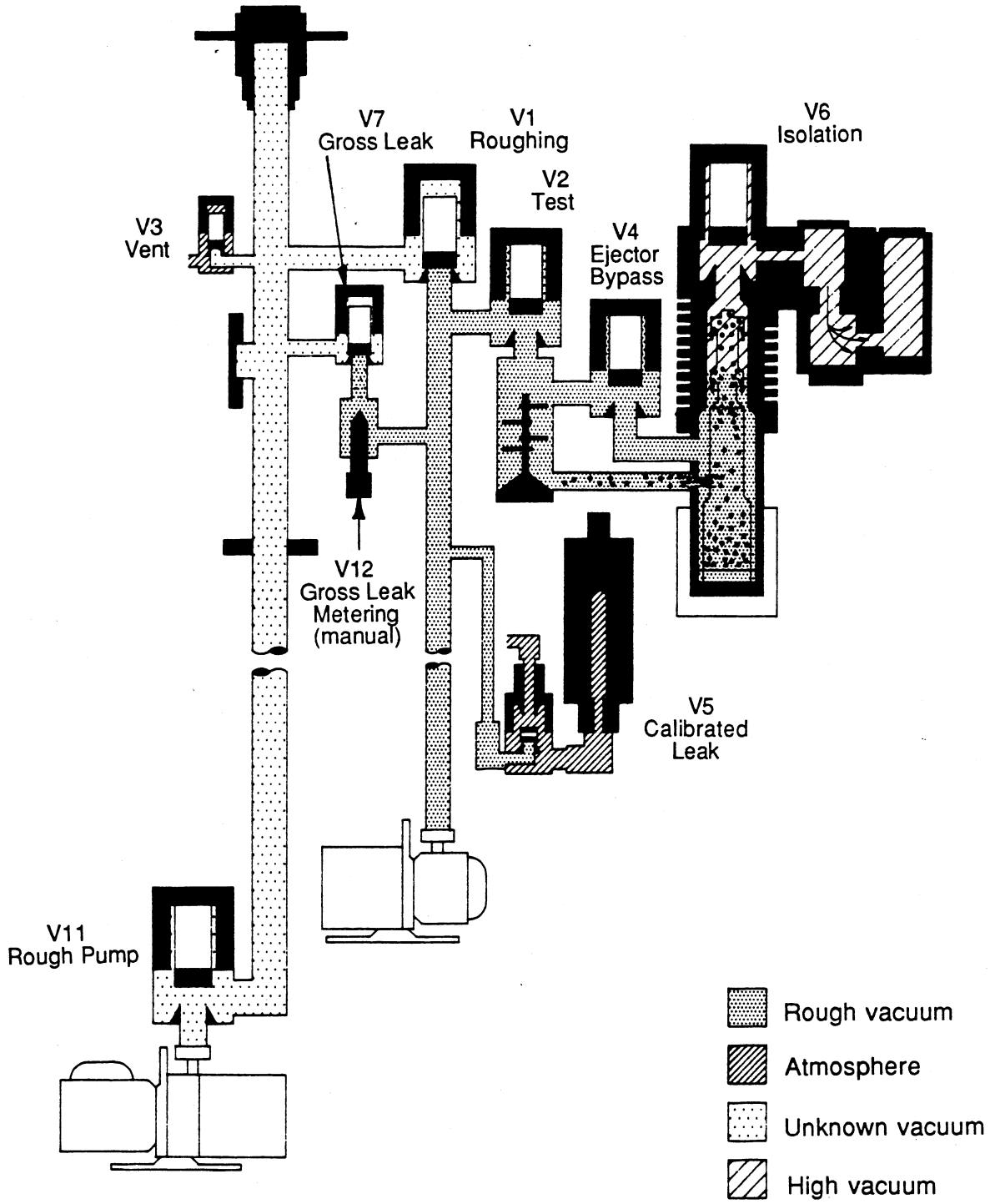


Figure 4-4. Roughing the test port with the external pump.

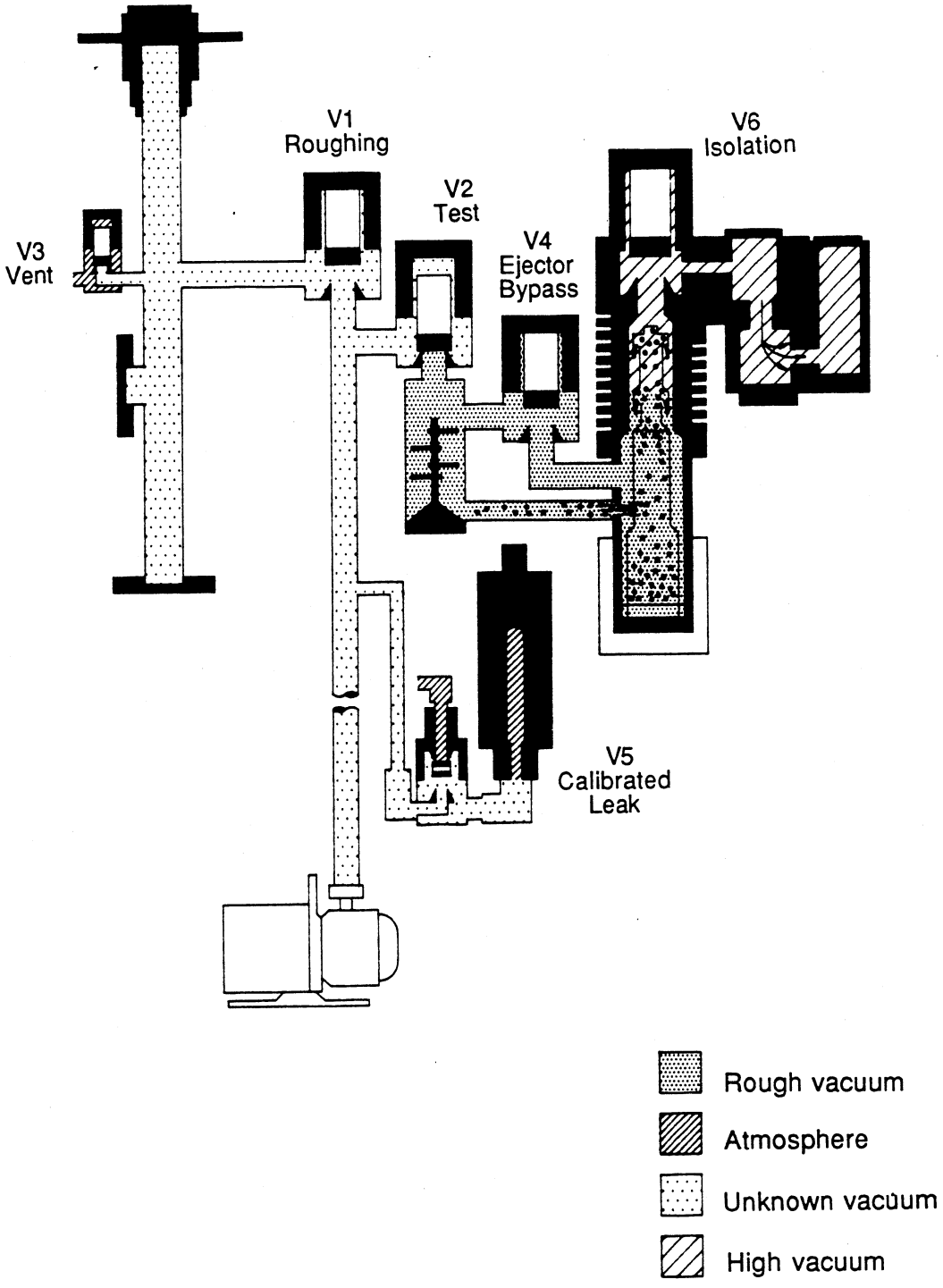


Figure 4-5. Roughing the Calibrated Leak (with internal leak option).

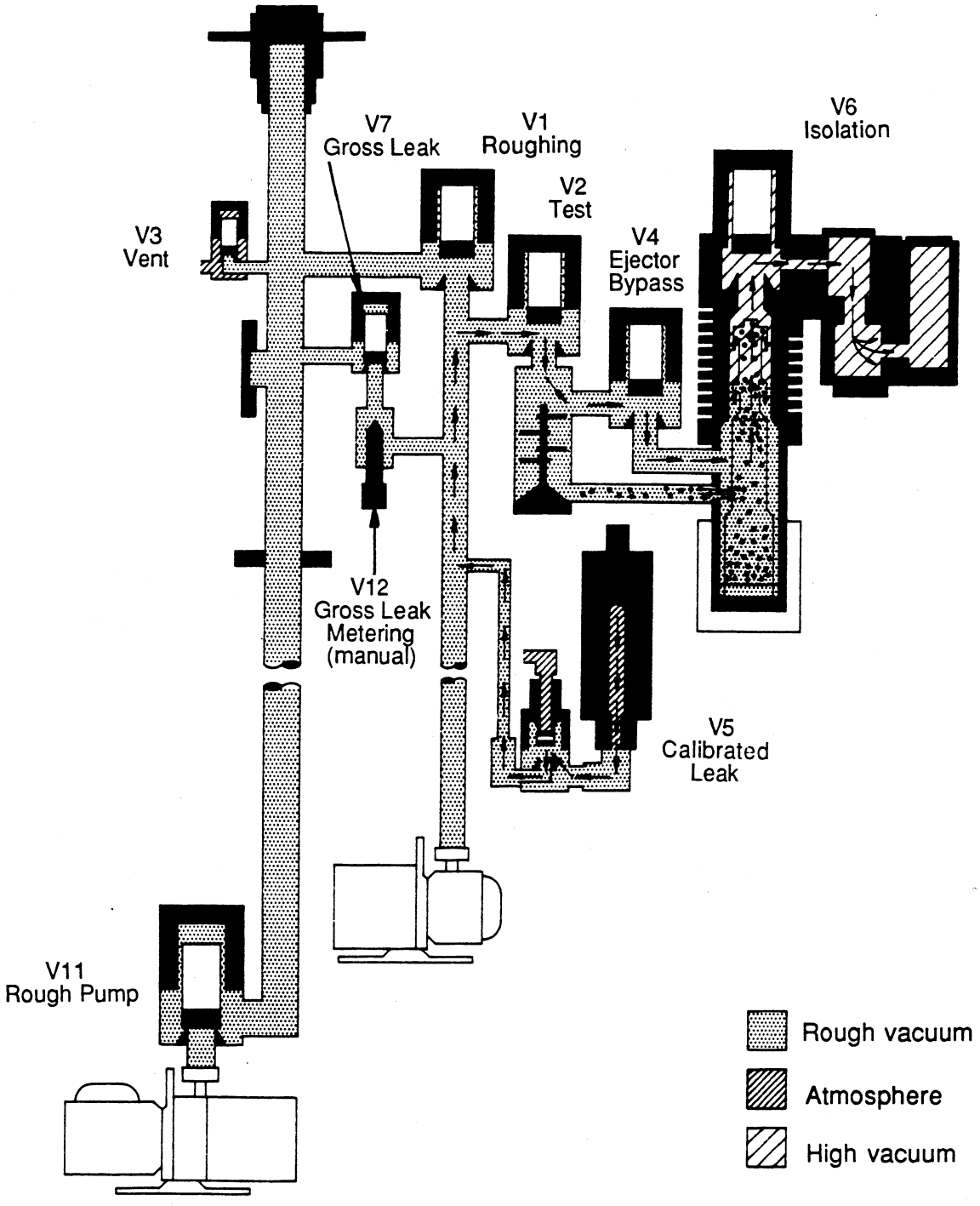


Figure 4-6. Calibrated leak open, vacuum system in the Test mode.

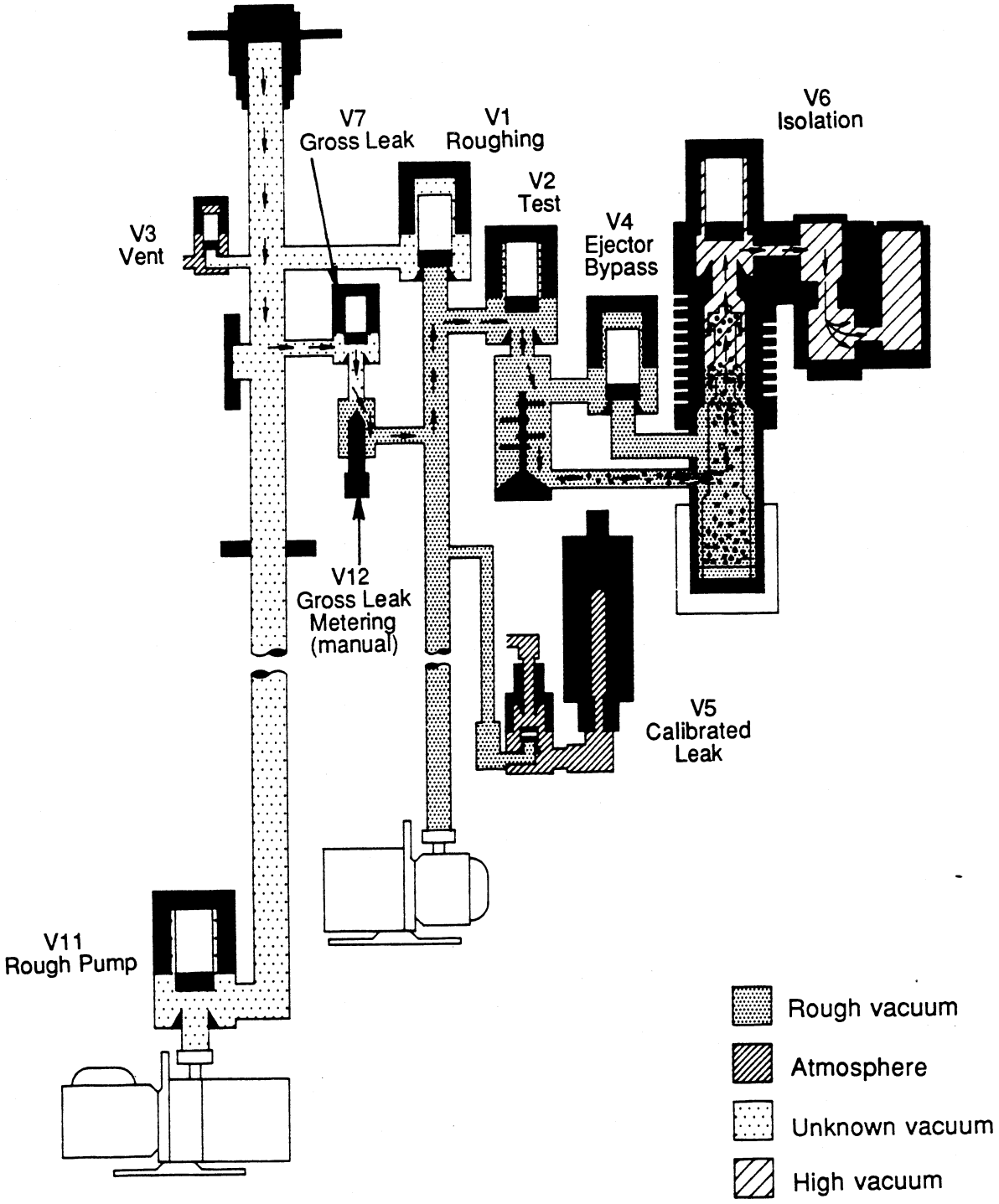


Figure 4-7. Vacuum system in the Gross Leak Test mode.

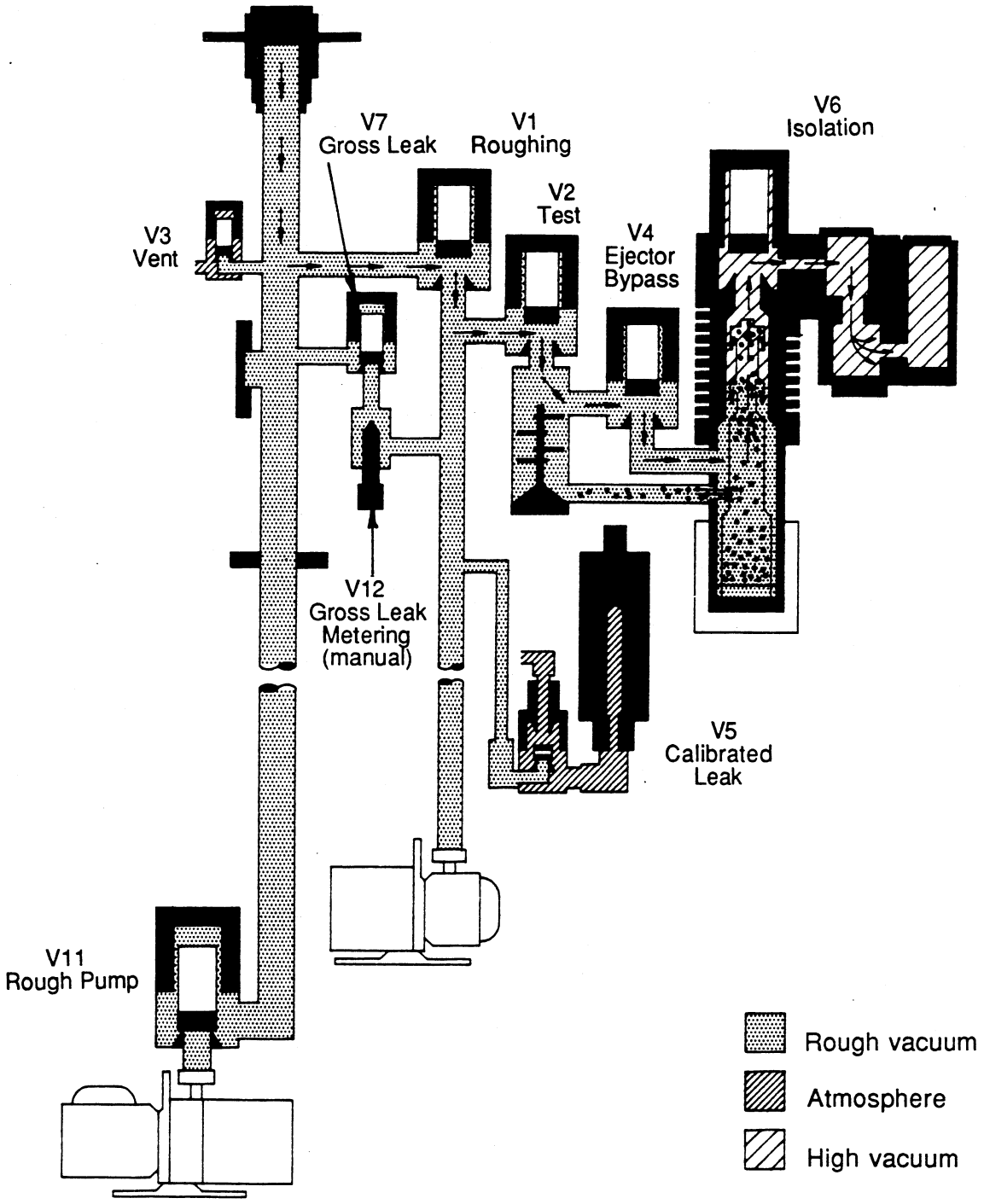


Figure 4-8. Vacuum system in the Fine Test mode.

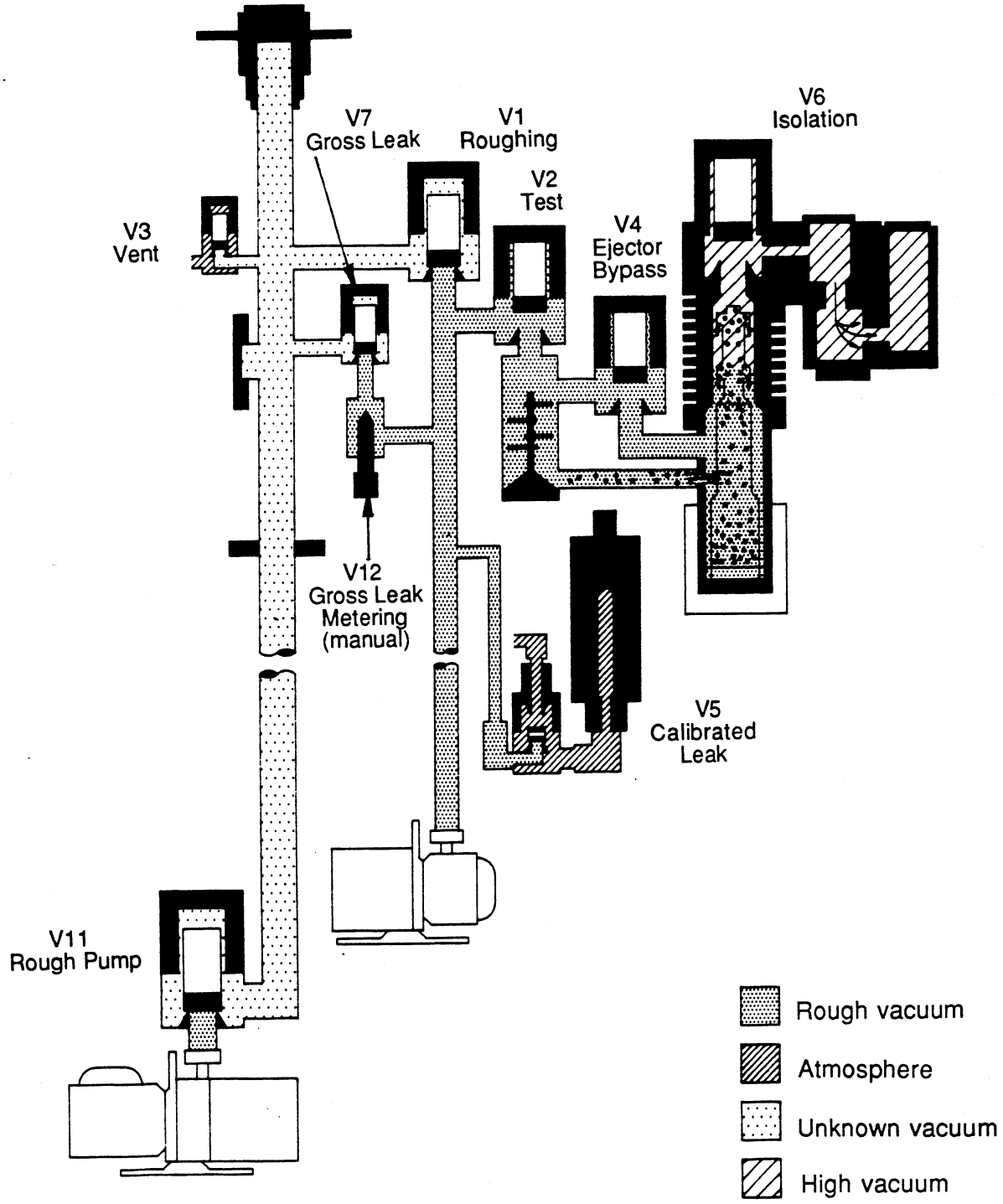


Figure 4-9. Vacuum system in the System Ready or Hold mode.

1 The HOLD mode is a safe mode in which the system can remain indefinitely. Valves V2 and V6 remain open while valves V1, V3, V5, V7, and V11 close. Valve V4 remains in the position before the HOLD mode occurred. The display reads " System Ready." (The second line of the display is user-defineable (Menu 9, option 2.)

2 The VENT mode is used to load and unload the test port and is also a safe mode and can be entered from any other mode. In the VENT mode, valves V2, V3, and V6 open while valves V1, V4, V5, V7, and V11 close. The display reads "System Ready - Vent".

3 The ROUGHING OUT TEST PORT mode can be entered only after system warmup. This mode is initiated by pressing the START key. Once the transfer pressure criteria is met, the system then proceeds to the GROSS LEAK TEST or FINE LEAK TEST mode. In the ROUGH DOWN mode, valves V1, V6, and V11 open while valves V2, V3, V4, V5, and V7 close.

4 The GROSS LEAK TEST mode can only be entered from the ROUGH OUT TEST PORT mode or the FINE LEAK mode. In this mode, valves V2, V6, and V7 open while valves V1, V3, and V5 close. Valve V4 opens or closes depending on the range of the leak detector. Valve V11 remains open or closed depending on the menu selection for flow split. V11 opens for flow split and remains closed if flow split is not selected.

5 The FINE LEAK TEST mode can be entered only from the ROUGH OUT TEST PORT mode if the gross leak option is not installed; the FINE LEAK mode can be entered from the gross leak mode only if the gross leak is present. In this mode, all valves remain as in the gross leak mode except roughing valve V1 which is opened or closed instead of gross leak valve V7.

Figures 4-2 through 4-9 show the vacuum system in different modes of operation.

4-5 FRONT PANEL CONTROLS (Detailed description) (See Figure 2-8)

As described in Section II, the front panel is divided into two functional groups of keys, the right half and the left half. The right half keys can be considered as primary control keys which directly control the equipment and are always operational unless control is passed on to the host, remote, or parallel connectors through optional selections. The left half keys (under the hinged cover on the left side of the control panel) are those keys which are seldom used for normal operation. The following paragraphs define the operating functions of the keys.

4-5-1 Right-side Control Key Functions

START
VENT
AUDIO (on/off)
AUDIO volume (VOLUME INCREASE or VOLUME DECREASE)
AUTO/MAN (ranging)
MAN (LARGER or SMALLER leak)

1 The START key initiates a rough down cycle and permits the 956 leak detector to proceed to the TEST mode if transfer pressure permits. The following restrictions apply.

The 956 Leak Detector proceeds to the most sensitive range if in the AUTO mode; it remains in the range selected if in the MANUAL mode.

The leak detector proceeds to FINE LEAK TEST mode unless held in GROSS LEAK mode by pressing the GROSS LEAK key (no. 6 in left half group).

The leak detector remains in the TEST mode unless:

a) The system is vented by pressing the VENT key.
b) A fault is present that can cause the system pressure to rise above the maximum transfer pressure in which case the system goes into the GROSS LEAK mode and proceeds to the ROUGHDOWN mode if it exceeds maximum transfer pressure in the GROSS LEAK mode.
c) Any failure occurs with the ion source, diffusion pump, or mechanical pump which will send the system into the HOLD mode.
d) The AUTO SEQUENCER cycle is terminated in which case the system goes into the HOLD mode if the test sample fails and to the VENT mode if the test sample passes.

2 The VENT key vents the test port, terminating the cycle, from any vacuum state.

3 The AUDIO (on/off) key turns the audio on and off. The audio is a tone whose pitch (frequency) is proportional to the leak rate. The frequency increases for an increasing signal.

4 The triangular AUDIO volume (VOLUME INCREASE or DECREASE) keys, when pressed or held down, increase or decrease the volume of the tone if the audio is on. If the audio is off, these keys are not active.

5 The AUTO/MAN key puts the 956 leak detector in either the AUTO or MANUAL range changing mode of operation by alternately pressing the key. Once in the TEST and AUTO modes, the leak detector proceeds to a range in which the mantissa value of the leak rate is greater than or equal to 0.8 and less than or equal to 9.9 thus proceeding to the most sensitive range possible. This key forces the leak detector to revert to the LIN scale. Once the leak detector is in the MANUAL and TEST modes, the leak detector remains in the range selected and can be changed using the LARGER and SMALLER (triangular) keys to the left of the AUTO/MANUAL key to read larger or smaller leaks.

6 The MANUAL (LARGER and SMALLER) keys become active in the MANUAL mode and cause the leak detector to go to the next larger leak rate range when the LARGER (up) key is pressed, and to the next smaller leak rate range when the SMALLER (down) key is pressed.

4-5-2 Left-side Control Key Functions

The left half group consists of sixteen keys which can mean and do different things depending on previous key presses. Eight of these keys can be considered first function, secondary control keys. They are:

ZERO
CAL (Calibrate)
LEAK (Standard leak)
SCALE (Log/Lin)
AUDIO SET PTS
GROSS LEAK
OPTION
SCRAM

1 The ZERO key, depending on the menu setup, will zero the background or return it to the previous value when the key is pressed again.

2 The CAL key, if enabled through menu selection, will automatically calibrate the system. The leak detector must be in the TEST mode or the command will be ignored. The calibrate function first autozeroes the vacuum system, turns on the standard leak, scans the spectrometer tube voltages to find the helium peak, calculates the gain, turns off the standard leak, and then autozeroes the system. The gain must be greater than 0.8 and less than 7.

3 The LEAK key is a toggle switch which, if in the TEST mode, turns the standard leak on and off.

4 The SCALE key switches between the log and linear scales of the bar graphs upon alternate key presses.

5 The AUDIO SET PTS key either arms or disarms the audio set point upon alternate key presses.

6 The GROSS LEAK key is active if the GROSS LEAK option is installed and will hold the leak detector in the GROSS LEAK mode or allow it to transfer to the FINE LEAK TEST mode if conditions allow upon alternate key presses.

7 The OPTION key is the single most important key which allows the 16 keys to have a second function. When this key is first pressed, the leak detector is forced into a programmable mode in which, through menu selections, the operator can examine or change the leak detector's parameters. The key also activates the second functions of this group of keys.

8 The SCRAM key causes the system to go into a SAFE SHUTDOWN mode (the key must be pressed and held for more than 1/2 second). In this mode (after the diffusion pump has cooled down), all pumps and valves are turned off and only the digital electronics and the front panel are active. Power consumption in this mode is approximately 30 to 40 watts. If the system is already in the SAFE SHUTDOWN mode, pressing the SCRAM key again will turn the system on.

4-5-3 Second Function Key Definitions

1 The ENTER key is used to accept a choice or activate the current menu.

2 The CLR key clears an active choice. This action can be considered as "Backing Out". If the CLEAR key is pressed before the ENTER key, then the erroneous entry is cleared and the old value appears. If the CLEAR key is pressed again, then the current value is destroyed and the default (factory-set) value now becomes the current choice.

3 The NEXT and PREVIOUS keys are used to advance the menus or choices, backward or forward.

4 The SCRAM key is used to back up one level of the menus. For example, if pressed at the sub menu level 2, the display will then show the level 1 menu title.

5 Pressing the OPTION key causes the 956 leak detector to enter the PROGRAMMABLE mode. Pressing it again causes the leak detector to terminate the mode and return to operating the unit.

6 Digits 1 through 9

When the OPTION key is first pressed, the second function of the keys becomes active. The following definitions apply to the second functions of the 16 keys.

ENTER key	SCRAM key
CLR key	OPTION key
NEXT and PREVIOUS keys	Digits 0 through 9

Before describing these functions, it is necessary to understand the possible types of entries, their use, and how they are shown on the alpha-numeric displays. The alpha-numeric displays consist of two rows of 24 characters each. During normal use of the leak detector, the display spells out messages to describe the status of the leak detector. Once the OPTION key is pressed, the leak detector enters into the programmable mode and the alpha-numerics are divided into two rows. The top row shows the title of the present menu or option; the bottom row shows the submenu or the option value until the ENTER key is pressed. The ENTER key advances the bottom row to show any further sub-sublist or displays the current option value.

The letters "C" or "D" (or both) may appear next to the option value; "C" representing the current active value of the option, and "D" its default (or factory-set) value. Option values can be considered as a stack which is Last In, First Out. The default value is at the bottom of the stack and cannot be changed or erased. The current active value is the next item on the stack and can be modified. Once modified, the old value is lost; however, the modified value does not become active unless and until the ENTER key is pressed (except in some cases described later). The letter "P" alongside the option value indicates that the value is Protected (a Security Level); the # sign indicates the number of that security level of that option (see Menu 22).

Option values can be of the following types:

1 List Pick
2 Numerical Entry
3 Incremental or Decremental
4 Alpha-numeric

1 List Pick is a list of all possible choices. When the proper choice is reached, the ENTER key accepts and makes the choice current.

2 Numerical Entry allows entry from digit keys 0 through 9. The display will show the single digit change and advance to the next digit if required. Again, the ENTER key accepts and makes the choice current.

3 Incremental or Decremental (NEXT or PREVIOUS) keys can be used to scroll through the choices rapidly by holding the appropriate key down.

4 Alpha-numeric entry is possible where required for special features such as names, job number fields, etc. This is accomplished by pressing the NEXT and PREVIOUS keys to scroll through the set of available characters. When the proper character is displayed, press ENTER. Entry of up to 22 characters is possible for names. The last entry should be "." (period or decimal point) to indicate the end of the message field.

All menu titles are identified by numbers which correspond to available functions. On the next sub-level are the sub menus (or options) which can also be identified by numbers. This sub level could continue further; however, a four-level depth is sufficient for the 956 leak detector. For convenience, digit keys 1 through 9 also have abbreviated menu titles printed on them. To activate the menus, press the OPTION key then, if the menu number is known, press digits 0 through 9. Otherwise, the NEXT and PREVIOUS keys can be used to scroll through the menus. Once the proper menu is reached (by either method), press the ENTER key to enter into or activate the sub menu. Again, either the digit keys or the NEXT or PREVIOUS keys can be used to activate the next menu in line or option choice. If the choice is an option value then, again, the NEXT or PREVIOUS keys can be pressed to show the desired choice and the ENTER key will activate the choice. For example, to change the ion voltage (or filament bias) of the spectrometer tube, the following sequence of key presses are necessary. Ion voltage (filament bias) appears under Manual Calibration (Menu 2, Option 2).

1 Press the OPTION key (activates the menus).
2 Continue pressing the NEXT key to advance to the CALIBRATION menu title.
3 Press ENTER to activate the menu.
4 Continue pressing the NEXT key to advance to MANUAL CALIBRATE menu title.
5 Press ENTER to activate the menu.
6 Continue pressing the NEXT or PREVIOUS keys to get to the ion voltage (filament bias) sub menu.
7 Press ENTER to activate the menu.

At this point, the operator can enter the desired ion voltage using digit keys 0 through 9 followed by the ENTER key, or scrolling up or down to the desired voltage. Once satisfied with the ion voltage, the operator can exit the Program mode by pressing the OPTION key again or continue to change other parameters.

4-6 MENU DESCRIPTIONS

Table 4-2 lists all of the menus used in the microprocessor for the 956 Leak Detector. Each menu, with its options and sub-options, is described in detail in following paragraphs.

Table 4-2. List of Menus

Menu No.	Title	Menu No.	Title
1	Zeroing	13	Recorder Output Control
2	Calibration	14	Serial Port Control
3	StandardLeak	15	Date and Time
4	Log/Linear Select	16	System Wake Up
5	Audio Controls	17	Sniffer Control
6	Xfer to Fine Test	18	Pump Options
7	Reject Setpt Controls	19	Service Information
8	Keyboard Controls	20	Security Control
9	Display Controls	21	Service Statistics
10	Display Units	22	Manual Controls
11	Sequencer	23	Service Initialization
12	Options Control	24	Software Control

Menu 1 - Zeroing

Option 1 Auto Zero Leak Rate < 0
1 Disable
2 Enable D

Option 2 Last Zero Background
1 Disable D
2 Enable

This menu refers to the ground reference of the helium signal. The hardware and software have the combined ability to shift the zero reference of the preamplifier by approximately 3 x 10^{-7} atm cc/sec.

As the vacuum system is used, the background will increase or decrease with time. Selecting Option 1 (Auto Zero Leak Rate < 0), the operator can let the leak detector automatically compensate for decreasing background and adjust the leak rate to the proper zero reference.

Auto Zeroing accomplishes the following.

- Zeroes the leak detector when the leak rate falls below 0.0 by 2% of that scale.
- Zeroes the leak detector within 0.5% of any scale.
- Displays the ZEROING message during the process.
- Disables the function keys such as VENT, STD LK, and CAL during the zeroing process.

Option 2 - Last Zero Background

In some cases, it is necessary for the operator to know how much the system background has changed since the last calibration was performed. Option 2 contains the difference between the current zero reference and the zero reference at the last auto calibration. A positive number implies that the background has risen; a negative number implies that the background

has improved. Values shown when this menu is accessed corresponds to the range the leak detector is in. This is due to the fact that the zero reference is different for different ranges.

Menu 2 - Calibration

Option 1	Auto Calibrate		
	1	Disable Calib. Key	D
	2	Enable for Int. Leak	
	3	Enable for Ext. Leak	
Option 2	Manual Calibrate		
	1	Ion Voltage	(210V to 320V)
	2	Emission Current	(0.2 mA to 2 mA)
	3	Calibration Gain	(0.8 to 7)
	4	Response Time	(0.05 sec to 10 sec)

Option 1 - Auto Calibrate

This menu defines calibration techniques available to the operator. If Option 1-1 is selected, pressing the CAL key will produce an audible beep indicating an illegal or inoperable key press.

If Option 1-2 is selected, pressing the CAL key will initiate the following auto calibrate sequence with the internal leak provided the leak detector is in the TEST mode. During the auto calibration procedure, the VENT, ZERO, and STD LEAK are disabled.

- Turns on the standard leak
- Scans the ion voltage (+210 to +320 V DC ± 10%)
- Scans the ion voltage to find the maximum signal
- Sets the ion voltage to that peak or indicates an error message
- Calculates the gain by using the leak value set in Option 3-1. If the gain is greater than 7 or less than 0.8, an error message is displayed
- Turns off the leak
- Zeroes the display. Valves may be automatically sequencing during this process

If Option 1-3 is selected, an external leak can be used to calibrate the leak detector. The value of this leak should be placed in Option 2 so that it can be used in the gain calculations. This procedure follows the same sequence as in Option 1-2 except for the following user intervention.

- The external leak with valve open should be placed in the test port before the system is pumped down.
- When the leak detector is in the FINE TEST mode and in its most sensitive range, the CAL key can be pressed to initiate the CALIBRATE process.
- No further action is required by the user to complete the process.
- For best results, an external leak with a value of -6 range to -8 range should be used.

Option 2 - Manual Calibrate

Although Auto Calibrate is the better way of calibrating the leak detector, it may be necessary

(for certain applications) to adjust the leak rate output to an operators' unique application. In this case, the operator has control of the Ion Voltage, Emission Current, Calibration Gain, and system response time.

Option 2-1 controls the Ion Voltage. Using the NEXT and PREVIOUS keys, the ion voltage can be increased or decreased from approximately 210V to 320V. This voltage adjustment should be used only when the other ion source parameters (repeller voltage, variable focus, and the enhancement magnet) have already been set up through the Service Calibration option menu (menu 22-1).

Option 2-2 controls the ion source emission current. Using the NEXT and PREVIOUS keys, the emission current can be increased or decreased from approximately 0.2 mA to 2 mA. This adjustment is also a peaking function of the helium signal. This current should be kept as low as possible so that the life of the ion source filament can be greatly increased. Typical emission currents are between 0.2 mA to 1 mA; the emission is factory-set at 0.2 mA.

Option 2-3, Calibration Gain, amplifies the output to the leak rate display. Its range is from 0.8 to 7.00.

Option 2-4 controls the response time of the leak detection system. Response time can be adjusted from 0.05 sec (direct) to 10 sec (slowest). Setting the response time applies to all ranges except the -9 range in which case the response is four times the set value (0.2 sec to 40 sec); the factory-set response time is 0.8 sec.

Menu 3 - Standard Leak

Option 1	Internal Standard Leak Value	
Option 2	External Standard Leak Value	
Option 3	Disable Leak	D

Option 1 contains the value of the Internal Standard Leak. This value is used to calculate gain by the Auto Calibration routine. **The value of this leak is automatically compensated for ambient temperature changes.**

Option 2 can be set to a value of a calibrated leak used at the test port. The value set in this option is used during Auto Calibration with an external leak. Even if external calibration is not used, the value of a leak used at the test port to verify system perfomance should be placed here.

Option 3 disables the Leak key and is used when the standard leak is not installed.

Menu 4 - Log/Linear Select

Option 1	Log	
Option 2	Lin (Linear)	D

This menu allows the operator to set the bar graph scale output (log or linear) to be selected to the desired choice when the leak detector is powered up.

Menu 5 - Audio Controls

Option 1	Audio Setpoint Value
Option 2	Audio Volume (1 to 100)

Option 1 of this menu allows the operator to set the value at which the audio will turn on if armed. The following criteria describes the audio set point.

- The audio is turned on for values greater than the set point and turned off for values less than the set point.
- The set point can be armed or disarmed by pressing key 5 only when in the non-programming mode (outside the menu options).
- When the audio set point is armed, the AUDIO ON light will flash to indicate that the set point alarm is armed.
- If the audio is on (enabled by the AUDIO key), the set point cannot be armed by pressing the AUDIO SET PTS key.
- If armed and the leak rate is greater than the set point, the AUDIO on light will go from the flashing state to the solidly lit state.
- Turning off the audio does not disarm the set point; it turns off the AUDIO ON and the sound only.

Option 2 allows the operator to adjust the volume level that can be applied when the leak detector is powered up and the audio is first turned on.

Menu 6 - Transfer to Fine Test

Option 1	Hold in Gross Leak
Option 2	Xfer to Fine Leak

Option 1 allows the operator to set the leak detector to stay in the GROSS LEAK TEST mode only. This state is retained upon every power-up.

Option 2 allows the operator to set the leak detector to transfer (Xfer) to the FINE LEAK TEST mode if pressure and leak rate conditions are met. As in Option 1, this state is retained upon every power-up.

Menu 7 - Reject Set Point Controls

Note

A "Standard Leak On" message overwrites the "Reject" message. If a standard leak is used to check the Reject Set point, the Reject message will not show untill the leak is closed (press the LEAK button).

Option 1	Reject Setpoint #1
Option 2	Reject Setpoint #2
Option 3	Reject Setpoint #3
Option 4	Reject Setpoint #4

Option 5	Reject for Set Point # (#1 to #4)
Option 6	Setpoint Hysteresis (5% to 50%)

Options 1 through 4 allow the operator to set values for four independent reject set points. Each set point directly controls the action of the four optical isolators whose outputs are connected to parallel I/O connector J10.

Option 5 allows the operator to set the main reject set point indicator message to any of the four set points available (#1 through #4).

Option 6 allows the operator to set the hysteresis value to all the set points except the audio set point. For example, if the hysteresis was set to 10 percent of full scale and the set point was set at 3.0×10^{-7}, then the reject set point will trip for leak rate values greater than or equal to 3.0×10^{-7} for an increasing signal and untrip when the leak rate falls below 2.0×10^{-7} (10 percent of full scale) for a decreasing signal.

Menu 8 - Keyboard Control

Option 1	Active Keys Control			
	1	Front Panel		
		1	Disable	
		2	Enable	D
	2	Parallel Port		
		1	Disable	D
		2	Enable	
Option 2	Key Press Beep			
	1	Disable		
	2	Enable		D

Options 1-1 and 1-2 select the location (s) of the source of the input commands.

Option 1-1-1 disables the START, VENT, AUTO/MAN, AUDIO ON/OFF, ZERO, CAL, LEAK, SCALE, AUDIO SET PT keys and the GROSS LEAK (Gross Leak Hold/Xfer Fine Test functions) key. The programming mode keys are still active.

Option 1-1-2 enables all the keys on the front panel.

Option 1-2-1 disables all the input lines of the parallel I/O connector J10. The output lines are always active.

Option 1-2-2 enables the parallel inputs on the parallel I/O connector J10

Option 2-1 disables the key press beep. Pressing a key on the front panel will not produce any beep except as follows.

- Two beeps will be heard to indicate an illegal or not active key press.
- Three beeps will be heard to indicate an error that changes the state of the leak detector. These beeps are not associated with key presses.

Note
Rapid entry of conflicting commands (e.g., START/VENT/START)will cause a Please Wait message to be displayed.

Option 2-2 enables the key press beep. Pressing any key on the front panel will produce a single beep to acknowledge the key. Other beeps will be heard as indicated in Option 2-1.

Menu 9 - Display Controls

Option 1 Alpha-numeric Display
- 1 Nothing D
- 2 Leak Rate
- 3 Ion Gauge Pressure
- 4 Test Port Pressure

Option 2 Hold Mode Display
- 1 Nothing D
- 2 Ion Gauge Pressure
- 3 System TC Pressure
- 4 Test Port Pressure

Option 3 Languages
- 1 English D
- 2 Spanish
- 3 German
- 4 French
- 5 Italian

Menu 9 allows the manipulation of the alpha-numeric displays. The first line of the alpha-numeric display describes the current state of the leak detector and the events taking place. This line is not controllable except for Options 2 and 3.

Options 1-1 through 1-4 apply to the information that can be displayed on the second line of the alpha-numeric display.

Option 1-1 allows the operator to keep the second line blank when the leak detector is in the TEST mode except for the leak rate units so that the display does not distract the operator with too much information.

Option 1-2 allow the operator to display the leak rate value to two decimal places thus giving more resolution.

Option 1-3 allows the operator to display the last reported system pressure from the ion gauge when the leak detector is in the TEST mode.

Option 1-4 allows the operator to monitor the test port pressure when the leak detector is in the TEST mode.

Option 2-1 through 2-4 allows the operator to display the various system pressures when the leak detector is in the Hold mode.

Options 3-1 through 3-5 allow the operator to display all the alpha-numeric messages in the language selected.

Menu 10 - Display Units

Option 1	Leak Rate Units		
	1	Atm cc/sec	D
	2	Oz Freon/yr	
	3	Pascal m^3/sec	
	4	Torr liters/sec	
	5	Air equivalent	
	6	User defined (0.001 to 99.999)	
Option 2	Pressure Units		
	1	Torr	D
	2	mbar	
	3	Pascal	
Option 3	Pump Speed Units		
	1	CFM	D
	2	m^3/hr	
	3	liters/min	

Menu 10 deals with the units of the numerical information reported on the displays. If the exponent value becomes positive or smaller than -9 due to units selected other than atm/cc sec, the exponent is blanked and the full value will appear on the alpha-numeric display. If the leak rate on the alpha-numeric display is disabled (Option 9-1-1), then the leak rate will be forced to be displayed.

Option 1-1 through 1-5 allows the operator to select the appropriate units for the leak rate output.

Option 1-6 allows the operator to enter a constant multiplier for units not commonly used. When this option is selected, the words "other units" will appear on the second line of the alpha-numeric display.

Option 2-1 through 2-3 allow the operator to display the pressure in the units selected.

Options 3-1 through 3-3 allow the operator to enter the pumping speed units for various mechanical pumps.

Menu 11 - Sequencer

Option 1	Sequenced Cycle		
	1	Disable	D
	2	Enable	
Option 2	Rough Time	(2 sec to 200 sec)	
Option 3	Test Time	(3 sec to 200 sec)	

Menu 11 is to be used when repetitive testing is required which give pass or fail results only. This menu, in conjunction with Menu 14, Option 4, makes a very powerful tool for automatic testing and logging test results on a printer.

Option 1-1 disables the sequenced cycle operation; the leak detector therefore operates as a standard leak detector.
Option 1-2 enables the sequenced cycle operation with the following rules.

- Pressing the START key initiates the cycle.
- The test port is rough-pumped to get to the TEST mode.
- To allow zeroing, calibration, etc., press the ZERO, CAL, or LEAK keys during the rough pumping. The cycle is interrupted until the VENT key is pressed.
- If rough out time expires, the system reverts to the HOLD mode and rejects the sample. Pressing the VENT key terminates the cycle.
- Once in the TEST mode, the system waits for the test time to expire, at which point the leak rate is compared with the reject set point.
- If the leak rate is less than the reject set point, the massage "Passed" appears on the display and the test port is automatically vented to terminate the cycle.
- If the leak rate is greater than the reject set point, then the message "Failed" appears on the display and the system reverts to the HOLD mode. The cycle is terminated when the VENT key is pressed.

Option 2 allows the operator to set the maximum rough out time. If the rough out time expires, the system reverts to the HOLD mode and rejects the sample. Pressing the VENT key terminates the cycle.

Option 3 allows the operator to set the maximum time in test before making the set point comparison. This is to allow the signal to settle down.

Menu 12 - Options Control

Option 1	Gross Leak (factory-set, for user information only)		
	1	Not Installed	D
	2	Installed	
Option 2	Internal Standard Leak (factory-set, for user information only)		
	1	Not Installed	D
	2	Installed	
Option 3	Vacuum System Type (factory-set, for user information only)		
	1	Diffusion Pump	D
	2	Turbo Molecular Pump	

Option 1 instructs the leak detector to function as a non gross leak machine. Fine Leak ranges from 10×10^{-4} to 0.2×10^{-9} are available to the user.

Option 1-2 enables the Gross Leak valve sequencing provided the option is installed. This allows additional ranges from 10×10^{0} to 0.2×10^{-3} to be available to the operator.

Option 2 instructs the leak detector whether the internal calibrated leak is installed or not installed.

Option 3 instructs the leak detector regarding the type of pump (diffusion pump or turbo pump) in the vacuum system.

Menu 13 - Recorder Output Control

Option 1	Leak Rate Output Scale		
	1	Log	
	2	Linear	D
	3	Linear with Offset	
Option 2	Recorder Output Signal		
	1	Leak Rate	D
	2	System Pressure	
	3	Test Port Pressure	

Option 1 applies to the leak rate at the recorder output only.

Option 1-1 allows the operator to select the log scale for the recorder output; the output is scaled 1 volt per decade. 100 mv corresponds to 1 x 10^{-9}; 10 v corresponds to 10 x 10^{0}.

Option 1-2 allows the operator to select the linear scale for the recorder output; 0 to 10 v repeated for each decade.

Option 1-3 adds an offset to produce a mid 9 range signal. This makes AVS recordings possible so that positive and negative background shifts of the vacuum system can be recorded.

Option 2-1 allows the operator to output the leak rate signal to the recorder output.

Option 2-2 allows the operator to output the last reported ion gauge pressure measurement to the recorder output. This allows the operator to monitor long-term system pressure performance. Pressure range is from 760 Torr to 1 x 10^{-6} Torr. If the filament is off, then the pressure is measured from the system thermocouple; if the filament is on, then the pressure is measured from the ion source/gauge. Output approximately corresponds to 1V per decade starting at 1000 Torr. 0V = 1000 Torr; 9V = 1 x 10^{-6} Torr.

Option 2-3 allows the operator to monitor the test port pressure on the recorder output. Again, the output corresponds to 1V per decade from atmosphere to 1 x 10^{-3} Torr. 0V = 1000 Torr; 6V = 1 x 10^{-3} Torr.

Menu 14 - Serial Port Control

Option 1	Baud Rates		
	1	1200 Baud	
	2	2400 Baud	
	3	4800 Baud	D
	4	9600 Baud	

Menu 15 - Date and Time

Option 1	Set Date Mo/Day/Yr		(01/01/1988 to 12/31/2086)
Option 2	Set Time Hr:Mn:Sec		
Option 3	Date/Time Format		
	1	USA Format	D
	2	European Format	
Option 4	Time Format		
	1	12 Hour	D
	2	24 Hour	

Option 1 allows the operator to view and set the current month, day, and year. Two digits for the month, two digits for the date, and four digits for the year must be completely entered to be accepted by the leak detector. Proper setting of the date allows the software to display maintenance requirements if required.

Option 2 allows the operator to view and set the current time in hours, minutes, and seconds. Two digits each for hours, minutes, and seconds must be completely entered to be accepted by the leak detector. This allows the software to turn on the instrument at the required time, etc.

Option 3 allows the operator to select AM or PM if a 12-hour format is selected.

Option 4 allows the operator to select the 12-hour or the 24-hour timekeeping format.

Menu 16 - System Wake Up

Option 1	Wakeup Time (00:00 to 23:59)		
Option 2	Monday		
	1	Disable	D
	2	Enable	
Option 3	Tuesday		
	1	Disable	D
	2	Enable	
Option 4	Wednesday		
	1	Disable	D
	2	Enable	
Option 5	Thursday		
	1	Disable	D
	2	Enable	
Option 6	Friday		
	1	Disable	D
	2	Enable	
Option 7	Saturday		
	1	Disable	D
	2	Enable	
Option 8	Sunday		
	1	Disable	D
	2	Enable	

Option 1 allows the operator to set the time at which the leak detector should be ready for use. The leak detector will then turn on one-half hour before the set time to ensure stability at the time required for use.

Option 2 allows the operator to select AM or PM for turn-on time. In a 24-hour format, this selection is not required.

Options 2 through 8 allow the operator to select the specific day(s) on which the leak detector will be turned on automatically. The leak detector will be at the System Ready level on each Enable-selected day.

Menu 17 - Sniffer Control

Option 1	Sniffer Enable	
	1 Disable	D
	2 Enable	
Option 2	Sniffer Zero Rate (10 sec to 99.9 seconds/decade)	

Menu 17 is very useful where excessive use of helium causes large ambient helium background shifts. This option allows the operator to set the rate at which the leak rate display will be driven to zero. Any positive or negative trends are instantly transferred to the display with the response time chosen in Menu 2, Option 2-4. Once the value appears on the display, it is reduced to 0 at the rate chosen in this menu. If the leak detector is in the MANUAL mode, the zero will be adjusted to the decade selected. If the leak detector is in the AUTO mode, the zero will be in the most sensitive range possible.

Option 1 enables or disables the sniffer zero control.

Option 2 allows the rate at which the display is zeroed in seconds/decade.

Menu 18 - Pump Options

Option 1	Rough Pump Control	
	1 Disable	D
	2 Enable	
	3 Enable For Rough Only	
Option 2	Rough Pump Rate (factory-set, for user information only)	
	1 7 CFM	D
	2 11 CFM	
Option 3	External Pump Control	
	1 Enable	
	2 Enable For Rough Only	D
Option 4	Extemal Pump Rate (0.1 to 99.9)	

Menu 18 controls the large rough pump and the associated valving. The size of the pump and when it is connected to the foreline allows the degree of sensitivity or flow split.

Option 1-1 is used when only one pump is installed, regardless of its size.

Option 1-2, Enable, permits control of the large rough pump in the Test mode. When selected, valve V11 opens giving additional pumping capability to hold large chambers in the TEST mode The operator must then select Option 2 to enter the proper size fore pump installed in the leak detector. There will be a loss of sensitivity in this mode.

Option 1-3 Enable for Rough Only, closes valve V11 in the TEST mode and selects only the 1.2 CFM fore pump. This allows the maximum sensitivity.

Option 2 permits the operator to enter the size of rough pump that has been installed (7 or 11 CFM). This will produce a loss in sensitivity; however, electronic gain is automatically added based on the size of the pump selected.

Option 2-1 selects the 7 CFM pump size for the large rough pump. This will produce a loss in sensitivity of a factor of 5 (approximately); however, the leak detector automatically adds electronic gain.

Option 2-2 selects the 11 CFM pump instead of the 7 CFM pump as described in Option 2-1. The loss of sensitivity in this case is a factor of 7. Again, the leak detector automatically adds electronic gain.

Option 3 allows one additional large pump to be controlled as described in Option 1. This pump is not intended to substitute for the gross leak option. This user-supplied pump could be connected to the blanked-off port inside the right cover. An electronic valve should be placed between the port and the pump such that the valve can be controlled by a logic signal available at pins 11 and 12 of connector J13.

Option 3-1 applies a logic O signal at pins 11 and 12 of connector J13 such that the valve can remain open in the Fine Test ranges. This is an open collector output capable of sinking 5 mA through 4.7K (see schematics). When ENABLE is selected, the software gain is automatically applied to compensate for the decrease in signal (see Option 4 of this menu).

Option 3-2 applies a logic 1 at pins 11 and 12 of connector J13 to close the external valve in the Fine Test ranges. Selecting "ENABLE - Rough only" allows a large pumping capacity to rough out test chambers and, once in the Fine Test mode, the valve closes to maintain the sensitivity.

Option 4 allows the operator to enter the external rough pump size in the units chosen in Menu 10, Option 3. This allows the software to apply the appropriate software gain where required.

Menu 19 - Service Information

Option	1	Salesman's Name
	2	Salesman's Phone
	3	Service Phone

Option 1 allows entry of the salespersons name up to 18 characters long. To enter the name, press and hold the scroll keys (up or down arrow) until the appropriate letter appears on the display then press ENTER to accept the character and advance the cursor to the next

character. After entering the name, press and hold the scroll key until the (.) (decimal point) appears on the display. Press ENTER to terminate the entry field.

Option 2 allows entry of the salespersons telephone number. Press and hold the scroll key until the appropriate numbers appear in the display. Press ENTER to accept the number and advance the cursor to the next number. After entering the number, press and hold the scroll key until the (.) (decimal point) appears on the display. Press ENTER to terminate the entry field.

Option 3 allows entry of the Varian National Service Center telephone number (1-800-227-9722). The number can be entered as described in Option 2.

Menu 20 - Security Control

Option 1	Display Security Level	(0 to 6)
2	Level 1	(0000 to 9999)
3	Level 2	(0000 to 9999)
4	Level 3	(0000 to 9999)
5	Set Level 1 Password	(0000 to 9999)
6	Set Level 2 Password	(0000 to 9999)
7	Set Level 3 Password	(0000 to 9999)

Menu 20 is one of the most useful menus through which the degree of flexibility of the leak detector is controlled. Through this menu, unauthorized changing of critical system parameters can be prevented. This menu is divided into six levels of security; levels 1, 2, and 3 are intended for customer use, while levels 4, 5, and 6 are considered for Varian use only. Level 5 security is for factory setup while level 4 is for the Varian salesperson to enter service information into Menu 19. Levels 4, 5, and 6 will not be described any further.

When the leak detector is shipped, the password for Levels 1, 2, and 3 are set to 1000. After verification, the security passwords for Levels 2 and 3 should be changed to any two different, unique, four-digit numbers. A copy of these numbers should be kept in a safe place for later use, if required.

The following is a complete list of menus that can be changed under Levels 1, 2, 3, and 4.

Level 1

Menu 8, Option 2	Key Press Beep
Menu 11, Option 1	Sequenced Cycle

Level 2 - All of the following including those in Level 1

Menu 1	Zeroing (Complete)
Menu 2, Option 1-1	Disable Calibration Key
Menu 2, Option 1-2	Enable for Internal Leak
Menu 2, Option 1-3	Enable for External Leak
Menu 2, Option 2-1	Ion Voltage
Menu 2, Option 2-2	Emission Current

Menu 2, Option 2-3	Calibration Gain
Menu 2, Option 2-4	Response Time
Menu 4	Log/Linear Select
Menu 5	Audio Controls (Setpoints)
Menu 6	Transfer to Fine Test
Menu 7	Reject Set Point Controls
Menu 8, Option 1	Active Keys Control (Complete)
Menu 9	Display Controls (Complete)
Menu 10	Display Units (Complete)
Menu 11, Option 2	Rough Time
Menu 11, Option 3	Test Time
Menu 13, Option 1	Leak Rate Output Scale
Menu 13, Option 2	Recorder Output Scale
Menu 15, Option 1	Set Date Mo/Day/Yr
Menu 15, Option 2	Set Time Hr:Mn:Sec
Menu 15, Option 3	Date/Time Format
Menu 15, Option 4	Time Format
Menu 16	System Wakeup (Complete)
Menu 17, Option 1	Sniffer Enable
Menu 17, Option 2	Sniffer Zero Rate
Menu 20, Option 5	Set Level 1 Password
Menu 20, Option 6	Set Level 2 Password
Menu 20, Option 7	Set Level 3 Password
Menu 22, Option 1-1	Ion Voltage
Menu 22, Option 1-2	Repeller Voltage
Menu 22, Option 1-3	Variable Focus
Menu 22, Option 1-4	Emission Current
Menu 22, Option 1-5	Calibration Gain
Menu 22, Option 1-6	System TC Gain
Menu 22, Option 1-7	Test Port TC Gain
Menu 22, Option 1-8	Ion Gauge Gain
Menu 22, Option 1-9	Temperature Sensor Gain
Menu 22, Option 1-11	Gross Leak Transfer Set Point
Menu 22, Option 1-12	Fine Leak Transfer Set Point
Menu 22, Option 4-1	Filament Select

Level 3 - All of the following including those in Levels 1 and 2

Menu 3, Option 1	Internal Standard Leak Value
Menu 3, Option 2	External Standard Leak Value
Menu 14, Option 1	Baud Rates
Menu 18	Pump Options
Menu 20, Option 7	Set Level 3 Password
Menu 21	Service Statistics
Menu 22, Option 1-10	Ejector Stage Gain
Menu 22, Option 1-13	Diffusion Pump Voltage
Menu 22, Option 1-14	Zero Offset
Menu 22, Option 2	Pump Controls
Menu 22, Option 3	Valve Controls

Menu 22, Option 4-2	Emission Level
Menu 22, Option 4-3	Ion Gauge Relay
Menu 22, Option 4-4	D.P. High Power
Menu 23, Option 1-1	Reset Options
Menu 23, Option 1-3	System Restart

Level 4 - All of the following including those in Levels 1, 2, and 3

Menu 19	Service Information
Menu 23, Option 1-2	Warmup Abort
Menu 23, Option 1-4	Memory Fill Value

Menu 20, Option 1 displays the current security level in which the leak detector is operating. This is only a displayable number 1 through 6.

Option 2 sets the leak detector into the most limited access form (Level 1). The password for this level should be left at 1000.

Option 3 sets the leak detector to Level 2 access mode. The system parameters listed in the previous table can be changed under Level 2 security.

Level 2 is intended for the supervisor who may want to set the machine to a unique set of system parameters. Initially, the password for this level is 1000, but should be changed to a different, unique, four-digit number such as the last four digits of the supervisor's Social Security number, for example.

Menu 20, Option 4 sets the leak detector to Level 3 security. This level is intended for in-house service personnel. The system parameters listed in the previous table can be changed under Level 3 security. Again, The as-shipped password is set to 1000; the number should be changed to a different, unique four-digit number.

Option 5 displays and/or sets the Level 1 security password. Level 2 or higher security access is required to see or change it.

Option 6 displays and/or sets the Level 2 security password. Level 2 or higher security access is required to see or change it.

Option 7 displays and/or sets the Level 3 security password. Level 3 or higher security access is required to see or change it.

Menu 21- Service Statistics

Option 1	Total Run Times		
	1	Diffusion/Turbo Pump	(0 to 10,000 hours)

On the 956 leak detector fitted with a diffusion pump, the clock is factory-set at 1500 hours (although not operating) and requires Level 3 security to change it.

Menu 22- Manual Controls

Option 1 System Calib. Controls

1	Ion Voltage	(210V to 320V)
2	Repeller Voltage	(Ion Voltage to Ion Voltage + 150)
3	Variable Focus	(Filament Bias to Fil. Bias + 150V)
4	Emission Current	(0.2 mA to 2 mA)
5	Calibration Gain	(0.8 to 7)
6	System TC Gain	(1.00 to 2.00)
7	Test Port TC Gain	(1.00 to 2.00)
8	Ion Gauge Gain	(0.80 to 2.00)
9	Temp. Sensor Gain	(0.80 to 2.00)
10	Ejector Stage Gain	(0.80 to 2.00)
11	Gross Leak Transfer Set Point	(0.1 Torr to 500 Torr)
12	Fine Leak Transfer Set Point	(20 mTorr to 200 mTorr)
13	Diff. Pump Voltage	(40.00 V to 68.00 V)
14	Zero Offset	(0 mV to 255 mV)
15	Temperature Offset	(Degrees C)

Option 2 Pumps Control

- 1 High Voltage
  - 1 Off
  - 2 On
- 2 Fore Pump
  - 1 Off
  - 2 On
- 3 Rough Pump
  - 1 Off
  - 2 On
- 4 External Pump
  - 1 Off
  - 2 On
- 5 Turbo Pump
  - 1 Off
  - 2 Low Speed
  - 3 High Speed

Option 3 Valves Control

- 1 Set Valves States
  - 1 All Valves Closed
  - 2 Vent State
  - 3 Roughdown State
  - 4 Gross Leak State
  - 5 Fine Leak State
  - 6 Hold State
- 2 Set Individual Valves
  - 1 Roughing Valve V1
    - 1 Close Valve
    - 2 Open Valve
  - 2 Test Valve V2
    - 1 Close Valve
    - 2 Open Valve

3 Vent Valve V3
1 Close Valve
2 Open Valve
4 Ejector Bypass Valve V4
1 Close Valve
2 Open Valve
5 Std. Lk. Valve V5
1 Close Valve
2 Open Valve
6 Isolation Valve V6
1 Close Valve
2 Open Valve
7 Gross Lk. Valve V7
1 Close Valve
2 Open Valve
8 Ext. Rough Valve V11
1 Close Valve
2 Open Valve

Option 4 Other Controls
1 Filament Select
1 Filament #1
2 Filament #2
2 Emission Level
1 Off
2 Low
3 High
3 Ion Gauge
1 Disable
2 Enable
4 D.P. High Power
1 Disable
2 Enable

Menu 23 - Service Initialization

Option 1 System Initialization
1 Reset Options
2 Warmup Abort
1 Continue Warmup
2 Abort Warmup
3 System Restart
1 Do Not Restart
2 Restart System
4 Watchdog Enable
1 Disable
2 Enable
5 Reset Option Checksum
1 Do Not Reset D
2 Reset Checksum

6	Option	Checksum
	1	Option Checksum
	2	Option Checksum (temporary, for service only)

Menu 24 - Software Control

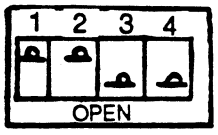
For factory use only, not available to user.

4-7 DIP SWITCH

As shown in Figure 4-10, a four-position DIP switch has been added to a small PC board on the CPU board. The switches are set at the factory when the leak detector is configured for specific customer requirements.

Switch	When Open	When Closed
1	11 CFM Pump Installed	7 CFM Pump Installed
2	Std Leak Installed	No Leak Installed
3	Gross Leak Installed	No Gross Leak Installed
4	Turbo Installed	Diffusion Pump Installed

Printed circuit boards provided with earlier software cannot be used with Revision 119 software; a reworked board is necessary.



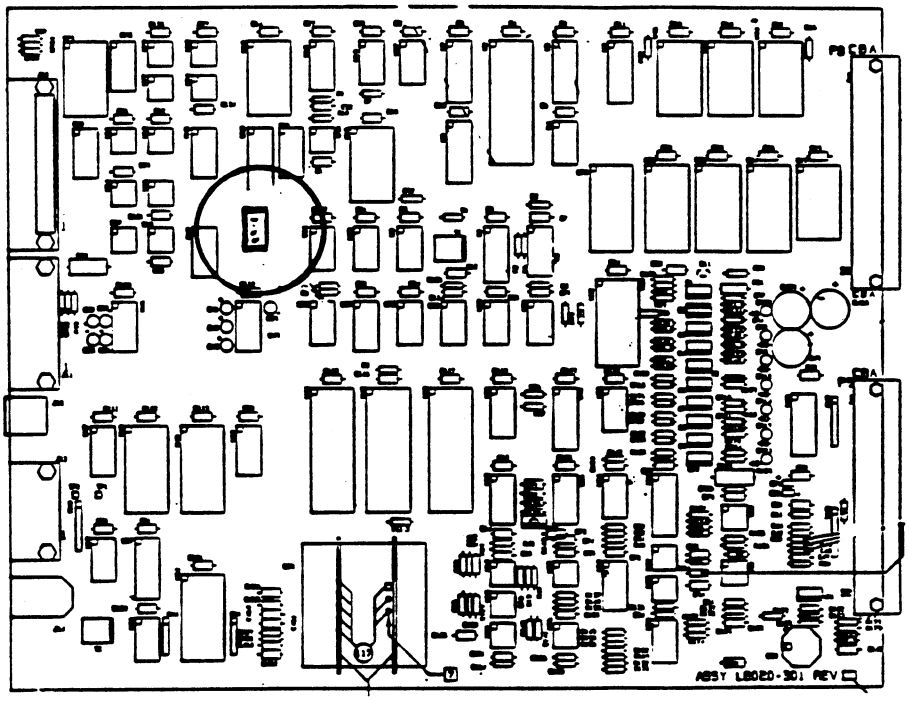
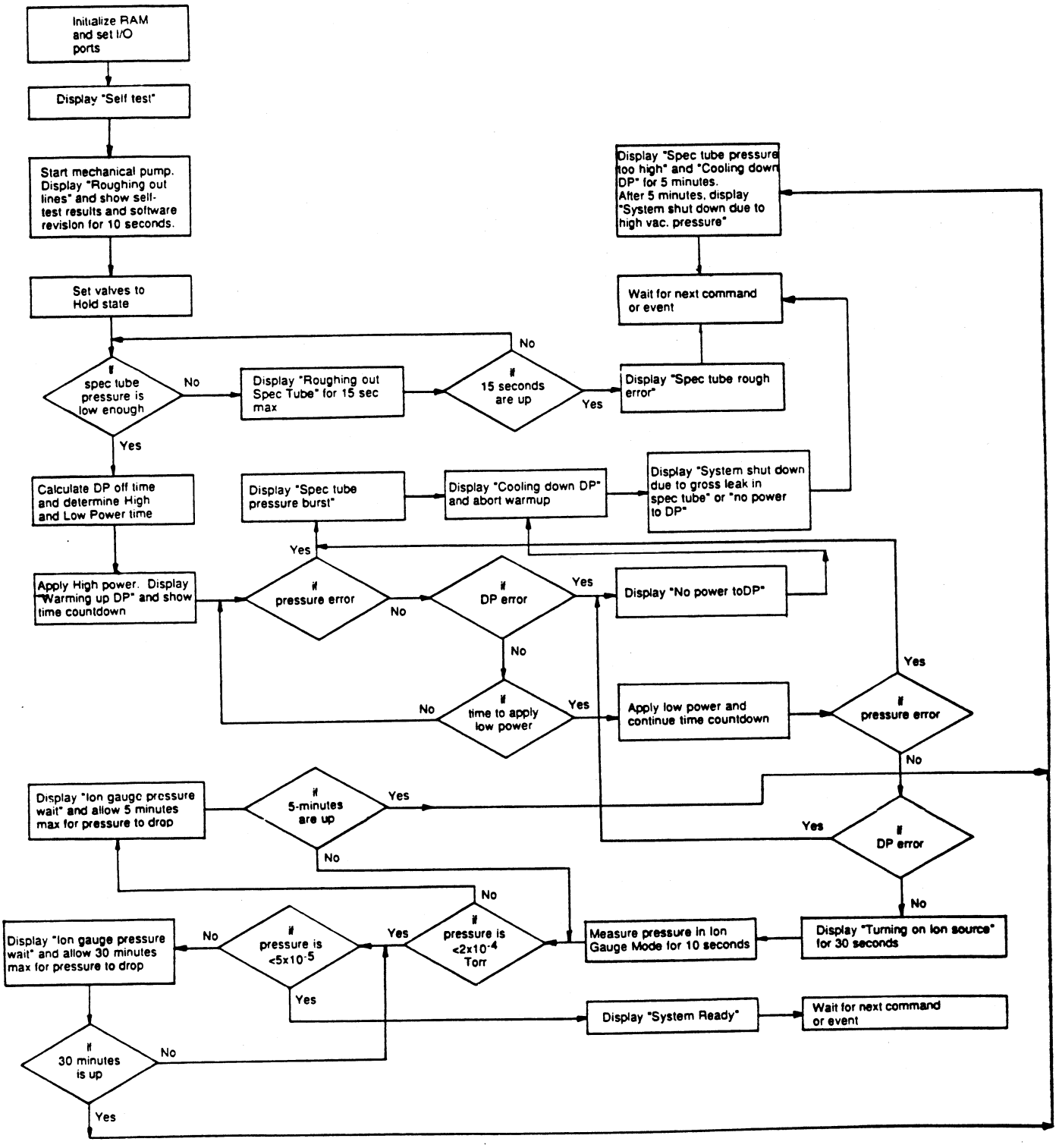
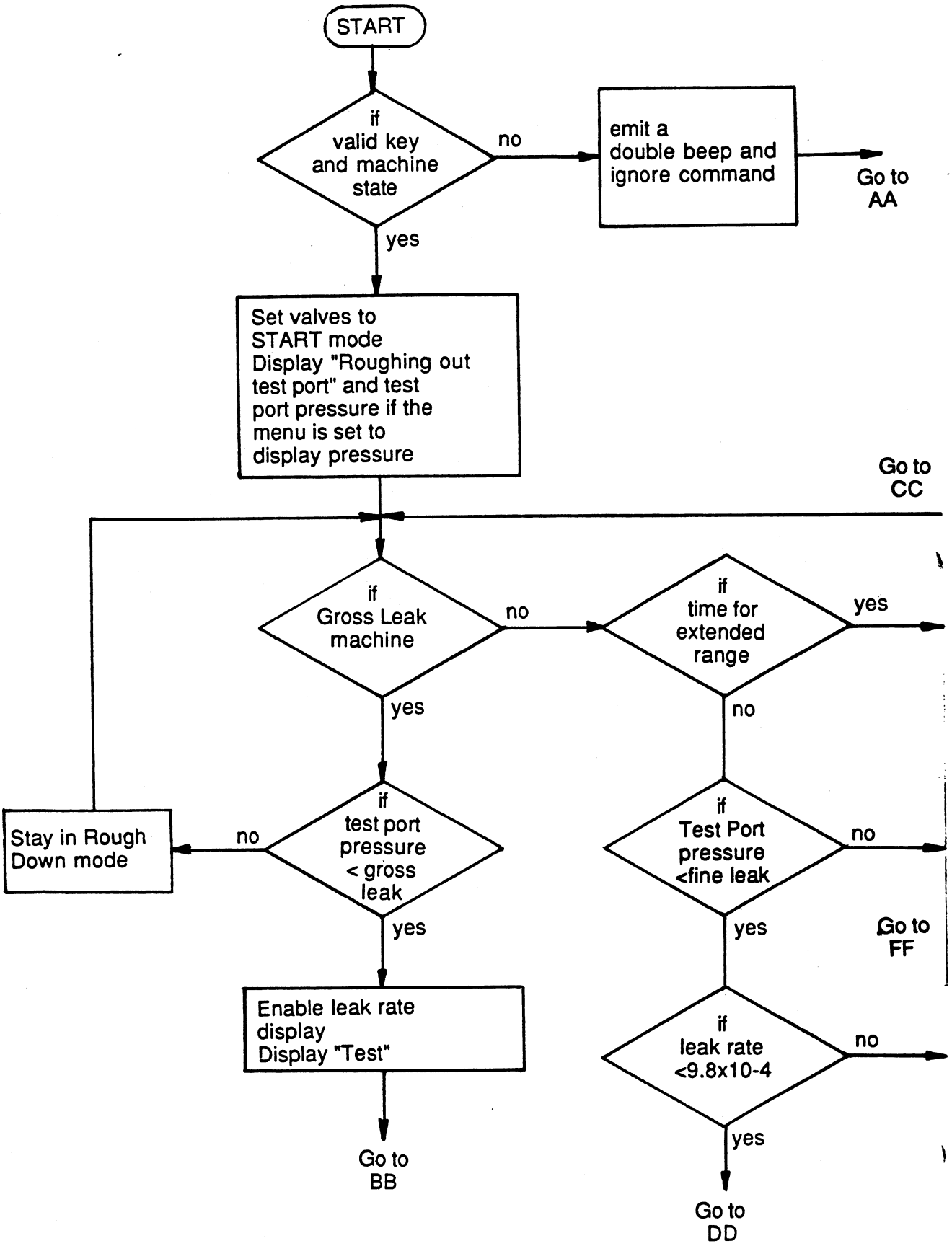


Figure 4-10. DIP switch positions and location on CPU board.

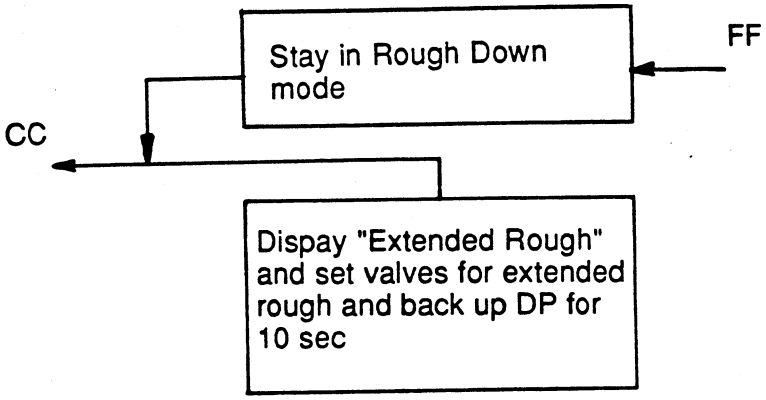
When in the POWER-UP mode, the leak detector will:

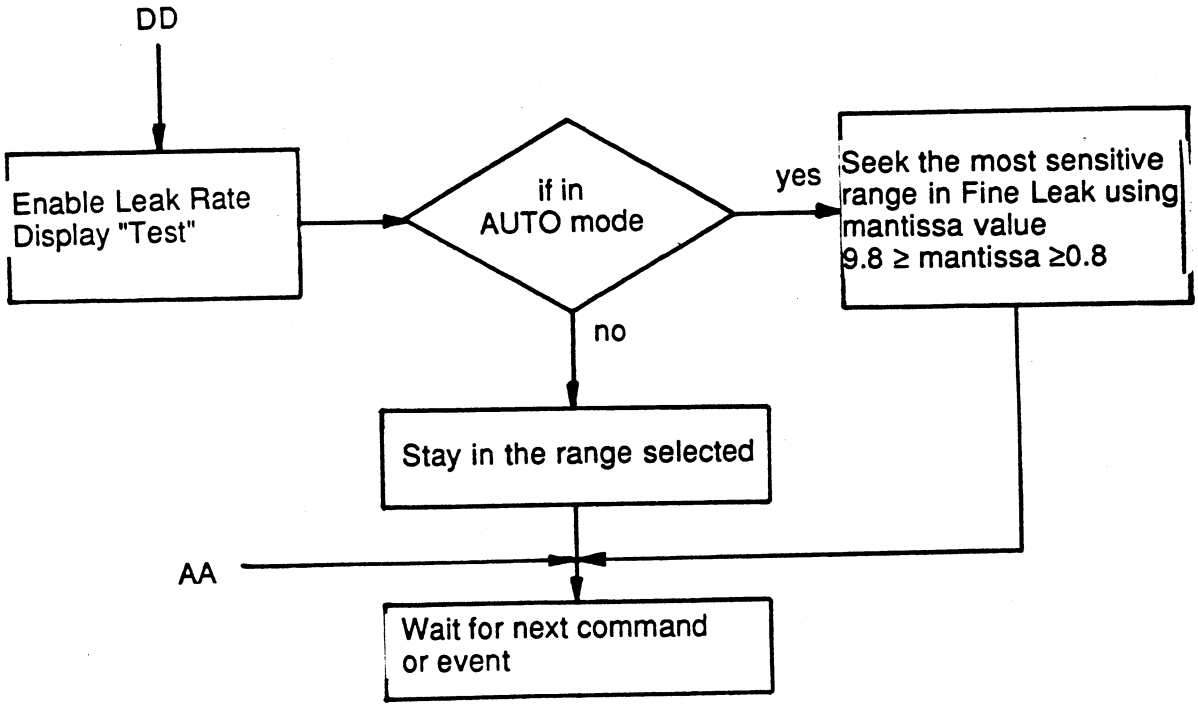


When the START key is pressed, the leak detector will:

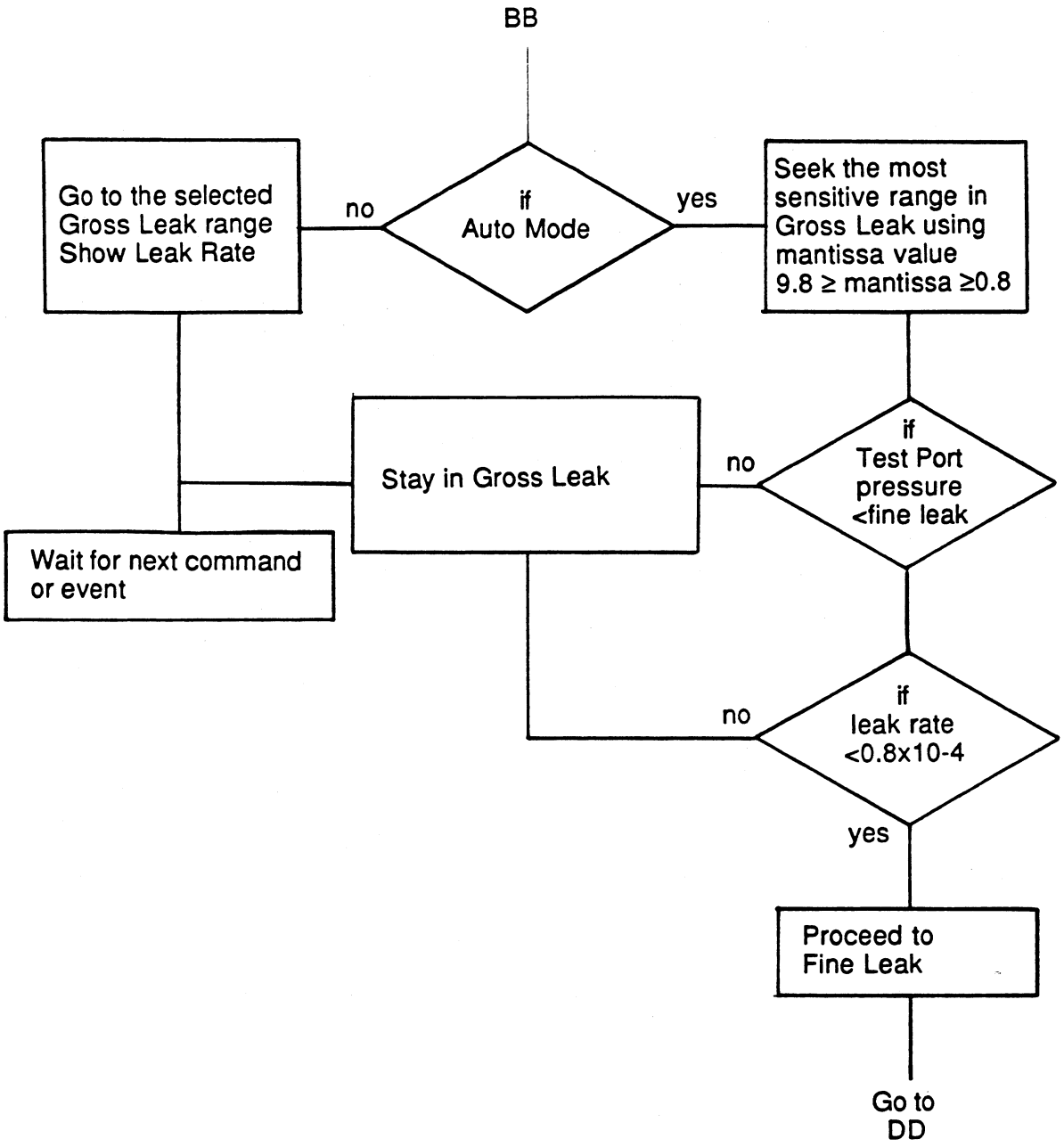


START (Cont.)

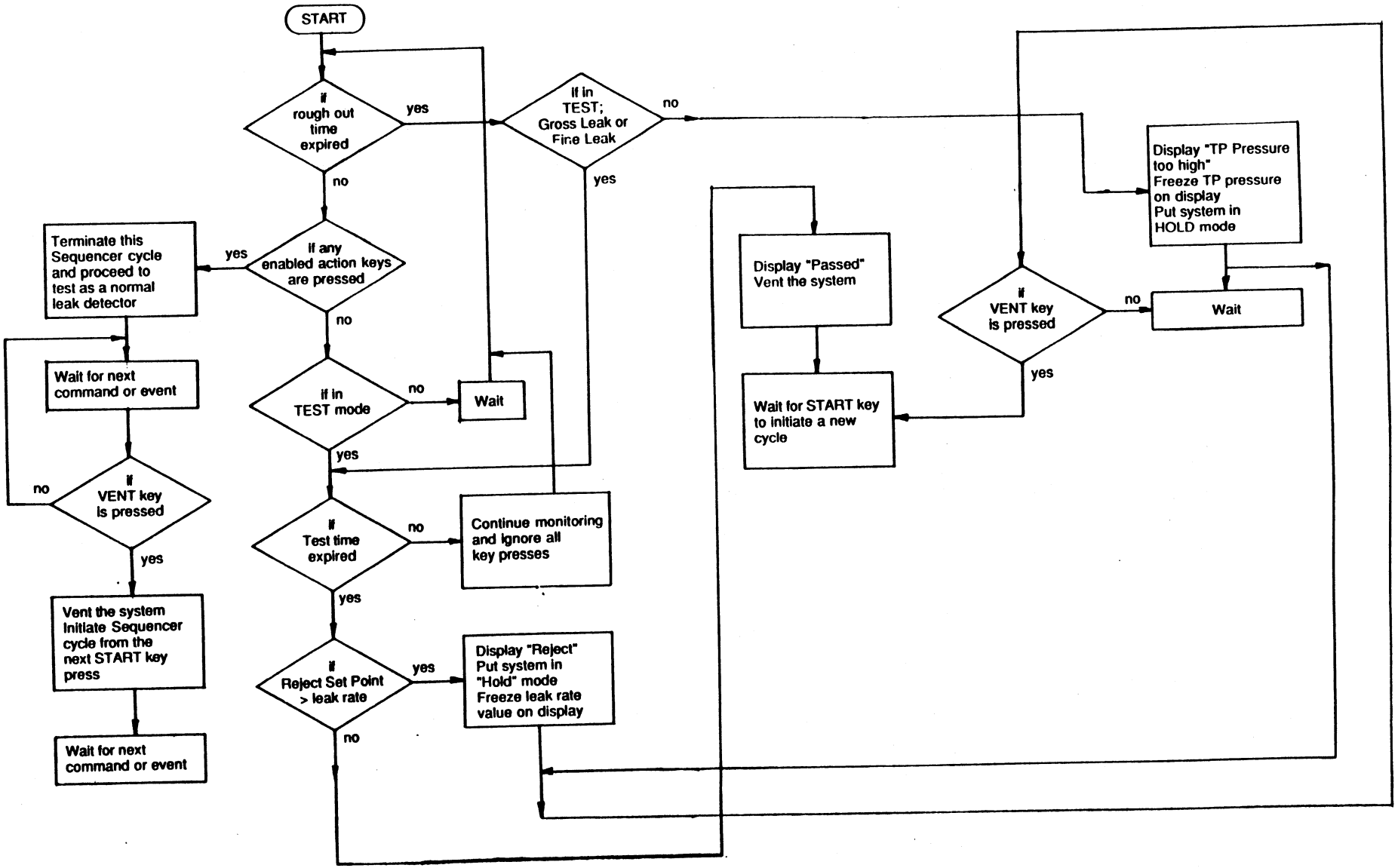

Stay in Rough Down mode
FF
CC
Dispay "Extended Rough" and set valves for extended rough and back up DP for 10 sec


DD
Enable Leak Rate Display "Test"
if in AUTO mode
yes
Seek the most sensitive range in Fine Leak using mantissa value
9.8 ≥ mantissa ≥0.8
no
Stay in the range selected
AA
Wait for next command or event

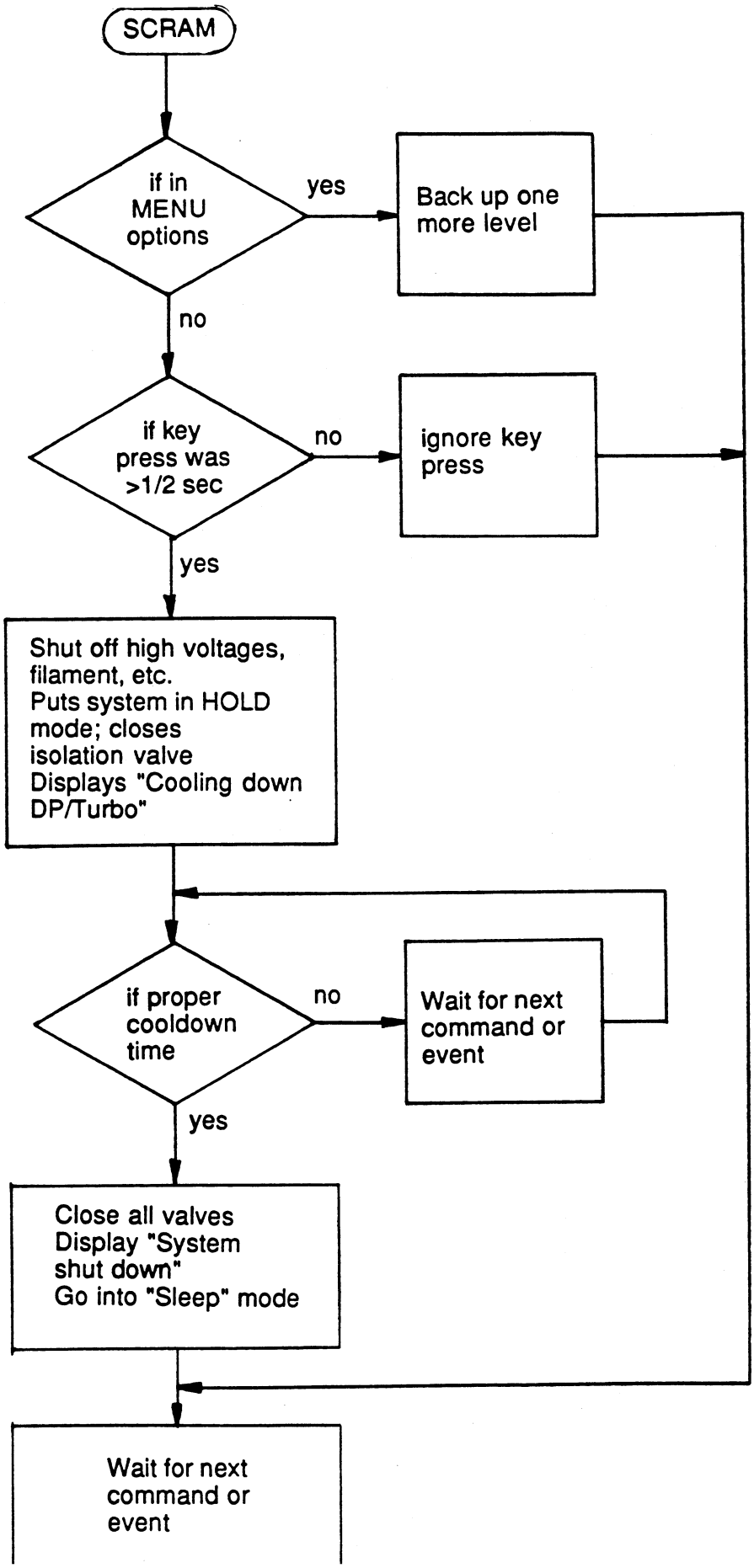
START (Cont.)


BB
Go to the selected Gross Leak range Show Leak Rate
no
if Auto Mode
yes
Seek the most sensitive range in Gross Leak using mantissa value 9.8 ≥ mantissa ≥0.8
Stay in Gross Leak
no
if Test Port pressure <fine leak
Wait for next command or event
no
if leak rate <0.8x10-4
yes
Proceed to Fine Leak
Go to DD

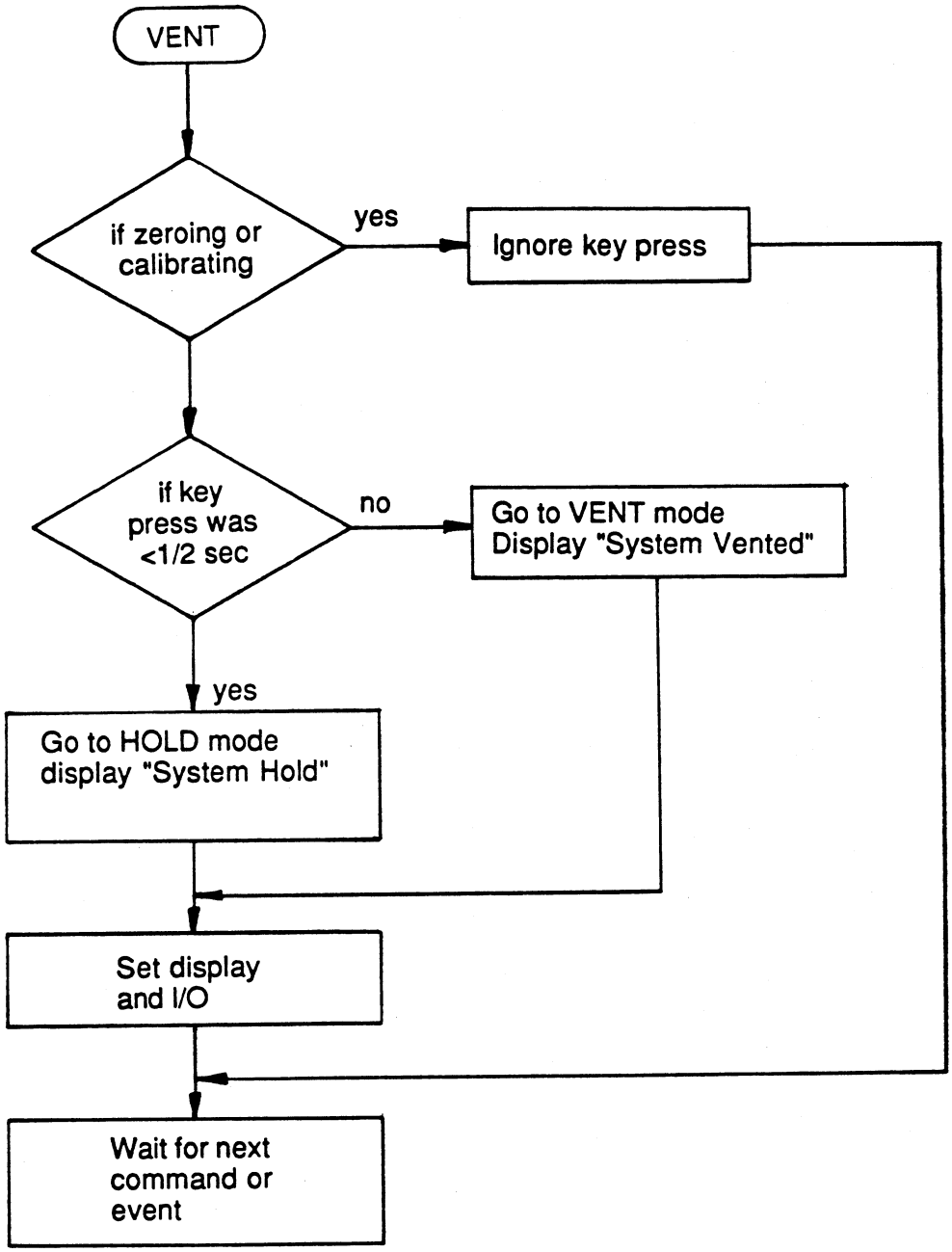
When the SEQUENCER key is pressed, the leak detector will:



When the SCRAM key is pressed, the leak detector will:



When the VENT key is pressed, the leak detector will:



SECTION V

MAINTENANCE, REPAIR, AND CALIBRATION

5-1 SCOPE

Quality test equipment, such as the Varian 956 Portable Mass Spectrometer Leak Detector, requires periodic maintenance, calibration, and checks to insure reliable operation. This section describes these procedures and the corrective steps to be taken should the proper findings be unobtainable through minor adjustments. Table 5-1 lists the area of maintenance, action to perform, frequency of action, the reference paragraph for step-by-step instructions, and the page number on which it is found.

Table 5-1. Maintenance actions to perform

AREA OF MAINTENANCE	ACTION TO PERFORM	FREQUENCY OF ACTION	PARA. REF.	PAGE
Calibration	Sensitivity check	Daily	5-2-1	5-2
Forepump and Roughpump oil level	Check for proper level and condition	Weekly	5-2-3	5-3
Forepump	Flush and oil change	Semi-Annually *	5-2-4 a)	5-4
Roughpump	Flush and oil change	Semi-Annually *	5-2-4 b)	5-7
Diffusion pump	Disassembly, cleaning	Annually	5-3-16	5-26
Spectrometer tube	Removal, disassembly, cleaning, reassembly, installation	Annually	5-3-5	5-11
Mechanical pumps	Purging	As required	5-3-2	5-9
Thermocouple gauges	Cleaning/replacement	As required	5-3-3 5-3-4	5-10 5-11
System vacuum manifold	Replacement	As required	5-3-11	5-20
Ion Source	Replacement	As required	5-3-4	5-11

* or as required

5-2 SCHEDULED MAINTENANCE

Scheduled maintenance is maintenance performed on a regular basis and is usually considered preventive in nature. The leak detector will operate at its peak when these maintenance (preventive) procedures are performed at their scheduled intervals.

5-2-1 Daily

The calibration and sensitivity check should be performed at the beginning of each workday, shift, or as local conditions dictate. Successful completion of the following Calibration and Sensitivity Check assures the operator of the leak detector's integrity.

Note
During the first hour of warmup, system parameters such as pressure and temperature may not be fully stable under some conditions. Therefore, Varian recommends that the leak detector be calibrated after the system has stabilized even though the system is sensitive to helium and can be used for leak-checking immediately after warmup.

1 Turn on the leak detector.

2 With the test port plugged, press the START button and allow the leak detector to reach the TEST mode.

3 Turn on the calibrated leak by pressing the LEAK button. Check that the leak detector is sensitive to helium; if not, refer to Troubleshooting, Not Sensitive to Helium.

4 Press the CAL button; if the calibration gain (Menu 22, Option 1-5) is greater than 3 after calibration, sensitivity may be improved by using the following manual tuning procedure.

5-2-2 Manual Tuning

The manual tuning procedure is a method of increasing spectrometer tube sensitivity to helium. Over time, spectrometer tube parameters may change slightly; adjustment may provide a way to improve performance.

1 Allow the leak detector to warm up for at least one hour.

2 Place the leak detector in the TEST mode with the calibrated leak on.

3 In Menu 22, Calibration, adjust the ion voltage (filament bias, Option 1-1), focus (Menu 22, Option 1-3), and the repeller (Menu 22, Option 1-2) to maximize the display.

4 Press the CAL button. Check if the calibration gain decreases (Menu 22, Option 1-5).

CALIBRATION AND SENSITIVITY CHECKS AND MANUAL TUNING COMPLETE

5-2-3 Weekly

a) Forepump and roughpump oil level check

Both the forepump and the roughpump are equipped with a sight glass through which the oil level can be checked. The forepump oil level sight glass is accessible through the rear of the pump enclosure; the roughpump sight glass is accessible through the side of the pump enclosure. With the pump motors running, the proper oil level is indicated when the oil covers the lower half of the sight glass. If it is low, fill it to the proper level with mechanical pump oil, Varian part no. 0491-K7516-302.

b) Condition of oil

If the oil has a milky or frothy appearance in either the forepump or the roughpump, it is an indication of excess water in the oil. An oil change is therefore in order; proceed as discussed in the following paragraphs.

c) Forepump Oil Change

Varian recommends that the forepump flush and oil change be performed semi-annually or whenever the vacuum system must be cleaned and accessibility to the Forepump is easiest. The following steps describe the proper method of changing the oil in the Forepump.

Tools and supplies required:

Standard screwdriver
Adjustable wrench
Drain pan
Wiping rag
Varian Pump Oil, part no. 0491-K7516-302, 1 liter

1 Press the SCRAM button and allow the leak detector to cool for 20 minutes.

2 Remove the three screws holding the rear panel on the Forepump enclosure.

WARNING
Hot oil will burn the skin. Service in this area must be performed by authorized personnel only.

3 Remove the fill plug.

4 Use the forepump drain guide (provided near the forepump) to guide the oil away from the leak detector and into the drain pan (see Figure 5-1).

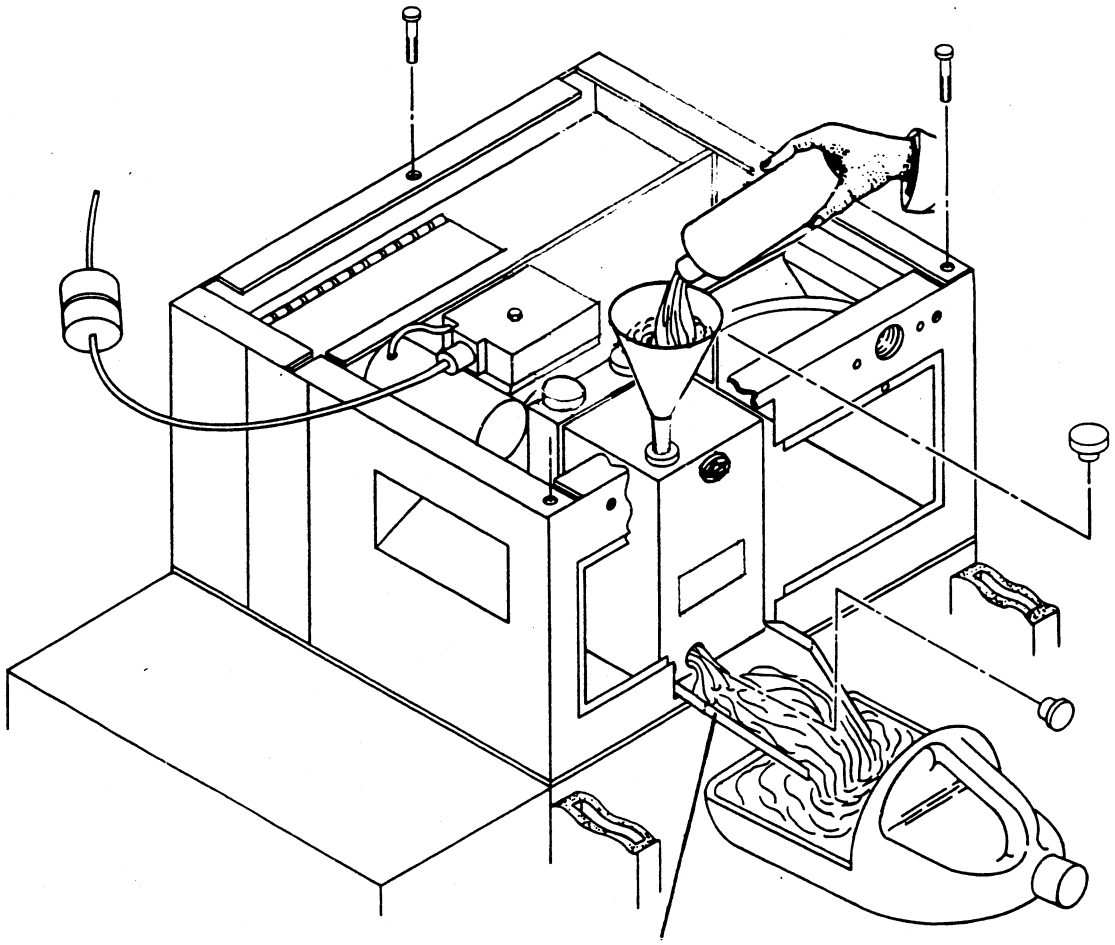


Figure 5-1. Fore Pump Flush and Oil Change

5 Place the drain pan under the drain guide then remove the drain plug. After the oil has stopped flowing, replace the drain plug.

6 Add fresh oil through the fill port. Check that the oil level is in the center of the sight glass.

7 Replace the fill plug and turn on the leak detector.

8 Check the oil level in the forepump sight glass; the oil must be visible in the middle of the glass when the pump is running.

5-2-4 Semi-Annually

a) Fore pump flush and oil change (See Figure 5-1)

Perform the fore pump flush and oil change in accordance with the following steps.

Tools and supplies required:

Standard screwdriver, 4" to 6"
Adjustable wrench
Funnel
Drain pan
Wiping rag
Varian Pump Oil, part no. 0491-K7516-302, 1 liter

1 Separate the fore pump module from the basic module as follows.

2 Remove the front and rear covers to expose the fore pump.

3 Remove the leak detector top cover and the side cover near the metal tubes connecting both pumps. F

4 Detach both metal tubes from the vacuum manifold.

5 Unplug the fore pump from inside the basic module.

6 Remove three screws to separate the basic module from the pump modules. See Figure 5-1.

7 Carefully separate the basic module from the fore pump module.

8 Remove the metal tube from the fore pump by removing the K-F clamp. F

WARNING
Hot oil will burn the skin. Service in this area must be performed by authorized personnel only. Stand back from fore pump before starting it.

CAUTION
Do not leave the fore pump on after the oil has stopped flowing. Damage to the fore pump can occur if it is allowed to operate with no oil.

9 Place a suitable drain pan under the fore pump drain guide and remove the drain plug. After the oil is drained, replace the drain plug.

10 With an offset funnel in place in the pump inlet (not in the front fill hole), plug the fore pump into a separate supply, turn it on, and SLOWLY pour in approximately 1 cup of Varian pump oil, part no. 0491-K7516-302.

11 Turn the fore pump off. With the drain pan in place, remove the drain plug and then turn the fore pump back on. Allow the pump to drain, then turn the fore pump off again.

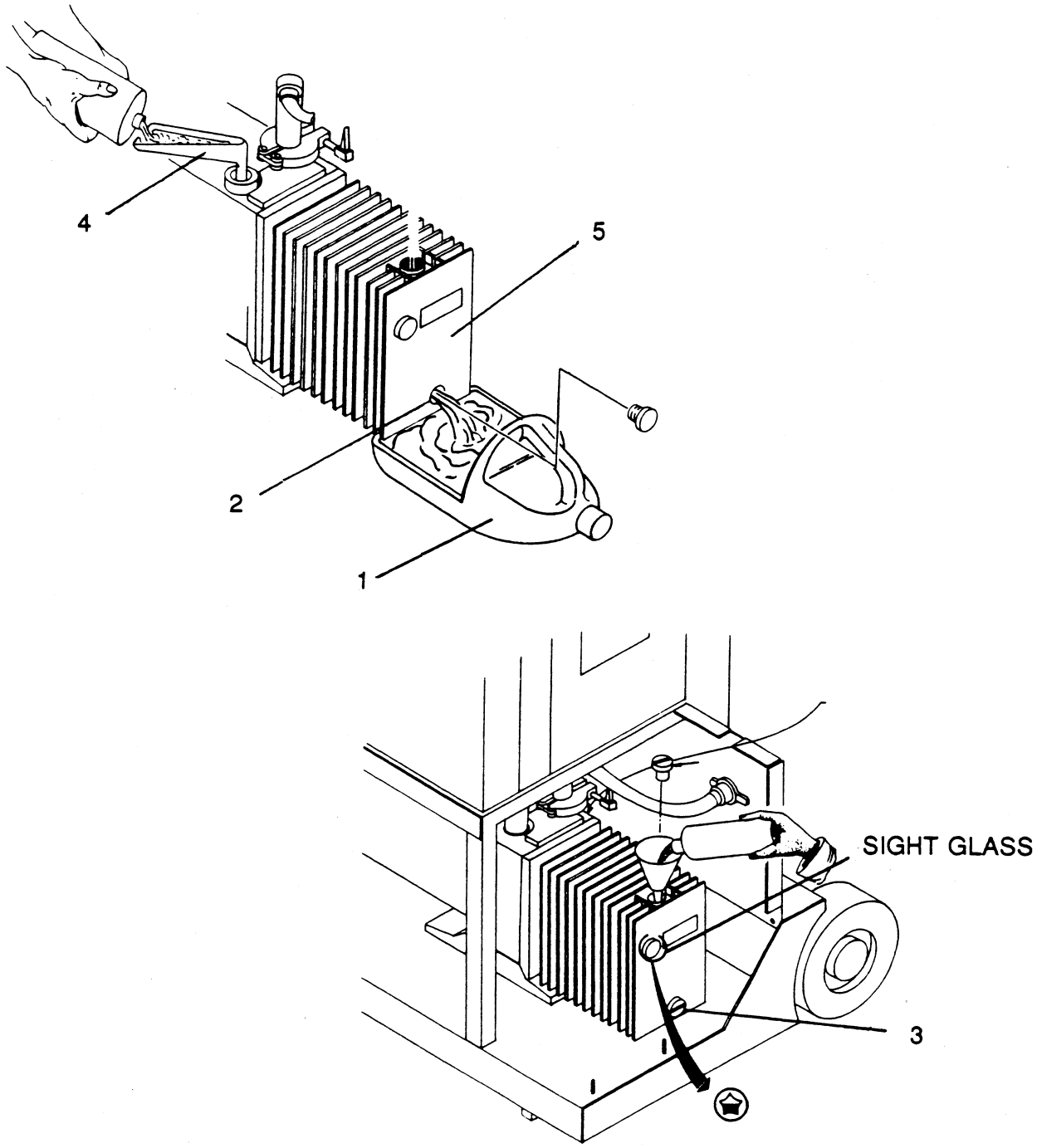


Figure 5-2. Rough Pump Flush and Oil Change.

12 Replace the drain plug then fill the pump through the fill hole on top of the pump.

13 Remove the fore pump power line from from the separate supply and plug it into the basic module. The leak detector remains off.

14 Replace the bellows and KF flange on the fore pump. Be sure there is a vacuum-tight connection.

15 Replace the basic module.

16 Start the leak detector and check the fore pump for proper oil level. The oil should be in the middle of the sight glass when the pump is running.

FOREPUMP FLUSH AND OIL CHANGE IS COMPLETE.

b) Rough pump flush and oil change (See Figure 5-2)

The rough pump oil should be changed semi-annually or when rough pump pressure of 50 milliTorr cannot be obtained. Flushing of the rough pump should precede adding new oil. When the weekly oil level check is performed, look for a milky color in the oil. This is an indication of dirty oil and that it should be changed. With the tools and supplies listed below, perform the rough pump flush and oil change in accordance with the steps indicated in para. 5-2.

Tools and supplies required:

Slotted screwdriver, 4" to 6"
Nut driver, Spintite, 5/16
Allen wrench, 6-mm
Funnel
Drain pan
Wiping rag
Varian pump oil, part no. 0491-K7516-302, 1 liter

1 Press SCRAM button and allow the leak detector to cool for 20 minutes.

2 Remove the lower front cover and the lower right cover.

3 Loosen and remove the valve from the rough pump inlet by loosening the screw with a 6-mm Allen wrench. Remove the KF clamp.

WARNING
Hot oil will burn the skin. Service in this area must be performed by authorized personnel only. Stand back from the rough pump prior to plugging it in.

CAUTION
Do not leave the rough pump on after the oil has stopped flowing. Damage to the rough pump can occur if allowed to operate with no oil.

4 Unplug the rough pump from the cart power enclosure and locate a separate electrical supply. DO NOT PLUG IN THE ROUGH PUMP AT THIS TIME.

5 Place a suitable drain pan (1, Figure 5-2) under the rough pump drain (2) and remove the drain plug (3). After the oil is drained, replace the plug.

6 With an offset funnel (4) in place in the pump inlet (not the front fill hole), plug in the rough pump (5) to turn it on and SLOWLY pour in approximately 1 cup of VARIAN pump oil, part no. 0491-K7516-302.

7 Unplug the rough pump to turn it off. With the drain pan (1) in place, remove the drain plug (3) and allow the pump to drain.

Reassembling and Filling the Rough pump.

8 Replace the drain plug (3) then fill the pump through the fill hole on top of the pump.

9 Install and tighten the valve to the pump inlet. Use a 6-mm Allen wrench to tighten the screw thus providing a vacuum-tight seal.

10 Check for:
- Proper level of oil in sight glass window (filled half way).
- Proper color of oil. Clean oil is light amber in color.
- Leaks at drain plug or anywhere on or about the rough pump.

THE ROUGH PUMP FLUSH AND OIL CHANGE IS COMPLETE.

5-3 UNSCHEDULED MAINTENANCE

Unscheduled maintenance is that maintenance to be accomplished on an as-required basis. The design characteristics of the Model 956 Leak Detector are such that unscheduled maintenance should be minimal. Strict adherence to scheduled (preventive) maintenance functions minimize unscheduled maintenance.

5-3-1 Purging (Gas Ballasting) the Fore Pump or Rough Pump

There may be occasions when, due to a high moisture content in the test pieces or the work environment, moisture may accumulate in the oil in either the fore pump or the rough pump or both. This moisture exhibits some very obvious symptoms. The first symptom is the failure of the leak detector to transfer into or to remain in the FINE TEST mode. Other symptoms are a reading of approximately 50 milliTorr on the Test Port Pressure gauge when the leak detector is in the FINE TEST mode, darkening of the pump oil, and/or froth (or foam) on top of the pump oil.

All these are indications of the need to purge the pump; refer to the following step-by-step procedures.

1 Remove the rear cover to expose the pump.

2 Open the gas ballast valve on the pump by turning it counter-clockwise. See Figures 5-1 and 5-2 for the location of the valves on the each pump.

3 Run the leak detector for 30 minutes then close the gas ballast valve (1). This procedure should evaporate most of the moisture which is mixed with the oil. (This may produce undesirable oil vapors in a closed room; exhaust these vapors outdoors if possible). If it does not evaporate the moisture, change the oil.

4 Check for the presence of froth or foam on top of the pump oil, as viewed in its sightglass.

5 Check also for proper coloration. The pump oil should be light amber in color as viewed in its sightglass. If it is not, change the oil.

6 Check that the test port pressure is below 20 milliTorr when the leak detector is in the TEST mode (Menu 13, Option 2-2).

7 If symptoms persist, a pump flush and oil change is required. Refer to para. 5-2-3 for proper procedure.

PURGING (GAS BALLASTING) OF THE FORE AND ROUGH PUMPS IS COMPLETE.

5-3-2 System Thermocouple Gauge (TC2) Cleaning/Replacement

Thermocouple gauge cleaning may be necessary if the gauge has been contaminated and/or it exhibits erratic pressure measurements due to outgassing. If the gauge continues its erratic behavior after cleaning, replace the gauge.

Tools and supplies required:

Wrench, open-end, 9/16 inch
Freon TF
Methanol
Sealant (Torr-Seal)

1 Press the SCRAM button and allow the leak detector to shut down then turn the leak detector off.

2 Remove the top cover of the leak detector to gain access to the diffusion pump.

3 Remove the connector from the system thermocouple gauge.

4 Remove the thermocouple gauge by unscrewing it from its elbow.

5 Flush the gauge with Freon, empty it, then repeat with methanol.

6 Air-dry the thermocouple gauge thoroughly before replacing it in the diffusion pump.

7 Lightly coat the threads of the thermocouple with Torr-Seal sealant then install the thermocouple gauge by screwing it into its elbow and tightening it firmly.

8 Install the connector on the thermocouple gauge.

9 Replace the top cover on the leak detector and turn it on. Wait ten minutes for it to warm up.

CLEANING/REPLACEMENT OF THE SYSTEM THERMOCOUPLE GAUGE IS COMPLETE.

5-3-3 Test Port Thermocouple Gauge (TC1 Cleaning/Replacement

Tools and supplies required:

Freon TF
Methanol
O-ring, Parker part no. 2-110

1 Put the leak detector in the VENT mode.

2 Remove the top cover and side panels of the leak detector to gain access to the bottom of the test port.

3 Remove the connector from the test port thermocouple gauge.

4 Remove the thermocouple gauge by gently twisting it out of the test port; check that the O-ring and its spacer are removed with the thermocouple.

5 Remove and discard the O-ring; retain the spacer.

5 Flush the gauge with Freon, empty it, then repeat with methanol.

6 Air-dry the thermocouple gauge thoroughly before replacing it in the test port.

7 Install the spacer and a new O-ring then install the thermocouple gauge by gently pushing it into the test port.

8 Install the connector on the thermocouple gauge.

9 Replace the side panels and the top cover on the leak detector.

CLEANING/REPLACEMENT OF THE TEST PORT THERMOCOUPLE GAUGE IS COMPLETE.

5-3-4 Ion Source Replacement

Tools and supplies required:

Phillips screwdriver
Allen wrench, 5/32-inch
Ion Source (Varian part no. 82850-302)
Clean, lint-free cloths

Replacement of the ion source should be accomplished when cleaning the spectrometer tube. Adjustment is required when replacement is complete.

1 Remove the ion source from the leak detector as described in steps 1 through 9, Disassembly of the Spectrometer Tube. The ion source can also be removed from the spectrometer tube while the tube is attached to the diffusion pump. The leak detector must cool for 20 minutes prior to venting.

2 Check the ground slit plate; if contaminated, Varian recommends that the spectrometer tube also be disassembled and cleaned.

3 Place the locating pin of the new ion source approximately in the center of the guide hole as shown in Figure 5-3.

4 Ensure that pins 1 and 8 are parallel to the sidewall of the spectrometer tube.

5 Secure the flange cap evenly and firmly by tightening the four Phillips head screws.

6 Re-attach the spectrometer tube.

7 Turn on the leak detector; wait 30 minutes then use the manual tuning procedure to maximize sensitivity (See para. 5-2-2). When the leak detector is tuned to helium, press CAL.

5-3-5 Disassembly of the Spectrometer Tube

Tools and supplies required:

Phillips screwdriver
Allen wrench, 5/32-inch

To remove the spectrometer tube from the leak detector, proceed as follows.

1 Press the SCRAM button and let the leak detector cool down then turn the leak detector off.

2 Remove the top cover of the leak detector.

3 Remove the side cover of the leak detector on the spectrometer tube side.

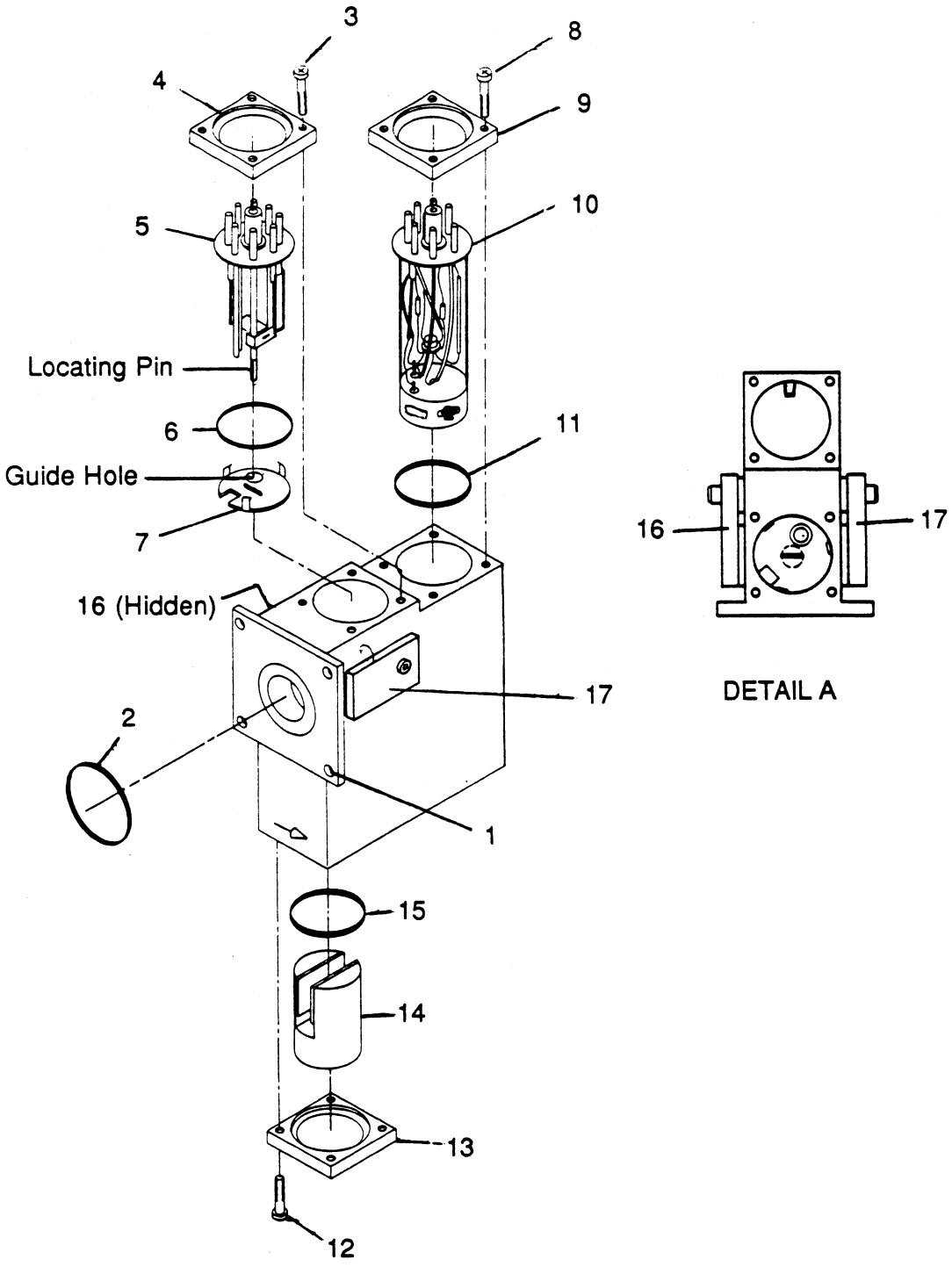


Figure 5-3. Spectrometer Tube Exploded View.

4 Unplug the preamplifier and the ion source.

5 Remove the Allen screws (1, Figure 5-3) from the spectrometer tube flange.

6 Rock the spectrometer tube gently to break its vacuum. Look for and carefully remove the O-ring (2) under the flange. Note the position of the grounding strap.

7 Place the spectrometer tube and the O-ring on a clean cloth on a non-magnetic bench for further maintenance.

8 Remove the four Phillips head screws (3) that hold the flange cap (4) onto the ion source (5).

9 Firmly but gently separate the flange cap (4) from the ion source (5). Note the O-ring (6) on the ion source; remove and discard both the O-ring and the ion source (Varian part no. 82850-302).

Note
In the following step, carefully note the position of the ground slit plate inside the ion source cavity. It must be replaced in exactly the same relative position.

10 Carefully remove the ground slit plate (7) from the ion source cavity with a long screw-holding screwdriver. Varian recommends installing a new ground slit plate (see para. 5-3-6 for cleaning instructions if a new plate is not available).

11 Remove the four Phillips head screws (8) that hold the flange cap (9) onto the preamplifier (10).

12 Firmly but gently separate the flange cap (9) from the preamplifier (10). Note the O-ring (11); remove and replace it.

13 Place the preamplifier (10) on a clean, static-free paper napkin or cloth.

14 Remove four 9/64 Allen head cap screws (12) that hold the flange cap (13) onto the analyzing magnet assemblies (14). Remove and discard the O-ring (15). Be extremely careful with the magnets; do NOT drop them and do NOT place them on a magnetic surface; put them on a clean cloth to preserve their magnetic properties.

15 DO NOT remove the enhancement magnets (16 and 17) from the body of the spectrometer tube. If the enhancement magnets become chipped or broken during handling, refer to para 5-3-8 for replacement/adjustment instructions.

DISASSEMBLY OF THE SPECTROMETER TUBE IS COMPLETE

5-3-6 Cleaning the Spectrometer Tube

Tools and supplies required:

Stiff-bristled brush
Freon TF
Methanol
Beartex or Scotch-Brite pads
Clean, lint-free cloths

CAUTION
Do not use Freon TF or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum. Do not clean any aluminum parts with Alconox. Alconox is not compatible with aluminum and will cause damage. Use new O-rings wiped with a clean, lint-free cloth.

1 Use Beartex or Scotch-brite flexible abrasive pads to remove heavy deposits from the spectrometer tube body and especially from the ground slit plate if it is not to be replaced. Varian recommends installing a new ground slit plate, however, for maximum reliability in the operation of the leak detector.

2 Wipe the internal surfaces of the spectrometer tube body with a cloth dampened with Freon TF. Repeat with methanol.

3 Inspect the preamplifier. Wipe oily surfaces with a clean lint-free cloth dampened with Freon TF. Repeat with methanol.

4 Carefully clean the analyzing magnet assembly. Use a small, stiff-bristled brush to clean deposits off the yoke and a soft, lint-free cloth dampened in Freon TF to clean the magnets. Repeat with methanol. Be careful not to damage the magnets, they are brittle and chip easily.

5 Allow all parts to air-dry thoroughly.

CLEANING OF THE SPECTROMETER TUBE IS COMPLETE

5-3-7 Assembly of the Spectrometer Tube (Refer to Figure 5-3)

Tools and supplies required:

Allen wrench, 5/32-inch
Phillips head screwdriver
Screw-holding screwdriver
Clean, lint-free cloth
Spare parts kit L8395-301

1 Install a new ground slit plate (7) carefully. Be sure that the snap prongs fit snugly and are facing up. Using a long, thin screwdriver, align the slit at 90° with the side wall of the spectrometer tube. Concentrically align the circular hole in the plate with the smaller guide hole in the bottom of the ion source cavity (see Detail A, Figure 5-3).

2 Wipe a new O-ring (6) and the mating surfaces with a clean, lint-free cloth and place the new ion source (5) in its cavity by:

a placing the locating pin approximately in the center of the guide hole (Detail A),

b ensuring that pins 1 and 8 are parallel to the side wall of the spectrometer tube, and

c tightening the flange cap (4) evenly and firmly with the four Phillips head screws (3).

3 Wipe a new O-ring (11) and mating surfaces. Place the preamplifier (10) in its cavity with the O-ring in place. Orient the preamplifier so it is properly keyed. Tighten the flange cap (9) evenly and firmly using the four 9/64 Allen head cap screws (8).

4 Carefully place the analyzing magnet assembly in its cavity with a new O-ring. **Be sure to place the magnets so that the arrow on the analyzing magnets is perpendicular to the side of the spectrometer tube body. Check that the arrow is in the same direction as the arrows on the spectrometer tube body and enhancement magnets (see Figure 5-3).** Again, wipe the O-ring and mating surfaces with a clean, lint-free cloth and tighten the flange cap (5) evenly and firmly.

5 Wipe a new mounting O-ring (2) and mating surfaces with a clean, lint-free cloth. Hold the spectrometer tube with one hand and install four Allen screws (1). Tighten the screws evenly to insure a proper metal-to-metal seal. Remember to attach the grounding wire.

6 Attach the plugs for the preamplifier and the ion source into their respective sockets. DO NOT INTERCHANGE THE PREAMPLIFIER AND ION SOURCE CONNECTORS.

7 Install the side cover of the leak detector.

8 Install the top cover of the leak detector.

9 Start the leak detector, wait 30 minutes. Use the manual tuning procedure to maximize sensitivity (para. 5-2-2) then calibrate the leak detector.

ASSEMBLY OF THE SPECTROMETER TUBE IS COMPLETE

5-3-8 Enhancement Magnet Replacement/Adjustment Procedure

The enhancement magnets should never need replacement or adjustment. However, should the magnets become chipped or broken during handling, proceed as follows.

1 While the spectrometer tube is disassembled from the pumping system frame, secure the rear magnet (closest to the pumping system frame). Check that the arrow on the magnet matches the direction of the arrow on the body of the spectrometer tube (see Figure 5-3).

2 Attach the front magnet in the center of its recess and secure it loosely with a 9/64-inch Allen wrench. Again, check that the arrow on the magnet matches the direction of the arrow on the body of the spectrometer tube.

3 Secure the spectrometer tube to the pumping system frame then connect all electrical connections to the spectrometer tube. DO NOT INTERCHANGE THE CONNECTORS TO THE PREAMPLIFIER AND THE ION SOURCE.

4 Turn on the leak detector and allow it to warm up for at least 30 minutes.

5 Press the START button to put the leak detector in the TEST mode.

6 Turn the calibrated leak on by pressing the LEAK button. While in the TEST mode, the leak detector must be sensitive to helium; if it is not, refer to Troubleshooting (Section 6), Leak Detector Not Sensitive To Helium.

7 Loosen the front magnet then adjust it by moving it very gradually. The leak rate will be very sensitive to magnet position. Maximize the signal then tighten the magnet carefully with a 9/64-inch Allen wrench without moving the magnet.

8 Record the filament bias (Ion Voltage, Menu 22, Option 1-1), the repeller voltage (Menu 22, Option 1-2), and the focus (Menu 22, Option 1-3). With the calibrated leak on, watch the leak rate meter and maximize the signal by adjusting these parameters. This step may be unnecessary if the magnet was replaced without removing the spectrometer tube or any of its parts.

9 Press the CAL button.

5-3-9 Vacuum System Removal

Tools and supplies required:

Screwdriver, Phillips head
Wrench, Open-end, 9/16-inch

1 Remove top cover and both side covers of the basic module.

2 Push down on the two locking clips at the rear of the control panel to unlock it then rotate the panel forward and lift it carefully to expose two connectors.

3 Carefully unplug the ribbon connector on the leak detector side.

4 Carefully unplug the connector at the control panel then remove the front panel.

5 Remove the KF clamps attaching the foreline plumbing assembly to the fore pump and to the roughing pump.

6 Remove the front cover by pulling it up then out.

7 Disconnect the connector to the electronics located near the front of the leak detector.

8 Disconnect the connector to the fans.

9 Unplug the diffusion pump.

10 Disconnect the calibrated leak vent line.

11 Remove the control panel support by removing four screws.

12 Remove the front bracket.

13 Lift the vacuum system/circuit card assembly straight out.

14 Unplug all connectors from the vacuum system to the backplane.

15 Separate the vacuum system frame from the circuit card chassis by removing five screws. See Figure 5-4.

16 Carefully separate the vacuum system and circuit card assembly from main unit. Place on clean workbench for further disassembly.

17 Use at least one C-clamp to secure the vacuum system frame vertically to the end of the bench for easy maintenance and disassembly.

18 Varian recommends that the fore pump be flushed and charged with new oil at this time due to its easy access. See para. 5-2.

VACUUM SYSTEM REMOVAL IS COMPLETE

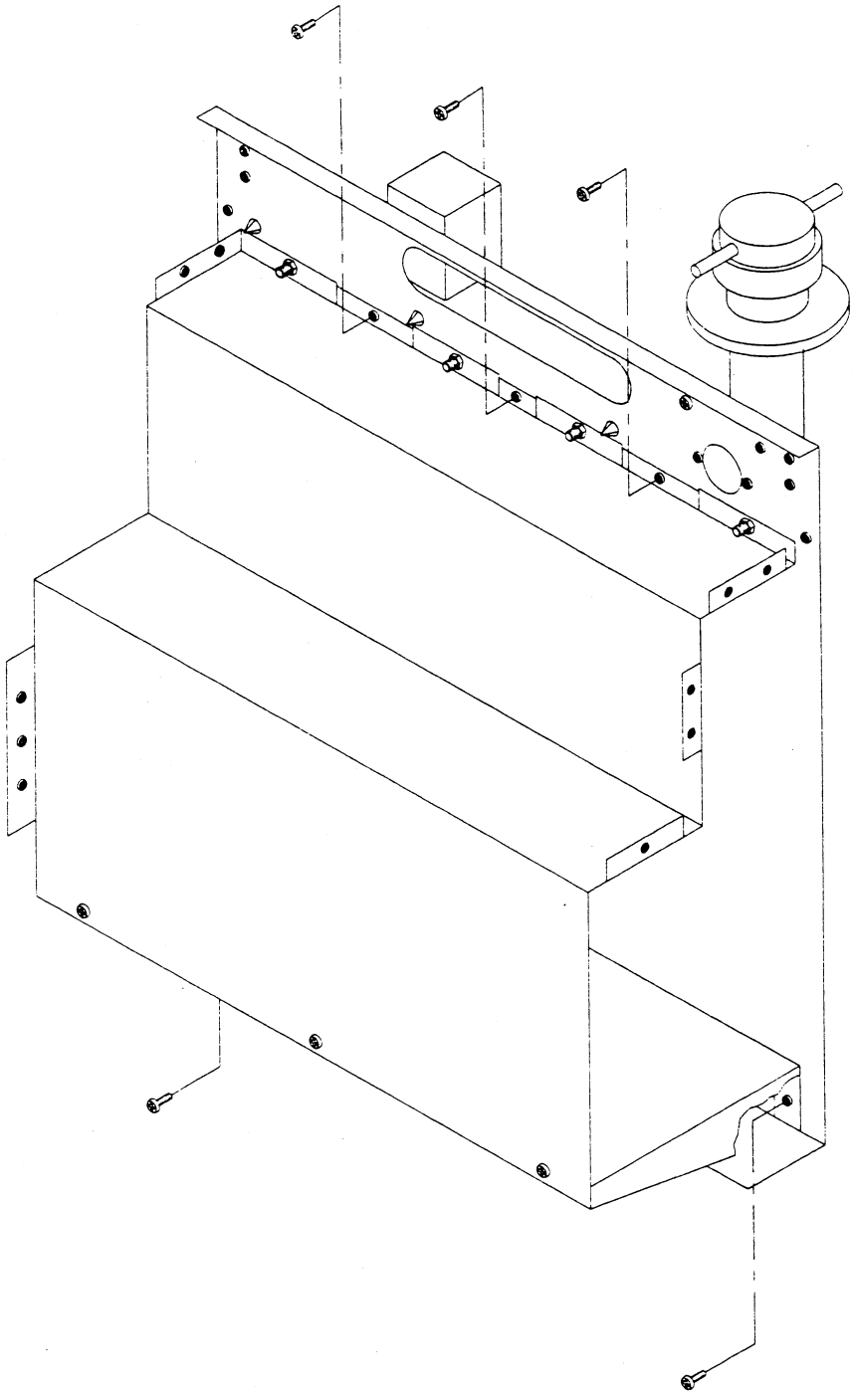


Figure 5-4. Mounting Screws for Vacuum System.

5-3-10 Disassembly of Calibrated Leak (Refer to Figure 5-5)

Tools and supplies required:

Screwdriver
Adjustable wrench
Non-metallic O-ring lifter

1 Unplug the wires to the calibrated leak solenoid. Disconnect the helium line (1). Retain the rubber washer (2).

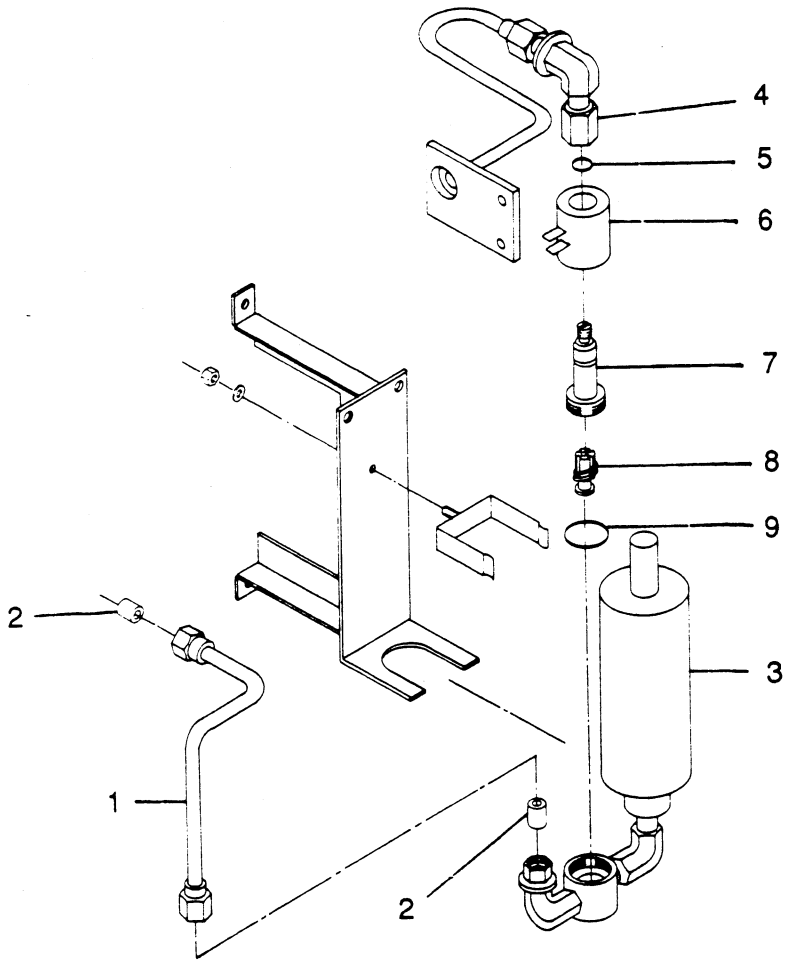


Figure 5-5. Calibrated Leak Exploded View.

2 Separate the calibrated leak (3) and the valve from the bracket.

3 Remove the fitting (4) from the top of the coil with an adjustable wrench.

4 Discard the small O-ring (5).

5 Lift out the coil (6).

6 Unscrew the valve actuator (7) using a screwdriver.

7 Remove the valve plunger and spring (8).

8 Lift out and discard the valve body O-ring (9). DO NOT SCRATCH THE SEALING SURFACE.

To clean the calibrated leak, refer to CLEANING THE VACUUM MANIFOLD.

DISASSEMBLY OF THE CALIBRATED LEAK IS COMPLETE

5-3-11 Disassembly of Vacuum Manifold (Refer to Figure 5-6)

Tools and supplies required:

Screwdriver
Adjustable wrench
Spanner, Commercial
Non-metallic O-ring lifter

1 Leave the foreline manifold assembly (1) mounted to sheet metal frame until all other parts are disassembled.

2 Remove coil holding nut (2) and washer (3) on the top of valve.

3 Remove coil (4).

CAUTION
In the following step, use the commercial spanner; DO NOT USE ANY OTHER TOOL. The valve stem can easily be bent or twisted rendering the valve inoperable and unrepairable.

4 Unscrew valve actuator (5) using commercial spanner.

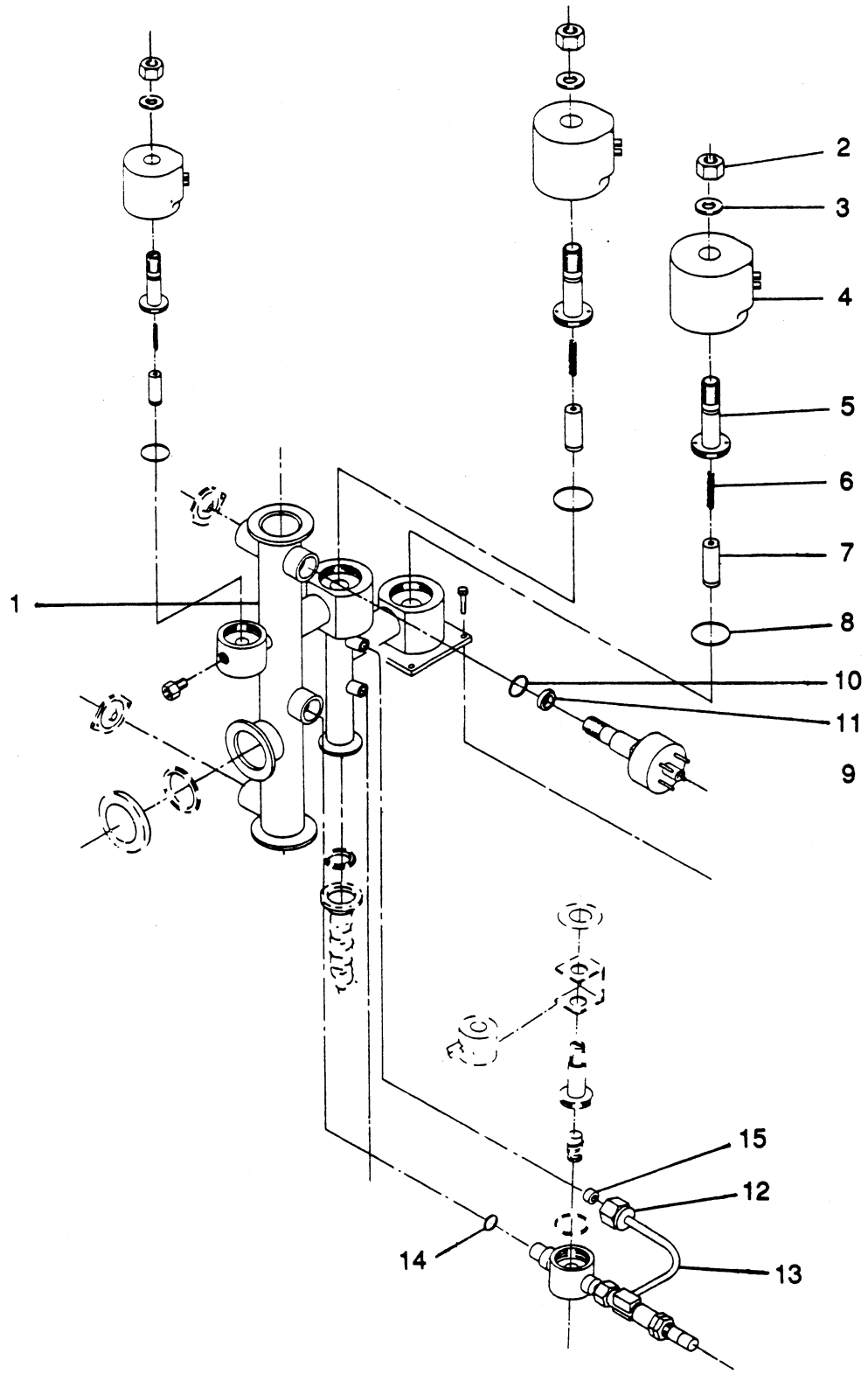


Figure 5-6. Exploded View of Vacuum Manifold

5 Separate the valve spring (6) and valve seat (7).

6 Remove valve body O-ring (8). DO NOT USE A SHARP METAL TOOL; it may damage the sealing surface.

7 Place all valve parts on individual clean lint-free cloths. Make sure that valve parts are not interchanged even though some parts are similar.

8 Repeat steps 2 through 8 for all four valves (rough, test, vent, gross leak, if fitted) and the ejector valve on the diffusion pump.

9 Remove the KF clamp at the test port. Disassemble it as shown in Figure 5-7. Discard all O-rings.

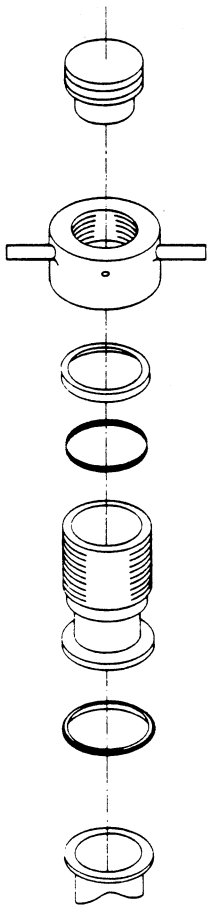


Figure 5-7. Exploded view of test port

10 Remove the test port thermocouple gauge (9) by gently twisting it while pulling the gauge body. Discard the O-ring (10) and save the washer (11).

11 Remove the gross leak nut (12) with a 9/16-inch open-end wrench. Remove the gross leak assembly (13) by pulling it gently. Discard the O-ring (14) and the rubber washer (15).

12 Remove four foreline flange mounting bolts. Discard the foreline flange O-ring.

13 Remove two foreline mounting screws; the foreline manifold will separate from the pumping system flange.

DISASSEMBLY OF THE VACUUM MANIFOLD IS COMPLETE.

5-3-12 Cleaning the Vacuum Manifold

Tools and supplies required:

Freon TF
Methanol
Clean, lint-free cloths or Kimwipes
Heat gun

1 Varian recommends that the diffusion pump be disassembled, cleaned, and charged with new oil whenever the foreline is cleaned. (Refer to para 5-3-16.)

2 Replace all O-rings and rubber gaskets.

3 The following parts should NOT be soaked in Freon or alcohol, but wiped with a cloth or napkin and a small amount of methanol.
- Calibrated leak and calibrated leak valve assembly
- Gross leak assembly
- Valve plunger

4 The following parts should NOT be cleaned with a solvent but wiped if necessary:
- Valve coil
- All rubber parts
- Coil holding nut
- All external hardware

5 The following parts should be soaked in Freon, rinsed with methanol, then thoroughly air-dried.
- Thermocouple gauge
- Valve spring
- Valve body
- Thermocouple gauge washer
- Gross leak nut
- Vacuum manifold assembly

6 The flexible metal hoses to both the roughing pump (optional) and the foreline pump should be cleaned by rinsing either Freon or methanol inside the tube, and then thorougly air-dried with a heat gun.

CLEANING OF VACUUM MANIFOLD IS COMPLETE

5-3-13 Assembly of Vacuum Manifold

Tools and supplies required:

Screwdriver
Spanner, Commercial
Spare parts kit 956-9901

CAUTION
Do not use Freon TF or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum. Wipe with a clean, lint-free cloth or use a small amount of diffusion pump oil.

When cleaning the diffusion pump and the vacuum manifold, Varian recommends that the diffusion pump be assembled first.

1 Bolt the vacuum manifold to the pumping system flange by securing two mounting bolts. This will hold the manifold assembly on LOOSELY.

2 Insert a new O-ring then attach the foreline vacuum manifold to the diffusion pump assembly using four mounting bolts. This connection provides vacuum manifold rigidity needed for further maintenance.

3 Assemble a new rubber washer (15), and O-ring (14), then insert the gross leak assembly (13) into its appropriate hole as shown in Figure 5-6. The O-ring is gently pushed in similar to a thermocouple gauge and the other end is tightened with a 9/16 wrench.

4 Assemble a new O-ring (10) and washer (11), then install the thermocouple gauge (9) by gently pushing and twisting the gauge body into its appropriate hole.

5 Repeat the following procedures for each of the four valves (test, rough, vent, and gross leak).

a Place the valve spring (6) on the valve actuator (5).

b Place a new valve actuator O-ring (8) in the vacuum manifold (1).

c Screw the valve actuator (5) into the vacuum manifold (1) with the valve spring (6) and valve seat (7) in place as shown in Figure 5-6. Tighten the valve body with the spanner or with a screwdriver for the smaller valves.

d Place the coil (4) on the valve actuator (5), add the washer (3), then tighten the coil holding nut (2) snugly on the top of the valve.

ASSEMBLY OF THE VACUUM MANIFOLD IS COMPLETE

5-3-14 Assembly of the Calibrated Leak (Figure 5-5)

Tools and supplies required:

Screwdriver
Adjustable wrench
O-ring kit

1 Install new valve body O-ring (9).

2 Install the spring and valve plunger in the valve body.

3 Screw in the valve actuator (7).

4 Install the coil (6).

5 Install a new, small O-ring.

6 Tighten the fitting on the end of the coil with an adjustable wrench.

7 Attach the calibrated leak assembly.

8 Re-attach the helium line.

9 Re-attach the wires to the calibrated leak coil.

ASSEMBLY OF THE CALIBRATED LEAK IS COMPLETE

5-3-15 Installation of the Vacuum System

Tools and supplies required:

Screwdriver

1 Check that the fore pump oil is in good condition (para. 5-2-2) or that it has been recently changed and flushed (due to its easy access at this time).

2 Attach the vacuum system frame to the circuit card chassis with five screws (Figure 5-4), then attach the connectors from the vacuum system to the backplane.

3 Install metal tubes, KF clamps, and O-rings (with retainers) to the fore pump and rough pump.

4 Check carefully that hanging wires and metal tubes are clear, then slide the vacuum system/circuit card assembly into position in the leak detector.

F

5 Install the control panel support with four screws.

6 Plug the diffusion pump into its appropriate socket. DO NOT PLUG IT INTO THE SOCKET FOR THE MECHANICAL PUMP; THE LEAK DETECTOR MAY BE DAMAGED.

7 Plug in the fan connector.

8 Plug in the power supply to its appropriate socket near the front of the leak detector.

9 Attach the metal tubes, with their KF clamps, O-rings and retainers, from the fore pump and rough pump to the vacuum manifold.

F

10 Re-install the vent line.

11 Install the side covers then the front cover by placing it above its mounting pins and pushing it down in place.

12 Plug the ribbon connector (red edge UP) into the leak detector then plug the pigtail from the leak detector into the back of the control panel assembly.

13 Install the control panel and secure it with its two holding clips.

14 Check all electrical connectors and nuts and bolts before starting the leak detector. Verify system performance before installing covers.

INSTALLATION OF THE VACUUM SYSTEM IS COMPLETED

5-3-16 Disassembly of the Diffusion Pump

CAUTION
The diffusion pump is constructed of many highy-machined aluminum parts; great care is required in handling these parts. Do not use Alconox or any strong detergent when cleaning aluminum.

Tools and supplies required:

Allen wrench, 5/32-inch
Approved hazardous waste container
Clean, lint-free cloths

1 Remove the system thermocouple gauge (14, Figure 5-8) by unscrewing it from its elbow.

2 Remove the spectrometer tube by removing four screws with a 5/32-inch Allen wrench. Rock the tube gently to break its vacuum then place the tube on a non-magnetic bench. Note the location of the grounding wire; remember to replace it when installing the tube.

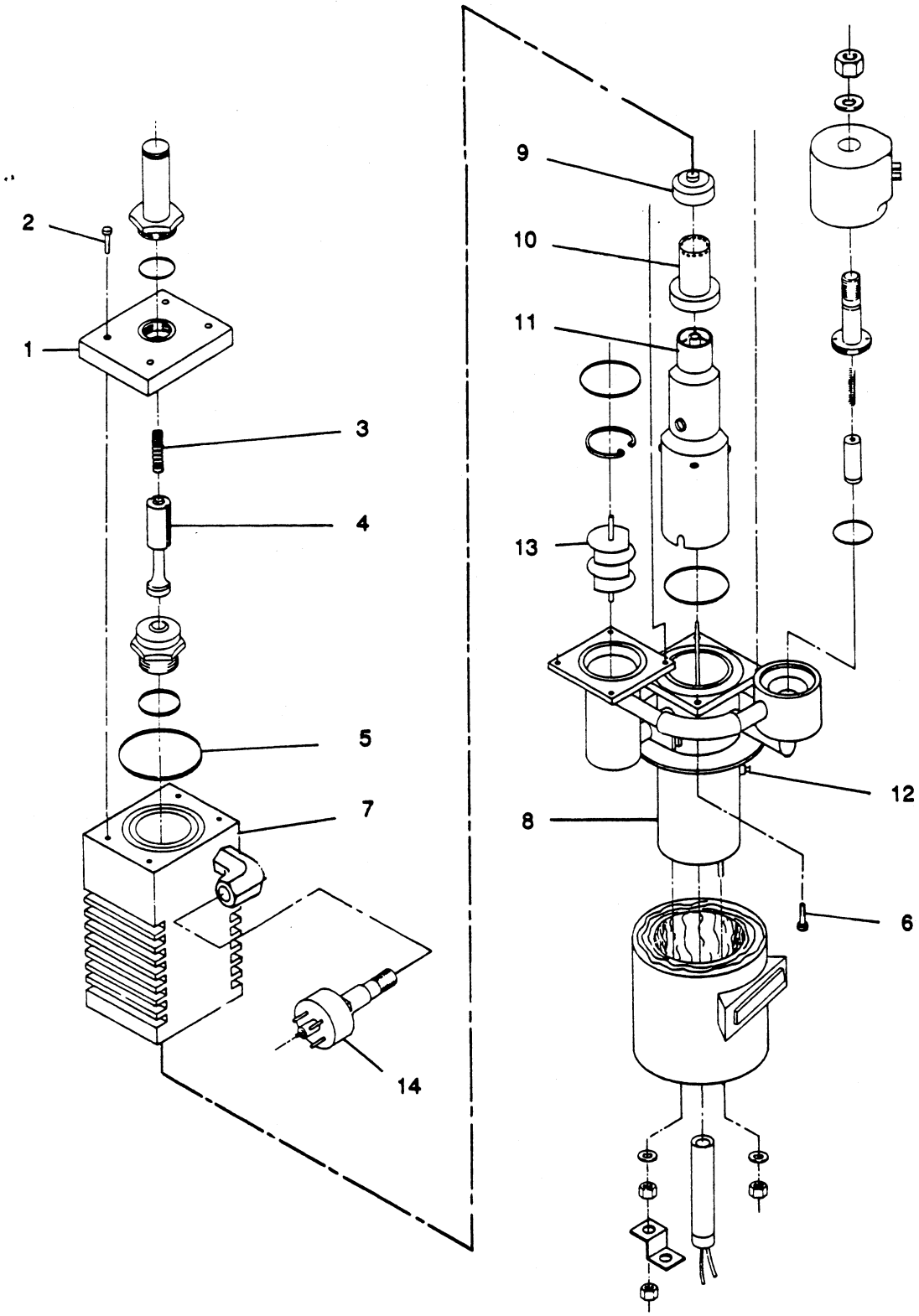


Figure 5-8. Exploded view of diffusion pump

3 To disassemble the top cover (1) near the isolation valve without disassembling the entire valve:

a Remove cover (1) by removing four screws (2) with a 5/32-inch Allen wrench. Be careful not to drop or lose the valve core (4) or the valve core spring (3).

b Remove the valve core (4) and the valve core spring (3). Examine the valve core spring and verify its direction (the compressed end of the spring should be up).

c Carefully remove and discard the O-ring (5) under the cover (1). BE CAREFUL NOT TO SCRATCH THE SEALING SURFACE; use a non-metallic tool to remove the O-ring.

d Inspect the valve for contamination.

4 Separate the diffusion pump from the vacuum system frame.

5 Remove four screws (6) with a 5/32-inch Allen wrench from the bottom of the diffusion pump body (7). Carefully separate the body from the boiler assembly (8). DO NOT TIP THE BOILER OVER, OIL WILL SPILL OUT.

6 Place the diffusion pump body (7) on a clean, lint-free cloth.

7 Unscrew the diffusion pump cold cap (9).

8 Lift out the second stage (10) with its attached orifice plate assembly.

9 Carefully pull out the base jet weldment (11). Note its orientation for reassembly; it is keyed into the base.

10 Leave the thermostat (12) in place; DO NOT EXPOSE IT TO FREON OR METHANOL DURING CLEANING.

11 Remove the baffle (13) and clip with retaining ring pliers.

12 Drain the oil from the diffusion pump as follows:

CAUTION
Diffusion pump oil is considered hazardous waste; drain the oil into a proper container, handle it carefully, and dispose of it in an approved hazardous waste area.

a Check the amount of oil in the boiler assembly; it should contain approximately 40 cc of oil (approximately 3/4-inch deep).

b Plug the diffusion pump into a power source for up to one minute to heat the oil (it will pour easier).

c Pour the oil into an approved waste container.

13 Remove the diffusion pump heater by removing the two nuts and the retaining washer, then pull out the heater and the reflector weldment.

DISASSEMBLY OF THE DIFFUSION PUMP IS COMPLETE

5-3-17 Cleaning the Diffusion Pump

Tools and supplies required:

Freon TF
Methanol
Abrasive paper
Cleaning container
Clean, lint-free wipes

CAUTION
Do not use Freon TF or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum. Wipe with a clean, lint-free cloth and use a small amount of diffusion pump oil or Apiezon L grease, just enough to make the O-rings shiny. Do not use Alconox or any strong detergent when cleaning aluminum.

The following parts are to be soaked or rinsed in Freon, then rinsed with methanol or alcohol and thoroughly air-dried, especially the boiler with its baffle. A fine abrasive powder or Scotchbrite may be used to clean baked-on deposits.

Tube weldment boiler (8) with threaded rod.
Base jet weldment (11)
Diffusion pump second stage (10)
Diffusion pump cold cap (9)
Thermocouple gauge (14)
Baffle and clip (13)
Hardware

The following parts should be wiped clean with a lint-free cloth soaked with Freon or methanol.

- Diffusion pump body (8) with service valve seat attached. DO NOT EXPOSE HIDDEN O-RING TO FREON OR METHANOL.

- Cover, body with service valve base assembly and body gasket. DO NOT EXPOSE HIDDEN GASKET TO FREON OR METHANOL.

The following parts should NOT be cleaned with alcohol or methanol; they should be wiped with a clean, lint-free cloth, if necessary.

Diffusion pump heater
Service valve coil
Reflector weldment
Heater
All O-rings
Insulation
Insulating disk
Thermostat

CLEANING OF THE DIFFUSION PUMP IS COMPLETE

5-3-18 Assembly of the Diffusion Pump (Figure 5-8)

Tools and supplies required:

5/32 Allen wrench
Diffusion pump oil (40-cc container, Varian part no. 0981-K7516-302)
O-ring kit, Varian part no. L8395303
Torr-Seal epoxy

1 Install the baffle (13) and clip with retaining ring pliers.

2 Make sure the diffusion pump boiler assembly has been thoroughly air-dried after cleaning then fill the pump with 40-cc of Sanovac diffusion pump oil.

3 Install the base jet weldment (11); check its orientation carefully, it is keyed for proper installation.

4 Place the diffusion pump second stage on the base jet weldment.

5 Screw on the diffusion pump cold cap (9) to tighten the whole assembly.

6 Attach the diffusion pump body (7) to the boiler assembly (8) (with O-ring (5) in place) by attaching four screws (6) from the bottom with a 5/32-inch Allen wrench. Be careful not to spill any oil or to contaminate the pump oil in any way.

7 Install the isolation valve as follows.

a Place the valve core (4) and valve core spring (3) into the center of the cover (1). CHECK THAT THE COMPRESSED END OF THE SPRING FACES UP INTO THE COVER.

b Install the cover (1) with new O-ring in place by attaching four screws (2) with a 5/32-inch Allen wrench. Make sure there is metal-to-metal contact for a proper seal.

8 Replace the diffusion pump heater. Use Milk of Magnesia or Never-Seize lubricant.

9 Install the reflector weldment and secure it with two nuts and the retaining washer to capture the heater.

10 Reinstall the thermocouple gauge. Use Torr-Seal epoxy to provide a tight, vacuum seal on the elbow/gauge.

11 Attach the diffusion pump to the pumping system frame with three screws.

12 Install connector on thermocouple gauge.

13 Install the spectrometer tube to the diffusion pump by attaching the four screws using a 5/32-inch Allen wrench. Make sure that a new O-ring is in place and that the grounding wire is attached to the top left screw.

DIFFUSION PUMP ASSEMBLY IS COMPLETE

5-3-19 Dissassembly of the Isolation Valve (Figure 5-9)

Disassemble the isolation valve as shown in the following steps.

a Carefully remove the fretaining clip (1) with a screwdriver.

b Remove the coil (2) by lifting it off the valve.

c Unbolt the solenoid actuator assembly (3) using a 3/4-inch wrench. Discard the O-ring (4) after removing it carefully with a non-metallic tool. DO NOT SCRATCH THE SEALING SURFACE.

d Lift out the valve plunger (5) and the valve core spring (6) and verify its orientation. The compressed end of the spring should be facing up.

DISASSEMBLY OF THE ISOLATION VALVE IS COMPLETE

5-3-20 Assembly of the Isolation Valve

1 Place a new O-ring (4) in the cover (7).

2 Place the valve plunger (5) with its spring (6) in the actuator base assembly. Make sure the compressed end of the spring is facing up.

3 Carefully center the valve plunger (5) then screw the solenoid base assembly into the cover (7).

4 Install the coil (2) and secure it with the retaining clip (1).

ASSEMBLY OF THE ISOLATION VALVE IS COMPLETE

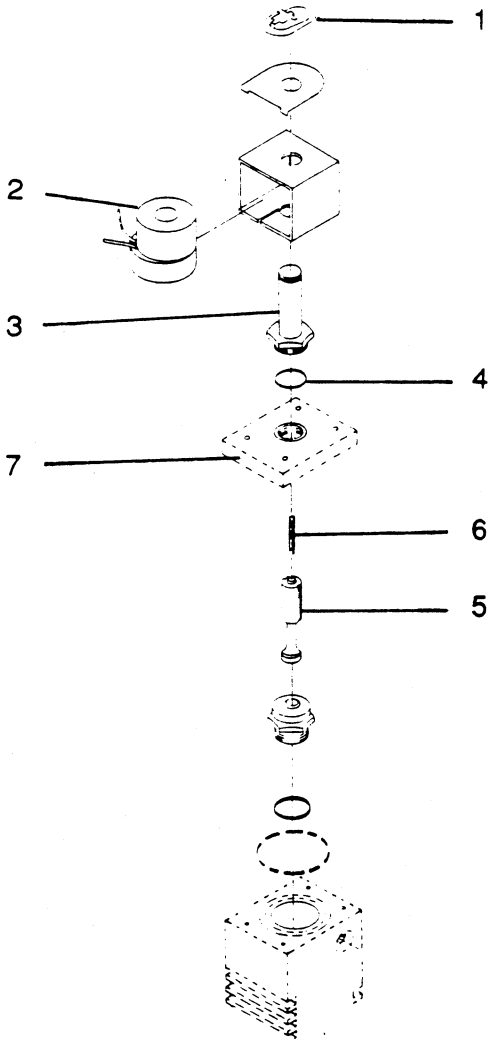


Figure 5-9. Exploded view of isolation valve.

5-4 CALIBRATION

The following finite calibration procedures apply when the leak detector has been disassembled, cleaned, and reassembled (annual maintenance) and a specific problem exists to prevent the leak detector from operating as it was designed.

5-4-1 System Thermocouple TC2 Calibration

The system thermocouple requires calibration only if error 5 or 6 (refer to Section VI, Troubleshooting) is displayed or if the user wishes to check the accuracy of the thermocouple. (If the error (s) are displayed, refer to Menu 21, Option 1-6, to increase or decrease the gain so that the system pressure from the thermocouple is 1 mTorr after the diffusion pump is fully warmed up. Excessive gain is not recommended. The gain should be increased up to the 1 mTorr mark. If the diffusion pump is not on, the thermocouple can also be calibrated during the first two to three minutes of leak detector warmup since the mechanical pump has the ability to pump the spectrometer tube down to between 1 to 10 mTorr. Again using Menu 21, Option 1-6, adjust the gain of the system thermocouple to produce a 5-mTorr reading.

5-4-2 Test Port Thermocouple TC1 Calibration

Calibration of the test port thermocouple is also not critical; however, if the leak detector experiences difficulty in transferring to the TEST mode, calibrating this thermocouple can help. With the test port plugged and the leak detector in the TEST mode, refer to Menu 21, Option 1-7, to adjust the test port thermocouple gain to show a 1- to 5-mTorr pressure reading. Further accuracy can be achieved with a calibrated thermocouple in the test port such as the Varian 810 gauge controller. Again, adjust the gain of the test port thermocouple to agree with the 810 controller.

5-4-3 Zeroing Ranges

For good performance of the leak detector, all ranges must be zeroed periodically when the leak detector is in the MANUAL mode. This requirement becomes obvious when the leak detector autoranges and stops in ranges several decades above the expected leak testing range due to high background. With the leak detector in the TEST mode and the test port plugged, the leak detector should be manually set and zeroed by pressing the ZERO key in ranges -1, -4, -6, and -9. These ranges are also automatically zeroed after auto calibration.

5-4-4 Ion Source Tuning

Refer to paragraph 5-2-2.

5-4-5 Checking Tolerable Forepressure

The following steps must be followed to display the test port pressure (Menu 9, Option 1, sub option 4, Test Port Pressure) and to set the Fine Leak Crossover Pressure (Menu 22, Option 1, sub option 12, Fine Leak Set Point).

1 Set the display to show the test port pressure (Menu 9, Option 1, sub option 4, Test Port Pressure).

2 On Menu 22 (Manual Controls), Option 1, sub option 12 (Fine Leak Set Point) set the fine leak set point to 150 mTorr.

3 Vent the leak detector to activate the new crossover pressure.

4 Connect a Varian 802 Thermocouple Gauge Controller with a tuning leak and start the system.

5 Verify that the pressure reading on the display panel is less than 10 mTorr and that the reading on the Gauge Controller is also below 10 mTorr.

6 Slowly open the tuning leak and watch the pressure rise on the display. The leak rate signal must still be increasing when the pressure of the test port is 120 mTorr. Record the pressure at which the leak rate begins to decrease.

7 If the leak rate is decreasing when the pressure is 120 mTorr, increase the diffusion pump voltage as follows.

8 On Menu 22 (Manual Controls), Option 1, sub option 13 (Diffusion Pump Voltage), increase the diffusion pump voltage one volt at a time. Wait 30 minutes for the diffusion pump heat to stabilize then repeat the tolerable forepressure test.

Note
A change of 1 volt in the diffusion pump voltage represents a 15 percent change in its sensitivity.

9 When the tolerable forepressure is met at 120 mTorr, reset the fine leak set point to 70 mTorr and reset the display back to show leak rate. If the diffusion pump voltage has been changed, the calibration gain must be reset to agree with the value of the calibrated leak.

5-4-7 Ejector Stage Calibration

The Ejector Stage can be calibrated so that the same leak rate reading is present in the -5 range when the tracer gas is going through the ejector bypass in the diffusion pump as in the -6 range when it is not going through the ejector bypass. Calibrate the ejector stage as outlined in the following steps.

1 Manually zero the leak detector in all ranges before setting the ejector stage gain.

2 Place a capillary leak in the test port or a helium permeation leak that is in the high -6 range. If using a capillary leak, apply enough helium to achieve a leak in the range of 7 to 9 x 10^{-6}. Manually go down to the -5 range to open the ejector bypass. The leak rate reading should be the same as was seen in the -6 range, plus or minus one bar. If the reading is not the same, proceed as follows.

3 On Menu 22, Option 1, sub option 10 (Ejector Stage Gain), raise or lower the value from 0.8 to 1.5 until the reading on the -5 range is plus or minus one bar from the -6 range reading. If this cannot be met, adjust the diffusion pump voltage as follows.

4 On Menu 22, Option 1, sub option 13 (Diffusion Pump Voltage), reduce the voltage if the reading on the -5 scale is lower than on the -6 scale; increase the voltage if the reading is higher on the -5 scale than on the -6 scale. Let the leak detector stabilize for 30 minutes after changing the voltage.

Note
A change of 1 volt in the diffusion pump voltage represents a 15 percent change in its sensitivity.

5 Check the ejector stage gain by following the procedure in steps 1 to 3.

6 Repeat this procedure until the reading in the -5 range agrees with the reading in the -6 range, plus or minus one bar.

7 If the diffusion pump voltage has been changed, the calibration gain must be reset to a calibrated leak. Also, if the diffusion pump voltage has been decreased, the Tolerable Forepressure must be rechecked.

8 Record the value of the ejector stage gain and the diffusion pump voltage.

5-4-8 Gross Leak Calibration

This adjustment is possible to ensure that the leak rate reading in the -4 range (when the leak detector is in the Fine Test mode) is the same as in the -4 range when the leak detector is in the Gross Leak mode.

1 Place a tuning leak in the test port and attach a helium hose to the intake of the tuning leak. Open the tuning leak until the leak rate reading is high (from 6 to 9) in the 10 (-4) range when the leak detector is in the Fine Test mode.

2 Switch to the -3 range then back to the -4 range. The leak detector is now in the Gross Leak mode.

3 Loosen the larger screw on the Gross Leak which holds the cover in. Move the cover back. Loosen the smaller screw so that the needle valve can be adjusted.

4 Adjust the gross leak needle valve until the reading is the same as was seen in the Fine Leak mode, plus or minus one bar.

5 Go back to the -4 range in the Fine Leak mode by first changing to the -5 range then to the -4 range. If the reading was not the same as it was in the Gross Leak mode (plus or minus 2 bars), adjust the gross leak valve again.

6 Return to the Gross Leak mode in the -4 range to adjust the valve.

7 Return to the Fine Leak mode in the -4 range and check the reading. Repeat this procedure until the readings in the Gross Leak mode and Fine Leak mode (both in the -4 range) agree within 4 bars.

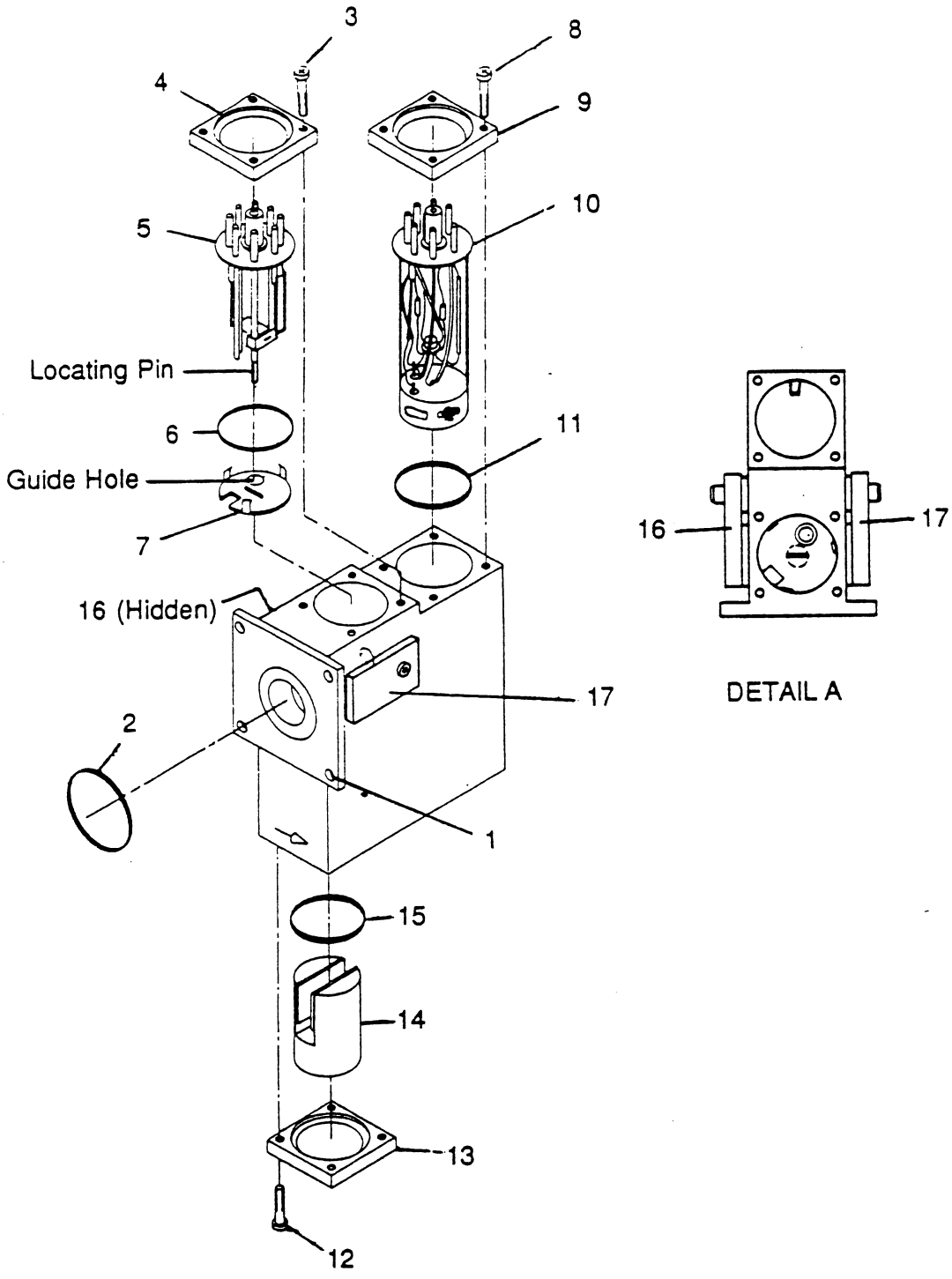
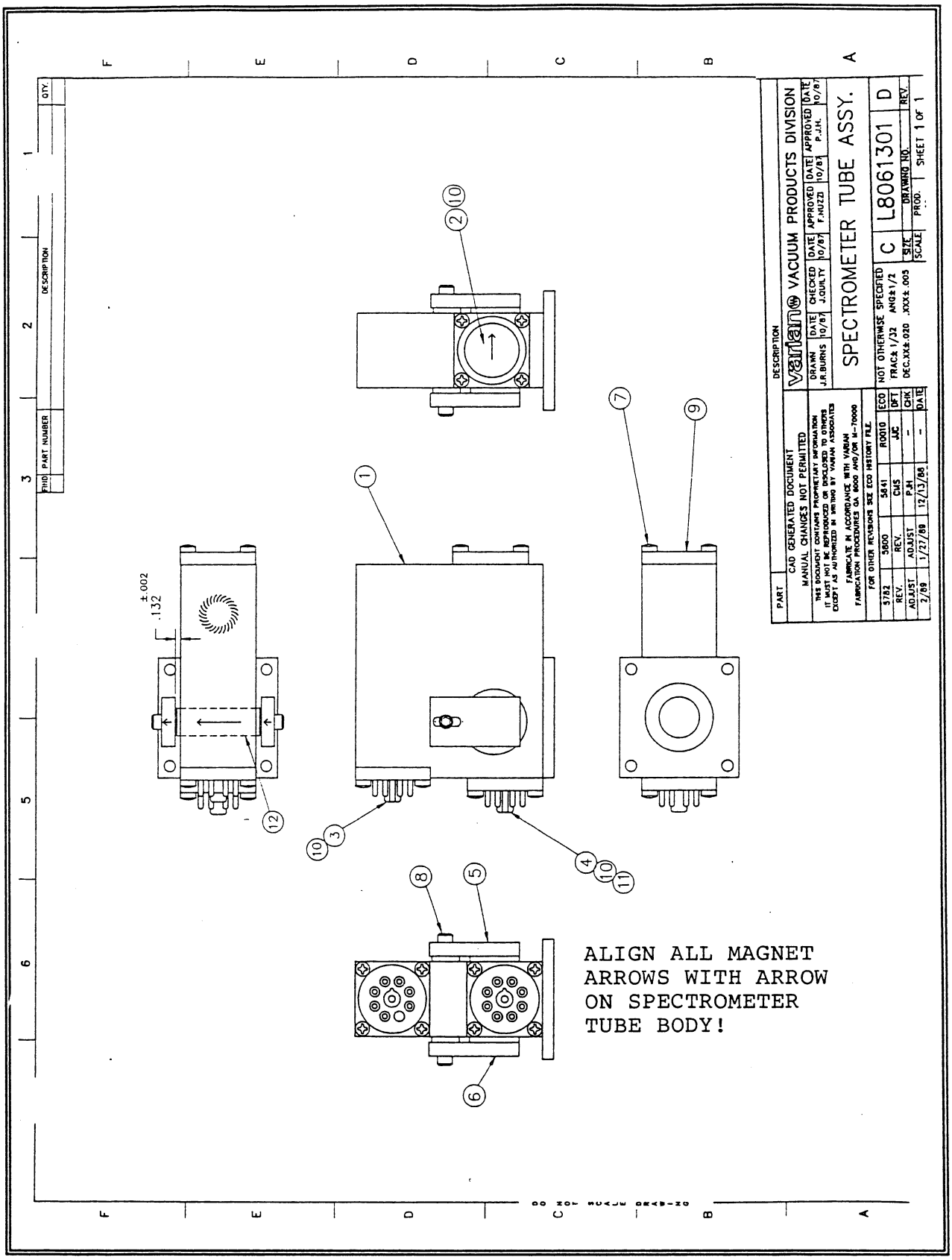
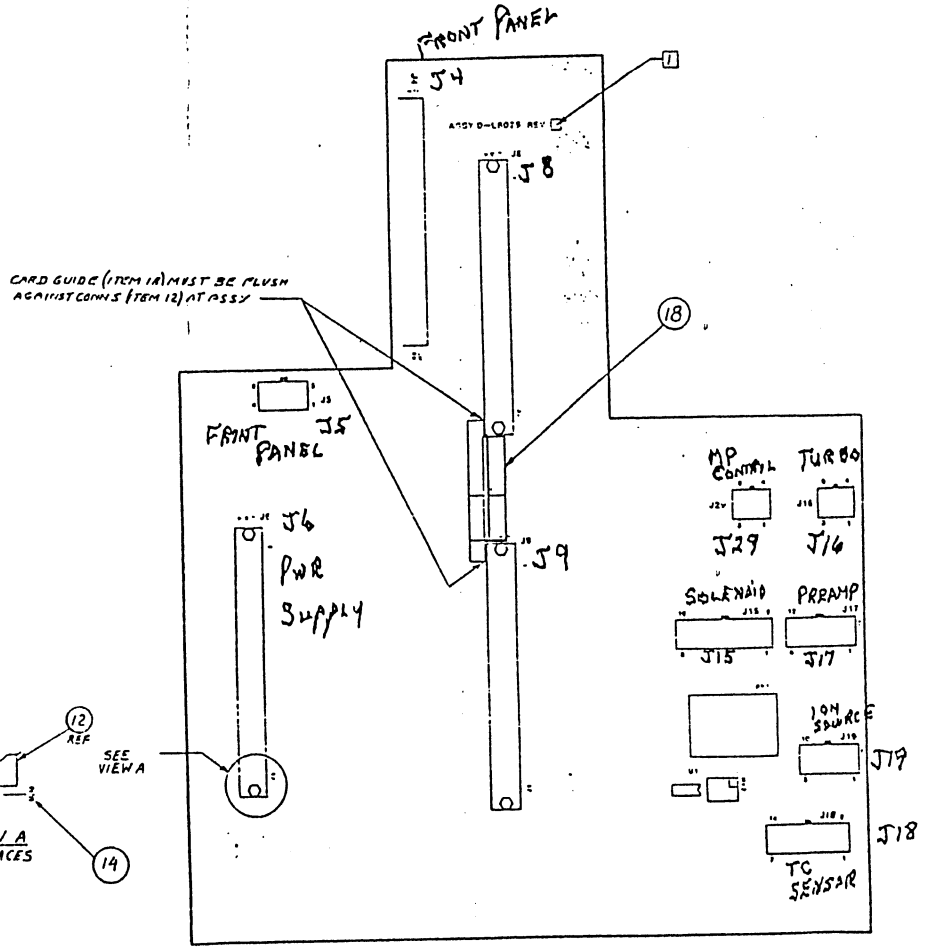
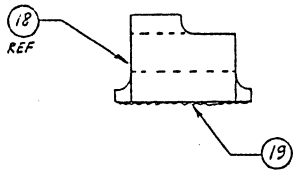


Figure 5-3. Spectrometer Tube Exploded View.


ITEM
PART NUMBER
DESCRIPTION
QTY.
ALIGN ALL MAGNET ARROWS WITH ARROW ON SPECTROMETER TUBE BODY!
SPECTROMETER TUBE ASSY.
L8061301
D
SHEET 1 OF 1





ASSEMBLE ITEM #18 TO PCB WITH LOCTITE # 438 "SUPER BOUNDER" ITEM AS SHOWN

956
Backplane
Test Points

1 CLEALY MARK P/L REV IN INDELIBLE BLACK INK IN AREA SHOWN.

PARTS LIST IS ON A DETACHED DOCUMENT

SHEET 1 OF 1

Access 4 - 5452 Sm
5 - 1109 Fact.
6 - 2908 Cus.
System ~~Restart~~ Reset - 1202

UNLESS OTHERWISE SPECIFIED FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES 9000 AND/OR VPSM9000

DO NOT SCALE THIS PRINT UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP EDGES DIMENSIONS ARE IN INCHES

DESCRIPTION OF CHANGE		DEL. RL	DEL RVI & JIB	ADD ITEM 18 & 19
INITIAL RELEASE				
PLW	-	3028	5176	5242
CJ	-			
DM	-	OEA	OEA	OEA
CHK	-	MCS	[illegible]	[illegible]
DATE	-	12-4-87	3-15-88	4-12-88

DRAWN	DATE	APPROVED	DATE	CODE
Q. ANTONINI	10-16-87	J QUILTY	10/16/87	
CHECKED	DATE	APPROVED	DATE	CLASS
MRB	10-16-87	W. FITZGERALD	10/16/87	09

BACKPLANE
PC ASSY

NOT OTHERWISE SPECIFIED TOLERANCE IS ANG ± 1° XXX ± .010 XXX ± .005

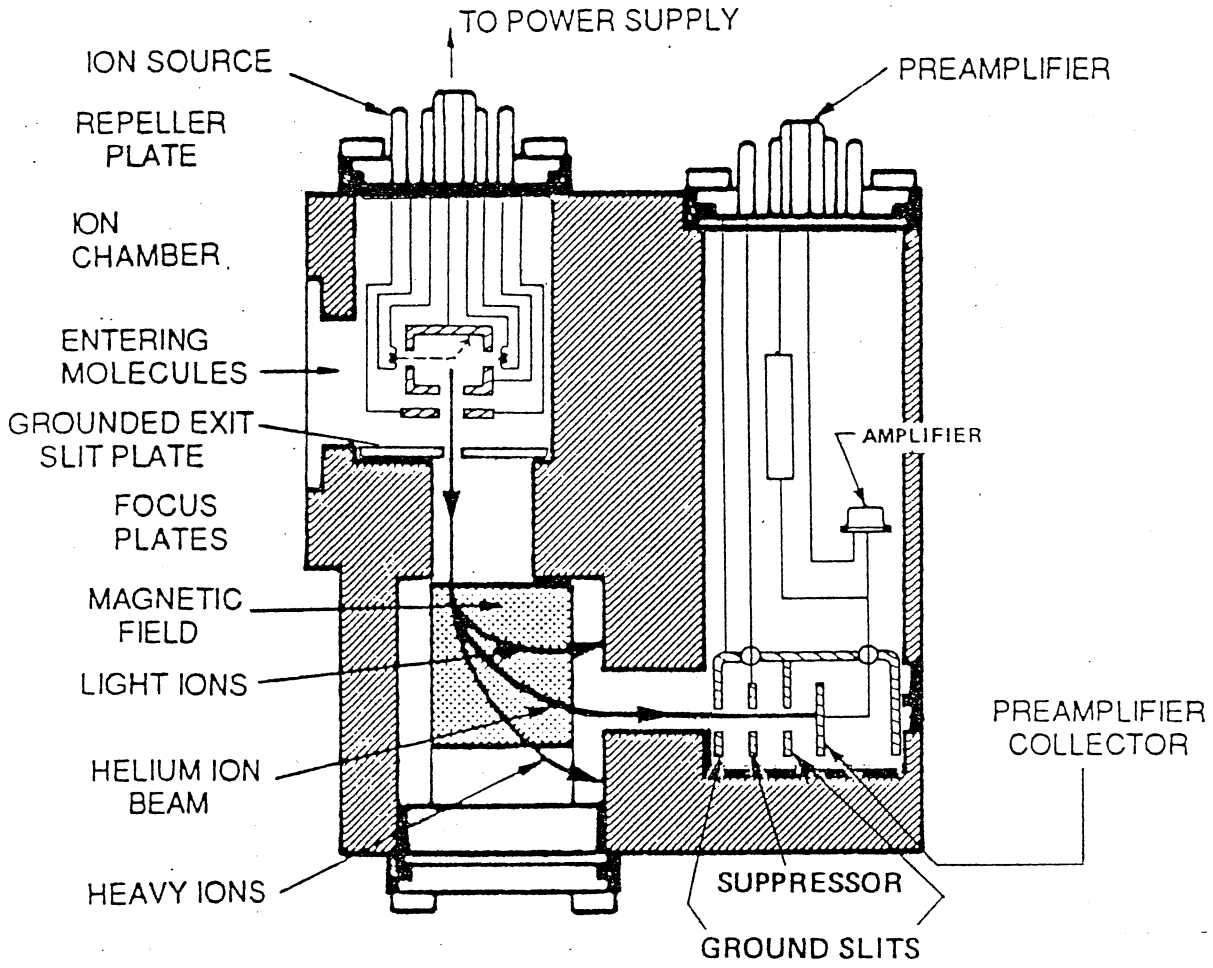
SCALE 1/1

VARIAN VAC. PROD. D L8029

ION SOURCE NOTES: (notes 1 to 5 apply to Model 956 only)

1. Remove connector cap to measure tuning voltages & filament continuity.
2. Ion source is used briefly during start-up as an ion gauge to verify pressure before calibration; i.e. "ion gauge pressure wait". Overpressure protection is provided by TC2.
3. Emission should be approx. 0.2mA (if using a 1.2 cfm forepump).
   " " " " 0.5 to 1.0 mA (if using a 7 cfm forepump).
4. Emission default value is 0.2 mA.
5. To check default volts when tuning manually, without losing the present setting(C), press "CLEAR" to read then press again to return to "C" value.

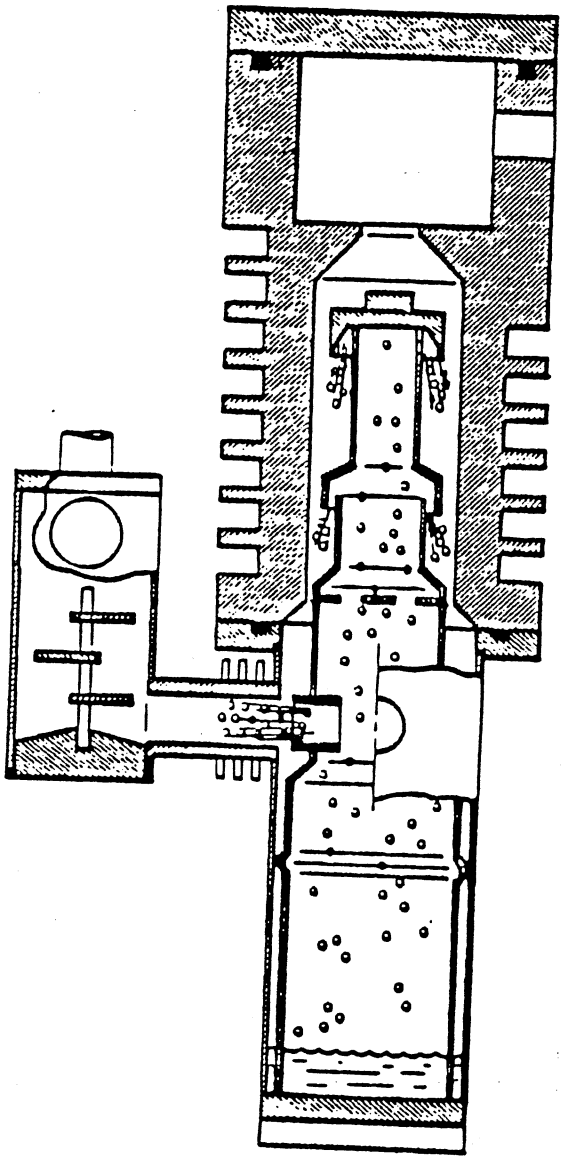
Don't exceed 1.25 w/ iridium - To use tungsten, crank it on up.



PREAMP NOTES:

1. To disconnect preamp cable requires power-down procedure.
2. ± 15 VDC operating voltage.
3. Preamp output should be 70 to 100 mV with a low 10E-7 calibrating leak.
4. Preamp pins 4 & 8 give a true preamp signal with resistor isolation, otherwise an approximate signal can be obtained at pins 7 & 8.
5. PT2 (Model 956) will not recognize a peak less than 1 X 10E-8 when calibrating.

ADDITIONAL TECHNICAL INFORMATION FOR MODEL 956 & 959-50 SPECTROMETER TUBES



- 40 cc SANTOVAC 5
- ≈ 4 MIN. FULL POWER, THEN REDUCED TO 61 TO 65 VAC (USE TRUE RMS METER)
- DONT TIGHTEN NUTS ON DP BOILER STUDS TOO TIGHT! THEY BREAK OFF EASILY!
- TEMP. SENSOR MOUNTED ON FRAME SIDE OF SERV. VALVE. IT IS USUALLY 10°C ABOVE STD. LK. TEMP. & IS USED TO COMPENSATE DURING CALIB. IS DISABLED WHEN EXTERNAL LEAK IS USED. (PROGR. OPTION) OR./WH & BRN./WH WIRES
- MEASURE DP VOLTS (TRUE RMS) AT J7 PINS 8 & 9 (BLACK & WHITE WIRES)

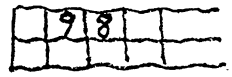


Figure 2-5. 956 Leak Detector Diffusion Pump (cutaway view)

- Scroll to select desired test mode display - Enter
- Scroll to Hold Mode Display - Enter
- Scroll to select desired hold/vent mode display - Enter
- Scram to Main Menu
- Scroll to Menu 12 - Options Control - Enter
- 1-Gross Leak - if system has the gross leak option - Enter
- If not - skip next step
- Scroll to installed - Enter
- Scroll to internal Standard Leak 0 if system has an internal standard leak - Enter
- If not - skip next step
- Scroll to installed - Enter
- Scroll to Vacuum System Type - Enter
- Scroll to Menu 15, check or insert date & time - Enter
- Scram to Main Menu
- Scroll to Menu 18 - Pump Options - Enter
- 1 - Rough Pump control - Enter
- Scroll to sleect Disable if system has only mone mech. pump - Enter
- Enable - if flow split mode is desired - Enter

  Scroll to rough pump size and enter size - Enter

  Enable rough only - if flow split mode is not desired - Enter
- Scram to Main Menu

The voltages for the next part are listed on the inside of the door that covers the keypad.

Note: The ion voltage is the same as FiL Bias voltage.

- Scroll to Menu 22 - Manual Controls - Enter
- 1 - System Calibrate Controls - Enter
- 1 - ion voltage - Enter
- Input FiL bias voltage - enter
- Scroll to Repeller Voltage - Enter
- Input input Repeller voltage - Enter

- Scroll to Variable Focus Voltage - Enter
- Input variable focus voltage - Enter
- Scroll to Emission Current - Enter
- Input emission current - Enter
- If the system is turbo pumped
- Scram to Main Menu
- If the system is diffusion pumped
- Scroll to Ejector Stage Gain - Enter
- Input ejector stage gain - Enter
- Scroll to diffusion Pump voltage - Enter
- Input diffusion pump voltage - Enter
- Scram to Main Menu
- Scroll to Menu 23 - System initialization - Enter
- Scroll to System Restart - Enter
- Scroll to Restart System - Enter
- Press Scram to restart
- At this point the system had all the basic options reset. The system should start up normally. When the system reaches System Ready you can pump the testport down and do an auto cal to bring the machine to full operational status. You can now lock the security back down to the desired level.
- Press Option
- Scroll to Menu 20 - Security - Enter
- Scroll to the desired security level - Enter
- Input 1000 - Enter. This locks the system down to the desired level from level 5, Factory Level.
- Press Option - to bring you back to the display

If at any time during the reset procedure, you have any problems or questions or the system fails to start or calibrate, please call 1-800-227-9722 for assistance.

ADDENDUM SHEET NO. 1

To Manual No: 6999-09-720, Rev. E, dated June 1990, add the following:

Paragraph 4-2, STARTUP AND SHUTDOWN PROCEDURES

Parameter Error

If, on startup, the message "Parameter Error, press Scram to restart" appears on the alphanumeric display, proceed as follows.

1 Verify that the leak detector is sensitive to helium by turning on the calibrated leak. Recalibrate the leak detector if required.

2 If any problem occurs in step 1, it may be necessary to reset the system operating parameters.

Menu 2	Calibration			
	Option 1	Auto Calibrate		
		1	Disable Calib. Key	D
		2	Enable for Int. Leak	
		3	Enable for Ext. Leak	
Menu 6	Xfer to Fine Test			
	Option 1		Hold in Gross Leak	
	Option 2		Xfer to Fine Leak	
Menu 18	Pump Options			
	Option 1		Rough Pump Control	
		1	Disable	D
		2	Enable	
		3	Enable for Rough Only	
Menu 22	Manual Controls			
	Option 1		System Calib Controls	
		1	Ion Voltage	
		2	Repeller Voltge	
		3	Variable Focus	
		4	Emission Current	
		5	Calibration Gain	

ADDENDUM SHEET NO. 1

To Manual No: 6999-09-725, Rev. G, dated June 1990, add the following:

Paragraph 4-2, STARTUP AND SHUTDOWN PROCEDURES

Parameter Error

If, on startup, the message "Parameter Error, press Scram to restart" appears on the alphanumeric display, proceed as follows.

1 Verify that the leak detector is sensitive to helium by turning on the calibrated leak. Recalibrate the leak detector if required.

2 If any problem occurs in step 1, it may be necessary to reset the system operating parameters.

Menu 2	Calibration			
	Option 1	Auto Calibrate		
		1	Disable Calib. Key	D
		2	Enable for Int. Leak	
		3	Enable for Ext. Leak	
Menu 6	Xfer to Fine Test			
	Option 1		Hold in Gross Leak	
	Option 2		Xfer to Fine Leak	
Menu 18	Pump Options			
	Option 1		Rough Pump Control	
		1	Disable	D
		2	Enable	
		3	Enable for Rough Only	
Menu 22	Manual Controls			
	Option 1		System Calib Controls	
		1	Ion Voltage	
		2	Repeller Voltge	
		3	Variable Focus	
		4	Emission Current	
		5	Calibration Gain	

SECTION VI

TROUBLESHOOTING

6-1 GENERAL

The accuracy, reliability, and stability of any mass spectrometer leak detector depends upon the leak-free integrity of its own vacuum system. Inherent helium background and its effect on sensitivity demands the elimination of all detectable leaks. If performance degrades during operation or after some part of the vacuum system is opened for service, a methodical check will eliminate the possibility of a leak as the cause.

The following suggestions apply whether leak-checking components, systems, or the leak detector itself.

Note
Varian recommends the use of its helium Spray Probe Assembly (part number 0991-K0167-301), or equivalent, designed specifically for accurate and economical leak checking.

1 When spraying suspected leak locations, always apply helium SPARINGLY, starting at the highest points first, since helium rises. Use only enough helium to reach the leaks; do not flood the area.

2 If drafts (such as from a fan) exist in the area, apply helium downstream from the source first, or deflect the draft until leak checks are completed.

3 If vent grooves exist at flanges or other assembled seals, apply helium to these points (rather that a general spray) to obtain the most positive response, minimize the use of helium, and save time in leak-checking.

4 Locate and repair large leaks before attempting to locate extremely small leaks.

6-2 TROUBLESHOOTING SYMPTOMS

Table 6-1 lists the particular symptoms encountered when troubleshooting the leak detector. With each symptom is a listing of possible causes, possible solutions, and additional checks that may be necessary.

Table 6-1. Troubleshooting Symptoms

SYMPTOM	EXPLANATION
Electrical Components	
No Power/No lights on panel	Verify that the leak detector is plugged into a power receptacle.

	Make sure that all circuit breakers are properly set or reset as appropriate.
	Check that the MAIN POWER switch on the back of the cart power enclosure is on and that the ON/OFF switch on the basic module is on.
	Check that all circuit boards are properly plugged in.
Fans & Diffusion Pump Heater	Check that the MAIN POWER switch on the back of the cart power enclosure is on and that the ON/OFF switch on the basic module is on.
	Verify that the fan cord is usable and properly plugged in.
	Verify that the heater cord is usable and properly plugged in.
Vacuum Pumps	
Pumps not running	Verify that the pumps are properly plugged into the leak detector and that the leak detector is plugged into a power receptacle.
Pumps make excessive gurgling sounds. (The 1.2 cfm fore pump will naturally gurgle; the operator should differentiate this sound from an actual leak.	The pump oil may be low.
	Tighten the KF clamps.
	Check the vacuum system manifold as well as the rest of the vacuum lines for possible vacuum leaks.
	Verify that the pump drain plugs are securely in place.
Diffusion Pump	
Not heating	Press the circuit breaker to reset.
	Make sure the diffusion pump heater is plugged in.

	Check for an open circuit on the plug for the diffusion pump heater. The resistance should be approximately 34 ohms; if open, replace the heater.
	Check that power is applied to the plug for the diffusion pump heater.
Leaks (Refer to para. 6-4-1 to 6-4-3 for more datails)	Tighten the KF clamps.
	Check the vacuum system manifold as well as the rest of the vacuum lines for possible vacuum leaks. Check all valves, vacuum lines, connectors, and vacuum seals for proper operation. Any leak or break in the vacuum integrity will be a cause for abnormal operation.

Leak Detector

Reaches System Ready state but fails to transfer to the TEST mode. Press START button; display reads 760 Torr	Remove test piece, plug test port, try again
	Check for a leak at an inlet line in the vacuum manifold.
	Look for the severe darkening of the forepump oil, the presence of foam or froth on top of the oil, or a pungent odor.
	The above conditions accompanied by a reading of approximately 100 milliTorr on the Test Port Pressure gauge indicate that either the rough pump or the fore pump is in need of an oil change and flush.
	Perform test port thermocouple gauge check (para. 6-4-7).
Press START button; display reads 760 Torr	Check that pumps are plugged into power source and are operating.
	If pumps do not operate, enter Menu 22, Option 2 to operate manually. If pumps still do not operate, check power to pumps or for pump failure.
	Check that rough pump valve V11 or roughing valve V1 are open (listen for an audible click).

If valve V11 does not operate, refer to Menu 22, Option 3 to operate manually. If valve does not open, check power to valve or for pump failure.

Check that the test port thermocouple gauge connector is plugged in and making a good electrical connection.

Check that there are no large leaks.

Check that the test port thermocouple is working properly (see para. 6-4-7).

6-3 ERROR MESSAGES

The following is a list of error messages that may appear on the front panel display. A description of each is followed by corrective action procedures.

6-3-1 "Spec tube rough error"

This error message can occur only during initial startup when the forepump fails to pump the spectrometer tube down within 15 seconds after the isolation valve V6 opens. Power will not be applied to the diffusion pump until this condition clears.

Corrective Action - Proceed as follows.

1. Press the SCRAM button twice to reset the leak detector and to allow further roughing of the spectrometer tube. Repeat the step again.
2. Check the system thermocouple connector to verify a good electrical connection.
3. Check that the system thermocouple gauge is operating properly (see para. 6-3-5).
4. Check for leaks in the vacuum system between the test valve and the spectrometer tube. See para. 6-4-1.

6-3-2 "Spec tube pressure burst"

Burst-type errors occur only when pressure criteria for that sensor met the conditions once and now has failed. In this case, it indicates that the thermocouple pressure has risen above 10 mTorr after the spectrometer tube was pumped down and the warmup of the diffusion pump has started.

Corrective Action - Refer to para. 6-3-1, steps 1 through 4.

6-3-3 "Pressure burst"

This message indicates a sudden pressure rise in the spectrometer tube. It can occur only when the filament is on, when the vacuum system is in the HOLD, ROUGH DOWN, or VENT state, or when the leak detector is in the TEST mode. If pressure recovers, then the filament is turned on in the ion gauge mode pressure is checked, the vacuum system reverts to the HOLD state, and the leak detector displays a "System ready" message.

Corrective Action - None; when this message appears, others will follow.

6-3-4 "System over pressure"

This error message is produced by the system pressure thermocouple TC2 and can occur any time after diffusion pump warmup. This message indicates a large pressure burst error. Typically, the high-vacuum side of the diffusion pump is air-released to a level that the thermocouple is able to measure it. Again, as in the "pressure burst" error, the filament is shut off first and, as the pressure recovers, conditions are automatically checked and the microprocessor proceeds to the "system ready" level.

If the pressure reported by the thermocouple does not drop within 5 minutes, the diffusion pump is shut off and cooled down to prevent possible damage.

Corrective Action - Check for leaks in the vacuum system between the test valve and the spectrometer tube (see para. 6-4-1).

6-3-5 "System pressure wait"

This message occurs when the system pressure thermocouple report pressure higher than the set point after the diffusion pump has warmed up.

Corrective Action - Refer to para. 6-4-1, steps 1 through 4.

6-3-6 "System pressure timeout"

This error message occurs when the pressure in the high-vacuum side of the diffusion pump, as reported by the system pressure thermocouple, does not go low enough in the allotted time.

Corrective Action - Refer to para. 6-3-1, steps 1 through 4.

6-3-7 "Ion gauge pressure wait"

This message can occur when, after warmup, the ion gauge reports pressure in the spectrometer tube to be greater than 5×10^{-5} Torr. Up to 30 minutes are allowed for this condition to improve.

Corrective Action - Wait for pressure to improve. Check for leaks and proper operation of pumps. Spectrometer tube may be contaminated and require cleaning.

6-3-8 "Ion gauge time out"

This message occurs when, after 30 minutes, the spectrometer tube pressure does not fall below 5 x 10^{-5} Torr. The diffusion pump is automatically shut off to prevent damage to the vacuum system.

Corrective Action - Check for leaks and proper operation of vacuum pumps. Spectrometer tube may be contaminated and require cleaning.

6-3-9 "Filament #1 burned out"

This error message indicates that filament #1 of the ion source is burned out.

Corrective Action - None. Leak detector will automatically switch to Filament #2.

6-3-10 "Filament #2 burned out"

This error message indicates that filament #2 of the ion source is burned out.

Corrective Action - If both filaments are burned out, the leak detector will display the message "both filaments burned out".

Before disassembling the spectrometer tube to change the ion source, Varian recommends the following.

1 Press SCRAM then SCRAM again. If the message does not disappear and the leak detector does not start up automatically, check the continuity of the ion source.

2 Remove the connector from the top of the ion source and check for continuity between pins 1 and 8 (filament #1) and between pins 5 and 6 (filament #2) of the ion source. If there is no continuity between either of the pins, change the ion source as described in Section V.

6-3-11 "Test port over pressure"

This error message occurs when the leak detector is in the TEST mode and indicates that the test port thermocouple TC1 reports pressure greater than the transfer pressure.

Corrective Action

1 Remove the test piece, plug the test port, try again.

2 In Menu 22, Option 1-2, adjust the Fine Leak Set Point if desired.

3 Check that the test port thermocouple gauge is properly connected electrically.

4 In Menu 22, Option 1-7 (Test Port TC Gain), check the value of the gain. Increase it by 20 percent. Press the SCRAM button twice and check if the message is still displayed. Increase the test port thermocouple gain twice if

necessary. If no improvement is noted, reset the gain to its original value.

5 Refer to para. 6-4-7 for detailed test port thermocouple gauge check.

6-3-12 "Xfer pressure wait"

This condition can occur when the leak detector is forced to transfer manually from the GROSS LEAK TEST mode to the FINE LEAK TEST mode and the test port pressure is higher than the fine leak transfer set point. This message will also appear when the leak detector is in the AUTO mode if the leak rate is less than 0.8×10^{-4} and the test port pressure is greater than the fine leak set point.

Corrective Action - Remove the test piece; the pressure is too high to test in the FINE TEST mode.

6-3-13 "Gain too high" (Low sensitivity to helium)

This error message is displayed when the calibration gain required after auto-calibration is greater than 7.

Corrective Action

1 Attempt the manual tuning procedure if the leak detector responds to helium but the sensitivity is low (Section 5-2-2).

2 Switch ion source filaments to determine if sensitivity improves. Refer to Menu 22, Option 4-1.

3 Check that the valves are operating properly, especially the ejector bypass valve V4 and the isolation valve V6. Refer to para. 6-4-4 for valve checks.

4 Clean the vacuum system, especially the spectrometer tube (section V).

6-3-14 "Gain too small" (sensitivity too high)

This error message is displayed when the calibration gain required after auto-calibration is less than 0.8.

Corrective Action - In Menu 22, Option 1-2, lower repeller voltage to reduce sensitivity. Repeat until calibration (Menu 22, Option 1-5) is between 1.2 and 2.0.

6-3-15 "No helium peak" (leak detector not sensitive to helium)

Note
Calibrated leak values below 3×10^{-8} may cause "No helium leak" to be displayed after autocalibration is attempted.

F

This error message is displayed when, during autocalibration, the leak detector scans the ion voltage and finds no peak, or the peak is less than 1×10^{-8}.

Corrective Action

1 Zero the leak detector in the TEST mode with the test port plugged.

2 Check that the valves are operating properly especially the standard leak valve, V5, the ejector bypass valve V4, the test valve V2, and the isolation valve V6. Refer to para. 6-4-4.

3 Check that the ion source is operating properly by performing the ion source check (para. 6-4-5).

8 Perform preamplifier check (para. 6-4-6). If preamplifier reads approximately 20-300 mv between pins 7 and 8 (Figure 6-3) and goes to 1 - 10 mv when all leaks are off, the vacuum system/spectrometer tube is operating properly; the problem exists in the electronics or the display (see para. 6-5, Electronics Troubleshooting) for further details.

6-3-16 "Too many peaks"

This error message is displayed when, during autocalibration, the leak detector scans the ion voltage and finds more than one peak.

Corrective Action - Clean the spectrometer tube.

6-3-17 "Diffusion pump failure"

This message is displayed when the diffusion pump heater is not turned on or it is burned out.

Corrective Action

Check for an open circuit on the plug for the diffusion pump heater. The resistance should be approximately 34 ohms; if open, replace the heater. In addition, check that power is applied to the plug for the heater.

6-4 DETAILED TROUBLESHOOTING

6-4-1 Leak Symptoms

1 Pumps make gurgling sound (more than normal)

2 Error messages which are repeated

a Spectrometer tube rough error
b System over pressure
c Spectrometer tube pressure burst
d Pressure burst

3 Difficulty in transferring into the TEST mode or failure to transfer into the FINE LEAK mode when the test port is plugged

4 Inconsistent reading of leak rate meter especially during leak checking

6-4-2 Leak-Checking the Leak Detector (small leaks)

Sometimes a small leak will cause inconsistent operation of the leak rate meter but will still allow the leak detector to transfer into the TEST mode. In this case, the operator can use helium to identify leaks in the vacuum system by spraying suspected areas and watching the response on the display.

6-4-3 Leak-Checking the Leak Detector (large leaks, will not reach System Ready)

Most leaks in the vacuum system will occur after the leak detector has been disassembled or cleaned. The most likely areas for leaks are O-rings and poor sealing surfaces. This can be caused by using damaged or rolled O-rings or by not tightening KF clamps properly. Poor sealing surfaces can be identified by scratches or possibly foreign substances across O-ring grooves. Check for loose bolts preventing metal-to-metal contact on sealing surfaces.

The key to finding leaks in the 956 leak detector is to anticipate which O-rings or seals are faulty. This can be accomplished by using a thermocouple gauge controller or digital voltmeter and using the test port thermocouple gauge TC1 and the system thermocouple gauge TC2 to measure pressure. Use the valves to manually isolate sections of the vacuum system (Menu 22, Option 3); use Menu 22, Option 2 to manually control the pumps. Use the flow diagrams in Section II to isolate and pump down sections of the vacuum system, then valve off the pumps.

Watch the thermocouple gauge controller or the digital voltmeter for a gradual pressure or voltage change. A gradual pressure rise will indicate a leak. A digital voltmeter can be used by placing it on the 20 mv scale and connecting the test leads across the red and green wires of a plugged-in thermocouple connector (see para. 6-4-7). A reading of 0 to 3 mv indicates atmosphere; 7 to 11 mv indicates vacuum.

6-4-4 Valve Check

1 Check that the test port is pumped down to a rough vacuum if possible.

2 In Menu 22, Option 3-1-6, put the leak detector in the HOLD state.

3 Verify proper valve operation by listening for an audible click when the valves are actuated. Start with the valves that are likely to cause a problem and always finish with the VENT valve.

4 If any valve fails to operate properly, measure the D-C voltage from each coil lead to ground while the leads remain connected to the coil. Voltages should be as shown in the following list (within 10 percent).

VENT valve (V3)	24 VDC
TEST valve (V2)	12 VDC

ROUGH valve (V1)	12 VDC
STD LEAK valve (V5)	24 VDC
GROSS LEAK valve (V7)	24 VDC
EJECTOR valve (V4)	24 VDC
ISOLATION valve (V6)	12 VDC
ROUGH PUMP valve (V11)	A-C line voltage

Refer to Figure 2-4 for location of valves in the vacuum system.

The presence of equal voltage on both leads indicates a) that the power supply is operating properly, b) the coil is good, and c) that the valve is de-activated.

An 80 percent voltage drop across the coil indicates a) that the coil is good and b) that the valve is activated.

5 In the case of the ROUGH PUMP valve, check the coil for continuity then plug the valve into an alternate A-C power source and listen for actuation.

6 If a voltage drop is present but any valve still does not operate, check whether the valve is mechanically stuck.

6-4-5 Ion Source Check

1 Separate the ion source from its connector. At Menu 22, Option 1-1, record the ion voltage (filament bias).

2 Reset the ion voltage to 250.

3 Measure the following D-C voltages (± 20 percent) at each pin to ground on the ion source connector as shown in Figure 6-1.

Pin 1	70V
Pin 2	350V
Pin 3	220V
Pin 4	70V
Pin 5	70V
Pin 6	250V
Pin 7	210V
Pin 8	70V

4 If no voltages can be read, go to Menu 22, Option 2-1, and turn on the high voltage. If voltage problems still exist, refer to para. 6-5, Electronics Troubleshooting.

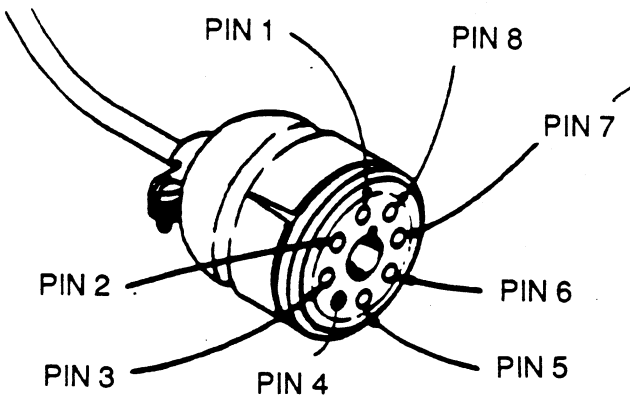


Figure 6-1. Ion Source Connector

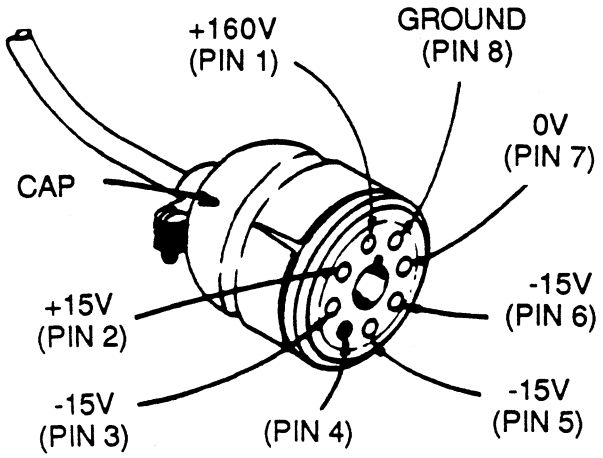


Figure 6-2. Voltages at Preamplifier Connector

5 With the ion source connector disconnected from the ion source, check for continuity between pins 4 and 5 of filament 2, and pins 1 and 8 of filament 1. Continuity verifies that the filaments are not open.

6 Check pins 2, 3, 6, and 7 in the ion source corresponding to the pins shown on the connector (Figure 6-1). Check that the pins are electrically isolated from ground as well as from each other.

7 Visually inspect the ion source and replace it if electrical shorts exist.

Note
Improper installation of the ion source could ground the repeller (pin 2). Check that the ion source is properly installed (refer to para. 5-3-5).

6-4-6 Preamplifier Check

1 Carefully unscrew the cap from the preamplifier connector while it is still connected to the preamplifier.

WARNING
HIGH VOLTAGES CAN KILL. DO NOT TOUCH OR SHORT OUT THE 160-VDC WIRE ON PIN 1.

2 Verify the voltages shown in Figure 6-2. If voltages do not exist, refer to para. 6-5.

3 Attach a voltmeter to pins 7 and 8 of the preamplifier (use the 200 mv scale).

4 Turn the leak on/off and note meter output changes. With a -7 range leak on, the meter should read 20 to 200 mv. With the leak off, the meter should read 1 to 10 mv. With the emission off, the meter should read 1 to 5 mv.

5 Turn the emission on (Menu 22, Option 4-2); the meter output should increase 1 to l0 mv. When the meter has stabilized, then the spectrometer tube is probably operating properly.

6-4-7 Test Port Thermocouple Gauge (TC1) Check

1 Verify continuity of all leads on the thermocouple gauge. If an open circuit exists, replace the gauge.

2 Check that the test port is pumped down properly (10 to 40 mTorr). Check by feeling the "force" of the vacuum at the test port and listening to the mechanical pump (the pump should not gurgle more than normal).

3 Loosen the screws securing the thermocouple cap to the wire. Unscrew the cap from the thermocouple gauge connector and measure the voltage across the white and black wires while the connector is plugged into the thermocouple. The voltage should read approximately 0.3 volt. If not, refer to para. 6-5, Electronic Troubleshooting. No voltage to thermocouple gauge.

4 Measure the voltage across the red and green wires while the connector is plugged into the thermocouple. The voltage should read 7 to 11 mv. With the meter still connected, vent the test port; the meter should decrease to 0 to 3 mv. If the meter output does not change, replace the test port thermocouple gauge.

6-4-8 System Thermocouple Gauge (TC2) Check

The system thermocouple gauge should be checked for proper operation if error messages such as "Spec tube rough error", "System pressure wait", "System pressure time out", and/or "Spec tube pressure burst" appear often and/or unpredictably.

1 Remove the thermocouple connector from the thermocouple gauge and check continuity of all four pins on the thermocouple gauge. an open circuit indicates that the gauge is defective; replace it.

2 Check that the thermocouple gauge connector makes good electrical contact with the thermocouple gauge.

3 Press the SCRAM button and allow the leak detector to shut down.

4 Vent the spectrometer tube by opening the following valves in Menu 21, Option 3-2: VENT (V3), ROUGH (V1), TEST (V2), and ISOLATION (V6).

5 Loosen the screws securing the thermocouple cap to the wire. Unscrew the cap from the thermocouple gauge connector and measure the voltage across the white and black wires while the connector is plugged into the thermocouple. The voltage should read approximately 0.28 volt with the leak detector on. If not, refer to para. 6-5, Electronic Troubleshooting. No voltage to thermocouple gauge.

6 Measure the voltage across the red and green wires while the connector is plugged into the thermocouple. The voltage should read 0 to 4 mv. With the meter still connected, start the leak detector so that the fore pump pumps down the spectrometer tube. The meter output should read 7 to 11 mv. If the meter output does not change, replace the thermocouple gauge.

6-5 ELECTRONICS TROUBLESHOOTING

When an electronic problem exists, Varian recommends that the service technician replace the circuit board rather than the individual components on the board. This section will aid the service technician in isolating the particular board.

SYMPTOM	EXPLANATION
No voltage to thermocouple gauge (should measure approximately 0.3V between the white and black wires while the connector is connected to the gauge) (See para. 6-4-7.)	Check for a short or broken thermocouple gauge connector and cable.
	Check that the thermocouple gauge cable is properly plugged into the Backplane.

	Check that the leak detector is on.
	Check that the circuit boards are properly plugged in.
	Replace the power supply board or CPU board.
No voltage to the ion source	Refer to Menu 22, Option 2-1 to turn on voltage to ion source.
	Check that all connectors are properly plugged into the Backplane board.
	Check for damaged ion source cable or connector.
	Replace the power supply board or CPU board.
No voltage to valve coil	Refer to Menu 22, Option 2-1 to turn on voltage to valves.
	Check for broken wires to valve coil.
	Check that circuit boards are properly plugged in.
	Check for loose or damaged connector on Backplane board.
	Replace power supply board or CPU board.
No voltage to preamplifier	Check for damaged preamplifier cable or connector.
	Check that all connectors are properly plugged into the Backplane board.
	Check that circuit boards are properly plugged in.
	Replace power supply board or CPU board.
Display not lit	Check that both connectors to the display are properly connected and undamaged.

	Check that circuit boards are properly plugged in.
No power to diffusion pump	Check that circuit breakers are reset.
	Check that diffusion pump is plugged in.
	Check that heater is not open.
	Replace power supply board.

6-6 POWER-UP SEQUENCE

The GO/NO GO diagram (see Section IV) shows the steps automatically taken by the microprocessor when the START button on the control panel is pressed. (GO/NO GO diagrams for the leak detector in each of several modes, START, SEQUENCER, SCRAM, and VENT are shown following the POWER-UP diagram).

All valves in the 956 are closed when power is off. As soon as power is applied, the system goes through hardware reset. After this reset, the software goes through its initialization and configures all the output lines. At this time, the 1.2 cfm pump is turned on and a message ROUGHING OUT VACUUM SYSTEM appears on the alpha-numeric display for approximately 5 seconds. This action evacuates the vacuum lines so that when the valves are opened, the spectrometer tube pressure may not rise.

Once the vacuum lines are roughed out, valves V2 and V6 open. If the spectrometer tube was already under vacuum, then the software determines how long the diffusion pump has been off and calculates how much power is required and for how long it must be applied to ready the system. A message DP OFF TIME is an index which is not relative to time but weighted average of diffusion pump on time inertia. The software then calculates the warmup time and displays a message WARMING UP DP on the upper display and a time countdown from between 10 seconds and 7 minutes to zero on the lower display. Power to the diffusion pump changes during this time, according to calculations of the software.

If the spectrometer tube was not under vacuum when valves V2 and V6 were opened, then a message ROUGHING OUT SPEC TUBE appears. If the pressure does not go low enough in 30 seconds, then the system produces SPEC TUBE ROUGH OUT ERROR and does not warm up the diffusion pump. This usually means that there can be one of the four following problems.

1 The test valve or the isolation valve did not open,
2 there is a leak between the spectrometer tube and the pump,
3 the thermocouple is burned out, or
4 a signal measurement problem exists from the thermocouple.

After the problem is found and fixed, and if power to the unit is not turned off, pressing the SCRAM key twice will restart the system by roughing out the vacuum lines. If the power was turned off, then the system will start from the beginning when the power is applied.

Once the diffusion pump is warmed up (time count down to zero), the system is ready to turn on the ion source; TURNING ON THE ION SOURCE will be displayed on the control panel for approximately 10 seconds. Power to the filament is increased at a very slow rate to extend the life of the filament. Once the proper emission is achieved, system pressure is automatically checked from the ion source in the ion gauge mode. If the pressure is less than 5×10^{-5} then the display SYSTEM READY will be shown and the leak detector is ready to be calibrated or operated.

If the system pressure is greater than 5×10^{-5}, the leak detector can be used although its sensitivity will be poor. Thus, a message SPEC TUBE PRESSURE WAIT appears on the display. If conditions don't improve within 30 minutes, the software executes the SCRAM function to prevent damage to the system. This can usually happen when the diffusion pump is contaminated or a small leak exists on the high vacuum side of the diffusion pump.

SECTION VII

PARTS LIST

7-1 GENERAL

This Parts List illustrates all of the procurable assemblies and parts for the Portable Leak Detector, Model Number 956, Varian Part Number 0956-L8003-301, designed and manufactured by Varian Associates, Vacuum Products Division, 121 Hartwell Avenue, Lexington, Massachusetts, 02173.

7-2 CONTENTS

The Parts List provides an illustration and description of procurable assemblies and parts, indexed for easy cross-reference. It is not to be taken as the authority for the procedure of assembly or disassembly; it is intended only for use in identifying parts, illustrating disassembly relationship, and ordering the correct replacement parts. Overhaul or repair should be done by authorized personnel using applicable Varian Instruction Manuals.

7-3 FIGURE AND INDEX NUMBER COLUMN

The Figure and Index No. column shows the applicable figure number on which an assembly/ part appears and the particular item number in the list for parts identification.

7-4 PART NUMBER COLUMN

Numbers listed in this column reflect the Varian part number for the assembly or part for ordering purposes. The three-digit class code (956) are an integral part of the part number for parts normally furnished with the Leak Detector. The class code 0991 applies only to optional parts available for the 956 Leak Detector. If the part is available commercially, the word "Coml" will appear in this column.

7-5 DESCRIPTION COLUMN

The description or name of the part is listed by its principal noun followed by modifiers, followed by size or specifications, and is indented under the numbers 1 through 6 to show the relationship of one part or assembly to another part or assembly. For example, an item listed under indent 3 is a component part of the next higher assembly listed under indent 2 above it.

7-6 ABBREVIATIONS

The following abbreviations are used in the parts listing.

Alum	Aluminum
Cad pl stl	Cadmium plated steel
Fil hd	Fillister head
MPT	Male pipe thread
NC	Normally-closed
NPT	National pipe thread
Rd hd	Round head
s/s	stainless steel

7-7 UNITS PER ASSEMBLY COLUMN

The number appearing in the Units Per Assembly column is the total quantity of the listed part required in its immediate assembly.

7-8 ILLUSTRATIONS

Titles

The illustration in the Parts List carries the same caption as its corresponding listing and is identical to the title of the Varian drawing to which it applies.

Method of Presentation

Wherever practical, one model is selected as the most representative of the equipment and its components are shown in the main portion of each illustration. Visually different parts for similar models are shown on the same illustration in ellipses. Circles are used to show detail sections of the equipment. A bracket indicates a breakdown of an assembly. Dashline drawings represent items that are illustrated for reference such as to show location or relationship to other parts or assemblies.

7-9 HOW TO USE THIS PARTS LIST

To find the part number if the major assembly in which the part is used is known:

a. Turn to the Table of Contents and find the page number of the illustration showing that major assembly. Turn to the page determined.

b. Locate the part and index number of the major assembly in the illustration.

c. Find the index number in the parts list to determine the part number and description.

7-10 HOW TO ORDER PARTS

a. Determine the complete part numbers, descriptions, and quantities of parts required from the appropriate parts lists. Include the class code number (for example, 0981) before each part number.

b. Call the National Order Entry toll-free telephone number listed inside the title page of this instruction manual (1-800-8-VARIAN).

c. Place the order with the operator, describing the name, model number, and serial number of the equipment on which the part is used. Give the complete part number of the part ordered (the figure and index number is not required), the description as shown on the parts list, and the quantity required.

d. A minimum order of $50 will be required to complete the order.

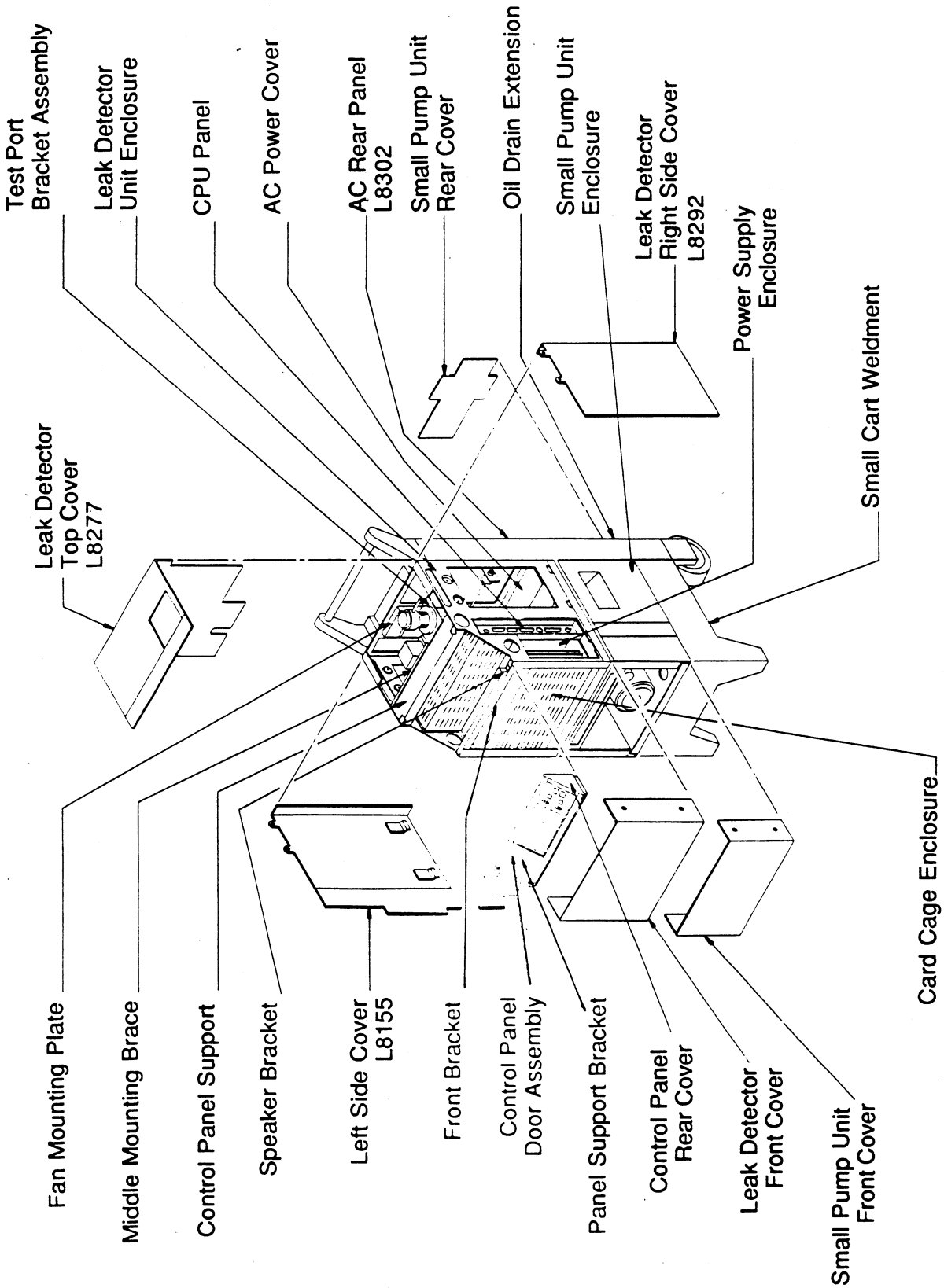
7-11 FACTORY-INSTALLED OPTIONS

The following factory-installed options are available for purchase with the 956 Auto-Test Leak Detector.

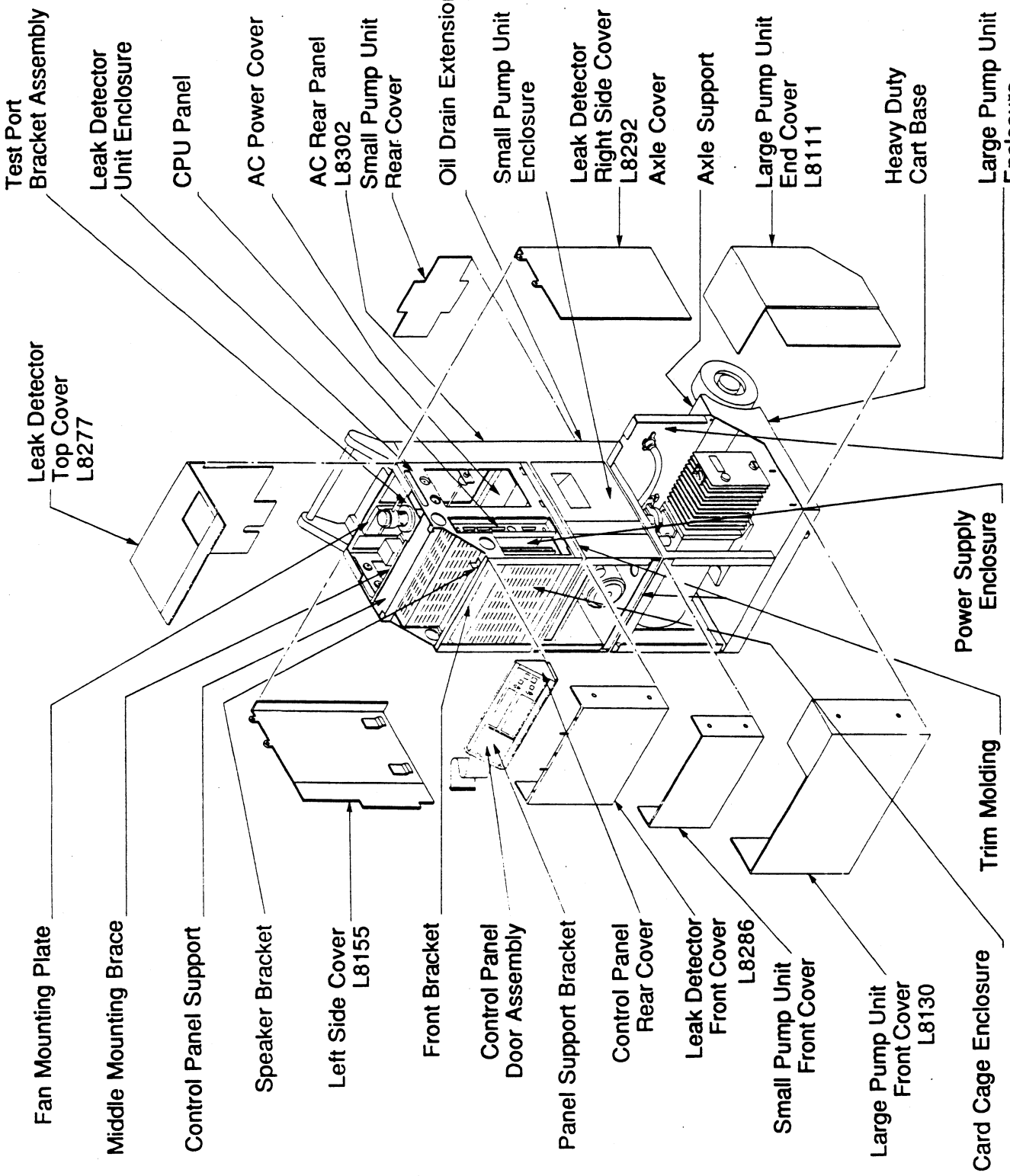
Remote Module, Part No. 956-0910

The calculator-type remote module displays leak rate readings with a visual bar graph and exponent and an audible alarm with adjustable volume. The module outputs leak rate readings in auto- or manual-ranging. Manual switching and auto-zero functions are included on the module and self-diagnostic codes are displayed. The Accessory Output option listed above is required with this module.

Gross Leak Valve Option, Part No. 956-0920



Model 956 Leak Detector with Small Cart, without Large Pump Unit



Model 956 Leak Detector with Large Pump Unit and Heavy-Duty Cart

RECOMMENDED SPARE PARTS KIT (9569901)
For Diffusion Pump Models

PARKER P/N	VARIAN P/N	QTY FOR ONE LEAK DETECTOR	DESCRIPTION/LOCATION
FOR THE SPECTROMETER TUBE			
2-025		3	O-Ring (Ion Source, Analyzing Magnets, Preamplifier)
2-212		1	O-Ring (Spectrometer Tube / Diffusion Pump)
FOR THE TEST PORT/FORELINE			
2-110		3	O-Ring (Foreline TC Gauge / Gross Leak)
2-220		1	O-Ring (Foreline Flange)
2-216		1	O-Ring (Test Port)
	Q1000301	1	NW 16 & Center Ring
	Q1000302	3	NW 25 & Center Ring
	624361040	1	Imperial 1/4" Viton sleeve (Gross Leak Option)
2-016		3	O-Ring (Gross Leak, Calibrated Leak, and Vent)
2-010		1	O-Ring (Calibrated Leak)
2-019		3	O-Ring (Ejector, Rough, and Test)
FOR THE DIFFUSION PUMP			
2-116		2	O-Ring (Valve)
2-225		2	O-Ring (Diffusion Pump Body)

All O-rings are "Viton" (Parker compound V747-75 or equal) unless otherwise specified.

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

P 9561011

ASSY NUMBER: 9561011 REV: Z DESCR: PT2D,MODU,115V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
	E	699909725	MANUAL,956 DP PT2	1	EA	
009			NUT KEPS 6-32 CAPLT	20	EA	KEPS
012			SCREW PAN HD PHIL 6-32 X 3/8 SSTEEL	21	EA	
024			NUT KEPS 6-32 CAPLT (SMALL PATTERN)	8	EA	KEPS
027			BRACE,MTG,MIDDLE	1	EA	
028	B	L8200301	PUMP ASSY,DIFF,115V	1	EA	
030			SCREW CAP SOC HD 10-32 X 1/2 SSTEEL	4	EA	
031			WASHER LOCK NO 10 SSTEEL	8	EA	
032	C	L8061301	S-TUBE ASSY	1	EA	
033			SCREW CAP SOC HD 10-32 X 5/8 SSTEEL	4	EA	
034			MOUNT,VIBRATION	5	EA	LORD 100PDL-8
035			WASHER SNUBBING	10	EA	LORD J-2049-1
036			SPACER MOUNT VIBRATION	3	EA	
037			SCREW CAP SOC HD 8-32 X 1 SSTEEL	5	EA	
038			WASHER LOCK NO 8 SSTEEL	7	EA	
039			O RING VITON PARKER 2-220 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
040			WASHER,PLAIN ,#6	33	EA	
043			BRKT,TEST PORT,PT2	1	EA	
051			SUPPORT,FRONT PANEL,PT2 ,	1	EA	
064			BRACE,FRT,PT2	1	EA	
065			SCREW FLT HD PHILLIPS 6-32 X 3/8 SSTEEL	2	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

P 9561011

ASSY NUMBER: 9561011 REV: Z DESCR: PT2D,MODU,115V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
066			PANEL ASSY CONTROL PT2	1	EA	
067			STRAIN RELIEF, PUSH MOUNT	4	EA	PANDUIT #PWMS-H-25
069	C	L8071301	HARNESS VALVE CONTR.	1	EA	
070	C	L8072301	CBL,ASSY,TC	1	EA	
071	C	L8073301	CBL,ASSY,ION SRC	1	EA	
072	C	L8074301	CBL,ASSY,PREAMP	1	EA	
074	D	L8016301	POWER SUPPLY ASSY PT2	1	EA	
075	D	L8017301	MAIN PCB&PANEL ASSY	1	EA	
076	P	L8286001	PANEL,FRONT	1	EA	
077			TAPE DOUBLE COATED 1 X 1/32 THK	5	FT	3M 4032
078	P	L8155001	PNL,LEFT,LD	1	EA	
079	P	L8292001	SIDE PANEL,FAB	1	EA	
080			SCREW PAN HD PHIL 8-32 X 3/8 SSTEEL	8	EA	
082			COVER,TOP PT2	1	EA	
083			STRIP,ACCNT #2	1	EA	
084			STRIP ACCENT,TOP COVER ,PT2	1	EA	
085			STRIP, ACCENT, PORTATEST II, PART A	1	EA	
086			SEAL,TEST PORT,PT2	1	EA	
087			COLLAR,TEST PORT,PT2	1	EA	
094			CABLE 13A, 125V	1	EA	BELDEN 17602
096			PLUG,HOLE 1.25 DIA	1	EA	HEYCO 2741 WHITE
100			CABLE TIE	4	EA	PANDUIT SST-1M
114			LBL,SYS DIAGR,DP	1	EA	

P 9561011

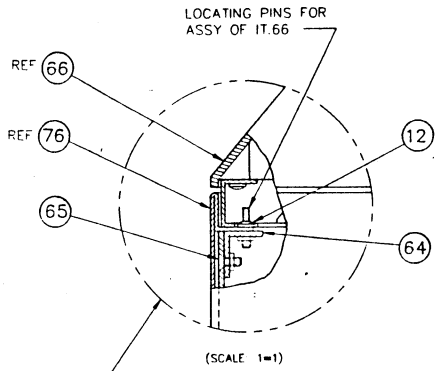
VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

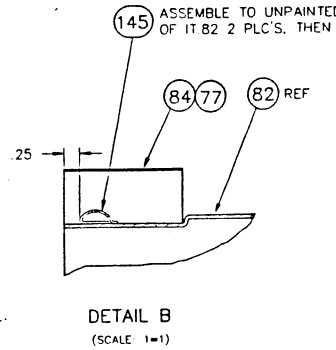
P 9561011

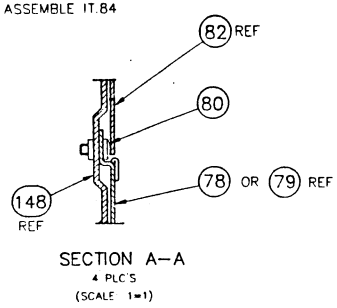
ASSY NUMBER: 9561011 REV: Z DESCR: PT2D,MODU,115V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

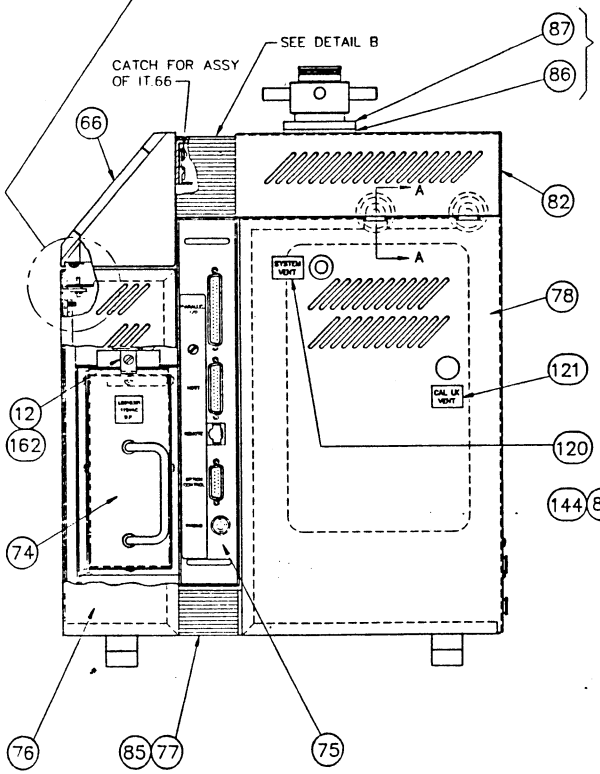
FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
120			LABEL,SYSTEM VENT	1	EA	
121			LABEL,CAL LK VENT	1	EA	
134			WIRE ASSY,CHASSIS	1	EA	
136			NUT KEPS 8-32 ZINC PLT	2	EA	KEPS
139			WASHER LOCK NO 6 SSTEEL	26	EA	
140			WASHER FLAT NO 10 SSTEEL (7/16 OD X .032THK)	3	EA	
142			O RING VITON PARKER 2-212 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
143			BKT,WELD,CALIB LEAK	1	EA	
144			WASHER FLAT NO 8 SSTEEL	2	EA	
145			SPRING SHIELDING RFI/EMI 3/8 LG.	4	EA	INSTRUMENT SPECIALTIES CO. #97-500-02 X=
145			SPRING SHIELDING RFI/EMI 3/8 LG.	6	EA	INSTRUMENT SPECIALTIES CO. #97-500-02 X=
146			CARD CAGE ASSY, 956 PT2	1	EA	
147	A	L8078301	MANIFOLD ASSY, 956 PT2	1	EA	
148			CHASSIS ASSY,956	1	EA	
161			LABEL	1	EA	BRADY DAT-48-969-10
162			MTG.CLAMP	1	EA	
164			MOLDING,TRIM	1	EA	SANTIN ENG.
164			PKG SET,PT2(NO CART)	0.03	EA	
165			PKG SET,LD W/CART	0.97	EA	

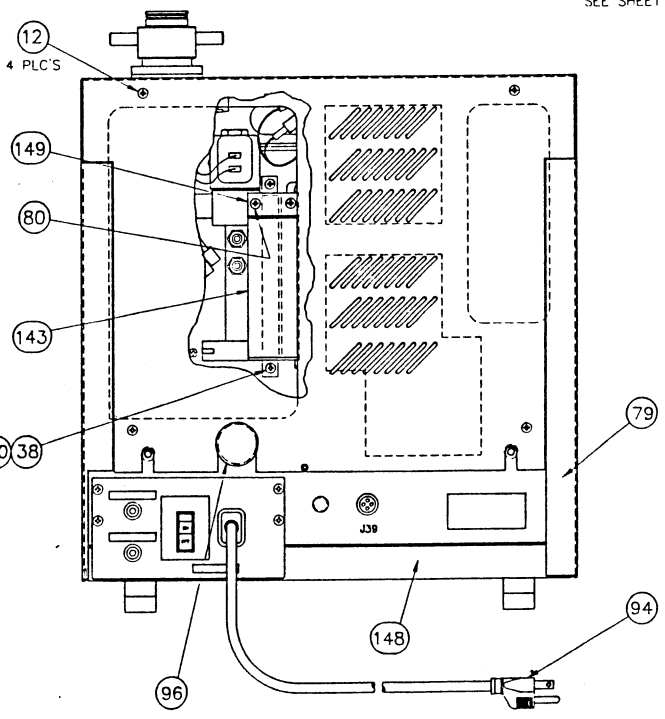
FIND	PART NUMBER	DESCRIPTION	QTY

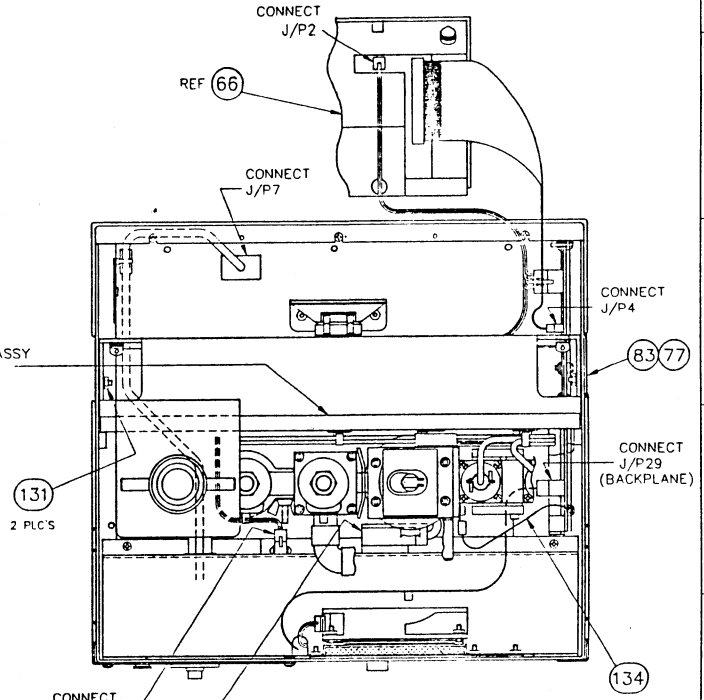












9561023	PT2D, MODU, 230V
9561011	PT2D, MODU.115V
ASSY NO.	DESCRIPTION

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES QA 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE

varian VACUUM PRODUCTS DIVISION

	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
	J.H	9/87			WGF	11/87	HMS	11/87

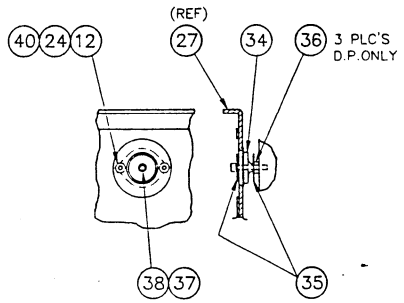
LEAK DETECTOR ASSY., D.P.

	6218	6183	6055	6059	ECO
	CWS	BW	BM	BM	DFT
	AMT	UPDATE	UPDATE	UPDATE	CHK
	11/6/89	9/19/89	6/20/89	6/19/89	DATE
	Z	Y	X	W	REV

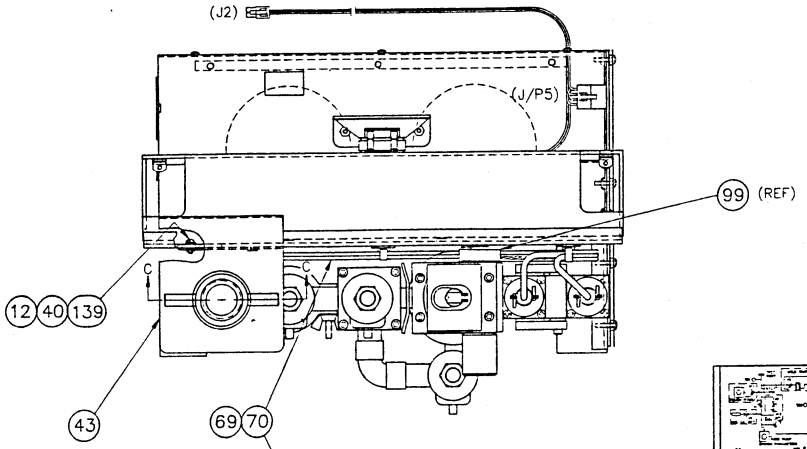
NOT OTHERWISE SPECIFIED
FRAC± 1/32 ANG±1/2
DEC XX± .020 .XXX± .005
FIN

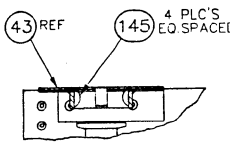
SIZE	DRAWING NO	REV
D	L8003	Z
SCALE 5=1	PROD 09	SHEET 1 OF 2

FIND	PART NUMBER	DESCRIPTION	QTY.

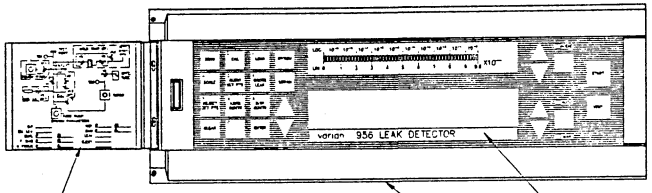


DETAIL B
5 PLC'S



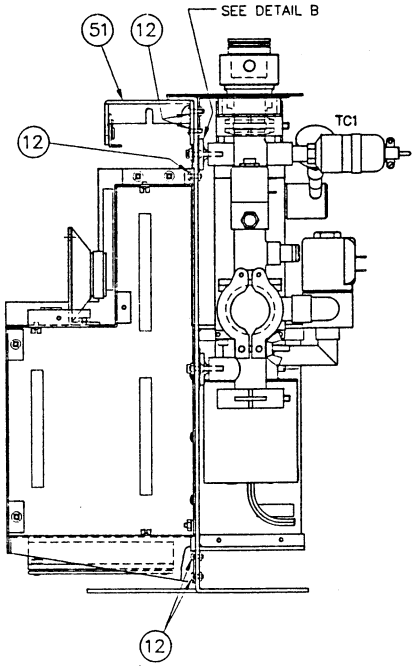


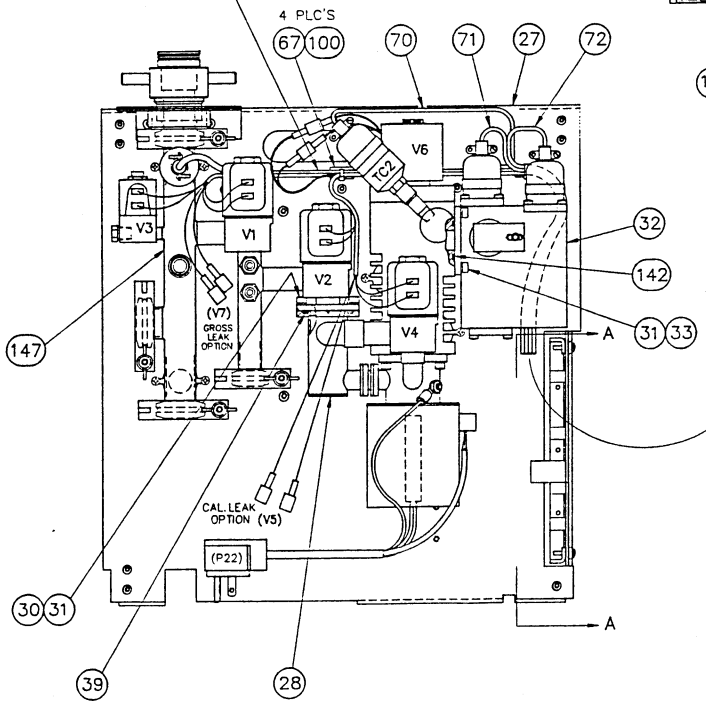
SECTION C–C
TEST PORT REMOVED

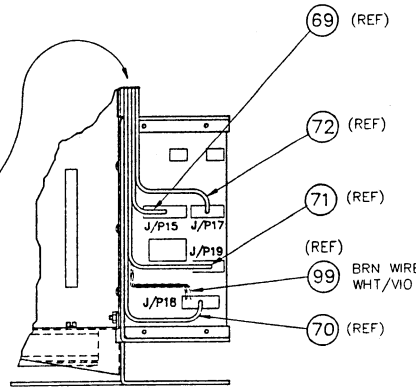


DETAIL D

NOTE:
ADD LABEL FOR 230V
PEEL BACKING OFF AND
PLACE LABEL SQUARELY
WITHIN OUTLINE.
PRESS LABEL FIRMLY
FROM ONE SIDE TO THE
OTHER TO REMOVE AIR
BUBBLES







VIEW A–A
CABLE CONNECTIONS

DO NOT SCALE DRAWING

PART	DESCRIPTION
CAD GENERATED DOCUMENT MANUAL CHANGES NOT PERMITTED	varian VACUUM PRODUCTS DIVISION

FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 0A 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE

	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE

LEAK DETECTOR ASSY. (D.P.)

FOR REV. SEE SHEET 1

ECO	NOT OTHERWISE SPECIFIED
DFT	FRAC± 1/32 ANG± 1/2
CHK	DEC.XX± .020 XXX± .005
DATE	CONC .005TIR
REV.	FIN. 63RMS

SIZE	DRAWING NO.	REV.
D	L8003	Z
SCALE 5=1	PROD. 09	SHEET 2 OF 2

P 9561023

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

P 9561023

ASSY NUMBER: 9561023 REV: Z DESCR: PT2D,MODU,230V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
	O	699909725	MANUAL,956 DP PT2	1	EA	
001			TEST PROCEDURES PT2 D.P.VERSION	0	EA	
009			NUT KEPS 6-32 CAPLT	20	EA	KEPS
012			SCREW PAN HD PHIL 6-32 X 3/8 SSTEEL	20	EA	
023						
024			NUT KEPS 6-32 CAPLT (SMALL PATTERN)	8	EA	KEPS
027			BRACE,MTG,MIDDLE	1	EA	
028	B	L8200302	PUMP ASSY,DIFF,230V	1	EA	
030			SCREW CAP SOC HD 10-32 X 1/2 SSTEEL	4	EA	
031			WASHER LOCK NO 10 SSTEEL	8	EA	
032	C	L8061301	S-TUBE ASSY	1	EA	
033			SCREW CAP SOC HD 10-32 X 5/8 SSTEEL	4	EA	
034			MOUNT,VIBRATION	5	EA	LORD 100PDL-8
035			WASHER SNUBBING	10	EA	LORD J-2049-1
036			SPACER MOUNT VIBRATION	3	EA	
037			SCREW CAP SOC HD 8-32 X 1 SSTEEL	5	EA	
038			WASHER LOCK NO 8 SSTEEL	7	EA	
039			O RING VITON PARKER 2-220 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
040			WASHER,PLAIN ,#6	33	EA	
043			BRKT,TEST PORT,PT2	1	EA	
051			SUPPORT,FRONT PANEL,PT2	1	EA	
064			BRACE,FRT,PT2	1	EA	
065			SCREW FLT HD PHILLIPS 6-32 X 3/8 SSTEEL	2	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

P 9561023

ASSY NUMBER: 9561023 REV: Z DESCR: PT2D,MODU,230V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
066	D	L8015301	PANEL ASSY CONTROL PT2	1	EA	
069	C	L8071301	HARNESS VALVE CONTR.	1	EA	
070	C	L8072301	CBL,ASSY,TC	1	EA	
071	C	L8073301	CBL,ASSY,ION SRC	1	EA	
072	C	L8074301	CBL,ASSY,PREAMP	1	EA	
074	D	L8016302	PS ASSY PT2 230V	1	EA	
075	D	L8017301	MAIN PCB&PANEL ASSY	1	EA	
076	P	L8286001	PANEL,FRONT	1	EA	
077			TAPE DOUBLE COATED 1 X 1/32 THK	5	FT 3M 4032	
078	P	L8155001	PNL,LEFT,LD	1	EA	
079	P	L8292001	SIDE PANEL,FAB	1	EA	
080			SCREW PAN HD PHIL 8-32 X 3/8 SSTEEL	8	EA	
082	P	L8277001	COVER,TOP PT2	1	EA	
083			STRIP,ACCNT #2	1	EA	
084			STRIP ACCENT,TOP COVER ,PT2	1	EA	
085			STRIP, ACCENT, PORTATEST II, PART A	1	EA	
086			SEAL,TEST PORT,PT2	1	EA	
087			COLLAR,TEST PORT,PT2	1	EA	
094	E	L8406301	POWER CORD ASSY,250V	1	EA	
114			LBL,SYS DIAGR,DP	1	EA	
120			LABEL,SYSTEM VENT	1	EA	
121			LABEL,CAL LK VENT	1	EA	
134			WIRE ASSY,CHASSIS	1	EA	

P 9561023

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

P 9561023

ASSY NUMBER: 9561023 REV: Z DESCR: PT2D,MODU,230V - DP LEAK DETECTOR (DWG. L8003) DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
135			ADHESIVE,LOCTITE 495	0.01	EA	
139			WASHER LOCK NO 6 SSTEEL	26	EA	
140			WASHER FLAT NO 10 SSTEEL (7/16 OD X .032THK)	3	EA	
142			O RING VITON PARKER 2-212 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
143			BKT,WELD,CALIB LEAK	1	EA	
144			WASHER FLAT NO 8 SSTEEL	2	EA	
145			SPRING SHIELDING RFI/EMI 3/8 LG.	2	EA	INSTRUMENT SPECIALTIES CO. #97-500-02 X=
146			CARD CAGE ASSY	1	EA	
147	O	L8078301	MANIFOLD ASSY, 956 PT2	1	EA	
148			CHASSIS ASSY 230V D.P.	1	EA	
149			LABEL FRONT 956 LEAK DETECTOR	1	EA	
150			LABEL	1	EA	BRADY DAT-48-969-10
160			FAN, 75CFM, 230V	2	EA	IMC #4710PS-23T-B30
162			MTG.CLAMP	1	EA	
163			SPRING SHIELDING RFI/EMI 3/8 LG.	4	EA	INSTRUMENT SPECIALTIES CO. #97-500-02 X=
163						
164						

C L8061301

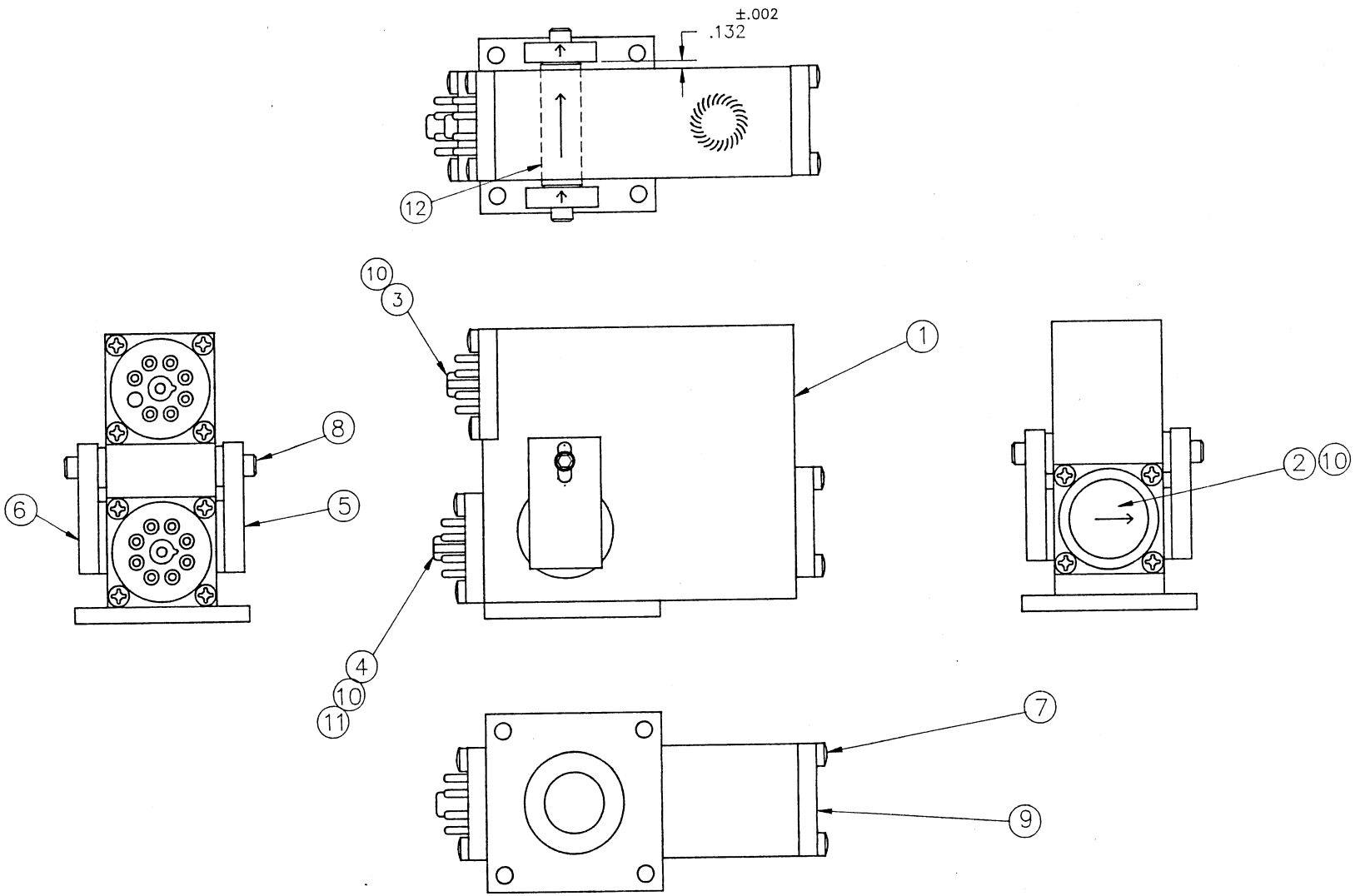
VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

C L8061301

ASSY NUMBER: L8061301 REV: D DESCR: S-TUBE ASSY DWG SIZE: C

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001	C	L8063001	BODY S-TUBE PT2	1	EA	
002	C	L8065301	MAGNET ANALYZING ASSY	1	EA	
003	O	K3333301	PRE-AMP SOLID STATE ASSY 936 LK DET	1	EA	
004	O	82850302	ION SOURCE ASSY	1	EA	
005	C	L8068301	INST ENH,MAG,LH,ASSY	1	EA	
006	C	L8068302	INST ENH,MAG,RH,ASSY	1	EA	
007			SCREW PAN HD PHIL 8-32 X 3/8 SSTEEL	12	EA	
008			SCREW CAP SOC HD 8-32 X 1/2 SSTEEL	2	EA	
009			FLANGE CAP	3	EA	
010			O RING VITON PARKER 2-025 V747-75 BLACK	3	EA	ACUSHNET COMPOUND F13329,BLACK
011	O	K3088001	GROUND PLATE 936 LK.DET.	1	EA	
012	C	L8064001	MAGNET ANHANCEMENT	1	EA	

FIND	PART NUMBER	DESCRIPTION	QTY.



DO NOT SCALE DRAWING

PART	DESCRIPTION
CAD GENERATED DOCUMENT MANUAL CHANGES NOT PERMITTED	varian VACUUM PRODUCTS DIVISION

FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES QA 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

5782	5800	5641	R0010	ECO
REV.	REV.	CMS	JJC	DFT
ADJUST	ADJUST	PJH	–	CHK
2/89	1/27/89	12/13/88	–	DATE

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
J.R.BURNS	10/87	J.QUILTY	10/87	F.NUZZI	10/87	P.J.H.	10/87

SPECTROMETER TUBE ASSY.

NOT OTHERWISE SPECIFIED
FRAC± 1/32 ANG±1/2
DEC.XX±.020 .XXX±.005

SIZE	DRAWING NO.	REV.
C	L8061301	D
SCALE	PROD.	SHEET 1 OF 1

D L8078301

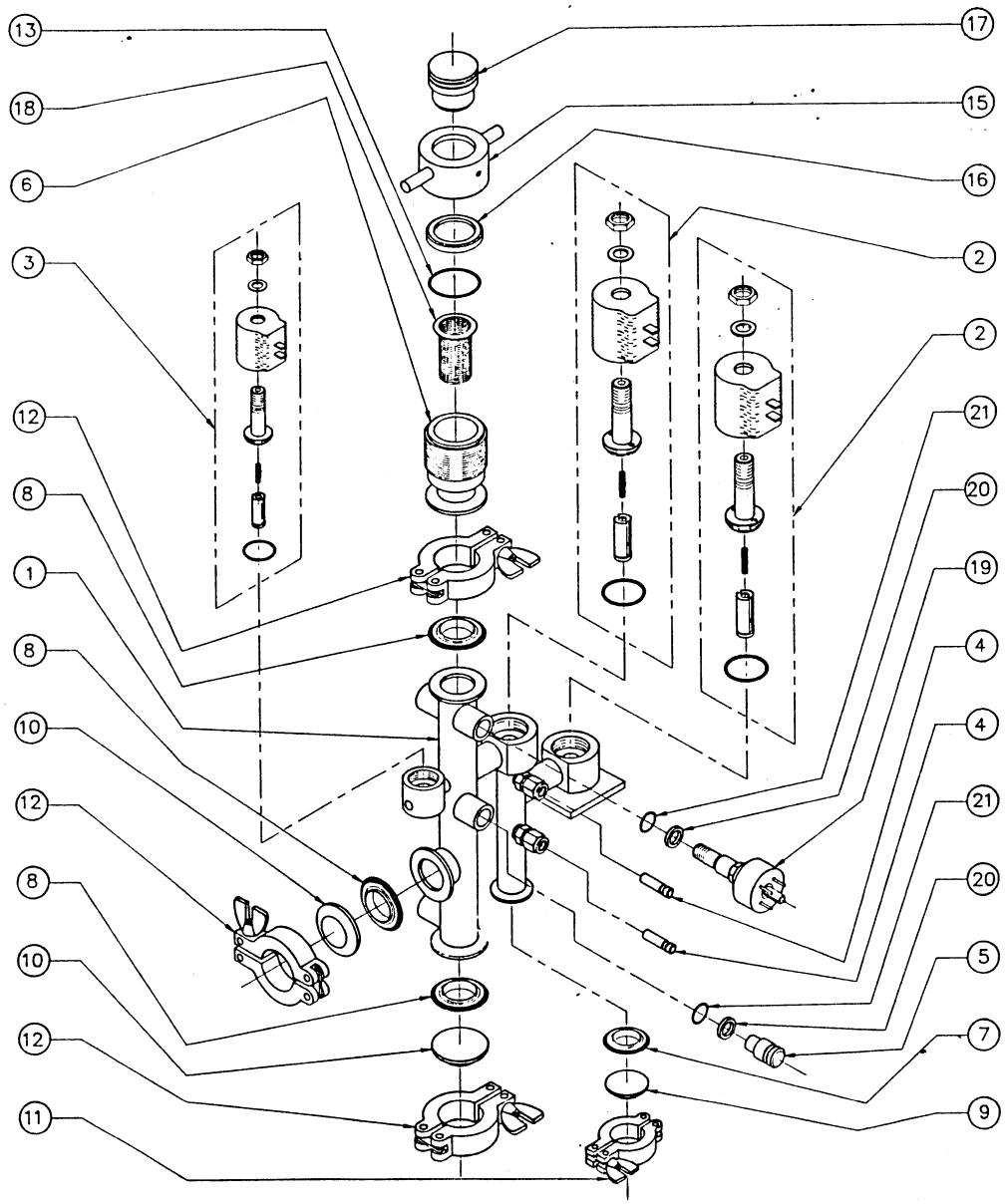
VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8078301

ASSY NUMBER: L8078301 REV: A DESCR: MANIFOLD ASSY, 956 PT2 DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001	0	L8014001	MANIFOLD/VALVE TEST PORT	1	EA	
002						
003						
004						
005						
006			PORT TEST,PT2	1	EA	
007	0	Q1000301	CENTER RING ASSY NW16 W/VITO	1	EA	800-0316
008	0	Q1000302	CENTER RING ASSY NW25 W/VITON O'RING	3	EA	800-0325
009	0	Q1003001	BLANK FLANGE NW16	1	EA	800-0916
010	0	625104050	FLANGE,BLNKOFF,NW25	2	EA	HPS 31-1603
011	0	635481016	CLAMP	1	EA	VARIAN TORINO 9594116
012	0	635481025	CLAMP	3	EA	VARIAN TORINO 9594125
013			O RING VITON PARKER 2-216 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
015			CAP	1	EA	
016			RING,TEST PORT	1	EA	
017			PLUG,TEST PORT,PT2	1	EA	
018			SCREEN ITEM 2	1	EA	
019			531 TC GAUGE ASSY	1	EA	
020			T.C.GAGE WASHER WAS 84120098	1	EA	
021			O RING VITON PARKER 2-110 V747-75 BLACK	2	EA	ACUSHNET COMPOUND F13329,BLACK

FIND	PART NUMBER	DESCRIPTION	QTY.



NOTES:

1. ASSEMBLY TO BE LEAK CHECKED 1×10^{-9} CC/SEC.
2. PROTECT DURING HANDLING AND STORAGE.

301	MANIFOLD AND TESTPORT
PART	DESCRIPTION

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES QA 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

varian VACUUM PRODUCTS DIVISION

	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
	C COMEAU	3-89						

MANIFOLD AND TESTPORT ASSY

L8004301,302			5782	ECO	NOT OTHERWISE SPECIFIED
L8003301,302			COMEAU	DFT	FRAC± 1/32 ANG±1/2
NEXT ASSY				CHK	DEC.XX±.020 .XXX±.005
			3-89	DATE	CONC .005TIR
			A	REV	FIN. 63RMS

SIZE	DRAWING NO.	REV.
D	L8078301	A
SCALE 1=1	PROD. 09	SHEET 1 OF 1

D L8200301

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8200301

ASSY NUMBER: L8200301 REV: S DESCR: PUMP ASSY,DIFF,115V DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001			BODY,DP,PT2	1	EA	
002			TUBE,WELDMENT,BOILER,PT2	1	EA	
003			BASE JET WELDMENT	1	EA	
004			DIFF,SECOND STAGE,DP	1	EA	
006			COVER BODY,DP,PT2	1	EA	
007			VALVE,SEAT,SERVICE	1	EA	
008			DIFF,FIRST STAGE,DP	1	EA	
009			REFLECTOR WELDMENT	1	EA	
010	O	626571054	VALVE 12DC,	1	EA	ASCO #U8030A17VH-12DC
011	B	L8383301	POWER CORD ASSY 115V	1	EA	
012	O	F0472301	531 TC GAUGE ASSY	1	EA	
013			O RING 2-225 VITON PER SPEC A93024	2	EA	PARKER
016			ROD, JET CONN.	1	EA	
017			NUT HEX 6-32 SSTEEL	4	EA	
018			WASHER FLAT NO 10 SSTEEL	2	EA	
019			SCREW CAP SOC HD 10-32 X 5/8 SSTEEL	8	EA	
020			WELDMENT,BAFFLE	1	EA	
021			O RING VITON PARKER 2-116 V747-75 BLACK	2	EA	ACUSHNET COMPOUND F13329,BLACK
022			INSULATION CERABLANKET .5 THK 8 LB DENSITY	0.2	SF	JOHNS MANVILLE
023			DISC,INSULATING	1	EA	
024			RET RING TRU 5000-112	1	EA	TRUARC 5000-112
030			WASHER,REFLECT,RET	1	EA	
032			NUT KEPS 10-32 CAPLT	1	EA	KEPS

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8200301

ASSY NUMBER: L8200301 REV: S DESCR: PUMP ASSY,DIFF,115V DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
033			WASHER LOCK NO 10 SSTEEL	8	EA	
034			TERMINAL (QUICK DISCONNECT MALE)	2	EA	HOLLINGSWORTH S05078
041			O RING VITON PARKER 2-110 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
042			ADAPTER,T.C. 90 DEG.	1	EA	
043						
044	B	L8362301	TEMP. SENSOR ASSY	1	EA	
045			SCREW PAN HD PHIL 8-32 X 3/4 SSTEEL	1	EA	
046			WASHER LOCK NO 8 SSTEEL	1	EA	
047	B	695405001	OIL SANTOVAC 5, 40CC, (IN 4 OZ BOTTLE)	1	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8200302

ASSY NUMBER: L8200302 REV: S DESCR: PUMP ASSY,DIFF,230V DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001			BODY,DP,PT2	1	EA	
002			TUBE,WELDMENT,BOILER,PT2	1	EA	
003			BASE JET WELDMENT	1	EA	
004			DIFF,SECOND STAGE,DP	1	EA	
006			COVER BODY,DP,PT2	1	EA	
007			VALVE,SEAT,SERVICE	1	EA	
008			DIFF,FIRST STAGE,DP	1	EA	
009			REFLECTOR WELDMENT	1	EA	
010	O	626571054	VALVE 12DC,	1	EA	ASCO #U8030A17VH-12DC
011	B	L8383302	POWER CORD ASSY 230V	1	EA	
012	O	F0472301	531 TC GAUGE ASSY	1	EA	
013			O RING 2-225 VITON PER SPEC A93024	2	EA	PARKER
016			ROD, JET CONN.	1	EA	
017			NUT HEX 6-32 SSTEEL	4	EA	
018			WASHER FLAT NO 10 SSTEEL	2	EA	
019			SCREW CAP SOC HD 10-32 X 5/8 SSTEEL	8	EA	
020			WELDMENT,BAFFLE	1	EA	
021			O RING VITON PARKER 2-116 V747-75 BLACK	2	EA	ACUSHNET COMPOUND F13329,BLACK
022			INSULATION CERABLANKET .5 THK 8 LB DENSITY	0.2	SF	JOHNS MANVILLE
023			DISC,INSULATING	1	EA	
024			RET RING TRU 5000-112	1	EA	TRUARC 5000-112
030			WASHER,REFLECT,RET	1	EA	
032			NUT KEPS 10-32 CAPLT	1	EA	KEPS

D L8200302

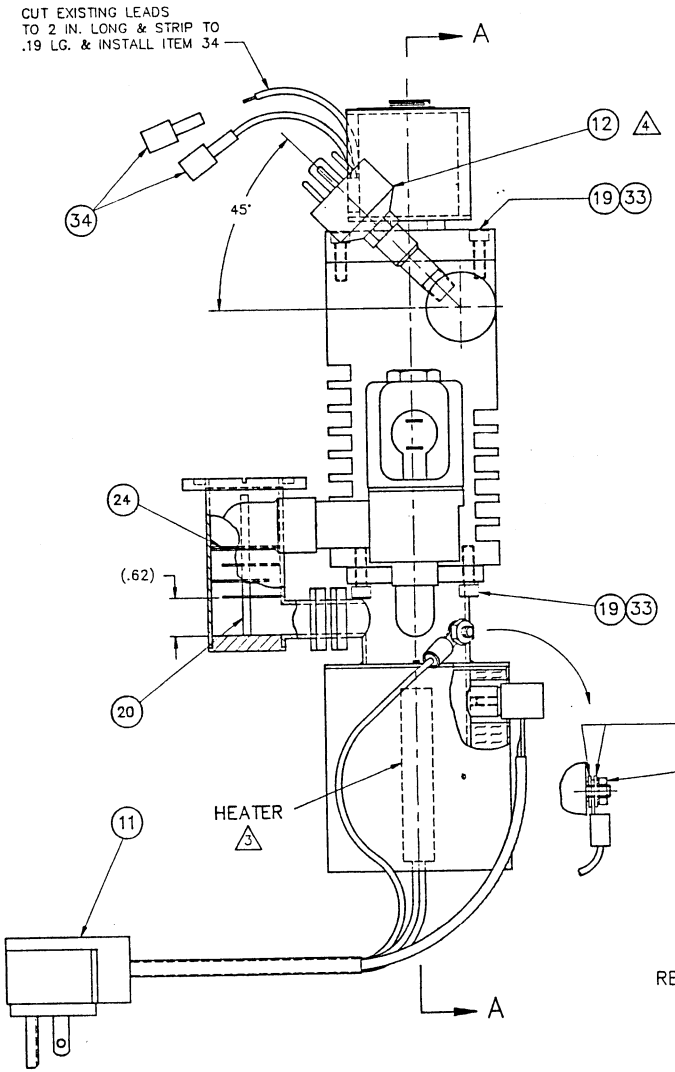
VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

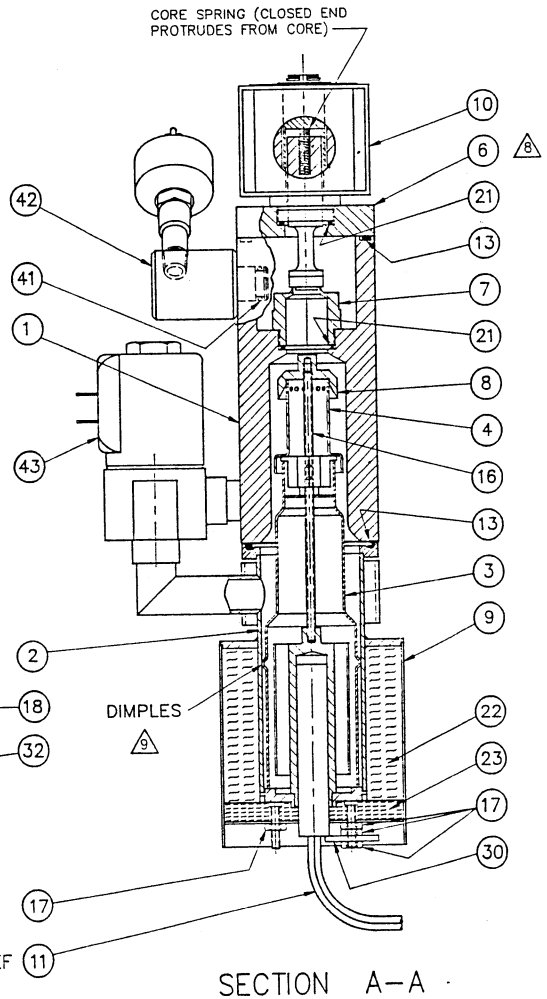
D L8200302

ASSY NUMBER: L8200302 REV: S DESCR: PUMP ASSY,DIFF,230V DWG SIZE: D

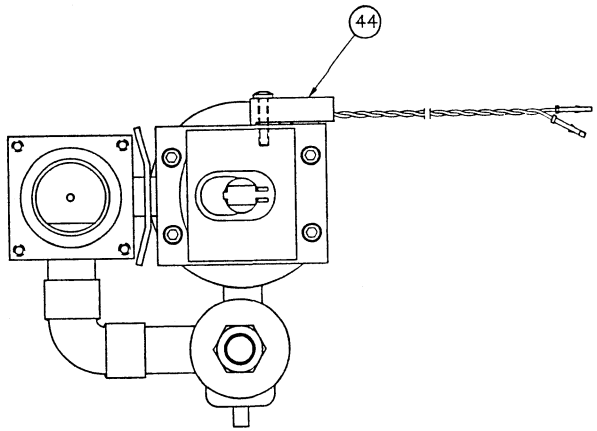
FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
033			WASHER LOCK NO 10 SSTEEL	8	EA	
034			TERMINAL (QUICK DISCONNECT MALE)	2	EA	HOLLINGSWORTH S05078
041			O RING VITON PARKER 2-110 V747-75 BLACK	1	EA	ACUSHNET COMPOUND F13329,BLACK
042			ADAPTER,T.C. 90 DEG.	1	EA	
043						
044	B	L8362301	TEMP. SENSOR ASSY	1	EA	
045			SCREW PAN HD PHIL 8-32 X 3/4 SSTEEL	1	EA	
046			WASHER LOCK NO 8 SSTEEL	1	EA	
047	B	695405001	OIL SANTOVAC 5, 40CC, (IN 4 OZ BOTTLE)	1	EA	

FIND	PART NUMBER	DESCRIPTION	QTY.





SECTION A–A



TOP VIEW

NOTES

1. FABRICATE PER QA–8000
2. PROTECT DURING HANDLING AND STORAGE
3. COAT OUTSIDE OF HEATER WITH "WATLUBE" ANTISIEZE COMPOUND
4. PIPE THREAD SEALING PROCEDURE–
   a. CLEAN THREADS PRIOR TO ASSEMBLY
   b. APPLY LOCTITE "PST" THREAD SEALANT TO SECOND AND THIRD THREADS FROM END, THEN ASSEMBLE
8. BEFORE ATTACHING ITEM 6, CHECK CONCENTRICITY OF ITEM 8 WITH ITEM 7, MUST BE WITHIN .020
9. 4 DIMPLES MUST BE FILED AT TIME OF ASSEMBLY FOR A SLIP FIT

SUFFIX	DESCRIPTION
–302	DIFFUSION PUMP ASSEMBLY 230 VAC
–301	DIFFUSION PUMP ASSEMBLY 115 VAC

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES QA 8000 AND/OR M–70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

varian VACUUM PRODUCTS DIVISION

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
M.MORGAN	5/87			J.QUILTY	10/87	WCF	10/87

DIFFUSION PUMP ASSEMBLY

5800	5690	5525	5378	ECO	NOT OTHERWISE SPECIFIED	D	L8200	S
REV	CMS	CMS	JMC	DFT	FRAC± 1/32 ANG±1/2	SIZE	DRAWING NO.	REV.
ADJUST		WCF	WCF	CHK	DEC.XX±.020 .XXX±.005			
L8003301, 302	2/89		9/21/88	6/88	DATE	CONC .005TIR	SCALE 1=1	PROD. 09	SHEET 1 OF 1
NEXT ASSY	S	H	G	F	REV	FIN.			

P 9569901 VARIAN ASSOCIATES P 9569901

VACUUM PRODUCTS DIVISION

PARTS LIST

ASSY NUMBER: 9569901 REV: C DESCR: KIT,SPARES,DP,NO.1 DWG SIZE: P

FIND	K	PART NUMBR	DESCRIPTION		QTY	UI	VENDOR / REFERENCE DATA
001	0	Q1000301	CENTER RING ASSY NW16 W/VITO	800-0	1	EA	
002	0	Q1000302	CENTER RING ASSY NW25 W/VITON O'RING	800-0	3	EA	
003	0	624361040	SLEEVE 1/4		4	EA	IMP. 60-FL 1/4
004			O RING VITON PARKER 2-010 V747-75 BLACK		1	EA	ACUSHNET COMPOUND F13329,BLACK
005			O RING VITON PARKER 2-016 V747-75 BLACK		3	EA	PARKER 2-016 V747-75 BLACK
006			O RING 2-019 VITON PER SPEC A93024		3	EA	PARKER
007			O RING VITON PARKER 2-025 V747-75 BLACK		3	EA	ACUSHNET COMPOUND F13329,BLACK
008			O RING VITON PARKER 2-110 V747-75 BLACK		3	EA	ACUSHNET COMPOUND F13329,BLACK
009			O RING VITON PARKER 2-116 V747-75 BLACK		2	EA	ACUSHNET COMPOUND F13329,BLACK
010			O RING VITON PARKER 2-212 V747-75 BLACK		1	EA	ACUSHNET COMPOUND F13329,BLACK
011			O RING VITON PARKER 2-216 V747-75 BLACK		1	EA	ACUSHNET COMPOUND F13329,BLACK
012			O RING VITON PARKER 2-220 V747-75 BLACK		1	EA	ACUSHNET COMPOUND F13329,BLACK
013			O RING 2-225 VITON PER SPEC A93024		2	EA	PARKER

SECTION VIII

GLOSSARY OF TERMS

ABSOLUTE PRESSURE

A term used in engineering literature to indicate pressure above the absolute zero corresponding to empty space as distinguished from "gauge" pressure. In vacuum technology, pressure is always absolute pressure, and therefore the term "absolute pressure" is redundant.

ABSORPTION

The binding of gas in the interior of a solid (or liquid).

ADSORPTION

The condensing of gas on the surface of a solid.

ATMOSPHERIC PRESSURE

The pressure of the atmosphere at a specified place and time. The standard atmosphere, or normal atmosphere, is defined (independently of barometric height) as a pressure of 1,013,250 dyne/cm^2.

AUDIBLE LEAK INDICATOR

An auxiliary component of a leak detector which converts the output signal to an audible note whose frequency is a function of the leak size.

BACKGROUND

An output signal of the leak detector due to entrapment of the tracer gas or other substance to which the detecting element responds in the vacuum system which cannot be quickly removed by pumping. A virtual leak of the tracer gas.

BACKGROUND SIGNAL

The steady or fluctuating output signal of the leak detector caused by the presence of residual tracer gas or other substance to which the detecting element responds.

BAKE-OUT

The degassing of a vacuum system by heating during the pumping process.

BOMB TEST

A form of leak test in which enclosures are pressurized with tracer gas for the purpose of driving it through possible leak passages and thus into the internal cavities. Subsequent leak testing is done by evacuation or immersion (see Helium Bombing).

BUBBLE TEST

A form of leak testing gas-containing enclosures in which a leak is indicated by the formation of a bubble at the site of a leak.

COLD TRAP

A vessel designed to hold a refrigerant and which, when inserted into a vacuum system, will trap on its surface condensable vapors present in the vacuum system. Most traps operate with liquid nitrogen at a temperature of -196°C (-320°F).

CONTRA-FLOW™

A technique that utilizes the differences in the maximum compression ratios of the tracer gases (such as helium) and other gases found in the air. When the tracer gas exceeds its maximum compression ratio, it diffuses backwards through the diffusion pump and is detected by the spectrometer tube.

DIFFUSION PUMP

A vapor pump having boiler pressures less than a few Torr and capable of pumping gas at intake pressures not exceeding about 2 milliTorr and discharge pressures (forepressures) not exceeding about 500 milliTorr.

FINE LEAK

A leakage rate of less than 10^{-4} std cc/sec.

FORELINE VALVE

A vacuum valve placed in the foreline to permit isolation of the diffusion pump from its fore pump.

FOREPUMP

The pump which produces the necessary fore vacuum for a pump which is incapable of discharging gases at atmospheric pressure. Sometimes called the backing pump.

GROSS LEAK

A leakage rate never more than 10^{-4} std cc/sec.

HELIUM BOMBING

A method of testing for leaks in which hermetically-sealed units containing an internal volume are subjected to a helium pressure. If leaks are present in the sealed unit, the helium pressure will drive some helium into the internal volume and this may be subsequently detected during bell jar testing or immersion in a hot fluid to detect bubbles. (See BOMB TEST.)

ION SOURCE

That part of a leak detector tube in which the trace gas is ionized prior to being detected.

LEAK RATE

The rate of flow through a leak with a specified gas (at a specified pressure on the inlet and exit sides). Preferred units: Standard cc/sec of a specified gas. Standard gas conditions: 760 mm pressure (absolute), 25°C (77°F) temperature.

MASS SPECTROMETER LEAK DETECTOR

A mass spectrometer adjusted to respond only to the tracer gas. Helium is commonly used as the tracer gas, and thus the instrument is normally referred to as a helium leak detector.

MILLISECOND

One one thousandth of a second.

MILLITORR

A unit of pressure equal to 10^{-3} Torr (1/1000 Torr).

MINIMUM DETECTABLE LEAK RATE

The magnitude of the smallest leak rate that can be unambiguously detected by a given leak detector (in the presence of noise and background).

OUTGASSING

The evolution of gas from a material in a vacuum.

PARAMETERS, TESTING

The controlled circumstances under which a test is conducted.

PRESSURE TESTING

A leak testing procedure in which tracer gas is introduced under pressure into or around the enclosure under examination, and detected as it is emitted from a leak.

PROBE

A tube having a fine opening at one end, used for directing or collecting a stream of tracer gas.

PROBE TEST

A leak test in which the tracer gas is applied by means of a probe so that the area covered by the tracer gas is localized. This enables individual leaks to be located.

ROUGH PUMP

A vacuum pump used for the initial evacuation of a vacuum system.

ROUGHING

The initial evacuation of a vacuum system.

ROUGHING VALVE

A vacuum valve placed in a roughing line to isolate the test port and vacuum system from the roughing pump.

SENSITIVITY

In the case of a leak detector, the response of the detector to tracer gas leakage (that is, scale division per unit leak rate).

SPECTROMETER TUBE

The sensing element of a helium leak detector.

STANDARD LEAK

(1) A capillary or porous wall leak, usually in a glass or metal tube, whose dimensions have been adjusted to give a specified leak rate of a gas at a standard temperature with specified inlet and exit pressures. (2) A device that permits a tracer gas to be introduced into a leak detector or leak testing system at a known rate to facilitate tuning and calibration of the leak detector. Also known as a calibrated leak.

TORR

Pressure unit used to replace the term millimeter of mercury (mm of Hg). The Torr is defined as 1/760 of a standard atmosphere or 1,013,250 dynes/cm^2.

VIRTUAL LEAK

The semblance of a leak in a vacuum system caused by slow release of trapped gas.

SECTION IX

SCHEMATIC DIAGRAMS

This section contains the following schematic diagrams and includes a description of the operation of the Power Supply circuit (following drawing D-L8022).

Title	Drawing No.
System Interconnect - 956 Portable Leak Detector	D-L8001
Printed Circuit Board Main Assembly (with parts list)	D-L8020
Main Printed Circuit Board Schematic Diagram	D-L8022
Power Supply Schematic Diagram	D-L8025
Auxiliary Power Supply Assembly Printed Circuit Board (with parts list)	D-L8026
Auxiliary Power Supply Printed Circuit Diagram	D-L8028
Backplane Printed Circuit Board Power Supply Schematic Diagram	D-L8031
Control Panel Assembly (with parts list)	D-L8032
Control Panel Printed Circuit Board Schematic Diagram	D-L8034
Control Panel Keyboard Schematic Diagram	C-L8345
Main Power Panel Schematic Diagram	D-L8409
Cart AC Power Assembly Schematic Diagram	—

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FIND	PART NUMBER	DESCRIPTION	QTY.

L.D. POWER ENCLOSURE
CB1
CB2
SW1
EM1
EM2
RY 3
TB1
P/J 20
P/J 21
P/J 22
P/J 39
P/J 31
P/J 28
SERVICE
L8433301
TURBO PUMP
L8118301
DIFF. PUMP
L8118302
CARD CAGE
L8433302
SM. PUMP ENCL. (TURBO)
L8415001
FANS

TURBO P/S
L8385301
P/J 40
L8386301
P/J 41
D.P. PUMP
P/J 42
TURBO PUMP
FORE PUMP
1.2 CFM
L8368301

BACKPLANE
L8029301
P/J 16
P/J 29
P/J 6
P/J 9
P/J 7
P/J 5
P/J 4
P/J 8
P/J 15
P/J 17
P/J 18
P/J 19

LVPS BOARD
L8023301
1. D.P. REGULATOR
2. ION SOURCE REG.
3. +5 @ 8A
4. +24 @ 3.5A
5. +12 @ 3A
6. ±15 @ 0.5A
7. +9 @ 1.0A
8. +24 @ 2A
J 30
P 30

HV BOARD
L8026301
1. FILAMENT BIAS
2. SUPPRESSOR
3. ION CHAMBER
4. FIXED FOCUS
5. VARIABLE FOCUS
6. REPELLER

CART POWER ENCLOSURE
CB3
CB4
CB5
TB3
RY 4
RY 5
P2
SERVICE
P/J 33
J32
L8377301
P/J 36
P/J 34
P/J 35

ROUGH PUMP VALVE V11
ROUGH PUMP
7, 11, 17 CFM

SPEAKER
L8312301
P/J 2
L8311301
P/J 3
FRONT PANEL BOARD
L8032301
(P/J 1)
FRONT PANEL DISPLAY
(P/J 4)
L8079301

CPU BOARD
L8020301
1. CPU
2. ROM, RAM, CLOCK
3. DISCRETE LOGIC
4. FREQ. GENERATORS
5. ADDR. ICS DECODERS
6. HELIUM SIG. INTEGRATE
7. D/A CONVERTERS
8. A/D CONVERTERS
9. V/F CONVERTERS
10 PARALLEL I/O
11. SERIAL I/O
12. RESET LOGIC
13. VALVE DRIVERS
14. TC DIFF. AMPS
15. REFERENCES (VOL)
16. ANALOG MUX.
17. AUDIO DRIVER

PARALLEL I/O
P/J 10
(PINS 34 & 35 TO RECORDER– NOT SUPPLIED)
HOST COMPUTER
P/J 11
P/J 12
J13
PHONG JACK
J 14

REMOTE CONTROL BOARD
L8035301
P/J 47
J/P 46
REMOTE CONTROL DISPLAY
L8342301

L8071301
V1 ROUGH
V2 TEST
V3 VENT
V4 BYPASS
V5 CAL LEAK OPTION
V6 ISOLATION
V7 GROSS LEAK OPTION

L8074301
P/J 24 PREAMP
L8362301
TEMP. SENSOR
P/J 25 TEST PORT PRESS TC1
L8072301
P/J 26 SYSTEM PRESS. TC2
L8073301
P/J 23 ION SOURCE

REF. DESIGNATIONS	
LAST	UNUSED
P/J 47	

DO NOT SCALE DRAWING

PART	DESCRIPTION

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES QA 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

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	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
	C COMEAU	10/88						

SYSTEM INTERCONNECT
PORTATEST II

ECO			NOT OTHERWISE SPECIFIED	D	L8001	B
DFT	CMS	C COMEAU	FRAC± 1/32 ANG±1/2			
CHK			DEC.XX±.020 XXX±.005	SIZE	DRAWING NO.	REV.
DATE		10/88	CONC .005TIR			

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2 DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001		PCB,PT2,MAIN	1	EA	
002		CAPACITOR .01UF,50V,10% REELED C1,C3-C11,C14,C15,C65 C17-C22,C24-C26,C93-C95 CC28-C32,C34,C50-C52 C57-C60,C62,C67-C70,C92 C76,C107,C108,C110-C121 C125,C131,C461-466,C109	68	EA	UNITRODE #CGB103KDX
003		CAPACITOR .22 UF, 50V (REELED) C2	1	EA	UNITRODE CGE224MDZ
004		CAPACITOR .47 UF, 50V C47,C98-C102,C23	7	EA	MURATA/ERIE RPA4025U474M50VPT
005		CAPACITOR .1MF,50V,20%,(REELED) C13,C54,C55,C61,C63, C64,C66,C72-C75, C77-C79,C103,C122-C124, C128,C129,C133-C142,	31	EA	AVX SA105E104MAA (FIRST CHOICE)
006		RESISTOR 1K OHM 1/4W 1% MF R11,R27,R59,R130,R148,R156 R163, R169,R185,R188	10	EA	DALE TYPE CCF-55
007		RESISTOR 1 M 1/4W 1PC MF R178	1	EA	DALE TYPE CCF-55
008		RES.,NET,7 X4700 RN3	1	EA	
009		RES,MF,1.50 M ,1/4 W R10	1	EA	
010		RES.NET.,8 X1K RN5	1	EA	
011		RESISTOR 2.2K SIP, 5RES RN1,RN4	2	EA	DALE MSP06A01-222G
012		RES,MF,2000 ,1/4 W R54	1	EA	

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2 DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
013		RESISTOR 15 RES DIP RN6-RN8	3	EA	BECKMAN 898-1-RIK
014		RES,MF,2870 ,1/4 W R43	1	EA	
015		RES,MF,4990 ,1/4 W R39,R50,R51,R52,R26,R33	6	EA	
016		RESISTOR 8.25K 1/4W 1PC MF R186	1	EA	DALE TYPE CCF-55
017		RES,MF,5110 ,1/4 W R131,R138,R176	3	EA	
018		CRYSTAL 5.0688MHZ Y2	1	EA	RCD MP050
019		CAPACITOR 6.8UF 35WDC +/-10PC TAN C56,C71	2	EA	SPRAGUE 199D685X9035DA1
020		RESISTOR 6.81K 1/4W 1PC MF R28	1	EA	DALE TYPE CCF-55
021		RES,MF,7150 ,1/4 W R45	1	EA	
022		RES,MF,5.1 ,1 W R32	1	EA	
023		RESISTOR 10 K 1/4W 1PC MF R42,R44,R61,R132,R140,R145 R147,R159,R168,R181,R184,R187 R174,R177,R30	15	EA	DALE TYPE CCF-55
024		RES,MF,10.0 K ,1/2 W R31	1	EA	
025		CRYSTAL,12.000 MHZ Y1	1	EA	
026		RES,MF,15.0 ,1/4 W R153,R166	2	EA	
027		RES,MF,20.0 K,1/4 W R36,R135,R142	8	EA	

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2

DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			R151,R160,R171,R180,R182			
028			CAPACITOR RB# 41TBD C35-C42	8	EA	SPRAGUE 513D226M025JA4
029			RES,MF,33.2 K ,1/4 W R183	1	EA	
030			RES,MF,47.5 K ,1/4 W R179	1	EA	
031			RES,MF,39.2 ,1/2 W R100	1	EA	
032			RES,MF,45.3 K,1/4 W R133	1	EA	
033			RES,MF,100 K ,1/4 W R47,	1	EA	
034			RESISTOR 2.21K OHM 1/4W 1% R3-R7,R9,R16, R22,R49,R136	10	EA	DALE TYPE CCF-55
035			RESISTOR 180 OHM 8 PIN SIP 7 RES RN2,RN9	2	EA	DALE MSP08C01-181G
036			RES,MF,182 ,1/4 W R137	1	EA	
037			RESISTOR 750K 1/4W 1PC R129,R175	2	EA	STACKPOLE RN1/4(TI) 750K
038			RES,MF,221 ,1/4 W R29	1	EA	
039			RES,MF,453K, 1/4 W R149,R158,R164,R170,	4	EA	
040			RES,MF,464 ,1 W R189	1	EA	
041			RES,MF,475 K ,1/4 W R8	1	EA	
042			RESISTOR 511 OHM 1/4W 1PC MF R1,R2	2	EA	DALE TYPE CCF-55

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2

DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
043		DIODE IN457A CR19,CR20	2	EA	IN457A FAIRCHILD NO SUBSTITUTE
044		CAPACITOR 33 PF, 50V C12	1	EA	UNITRODE CGB330KEN
045		DIODE IN4005 CR4,CR6,CR7,CR10,CR15,CR18 CR21,CR24,CR28,CR30,CR31-CR34	14	EA	IN4005
046		DIODE IN4148 CR1,CR3,CR8,CR11,CR13 CR16,CR22,CR25	8	EA	IN4148
047		DIODE IN4740 ZENER10V-25MA CR26	1	EA	MOTOROLA IN4740
048		IC SI8601DJ U54	1	EA	SILICONIX SI8601DJ
049		IC DS-1216B U23	1	EA	DALLAS SEMICONDUCTOR
050		IC DS-1225Y U24	1	EA	DALLAS SEMICONDUCTOR DS-1225Y
051		RESistor 54.9K 1/4W 1%mf R48	1	EA	DALE TYPE CCF-55
052		IC 74LS02 PEP-3 OR EQUAL U4,U27,U28	3	EA	T.I. 74LS02 PEP-3 OR EQUA
053		IC SN74LS08N U25,U31	2	EA	T.I. SN74LS08N
054		IC SN74LS14N U3,U35	2	EA	T.I. SN74LS14N
055		INT.CKT.#74LS30 U13	1	EA	74LS30
056		IC SN74LS32N RB# 162-600886 U11,U32	2	EA	T.I. SN74LS32N
057		INT.CKT.#74LS76 U20	1	EA	74LS76

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2

DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
058			IC SN74LS138 LEVEL II (D) OR EQUAL U15	1	EA	MOTOROLA SN74LS138
059			INT.CKT.#74LS139 U66	1	EA	74LS139
060			INT.CKT.#74LS154 U12,U16,U17	3	EA	74LS154
061			IC SN74LS240 LEVEL II (D) OR EQUAL U33,U37,U41,U43	4	EA	MOTOROLA SN74LS240
062			IC SN74LS244N PEP-3 OR EQUAL U40	1	EA	T.I. SN74LS244N PEP-3 OR EQ
063			INT,CKT.#SN74LS245N U9	1	EA	SN74LS245N
064			DIODE CR27,CR35	2	EA	ITT IN270
065			INT.CKT.#N74LS368AN U5	1	EA	N74LS368AN
066			INT.CKT.#74LS393 U29	1	EA	74LS393
067			CONN,DIN,96 MALE PA8,PA9,PB8,PB9,PC8,PC9	2	EA	
068			IC 7406 PEP-3 OR EQUAL U71,U84	2	EA	T.I. SN7406N3
069			IC SN7407 HEXBUFFER DR. PEP-3 OR EQUAL U18	1	EA	T.I. SN7407 PEP-3 OR EQUA
070			REGULATOR PLUS 5VDC VR1	1	EA	UA7805CKC PEP-3 PLUS 5V
071			INT.CKT.#P8088 U2	1	EA	P8088
072			IC P8251A U45,U48	2	EA	INTEL P8251A
073			IC P8253	3	EA	INTEL P8253

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PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2 DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
		U34,U36,U83			
074		IC P8255A U38,U42,U44	3	EA	INTEL P8255A
075		INT.CKT.#P8259 U22	1	EA	P8259
076		INT.CKT.#P8284 U1	1	EA	P8284
078		IC V/F 1MHZ 460J U59	1	EA	ANALOG DEVICES V/F 1MHZ 460J
080		IC U39	1	EA	STD MICROSYSTEM CORP. COM-8146P
082		IC DG201ABK U60,U62	2	EA	SILICONIX DG201ABK
087		IC Q1,Q3-Q9	8	EA	IRF 510
089		IC LM311P U82	1	EA	T.I. LM311P
091		IC MAX232CPEDUAL RS232 TRAS/RECEIVER 16 PIN DIP U46,U49	2	EA	MAX232CPE 32CPE
092		IC NE555N U30	1	EA	RCA NE555N
093		IC PMI OP 04 DY U73	1	EA	PMI OP 04 DY
094		IC PMI OP07CP RB# 6260136000 U58,U72,U76,U78 U55,U57,U63,U65,	8	EA	PMI OP07CP
097		CAPACITOR 1 MF 50 V C96	1	EA	SPRAGUE 2C20Z5U105M050B
098		CAP,AL, 470MF,35 V C49,C459	2	EA	
099		CAP,AL,470 MF, 63V C460	1	EA	

D L8020301

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2

DWG SIZE: D

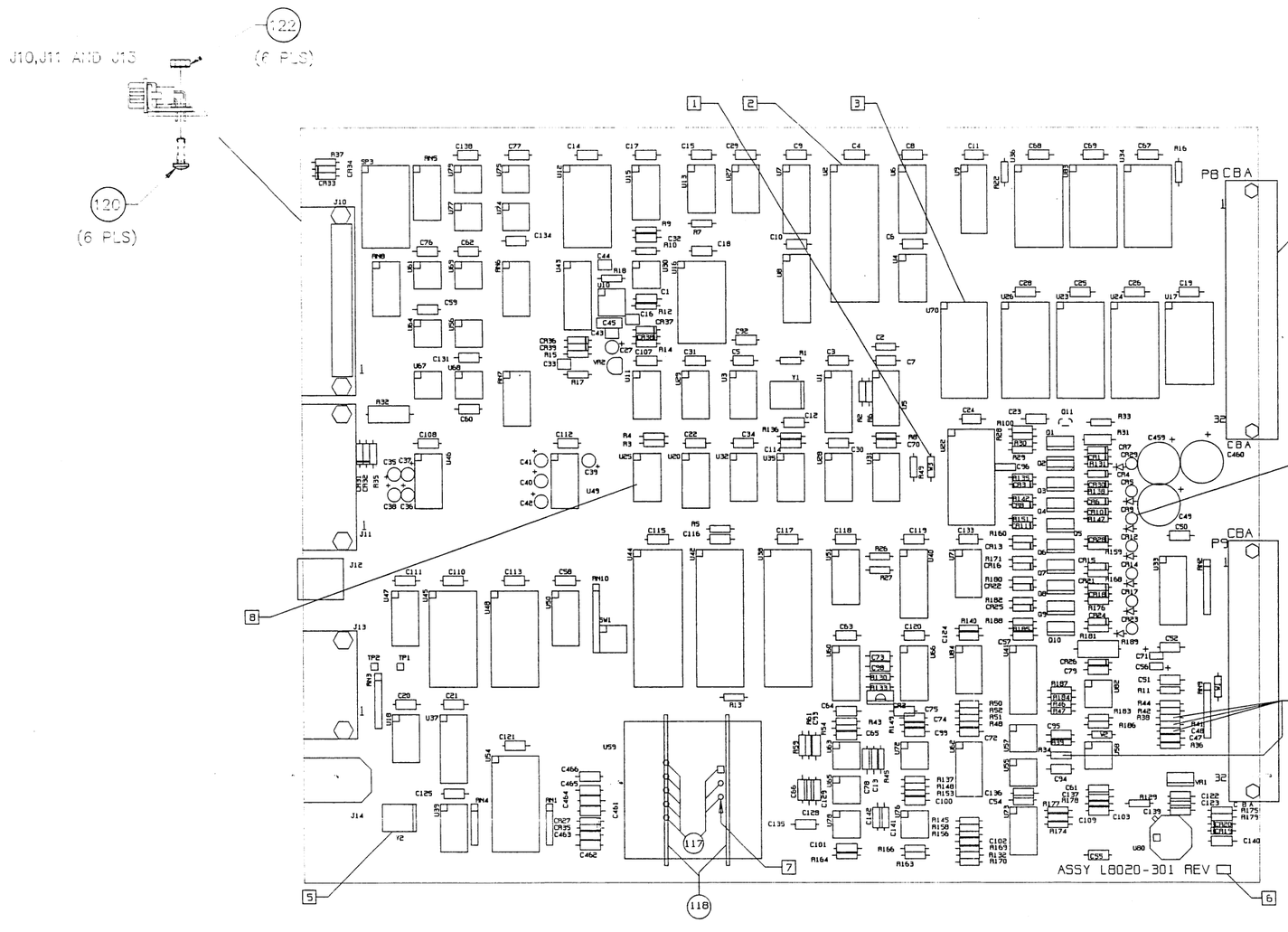
FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
100			CONN.,D-MIN, 15 SOC. J13	1	EA	
101			CONN.,D-MIN,25 SOC. J11	1	EA	
102			CONN.,D-MIN, 37 SOC. J10	1	EA	
103			INT.CKT.#SN74LS373N U6,U7,U8	3	EA	SN74LS373N
104			EPROM A PROGRAMMED REV. 1.03 U26	1	EA	
105			IC FET OPERATIONAL AMPLIFIER U80	1	EA	ANALOG DEVICES AD545AM OR AD545AKH
106			IC AD558KN U47,U50,U51	3	EA	ANALOG DEVICES AD558KN
107			TRANSISTOR,#D40K1 Q2	1	EA	D40K1
108			TRANSISTOR Q11	1	EA	MOTOROLA 2N3904
109			ISOLATOR,OPTO U56,U61,U64,U67-U69 U74,U75,U77,U79	10	EA	
110			DISPLAY (LED DISPLAY) CR5,CR9,CR12,CR14,CR17,CR23 CR29	7	EA	HP HLMP-1700 (LED DISPLAY)
111			TRANSISTOR HEXFET Q10	1	EA	INTN'L RECTIFIER IRF9520
112			INT.CKT.#LM336Z-5.0 CR2	1	EA	LM336Z-5.0
113			CONN PHONE,PCB J12	1	EA	VIRGINIA PLASTIC #R/A 020.000.010
114			JACK PHONE R/A PC MOUNT J14	1	EA	RN112APC SWITCHCRAFT

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8020301 REV: Q DESCR: PCB ASSY MAIN PT2 DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
115			SOCKET 28 pin dip	4	EA	AMP #2-640362-2
116			SOCKET 40 pin dip	1	EA	AMP #2-640379-2
117			SOCKET	8	EA	AMP.NO. 50865-8
118			MOUSE TAIL 3IN LOG.	2	EA	RUBBER-TECK 2829-75-3
119			TAPE DOUBLE COATED 1 X 1/32 THK	0.08	FT	3M 4032
120			SCREW PAN HD 4-40 X 3/8 SSTEEL	6	EA	
121			SCREW PAN HD 2-56 X 1/2 SSTEEL	4	EA	
122			NUT KEPS 4-40 CAPLT	6	EA	KEPS
123			NUT HEX 2-56 SSTEEL	4	EA	
124			RES,MF,5.11M, 1/4 W R46,	1	EA	
125			RES,MF,10.0 ,1/4 W R35,R37	2	EA	
126			WIRE SOLID BUSS. 22 AWG. W1,W2	0.13	FT	
127			WIRE 18 AWG WHITE STRANDED NABOND (BUNCHED TIN) TYPE	0.67	FT	
128			RESISTOR 11.8K 1/4W PM1PC R13	1	EA	DALE TYPE CCF-55

FIND	PART NUMBER	DESCRIPTION	QTY.



NOTES

1. DO NOT ASSEMBLED W3.
2. U2 IS ASSEMBLED WITH A SOCKET (ITEM 116).
3. U70,U26,U23 AND U24 ARE ASSEMBLED WITH SOCKETS (ITEM 115).
4. DO NOT ASSEMBLE R34,R38,R41 AND C48.
5. USE ITEM #119 TO MOUNT Y1 & Y2 ON THE PC BOARD.
6. CLEARLY MARK REV IN INDELIBLE BLACK INK AREA SHOWN.
7. STRIP & TIN ITEM 127 0.12" ON BOTH ENDS & SOLDER BETWEEN U59-3 & PC9-16 ON SOLDER SIDE.
8. U25 ARE ASSEMBLED WITH SOCKET (ITEM 134).

DO NOT SCALE DRAWING

PART	DESCRIPTION
CAD GENERATED DOCUMENT MANUAL CHANGES NOT PERMITTED	varian VACUUM PRODUCTS

FABRICATE IN ACCORDANCE WITH VARIAN WORKMANSHIP STANDARDS VTED 2000.

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
	O.ANTONINI	10/87	M.R.B.	10/87	J.QUILTY	10/87	W.O.F.	10/87

PCB ASSY MAIN

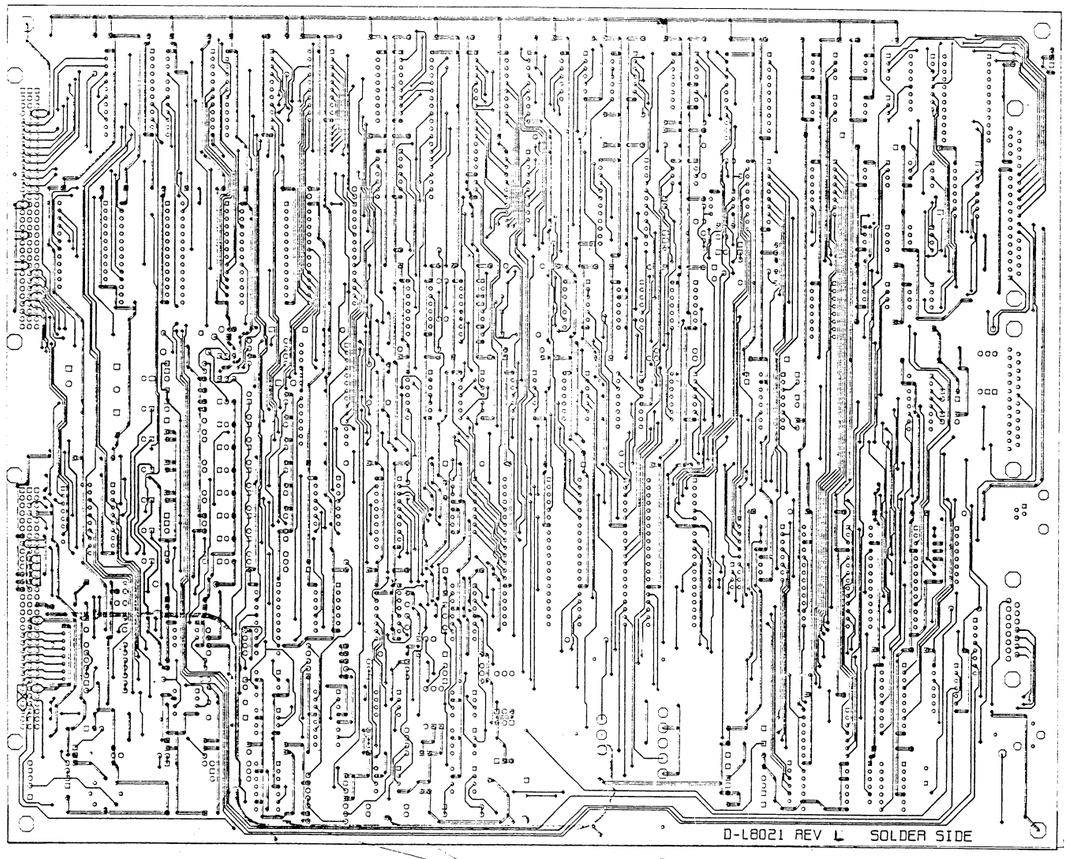
PT2

	6583	6622	6648	6867	ECO
	O.E.A.	O.E.A.	O.E.A.	O.E.A.	DFT
	M.R.B.		M.R.B.	[illegible]	CHK

NOT OTHERWISE SPECIFIED
FRAC± 1/32 ANG±1/2
DEC.XX±.010 .XXX±.005

SIZE	DRAWING NO.	REV.
D	L8020	Y

FIND	PART NUMBER	DESCRIPTION	QTY.



NOTES

1: IT IS IMPORTANT TO MAKE SURE THAT WIRE IS NOT TOUCHING ANY PADS, EXCEPT VIA HOLES, ESPECIALLY WHEN BENT, SINCE IT WILL INTERFERE WITH IN-CIRCUIT TESTING.

[2] IT IS IMPORTANT TO MAKE SURE THAT WIRE IS A MINIMUM OF .025 INCHES FROM EDGE OF PCB, SINCE IT WILL INTERFERE WITH FUNCTIONAL TESTING.

[3] THESE ARE SUGGESTED LOCATIONS WHERE TO PUT A DROP OF ADHESIVE (LOCTITE TAK-PAK OR EQUIV.) TO MOUNT WIRE FIRMLY TO PCB.

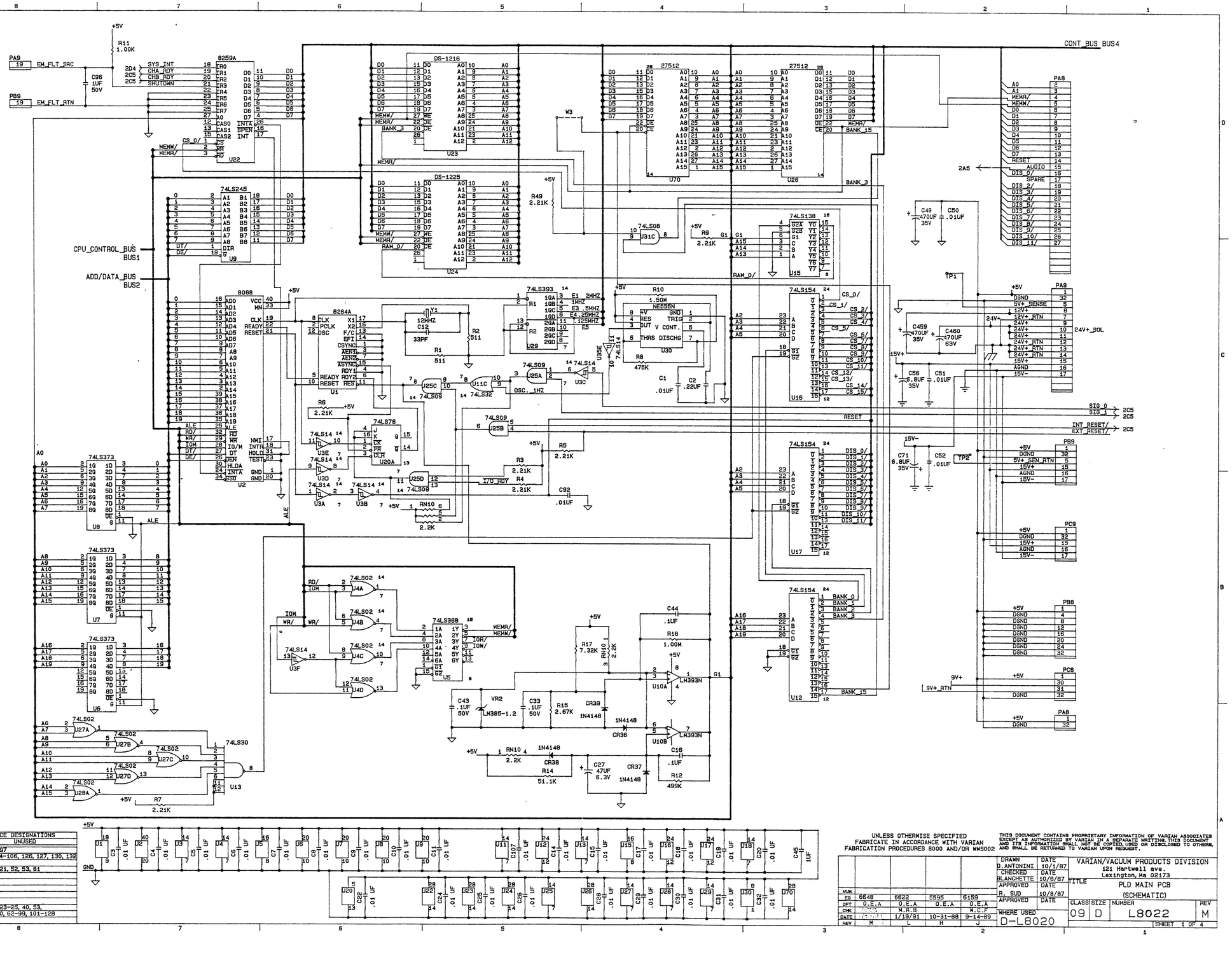
4: IT IS IMPORTANT TO MAKE SURE THAT THE DROPS OF ADHESIVE DO NOT TOUCH ANY PADS, EXCEPT FEED THRUS, SINCE IT WILL INTERFERE WITH IN-CIRCUIT TESTING.

[5] IMPORTANT: THESE 3 SPOTS OF ADHESIVE MUST BE APPLIED ON ONE SIDE OF THE WIRE FURTHEST FROM THE PCB EDGE, RATHER THAN HAVING THE ADHESIVE DRAPED OVER BOTH SIDES OF THE WIRE, SINCE IT WILL INTERFERE WITH FUNCTIONAL TESTING.

6: IT IS RECOMMENDED THAT SAFETY GLASSES BE USED WHEN APPLYING ADHESIVE.

PART	DESCRIPTION
CAD GENERATED DOCUMENT MANUAL CHANGES NOT PERMITTED	varian — VACUUM PRODUCTS
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS EXCEPT AS AUTHORIZED IN WRITING BY VARIAN ASSOCIATES	DRAWN O.ANTONINI DATE 9/'90 — CHECKED — DATE — APPROVED — DATE — APPROVED — DATE
FABRICATE IN ACCORDANCE WITH VARIAN WORKMANSHIP STANDARDS VTED 2000.	PCB ASSY MAIN
FOR OTHER REVISIONS SEE ECO HISTORY FILE.	PT2
FOR E.C.O. SEE SH 1 — ECO / DFT / CHK / DATE	NOT OTHERWISE SPECIFIED FRAC± 1/32 ANG±1/2 DEC.XX±.010 .XXX±.005 CONC .005TIR
	SIZE D — DRAWING NO. L8020 — REV. Y SCALE — PROD. — SHEET

DO NOT SCALE DRAWING



REFERENCE DESIGNATIONS	
LAST	UNUSED
C466	C46, 53, 97
	80-91, 104-106, 126, 127, 130, 132
	143-458
U84	U14, 19, 21, 52, 53, 81
CR39	
RN10	
Y2	
Q11	
VR2	
R188	R19-21, 23-25, 40, 53,
	55-58, 60, 62-99, 101-128
W3	

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

MJM				
EQ	6648	6622	5595	6159
DFT	O.E.A	O.E.A	O.E.A	O.E.A
CHK		M.A.B		W.C.F
DATE		1/19/91	10-31-88	9-14-89
REV	M	L	H	J

DRAWN D.ANTONINI 10/1/87
CHECKED BLANCHETTE 10/8/87
APPROVED R. SUD 10/8/87
APPROVED DATE

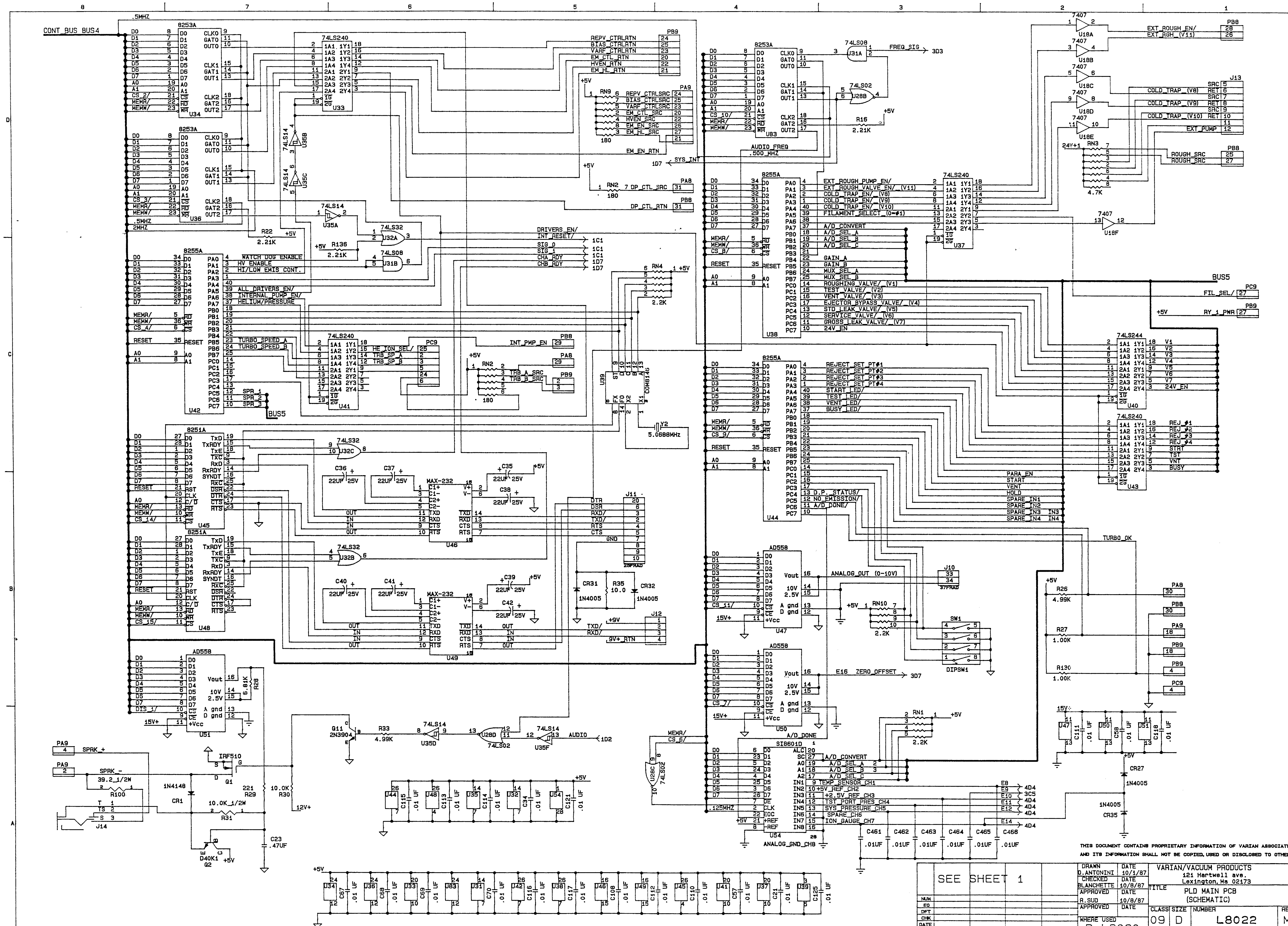
VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

TITLE: PLD MAIN PCB (SCHEMATIC)

WHERE USED: D-L8020

CLASS	SIZE	NUMBER	REV
09	D	L8022	M

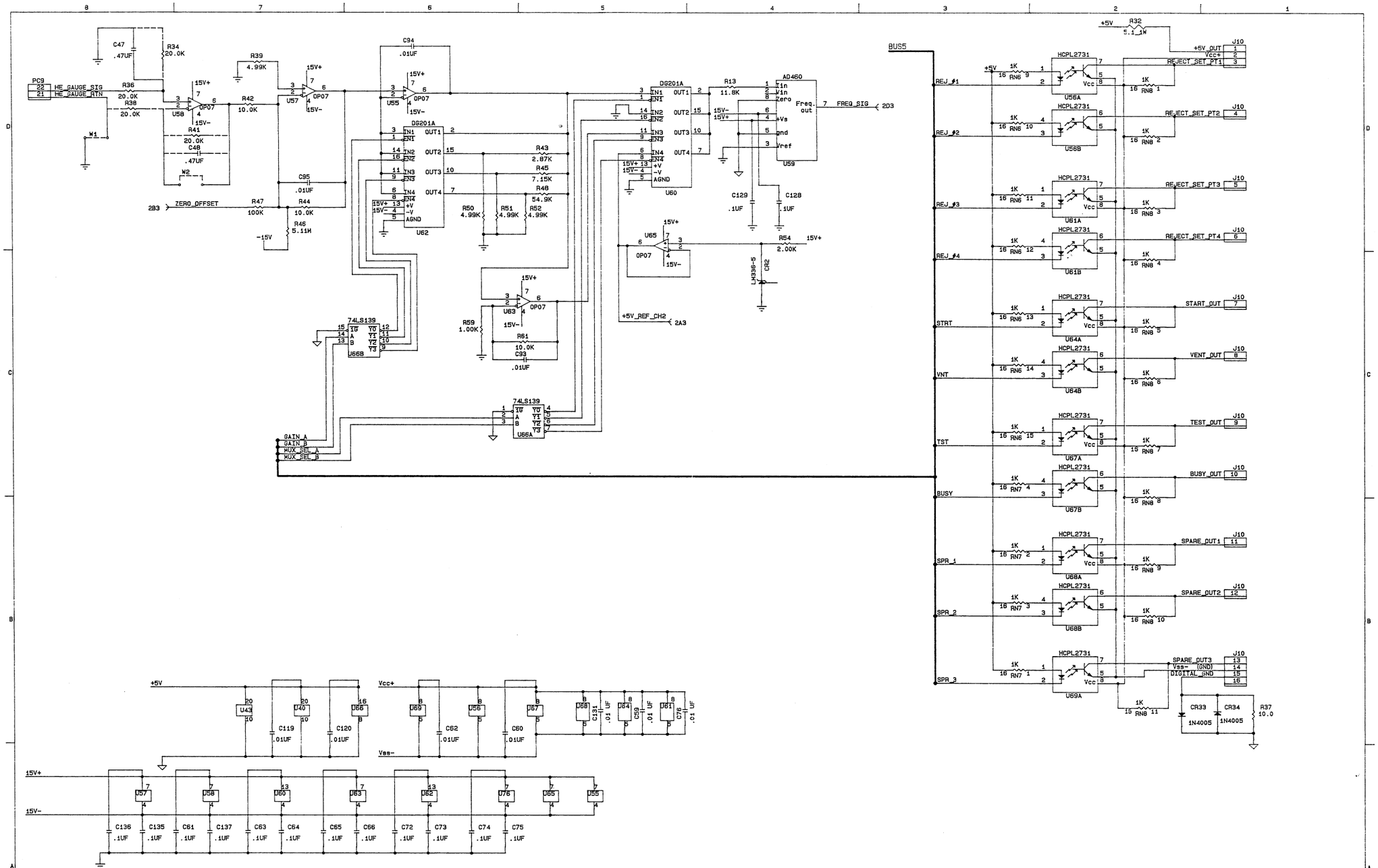
SHEET 1 OF 4



THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF VARIAN ASSOCIATES, AND ITS INFORMATION SHALL NOT BE COPIED, USED OR DISCLOSED TO OTHERS.

SEE SHEET 1

DRAWN D.ANTONINI	DATE 10/1/87	VARIAN/VACUUM PRODUCTS 121 Hartwell ave. Lexington, Ma 02173
CHECKED BLANCHETTE	DATE 10/8/87	TITLE PLD MAIN PCB (SCHEMATIC)
APPROVED R.SUD	DATE 10/8/87	
APPROVED	DATE	CLASS 09 SIZE D NUMBER L8022 REV M
WHERE USED D-L8020		SHEET 2 OF 4



NOTES
1. The symbol for analog ground is =
2. The symbol for digital ground is =
3. Unless specified all resistors are 1/4w 1%.

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

SEE SHEET 1

		DATE
DRAWN	D.ANTONINI	10/1/87
CHECKED	BLANCHETTE	10/8/87
APPROVED		DATE
	R. SUD	10/9/87
APPROVED		DATE
WHERE USED	D-L8020	

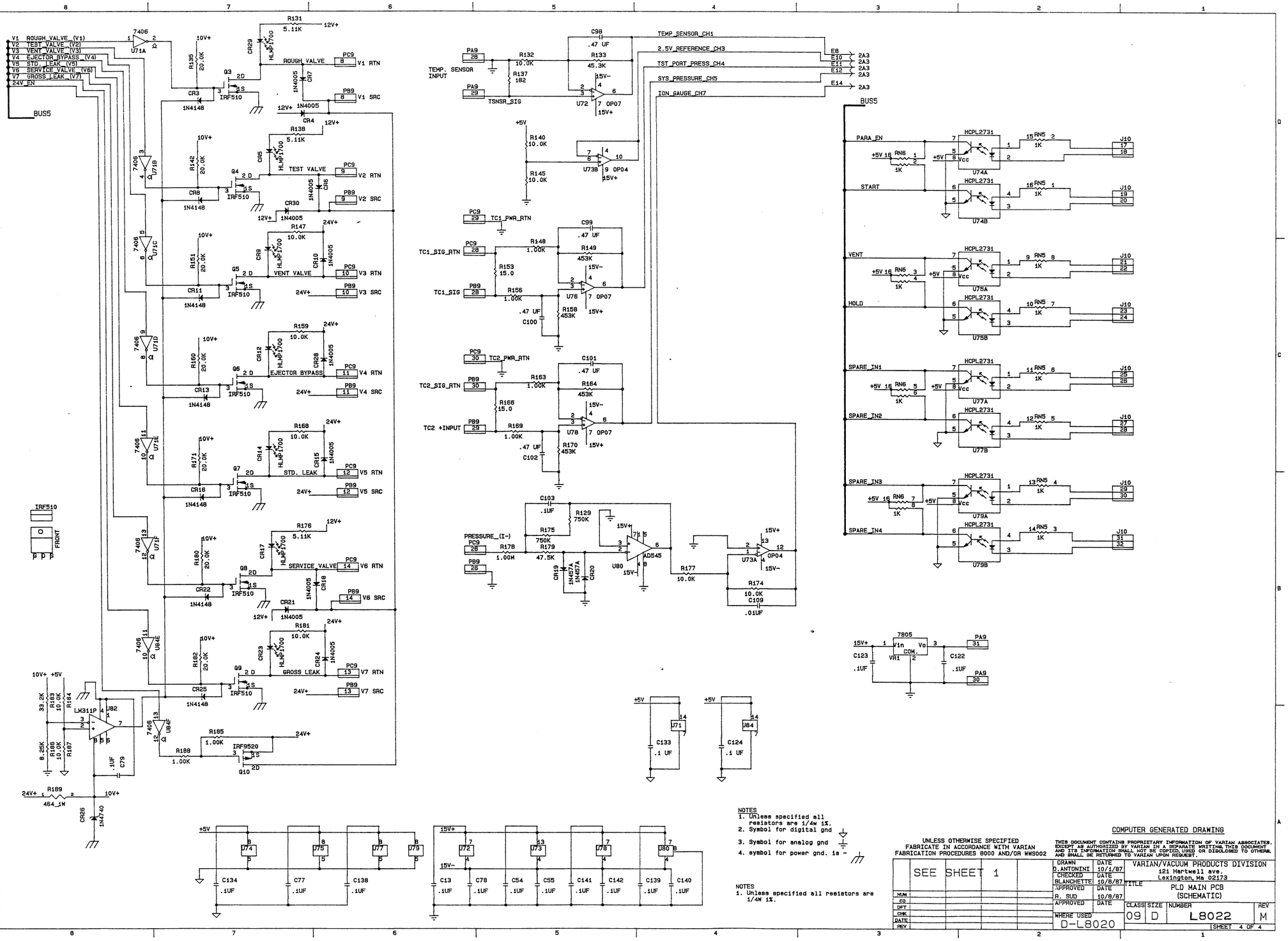
MJH
EQ
DFT
CHK
DATE
REV

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

TITLE: PLD MAIN PCB (SHEMATIC)

CLASS	SIZE	NUMBER	REV
09	D	L8022	M

SHEET 3 OF 4



NOTES
1. Unless specified all resistors are 1/4w 1%.
2. Symbol for digital gnd
3. Symbol for analog gnd
4. symbol for power gnd. is -

NOTES
1. Unless specified all resistors are 1/4W 1%.

UNLESS OTHERMISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WW9002

		DATE
DRAWN	D.ANTONINI	10/1/87
CHECKED	BLANCHETTE	10/8/87
APPROVED	R. SUD	10/8/87
APPROVED		DATE
WHERE USED		

CLASS	SIZE	NUMBER	REV
09	D	L8022	M

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
002		CAP,0.1 MF,250 VAC C86	1	EA	
003		CAPACITOR .01UF,50V,10% REELED C14,C31,C115,C73,C74	5	EA	UNITRODE #CGB103KDX
004		CAP,CR,.01 UF,500 V C19	1	EA	
005		INT.CKT.#AD536AJD U3	1	EA	AD536AJD
006		CAP,MY,0.015 MF,400V C103	1	EA	MATSUSHITA ECEQE153K
007		CAPACITOR .047UF,50V,20%, REELED C15,C28,C87,C88,C110 C111,C112,C118,C126,C132	10	EA	UNITRODE CGB473MDZ
008		CAP,CR,4700 PF, 100V C38	1	EA	
009		INT. CKT.# 324 U12	1	EA	
010		INT.CKT.#LM358 U4	1	EA	LM358
011		RESISTOR 1 M 1/4W 1PC MF R16,R17,R23,R24,R26,R54,R53 R55,R203	9	EA	DALE TYPE CCF-55
012		INT.CKT.#LM393N U8	1	EA	LM393N
013		IC NE555N U13,U27	2	EA	RCA NE555N
014		RES,MF,1210 ,1/4 W R33,R180	2	EA	
015		RES,MF,1.30,1/4W R157	1	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8023301

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
016		IC 4N35 U1,U7,U30,	3	EA	GE 4N35
017		ISOLATOR,OPTO U9,U36	2	EA	
018		TRANSISTOR, #IRF540 Q4	1	EA	IRF540
019		TRANSISTOR, #IRFZ20 Q12	1	EA	IRFZ20
020		INT.CKT.#LM317T VR1	1	EA	LM317T
021		TRANSISTOR,#2N5114 Q3	1	EA	2N5114
022		TRANSISTOR Q6,Q13,Q16	3	EA	MOTOROLA 2N3904
023		TRANSISTOR,2N3906 Q5	1	EA	2N3906
024		ISOLATOR,OPTO,4N45 U11	1	EA	
025		INT. CKT.# 339 U5,U31	2	EA	
026		INT. CKT.# 7815 VR2,VR3	2	EA	
027		INT.CKT.#LM2917N U2,U10	2	EA	LM2917N
028		INT.CKT.#LT317AT VR4,VR5	2	EA	LT317AT
029		THYRISTOR Q1,	1	EA	MOTOROLA 2N6349A
030		DIODE,#MBR1635 CR19,CR48	2	EA	
031		DIODE IN4005 CR1,CR4,CR10	3	EA	IN4005

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
032			DIODE, 1N5242B CR16	1	EA	
033			DIODE, 1N4728A CR12	1	EA	
034			DIODE, 1N5250 CR15	1	EA	
035			DIODE, #MUR415 CR38,CR39,CR40,CR41	4	EA	
036			DIODE, #MUR1515 CR43,CR53	2	EA	
037			DIODE IN4148 CR2,CR3,CR5-CR9,CR11,CR14,CR18 CR20,CR32,CR44-CR46,CR13, CR49,CR50,CR52,CR55-CR59	24	EA	IN4148
038			BRIDGE RECTIFIER 4A,800V, FWLC 800 CR31,	1	EA	FWLC 800
039			DIODE IN6373 CR47	1	EA	MOTOROLA IN6373
040			INT.CKT.#TL431CLP U33	1	EA	TL431CLP
041			INT.CKT.#UC3842N U14,U26	2	EA	UC3842N
042			INT.CKT.#UC3846N U28	1	EA	UC3846N
043			DIODE, MUR160 CR34,CR35	2	EA	
044			CAPACITOR 6.8UF 35WDC +/-10PC TAN C116,C11	2	EA	SPRAGUE 199D685X9035DA1
045			CAP,CER,0.1 M,50 V C3,C6-C10,C20,C22-C25,C27 C30,C33,C34,C36,C37,C71, C72,C77,C78,C79,C83,C89, C94,C97,C100,C101,C125,	33	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			C128,C130,C133,C134			
046			CAPACITOR .47 UF, 50V C43,C122	2	EA	MURATA/ERIE RPA40Z5U474M50VPT
047			CAP,CER,47 PF,200V 29	1	EA	
048			IC 500v, 8 amp Q10,Q11	2	EA	MOTOROLA MTP8N50
049			CAP,CR,100 PF, 10V C113,C131,C136	3	EA	
050			IC TRIAC TLE3104 SIEMENS U6	1	EA	SIEMENSTLE3104
051			CAP,CR,220 PF,200 V C32	1	EA	
052			CAPACITOR .01MF 1KV C80,C93,	2	EA	SPRAGUE 5GA-S10
053			CAPACITOR 220 UF, 16V C13	1	EA	NICHICON ULB1C221M
054			RES,MF,4.75 ,1/4 W R174,	1	EA	
055			RESISTOR 10 MEG 1/4W 5PC R58,R139	2	EA	ALLAN BRADLEY TYPE CB1065
056			RES,MF,249 K ,1/4 W R59	1	EA	
058			RES,MF,82.5 K,1/4 W R74	1	EA	
059			RES,MF,1.24K ,1/4 W R136	1	EA	
062			CAPACITOR 1 MF 50 V C1,C12,C76,C70	4	EA	SPRAGUE 2C20Z5U105M050B
063			CAPACITOR 1 UF 35V C117,	1	EA	SPRAGUE 196D105X9035HA1

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
064			CAP,MY, 1 MF,250 V C17,C18	2	EA	
065			CAP,CR,1000 PF, 200V C119,C120,C151,150,C75	5	EA	
066			CAP,AL,47 MF, 25V C129	1	EA	
067			CAP,AL,100 MF, 35V C95,C98,C107,C124,	4	EA	
068			CAP,AL,150 MF, 35V C35	1	EA	
069			CAP,PS, 180 PF,160 V C127	1	EA	
070			CAP,AL,10 MF, 50V C5,C26,C92,C96,C99	5	EA	
071			RES,MF,1500 ,1/2 W R50	1	EA	
072			RES,MF,150 ,1/2 W R77	1	EA	
073			RESISTOR 1K 1W 1PC TYPE RN65D R1,R27,	2	EA	
074			RES,MF,3.32 M,1/4 W R69	1	EA	
075			RES,MF,1100, 1/4 W R186	1	EA	
076			RESISTOR 0.10 OHM 2W 1PC WW R81,R82	2	EA	DALE LVR2-0.10-F
077			RES,MF,20.5K, 1/4 W R18	1	EA	
078			RESISTOR 1K OHM 1/4W 1% MF R31,R73,R167,R214	4	EA	DALE TYPE CCF-55
079			RESISTOR M OX 150 5% 2W R79	1	EA	STACKPOLE RS-2

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
080		RESISTOR M OX 470 5% 3W R149	1	EA STACKPOLE	RS-3
082		RES,MF,1500 ,1/4 W R165	1	EA	
083		RES,MF,1820 ,1/4 W R201	1	EA	
084		RES,MF,10.0 ,1/4 W R143,R144,R148,R213,R140,	5	EA	
085		RESISTOR 100 OHMS 1/4W 1PC MF R158	1	EA DALE	TYPE CCF-55
086		RES,MF,100 K ,1/4 W R19,R60,R61,R72,R192, R80,R162,R163,R210	9	EA	
087		RESISTOR 10 K 1/4W 1PC MF R9,R14,R47,R57,R63-R65, R70,R71,R153,R164,R166 R184,R197,R219	15	EA DALE	TYPE CCF-55
088		RES,MF,121 K ,1/4 W R208	1	EA	
089		RES,MF,12.1 K,1/4 W R207	1	EA	
090		RES,MF,150 ,1/4 W R30	1	EA	
091		RES,MF,15.0 K,1/4 W R75,R76,R209,R20	4	EA	
092		RES,MF,2.21 M ,1/4 W R56	1	EA	
093		RES,MF,20.0 K,1/4 W R5,R169,R193,R220,R10,R68	6	EA	
094		RES,MF,619 K ,1/4 W R8	1	EA	
095		RES,MF,22.1 ,1/4 W	1	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			R212			
096			RES,MF,22.1 K ,1/4 W R13	1	EA	
098			RES,MF,27.4 K ,1/4 W R205,R206	2	EA	
099			RES,MF,2.00 M ,1/4 W R37	1	EA	
100			RES,MF,3320 ,1/4 W R168	1	EA	
101			RES,MF,30.1 K,1/4 W R200,R202	2	EA	
103			RES,MF,33.2 K ,1/4 W R183	1	EA	
104			RESISTOR 392K 1/4W 1PC MF R29,R191	2	EA DALE	TYPE CCF-55
106			RES,MF,1.50 M ,1/4 W R67	1	EA	
108			RESISTOR 4.75K 1/4W 1PC MF R28,R32,R40,R41,R145 R146,R159,R182,R196	9	EA DALE	TYPE CCF-55
109			RES,MF,475 K ,1/4 W R3, R36,R42	3	EA	
110			RES,MF,56.2 K,1/4 W R6,R7,R44,R45	4	EA	
111			RESISTOR 681K 1/4W 1PC MF R66	1	EA DALE	TYPE CCF-55
112			RES,MF,8.25M, 1/4 W R35	1	EA	
115			RES,MF,12.1 ,1/4 W R152	1	EA	
116			RES,MF,121 ,1/4 W R151	1	EA	

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VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
122			RESISTOR 2.21K OHM 1/4W 1% R52,R62,R137,R138	4	EA DALE	TYPE CCF-55
123			RES,MF,3.92,1/4W R156	1	EA	
124			RES,MF,4.32,1/4W R154	1	EA	
125			RES,MF,26.7K, 1/4 W R22,R25	2	EA	
126			RES,MF,4870, 1/4 W R12	1	EA	
127			RES,MF,5.62,1/4W R211	1	EA	
128			RES,MF,34.8K,1/4W R46	1	EA	
130			RES,MF, 16.2, 1/4 W R215,R217	2	EA	
131			RES,MF,16.9, 1/4W R216,R218	2	EA	
132			RES,MF,2670,1/4W R170	1	EA	
133			RESISTOR 750 OHM 1/4W 1PC MF R150	1	EA DALE	TYPE CCF-55
134			RES,MF,9090 ,1/4 W R48	1	EA	
136			RES,MF,976 ,1/4 W R49	1	EA	
139			POT 100 .5W 20% CERMET S/TURN RV2	1	EA BOURNS 3329H1101	
140			RES,VAR., 50K, 1/2 W RV6,	1	EA	
141			RESISTOR 40.2K 1/4W 1PC MF	1	EA DALE	TYPE CCF-55

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VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			R11			
142			RES,MF,47.5 K ,1/4 W R2,R21,R43,R4,,R190	5	EA	
143			RES,MF,47.5K, 1W R142	1	EA	
144			RES,MF,56.2K, 1W R141	1	EA	
145			RES,MF,221 ,1/2 W R78	1	EA	
146			RES,MF,274 ,1/4 W R171	1	EA	
147			RES,MF,274 K ,1/2 W R147	1	EA	
148			RES,MF,274,1W R195	1	EA	
149			DIODE,#UES1002 CR17,CR60	2	EA	
150			RESISTOR 499K 1/4W 1PC MF R51	1	EA DALE	TYPE CCF-55
151			THERMISTOR CL-150 R221	1	EA KEYSTONE CL-150	
152			VARISTOR 275V R400	1	EA PANASONIC ERZ-C07DK431 275V	
156			RESISTOR 115K 1/4WD 1PC MF R15	1	EA DALE	TYPE CCF-55
160			CAP,AL,330 MF, 25 V C91	1	EA	
161			CAP,MI,470 PF, 500V C90,C121	2	EA	
162			CAP,AL, 470MF,35 V C39,C102,C104-C106,C123,C135	7	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN

DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
163			CAP,AL,680 MF,250 V C81,C82	2	EA	
164			CAP,AL,1000 MF, 10 V C108	1	EA	
165			CAP,AL,2200 MF, 10 V C40-C42,C109	4	EA	
166			CAP,0.0047 M,250 VAC C84,C85	2	EA	
167			CAP,CR,6800 PF,100V C4,C21	2	EA	
168			CAP,AL,220 MF,63 VDC C2,C16	2	EA	
170			DIODE, 1N4937 CR36	1	EA	
171			DIODE, #1N5246B CR33,CR37	2	EA	
172			DIODE, 1N5363B CR42	1	EA	
175			CONN,PC, HEADER J7	1	EA	
176			CONN,DIN,96 MALE P6	1	EA	
177			TRANSFORMER (TX1) TX1,	1	EA	GFS P/N 87-1707-1
178			TRANSFORMER (TX2,4,5,6,8) TX2,TX4-TX6,TX8,	5	EA	GFS P/N 87-1706-1
179			TRANSFORMER (TX3) TX3,	1	EA	GFS P/N 87-1708-1
180			TRANSFORMER (TX7) TX7,	1	EA	GFS P/N 87-1709-1
181			TRANSFORMER (TX9) TX9,	1	EA	GFS P/N 87-1710-1

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
182			INDUCTOR,COMMON MODE,(L1) L1,	1	EA	GFS P/N 87-1702-1
183			INDUCTOR,16UH,12A,(L5) L5,	1	EA	GFS P/N 87-1703-1
184			INDUCTOR,500NH,8A (L6) L6,	1	EA	GFS P/N 87-1704-1
185			INDUCTOR,500NH,4A (L7,L8) L7,L8,	2	EA	GFS P/N 87-1705-1
186			HEATSINK P.S. PRIMARY	1	EA	
187			HEATSINK	2	EA	THERMALLOY 6021PB
188			WASHER INSULATING, HEATSINK	10	EA	CHOMERICS 60-12-8302-1684
189			BUSHING,INSULATING NYLON	10	EA	KEYSTONE #3049 NYLON
190			WASHER FLAT NO.4 S/S .125 ID X.250 OD MSU5795-803 MIL.	10	EA	
191			NUT KEPS 4-40 CAPLT	12	EA	KEPS
192			SCREW FLT HD 4-40 X 3/8 SSTEEL	10	EA	
193			SCREW PAN HD 4-40 X 3/8 SSTEEL	2	EA	
194			SCREW PAN HD 2-56 X 1/2 SSTEEL	2	EA	
195			NUT HEX 2-56 SSTEEL	2	EA	
196			CONN 10PIN D ROW MALE J30	1	EA	SAMTEC DW-10-14-T-D-1140
197			BRACKET	2	EA	KEYSTONE #708
198			SCREW PAN HD PHIL 6-32 X 1/4 SSTEEL	2	EA	
199			SCREW PAN HD 4-40 X 1/4 SSTEEL	4	EA	
200			SOCKET (TO DWG) JP1(3),JP2(3),JP3(3),JP4(3)	12	EA	AMP.NO. 50865-8
201			PLUG JP1,JP2,JP3,JP4	4	EA	CAMBION 461-2871-02-03-16

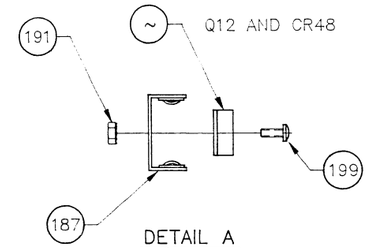
VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8023301

ASSY NUMBER: L8023301 REV: J DESCR: PCB,ASSY,PS,MAIN DWG SIZE: D

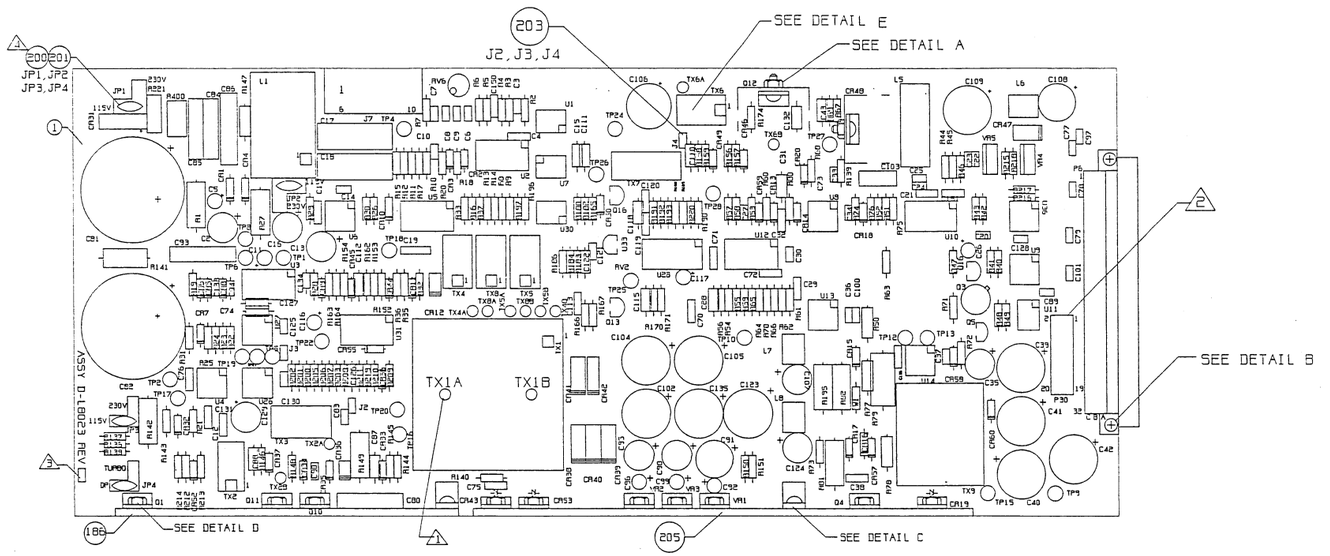
FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
202			WIRES,P/S,TRANSFRMER	1	EA	
203			WIRE SOLID BUSS. 22 AWG.	0.13	FT	
204			TERMINAL JP1,JP2,TP1,TP2,TP4-TP6 TP8-TP10,TP12,TP13,TP15-TP22 TP24-TP28	23	EA	CAMBION 160-2034-2-01-00
205			HEAT SINK	1	EA	

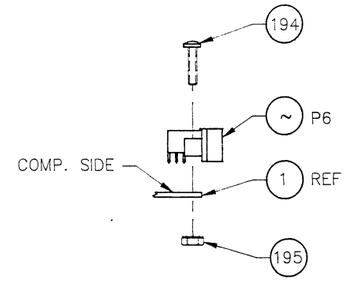
FIND	PART NUMBER	DESCRIPTION	QTY.



DETAIL A

2 PLS



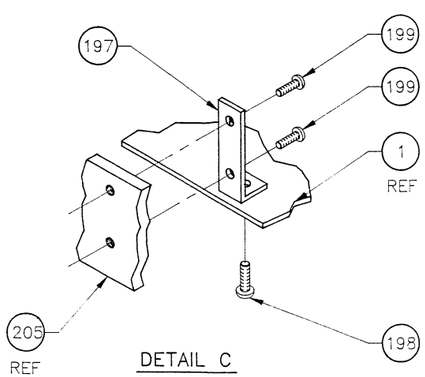


DETAIL "B"

2 PLS

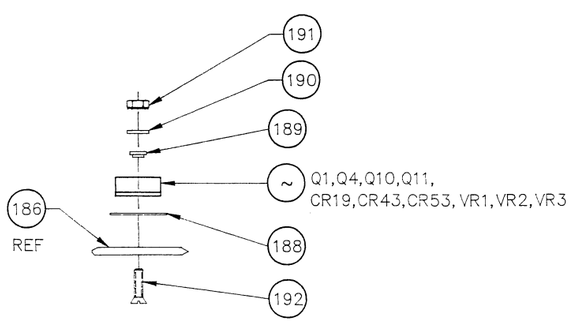
NOTES

1. INSERT WIRE FOR TX1 AROUND THE TRANSFORMER BETWEEN THE CORE AND BOBBIN.
2. ASSEMBLE P30 SO THAT THE SHORTER LEADS ARE SOLDERED INTO THE PCB.
3. CLEARLY MARK ASSY PARTS LIST REV. IN INDELIBLE BLACK INK IN AREA SHOWN.
4. PUT JP1,JP2 AND JP3 IN THE 115V POSITION FOR INPUT VOLTAGES FROM 100–120 VAC.
   PUT JP1,JP2 AND JP3 IN THE 230V POSITION FOR INPUT VOLTAGES FROM 200–240 VAC.
   PUT JP4 IN THE DP POSITION FOR THE DIFFUSION PUMP VERSION.
   PUT JP4 IN THE TURBO POSITION FOR THE TURBO PUMP VERSION.



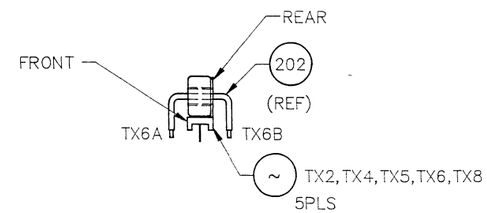
DETAIL C

2 PLS



DETAIL D

10 PLS



NOTE: PUT WIRES THROUGH TRANSFORMERS SO THAT THE END MARKED TXXA COMES OUT OF THE FRONT AND THE END MARKED TXXB COMES OUT OF THE REAR AS SHOWN. SOLDER WIRES INTO CORRESPONDING HOLES ON P.C.B.

DETAIL E

5 PLS

−302	POWER SUPPLY ASSY 200–240VAC				
−301	POWER SUPPLY ASSY 100–120VAC				
PART	DESCRIPTION				

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

varian VACUUM PRODUCTS DIVISION

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
O.ANTONINI	1/88			J.QUILTY	1/88	W.C.F.	1/88

FABRICATE IN ACCORDANCE WITH VARIAN WORKMANSHIP STANDARDS VTED 2000.

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

POWER SUPPLY (ASSY) PT2

6211	6224	6237	6571	ECO
O.E.A.	O.E.A.	O.E.A.	O.E.A.	DFT
W.C.F.	W.C.F.	W.C.F.		CHK
10/24/89	10/24/89	11/1/89		DATE

NOT OTHERWISE SPECIFIED
FRAC± 1/32 ANG±1/2
DEC.XX±.020 .XXX±.005
CONC .005TIR

SIZE	DRAWING NO.	REV.
D	L8023	K

D-L8016

POWER SUPPLY BOARD

Introduction

The power supply board is housed with the CPU board in the card cage and contains the circuitry to supply voltages to the various electrical components in the system. It also contains a regulator circuit for controlling emission current and a second regulator circuit for controlling power to the diffusion pump heater coil. The power supply block diagram is shown in Figure 9-1. The AC line voltage can be either 110 or 220 volts (a jumper on the power supply board will allow operation from either line voltage). There is a filter and rectifier section which converts the AC line voltage into DC for use by the main converter section which is a switching power supply that controls the 24-volt output (labeled 24VINT). The flyback transformer in the converter has six secondary windings which supply the voltages listed in the block diagram. The diffusion pump power regulator is connected directly to the AC line voltage. This regulator can deliver as much as 500 watts to the diffusion pump. For this reason, it has been kept separate from the main converter section and is powered directly from the main AC line.

In the paragraphs that follow, each major component of the power supply board is described.

Main Converter

The main converter is a two-switch converter running off of DC power provided by the AC rectifier. The schematic for this circuit is shown on drawing L8025, sheet 2. Transformer TX1 has a primary winding N1 which is controlled by the two MOSFET's, Q10 and Q11. These transistors switch at roughly 100 kHz rate and provide power to the six secondary windings on transformer TX1.

Winding N5 on transformer TX1 provides a supply voltage to regulator VR1 which controls the 9V output.

A +15-volt supply is provided by winding N6. This voltage is also controlled by a three-terminal regulator VR2. A -15 volt supply is provided by winding N7. A three-terminal regulator VR3 controls this output. Ground for all three of these power supplies are connected to analog ground AGND.

Winding N4 provides a 12-volt semi-regulated output.

The regulated 24-volt output 24VINT is controlled by the primary feedback loop in the power supply. The control regulator is chip U26 which is a pulse width modulator. U27 provides the clock frequency to this chip. The control loop has a primary current sensing loop which controls the peak current in the primary of transformer TX1. There is an outer loop for this controller provided by measuring the size of the voltage on 24VINT. This feedback is provided through optocoupler U30 to provide isolation between the primary and secondary side of the power supply. The output voltage is controlled by varying the pulse widths delivered to MOSFET's Q10 and Q11 as the primary switches. Pulse width modulation varies the output voltage to close the loop.

A few additional features are provided in the basic converter control loop. Amplifier U31 detects an undervoltage condition and shuts down the pulse width modulator chip if the AC line voltage is too low. In addition, there are three secondary current sensors in the control loop. The output currents for the 12-volt supply, the unregulated 24-volt supply I24, and the regulated 24-volt supply 24VINT are measured. If these currents become too high, these conditions are OR'ed together to provide a fault condition shutting down the pulse width

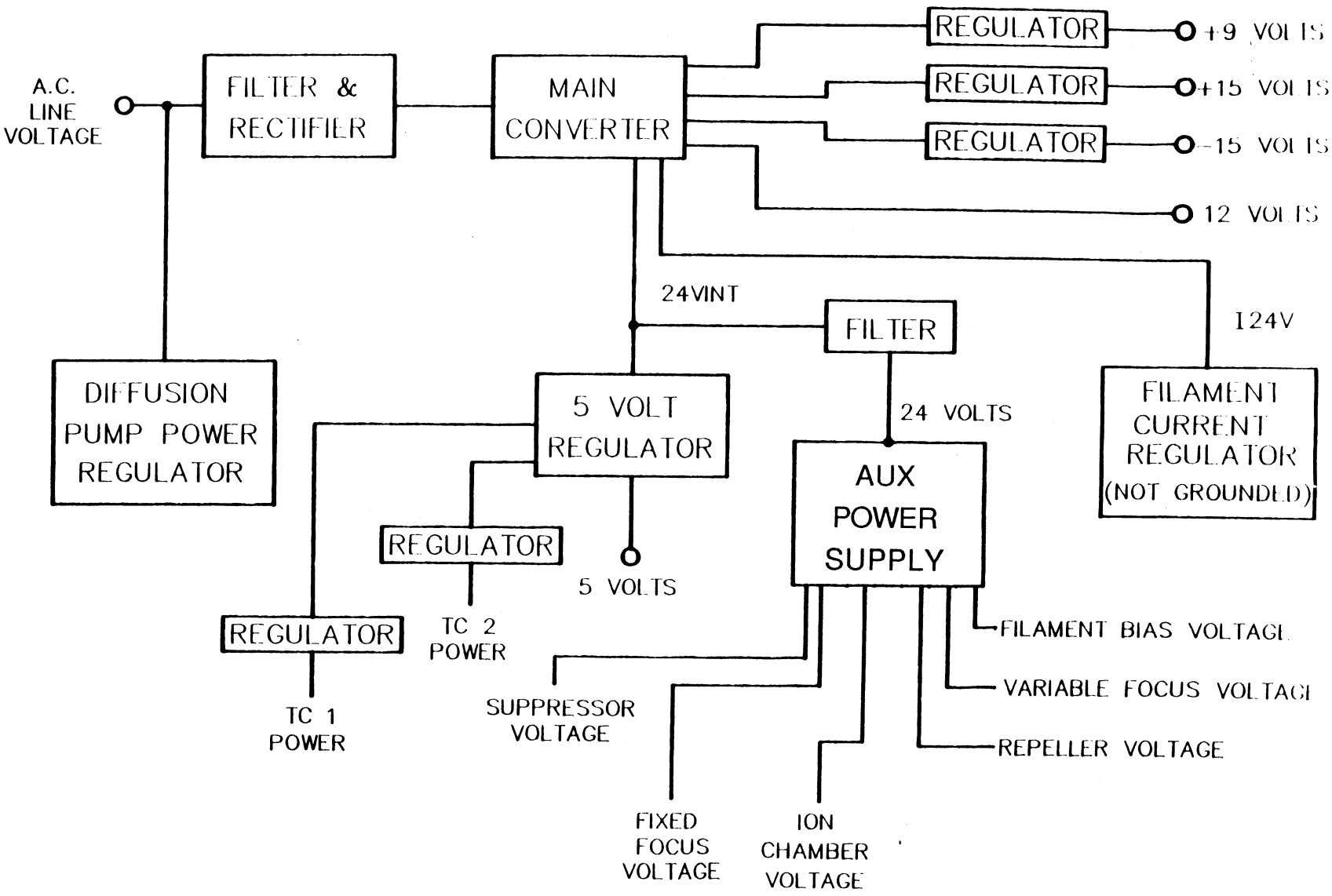


Figure 1. Power Supply Block Diagram

modulator. The undervoltage lockout amplifier and the three secondary current fault condition amplifiers are contained in chip U31.

5-Volt Regulator

The 5-volt regulator (see Figure 9-1) receives its power from the regulated 24-volt supply in the main converter. The 5-volt regulator schematic is shown on drawing L8025, sheet 3. The 5-volt regulator is implemented by using MOSFET transistor Q12 to switch voltage across inductor L5. When Q12 is on, energy is delivered to L5. When Q12 is off, energy is delivered from L5 to the 5-volt output.

The basic operation of the regulator is controlled by U28. This device has an inner and an outer loop for operation. The inner loop controls the peak current flowing through Q12. Measurement of this peak current is implemented using transformer TX6. The output of the transformer is rectified by CR46. This signal is fed back to U28 to sense the current flowing to inductor L5. The outer loop of the 5-volt supply is a voltage regulator. The output of the 5-volt supply is detected using the 5-volt sense lines. If these remote sense lines are not connected, resistors R160 and R161 provide internal connections to the 5-volt output. Remote sense amplifier U34 feeds back the output voltage for comparison with an internally-generated reference voltage in U28. Fine adjustment of the 5-volt power supply output can be implemented by adjusting potentiometer RV1. The pulse width modulation controller regulates the output by controlling the pulse on time delivered to the drive circuitry for Q12. The drive circuitry is implemented using transformer TX7 and its associated resistors and capacitors.

The regulator loop has an undervoltage lockout amplifier U34. If, for some reason, the 24-volt supply drops to a low value, the pulse width modulator is turned off by the output of U34.

The 5-volt supply also supplies the input to the two three-terminal regulators, VR4 and VR5, which in turn power thermocouples TC1 and TC2 which provide 150-ma currents to the test port thermocouple and system thermocouple respectively.

Auxiliary Power Supply

The auxiliary power supply provides the high voltages to operate the ion source and the mass spectrometer. Raw power is delivered to this controller by using the filtered 24-volt supply labeled 24V+. Again, pulse width modulation is used to control a current switch, Q8. This supply schematic is shown on drawing L8028. The pulse width modulation control is implemented by chip U22. The primary current in transformer TX10 is sensed by resistor R118. This peak current is controlled by the pulse width modulator. An outer loop senses the suppressor voltage provided by the secondary of TX10. The pulse width modulator controls the output voltage by varying the pulse width of the drive circuitry to Q8.

There are three fixed voltages generated in the auxiliary voltage supply, the suppressor voltage, the fixed focus voltage, and the ion chamber voltage. In addition, there are three variable voltages which are controlled by a variable frequency signal from the CPU. The three variable voltages are the filament bias voltage, the variable focus voltage, and the repeller voltage.

The commands for these voltages are generated using U16, U19, and U24, a frequency-to-voltage coverter (F/V converter). These chips convert variable frequency commands from the CPU to analog command voltages which are delivered to shunt regulators. The currents required from these three variable voltage supplies are low. Therefore, shunt regulators can be used to control their outputs. Chips U17, U20, and U25 are feedback amplifiers which compare the command voltage from the F/V converter with a sample of the output voltage. The

error signal generated is delivered to the base of Q7, Q9, and Q17. These transistors draw varying amounts of current through a voltage dropping resistor. This scheme controls the output voltage from the regulator. A sample of this output voltage is fed back to the operational amplifier thereby closing the loop. Capacitors C50, C58, and C72 provide frequency compensation to stabilize the feedback loop.

These three voltages (filament bias, variable focus, and repeller) controlled by the CPU can be adjusted by the operator to tune the system to detect helium.

Emission Current Regulator

The emission current regulator is used to control the emission current from the ion source. A schematic of this control loop is shown on drawing L8025, sheet 1. The power provided to the filament floats on top of the filament bias voltage supply. Therefore, the voltage which supplies this power must be floating rather than grounded. This floating supply is provided by I24V from the main converter section. Frequency-to-voltage converter U10 receives a command signal from the CPU to determine the current command signal. The output voltage provided to the filament element is controlled by the primary voltage switch Q4. This switch controls the primary current delivered to transformer TX9. The current through this switch is sensed through resistors R81 and R82. The primary current signal is fed back to pulse width modulator chip U14. Chip U13 is a clock chip which provides the timing signal for the pulse width modulator. The output voltage applied to the filament element is fed back to voltage sensing amplifier U12.

This basic design is similar to the pulse width modulation schemes used in other parts of the power supply. That is, the primary current in transformer TX9 is controlled by an inner loop and the voltage across the filament element is controlled by the outer voltage loop. This voltage regulator, in turn, is controlled by the current command from the frequency-to-voltage converter. Emission current from the filament element is measured across resistors R48 and R49. Switch Q3 is turned on if high emission current is required. When Q3 is turned off, the voltage is measured across both R48 and R49 to give low emission current. The range switching for emission current is provided through optocoupler U11.

The variable frequency signal from the CPU which commands the magnitude of the emission current is delivered through optocoupler U9. The emission enable circuitry is implemented using transistor Q6. A control line from the CPU allows the filament emission current to be turned on or off under operator control. The emission enable circuit signal is also provided through optocoupler U9.

There are two fault sensing circuits in the emission current regulator. Amplifiers U12 are used to sense a low current or open filament element condition. Pin 7 of U8 controls the emission low output of optocoupler U36. This signal ordinarily is low and will go high if a fault condition exists. This output is sensed by the CPU and generates an error message on the display indicating a burned out filament.

The output of U8, pin 1, controls the emission burst current error condition. If a large rate of change in the filament current is detected, the emission fault line output of optocoupler U36 goes high. This output is sensed by the CPU and generates a message on the display indicating a pressure burst in the mass spectrometer tube.

Diffusion Pump Power Regulator

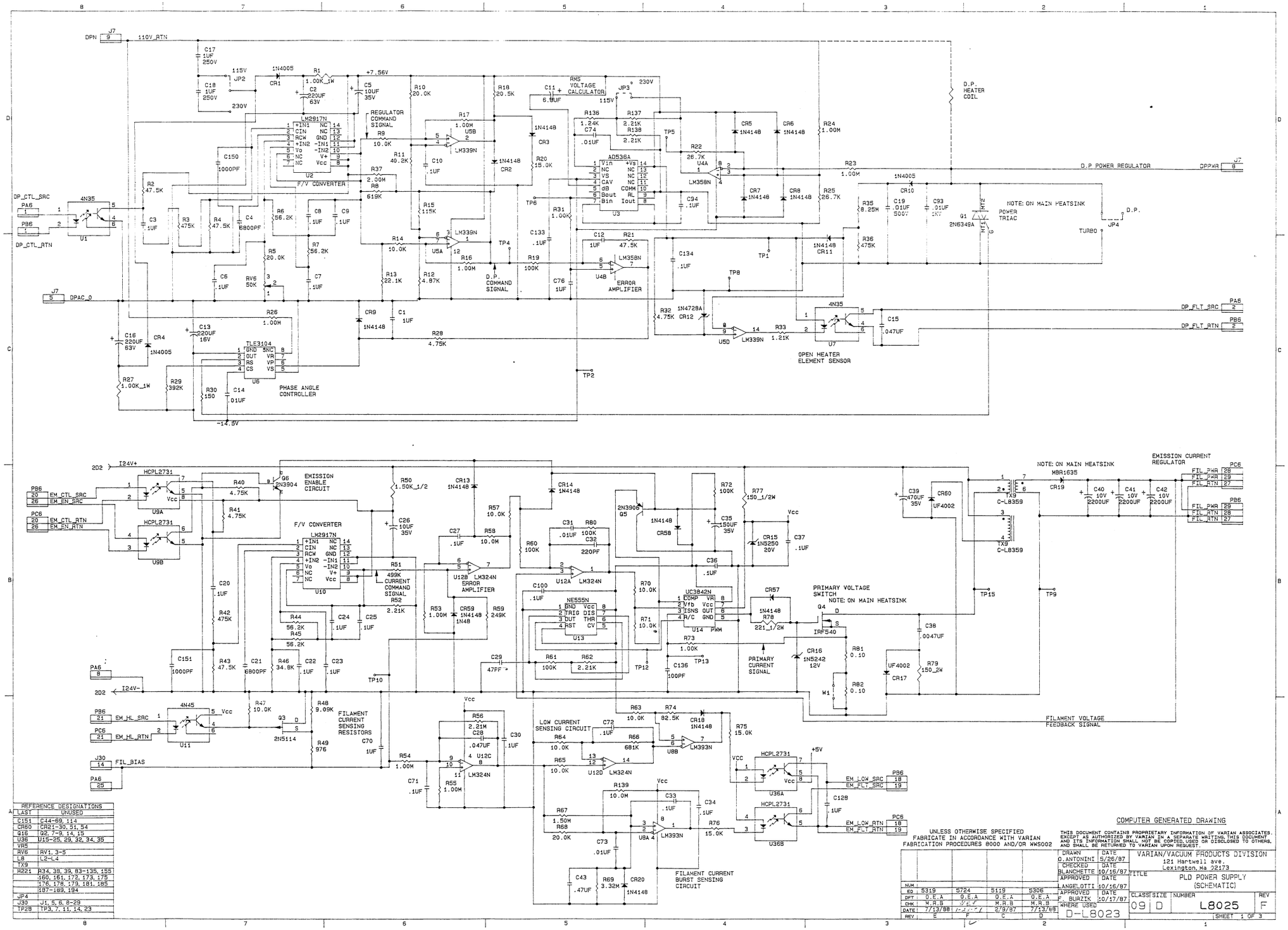
The schematic for the diffusion pump power regulator is shown on drawing L8025, sheet 1. The diffusion pump power regulator receives input power directly from the line voltage. A

switch in the circuit allows operation from either 110 or 220 volts. A +7.56-volt supply is generated by rectifying the AC line voltage using CR1. A -14.5 voltage is generated from the AC power using CR4.

This regulator is a feedback loop used to control the RMS voltage delivered to the diffusion pump heater coil. The power triac Q1 is connected in series with the heater coil to control the power delivered to the heater element by varying the firing angle of the triac. The firing angle is controlled by a phase angle controller chip U6. Chip U3 calculates the RMS voltage across the power triac. This output is compared with a command signal in error amplifier U4 (pins 5, 6, and 7). The error signal is used to control the phase angle controller (pin 6 of U6).

The power delivered to the diffusion pump heater coil is commanded by a frequency modulated signal applied to the control loop through optocoupler U1. This signal is converted to an analog command voltage by the frequency-to-voltage converter U2.

An open heater element condition is determined by a low voltage condition across the power triac. When the diffusion pump heater coil is connected, the voltage across the traic is never less than 25 volts RMS. This voltage is rectified and compared with a reference voltage Zener diode CR12. If the voltage does drop below 25 volts due to an open heater coil, the optocoupler U7 is not turned on. The open heater element condition is indicated by the diffusion pump fault line being high. This condition is sensed by the CPU and a message is displayed indicating an open diffusion pump heater coil.



REFERENCE DESIGNATIONS	
LAST	UNUSED
C151	C44-69, 114
CR60	CR21-30, 51, 54
Q15	Q2, 7-9, 14, 15
U36	U15-25, 29, 32, 34, 35
VR5	
RV6	RV1, 3-5
L8	L2-L4
TX9	
R221	R34, 38, 39, 83-135, 155 160, 161, 172, 173, 175 176, 178, 179, 181, 185 187-189, 194
JP4	
J30	J1, 5, 8, 8-29
TP28	TP3, 7, 11, 14, 23

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

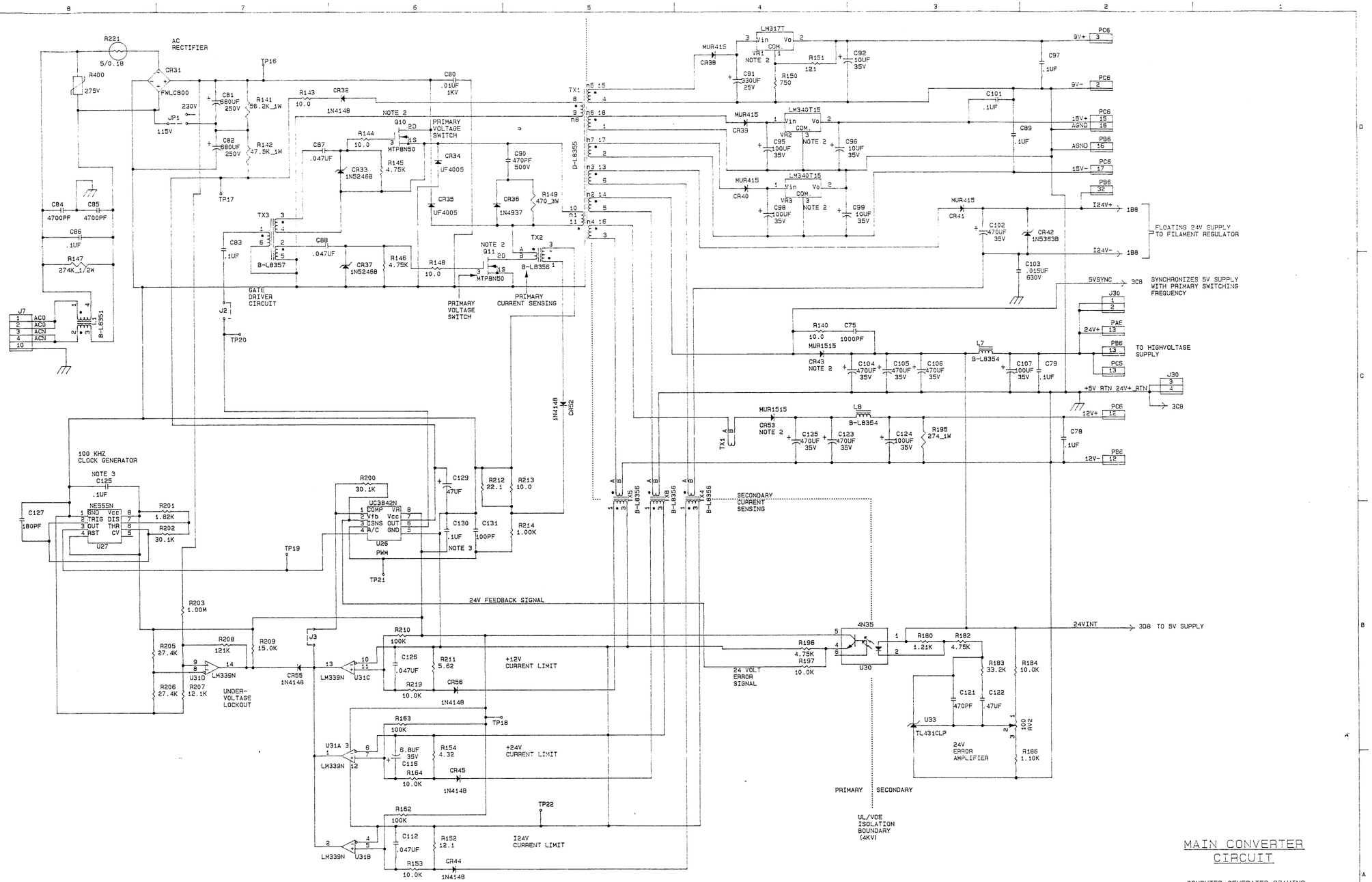
				DRAWN	DATE
				O.ANTONINI	5/26/87
				CHECKED	DATE
				BLANCHETTE	10/16/87
				APPROVED	DATE
				LANGELOTTI	10/16/87
NUM				APPROVED	DATE
EQ	5319	5724	5119	5306	F. BURZTK	10/17/87
DFT	O.E.A	O.E.A	O.E.A	O.E.A	WHERE USED
CHK	M.R.B	M.R.B	M.R.B	M.R.B	
DATE	7/13/88	7/13/87	2/9/87	7/13/87	D-L8023
REV	E	F	C	D	

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington,Ma 02173

TITLE
PLD POWER SUPPLY
(SCHEMATIC)

CLASS	SIZE	NUMBER	REV
09	D	L8025	F

SHEET 1 OF 3



NOTES: 2 COMP TO BE MOUNT ON MAIN HEATSINK.
3 .1UF CAPS TO BE MOUNT AS NEAR AS POSSIBLE TO EACH DEVICE, U26 AND U27.
4 C92, C96 AND C99 TO BE NEAR TO VR1, VR2 AND VR3 AS APPLICABLE.

MAIN CONVERTER CIRCUIT

COMPUTER GENERATED DRAWING

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES 8000 AND/OR WWS002

SEE SHEET 1

		DATE
DRAWN	O.ANTONINI	5/26/87
CHECKED	BLANCHETTE	10/16/87
APPROVED	LANGELOTTI	10/16/87
APPROVED	F. BURZIK	12/18/87

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

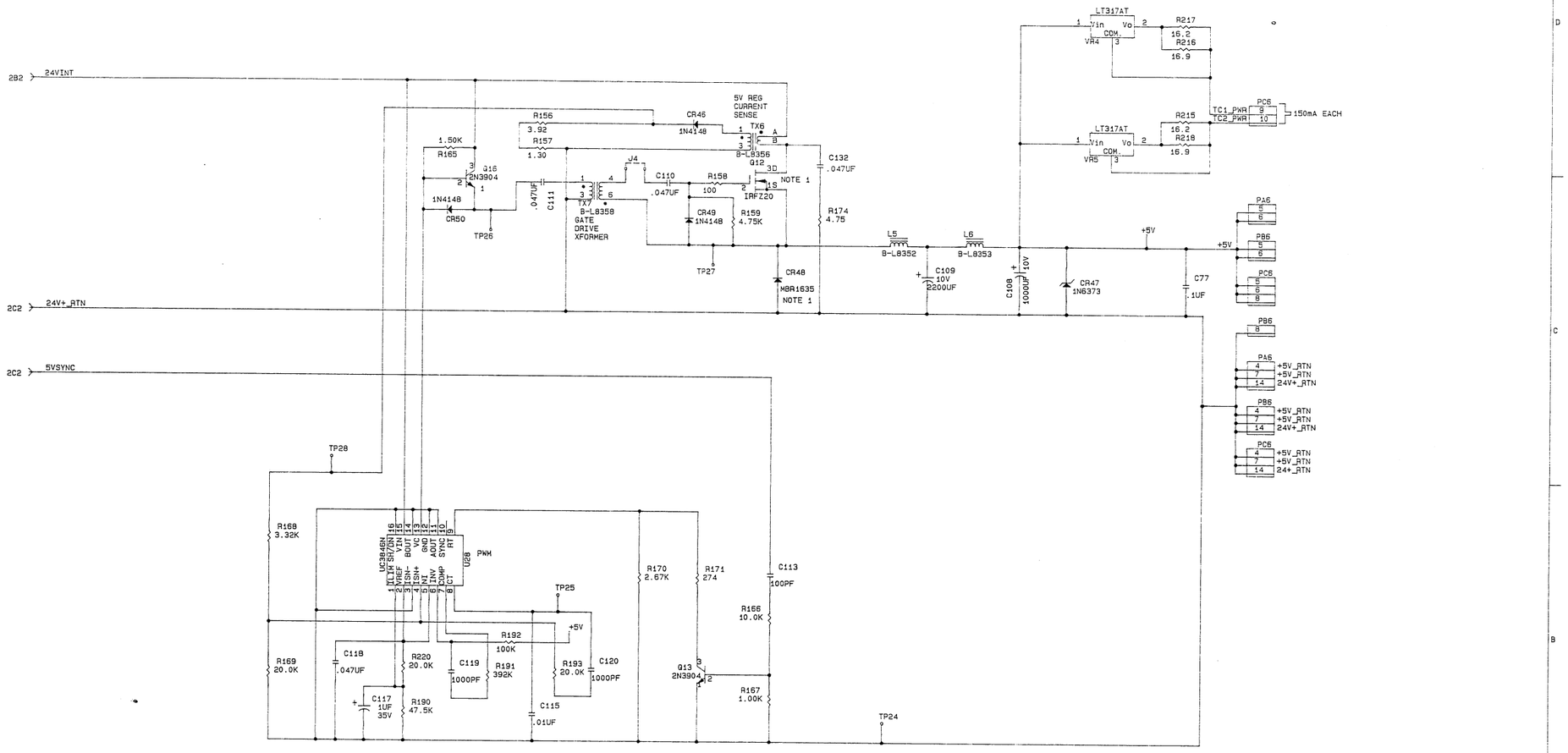
TITLE: PLD POWER SUPPLY (SCHEMATIC)

NUM	ECO	DFT	CHK	DATE	REV

WHERE USED: D-L8023

CLASS	SIZE	NUMBER	REV
09	D	L8025	F

SHEET 2 OF 3



5 VOLT REGULATED SUPPLY

NOTE: 1 COMP. TO MOUNT ON HEATSINK (THERMALLOY #6021 OR EQUIV.)

COMPUTER GENERATED DRAWING

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES 8000 AND/OR WWS002

SEE SHEET 1

NUM
EQ
DFT
CHK
DATE
REV

DRAWN	O.ANTONINI	5/26/87
CHECKED	BLANCHETTE	10/16/87
APPROVED	LANGELOTTI	10/16/87
APPROVED	F. BURZIK	12/18/87

WHERE USED: D-L8023

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

TITLE: PLD POWER SUPPLY (SCHEMATIC)

CLASS	SIZE	NUMBER	REV
09	D	L8025	F

SHEET 3 OF 3

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8026301

ASSY NUMBER: L8026301 REV: D DESCR: PCB,ASSEM,PS,AUX DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
001			PCB,FAB,PS,AUX	1	EA	
002			CAPACITOR 10UF,16V,-10/+50,RADIAL LEAD,ELECTROLYTIC C49,C57,C71,	3	EA	PANASONIC ECEA1CV100S
003			CAPACITOR MONOLYTHIC CERAMIC .01UF 50V PER SCD C62,	1	EA	SPRAGUE 1C25Z5U103M050B
004			RES,MF,1.00,1/4W R118	1	EA	
005			RESISTOR 1K 1W 1PC TYPE RN65D R137	1	EA	
006			INT.CKT.#LM358 U17,U20,U25	3	EA	LM358
007			RESISTOR 2.21K OHM 1/4W 1% R90,R104,R126	3	EA	DALE TYPE CCF-55
008			TRANSISTOR Q18	1	EA	MOTOROLA 2N3904
009			RESISTOR 10K 1W 1PC TYPE RN65D R140	1	EA	
010			CAP,AL,10 MF, 50V C59,C73,C75,	3	EA	
011			RESISTOR 4.75K 1/4W 1PC MF R84,R98,R117,R120	4	EA	DALE TYPE CCF-55
012			DIODE, 1N5242B CR23	1	EA	
013			CAPACITOR .1UF 100V C43,C45-C48,C51,C53-C56, C60,C63,C65,C67-C70,	17	EA	SPRAGUE 1C25X5R104K100B
014			DIODE IN4148 CR30	1	EA	IN4148
015			RES,MF,24.3K, 1W	1	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8026301

ASSY NUMBER: L8026301 REV: D DESCR: PCB,ASSEM,PS,AUX DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			R135			
016			RES,MF,30.1 K,1/4 W R96,	1	EA	
017			RES,MF,33.2K ,1 W R94,R109,R131	3	EA	
018			RES,MF,36.5K, 1/4 W R112	1	EA	
019			RES,MF,47.5 K ,1/4 W R86,R100,R122	3	EA	
020			RES,MF,59.0K,1/4W R87,R101,R123	3	EA	
021			RES,MF,140 K ,1/4 W R136,	1	EA	
022			RES,MF,475 K ,1/4 W R85,R99,R121	3	EA	
023			RES,MF,1500 ,1/2 W R119	1	EA	
024			RES,MF,475 ,1/2 W R115	1	EA	
025			RESISTOR 1K OHM 1/4W 1% MF R93,R107,R114,R116,R129	5	EA DALE	TYPE CCF-55
026			RES,MF,44.2K, 1/4 W R134,	1	EA	
027			RES,MF,100 K ,1/4 W R108,R113	2	EA	
029			RES,MF,15.0 K,1/4 W R222	1	EA	
031			RES,MF,22.1 K ,1/4 W R110	1	EA	
032			RES,MF,332 K ,1/4 W R92,R106,R128	3	EA	

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

D L8026301

ASSY NUMBER: L8026301 REV: D DESCR: PCB,ASSEM,PS,AUX DWG SIZE: D

FIND K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
033		RES,MF,33.2 K ,1/4 W R91,R127	2	EA	
035		RES,MF,56.2 K,1/4 W R88,R89,R102,R103,R124,R125	6	EA	
036		RESISTOR 750 OHM 1/4W 1PC MF R83,R97	2	EA DALE	TYPE CCF-55
038		DIODE IN4005 CR21,CR22,CR24	3	EA IN4005	
039		RESISTOR 1 M 1/4W 1PC MF R95,R111,R133,	3	EA DALE	TYPE CCF-55
041		RES,MF,316 K ,1/4 W R138	1	EA	
042		CAP,CR,1000 PF, 200V C152-C154,	3	EA	
043		RES,MF,4990 ,1/4 W R139	1	EA	
044		DIODE,#UES1002 CR26,CR28,	2	EA	
045		CONN 10 PIN D/ROW FEMALE P30	1	EA SAMTEC	ESW-110-44-T-D
046		RES,MF,49.9K ,1/4 W R105	1	EA	
047		CAP,CR,56 PF, 200 V C61	1	EA	
048		CAP,CR,100 PF, 10V C64	1	EA	
049		CAP,CR,6800 PF,100V C44,C52,C66	3	EA	
050		TRANSISTOR,#2N6517 Q7,Q9,Q17	3	EA 2N6517	
051		IC 4N35 U21	1	EA GE	4N35

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

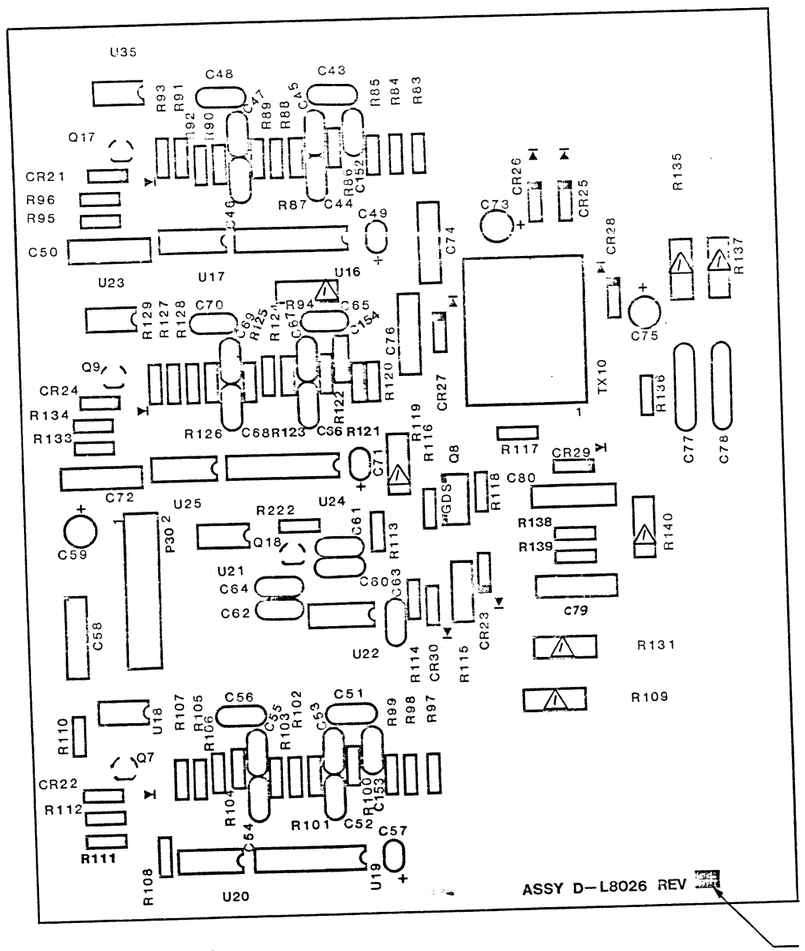
ASSY NUMBER: L8026301 REV: D DESCR: PCB,ASSEM,PS,AUX

DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
052			ISOLATOR,OPTO,4N45 U18,U23,U35	3	EA	
053			INT.CKT.#LM2917N U16,U19,U24	3	EA	LM2917N
054			TRANSISTOR, #IRF623 Q8	1	EA	IRF623
055			INT.CKT.#UC3842N U22	1	EA	UC3842N
056			DIODE, MUR160 CR25,CR27,CR29	3	EA	
057			TRANSFORMER (TX10) TX10,	1	EA	GFS P/N 87-1711-1
060			CAP,MY,0.1 MF, 250 V C50,C58,C72,C74,C76,C80	6	EA	
062			CAP,CR,0.01 MF,200V C77-C79	3	EA	

L8026

PT2 D-L8016



CLEARLY MARK ASSY REV IN INDELIBLE BLACK INK IN AREA SHOWN

NOTES: ⚠ COMP. TO BE MOUNT OFF PC CARD.

PARTS LIST : P/L

PARTS LIST IS ON A DETACHED DOCUMENT

UNLESS OTHERWISE SPECIFIED FABRICATE IN ACCORDANCE WITH VARIAN FABRICATION PROCEDURES 8000 AND/OR WWS602

DO NOT SCALE THIS PRINT UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP EDGES DIMENSIONS ARE IN INCHES

DESCRIPTION OF CHANGE	INITIAL RELEASE	REVISION ADJUSTMENT	EM UPDATES, ENG CHG 6314	ADD REF DES. C79		
NUM	—					
EO	—	5800	5850	6249		
DFT	[illegible]		WSW	DEA		
CHK	—					
DATE	—	1-30-89	3-3-89			
REV	A	B	C	D		

DRAWN	DATE	APPROVED	DATE	CODE
O Antonini	10-13-87			
CHECKED	DATE	APPROVED	DATE	CLASS
MRB	10/14/87	[illegible]	11/27/87	09

POWER SUPPLY AUX. ASSY.

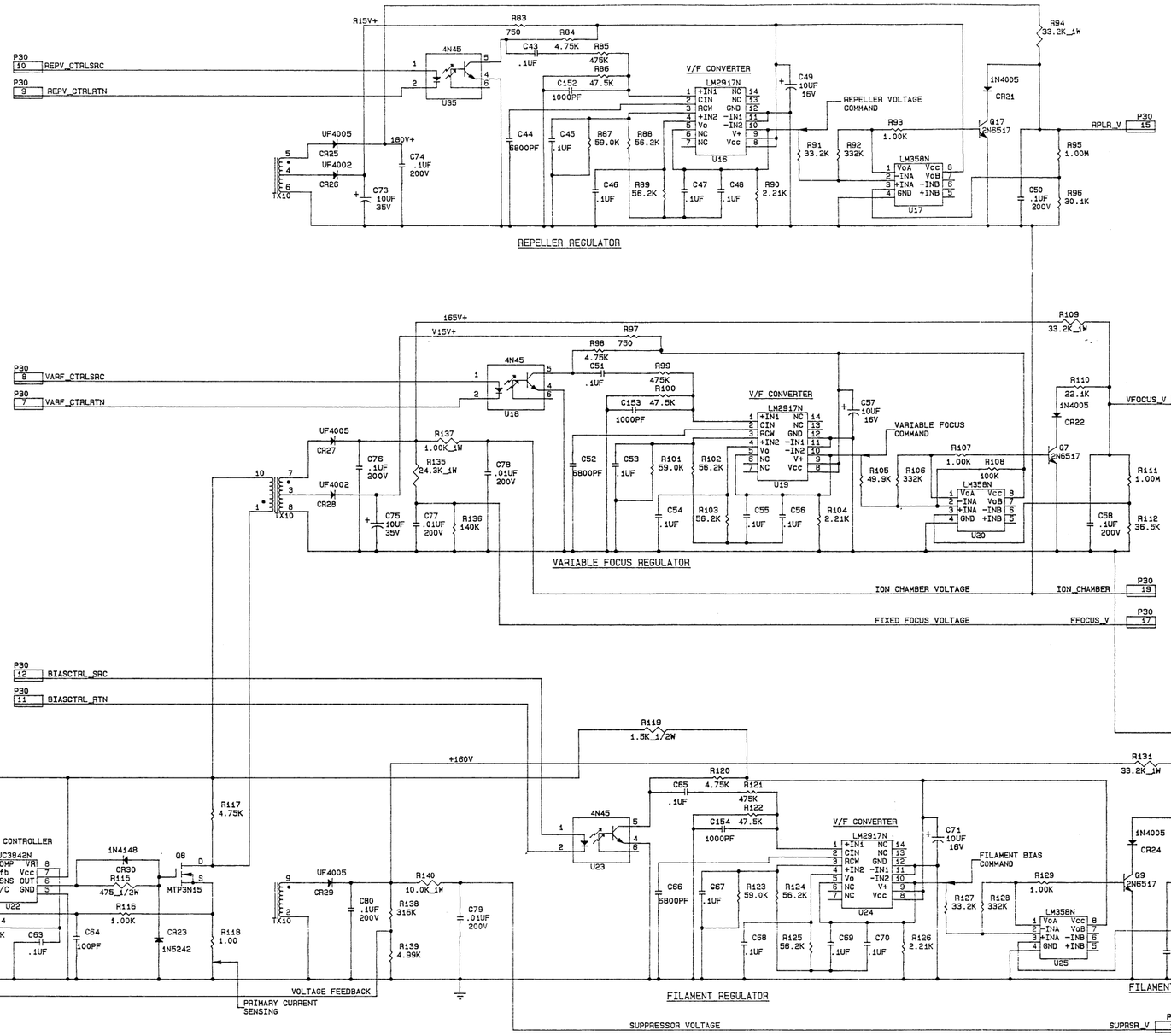
NOT OTHERWISE SPEC FRAC = ± ANG = ± SCALE 2:1

FIN √ DEC X = ± XX = ± XXX = ±

varian | VAC. PROD. | D | L8026 | D

DIVISION | SIZE | DRAWING NO. | REV

AUXILIARY VOLTAGE SUPPLY



DO NOT SCALE THIS PRINT,
UNLESS OTHERWISE SPECIFIED
BREAK ALL SHARP EDGES
DIMENSIONS ARE IN INCHES

COMPUTER GENERATED DRAWING

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

			RELEASE	CHANGE R134 TO 44.2K		
NUM				5092		
EQ						
OPT	O.E.A	O.E.A	O.E.A	O.E.A		
CHK				M.R.B		
DATE	7-29-87	9-30-87	10/14/87	1/26/88		
REV	1	3	A	B		

DRAWN	G.ANTONINI	DATE 5/26/87
CHECKED	BLANCHETTE	DATE 10/14/87
APPROVED	LANGELOTTI	DATE 10/14/87
APPROVED		DATE
WHERE USED	D-L8026-301	

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

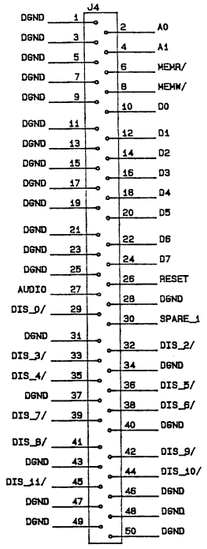
TITLE: PLD AUX P/S PCB (SCHEMATIC)

CLASS	SIZE	NUMBER	REV
09	D	L8028	B

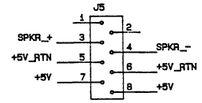
SHEET 1 OF 1

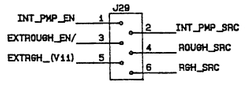
REFERENCE DESIGNATIONS	
LAST	UNUSED

TO FRONT PANEL

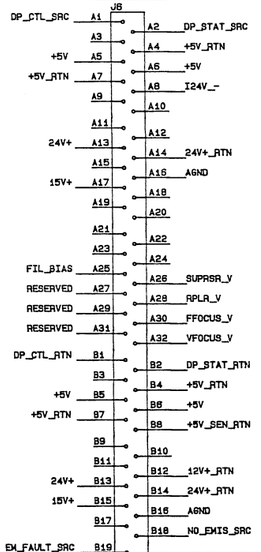


TO FRONT PANEL (PWR)



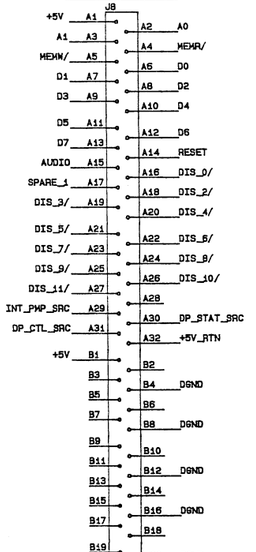


POWER SUPPLY



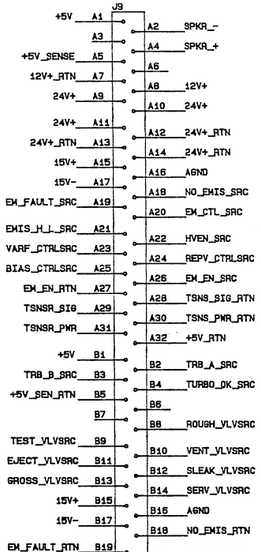
POWER SUPPLY

MAIN PC TOP CONN.



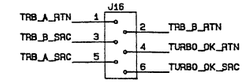
MAIN PC TOP CONN.

MAIN PC BOTTOM CONN.

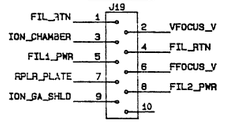


MAIN PC BOTTOM CONN.

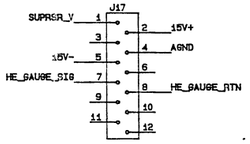
TURBO



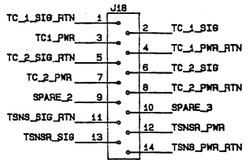
ION SOURCE



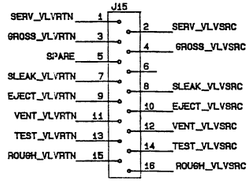
PREAMP

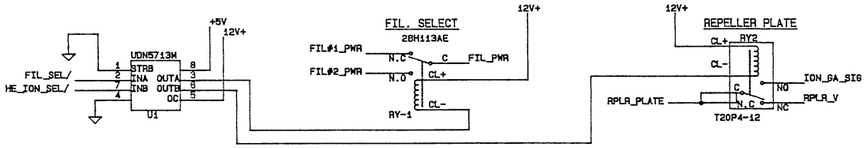


TC SENSOR



SOLENOID





REFERENCE DESIGNATIONS	
LAST	UNUSED

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WMS002

COMPUTER GENERATED DRAWING

	DEL. R1	DEL. RV1		RELEASE
NUM				
EQ	5028	5176		
DFT	O.E.A	O.E.A		W.J.C
CHK		W.C.F		
DATE	11/12/87	3/15/88		10/15/87
REV	B	C		A

DRAWN	D.ANTONINI	DATE 10/15/87
CHECKED	BLANCHETTE	DATE 10/15/87
APPROVED	R. SUD	DATE 10/15/87
APPROVED		DATE
WHERE USED	D-L8029	

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

TITLE: PLD BACKPLANE (SCHEMATIC)

CODE	SIZE	NUMBER	REV
09	D	L8031	C

SHEET 1 OF 1

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8032301 REV: D DESCR: CONTROL PANEL,PCB ASSY DWG SIZE: D

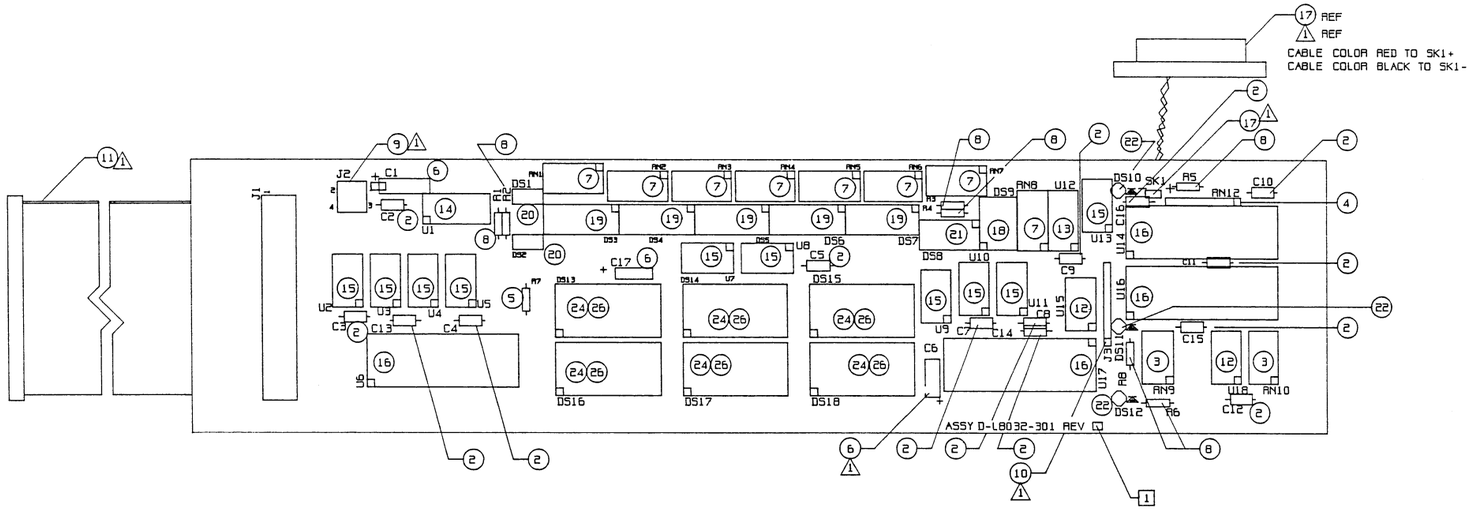
FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
			SCHEM,PCB,CONT,PNL	0	EA	
001			PCB,FAB,CONTROL PANEL,PT2	1	EA	
002			CAPACITOR .01UF,50V,10% REELED C2-C5,C7-C16	14	EA	UNITRODE #CGB103KDX
003			RES.NET.,7 X2200 RN9,RN10	2	EA	
004			RESISTOR NETWORK 2.2K SIP, 10PIN,9RES RN12	1	EA	DALE MSP10A01222G
005			RESISTOR 2.21K OHM 1/4W 1% R7	1	EA	DALE TYPE CCF-55
006			CAPACITOR 6.8 UF 35V C1,C6,C17	3	EA	SPRAGUE 150D 685X 9035B2
007			RESISTOR 180 OHM 16 PIN DIP 8 RES RN1-RN8	8	EA	DALE MDP1603-181-G
008			RES,MF,182 ,1/4 W R1-R6,R8	7	EA	
009			CONN,PC, HEADER J2	1	EA	
010			CONN 11 PIN,MALE,STR J3	1	EA	SAMTEC TSW-111-07-G-S
011	O	L8363301	CBL,ASSY,P1/P4	1	EA	
012			IC SN74LS14N U15,U18	2	EA	T.I. SN74LS14N
013			IC SN74LS247 LEVEL II (D) OR EQUAL U12	1	EA	MOTOROLA SN74LS247
014			IC ULN2813A U1	1	EA	SPRAGUE ULN2813A
015			IC 7406 PEP-3 OR EQUAL U2-U5,U7-U11,U13	10	EA	T.I. SN7406N3

VARIAN ASSOCIATES
VACUUM PRODUCTS DIVISION
PARTS LIST

ASSY NUMBER: L8032301 REV: D DESCR: CONTROL PANEL,PCB ASSY DWG SIZE: D

FIND	K	PART NUMBR	DESCRIPTION	QTY	UI	VENDOR / REFERENCE DATA
016			IC P8255A U6,U14,U16,U17	4	EA	INTEL P8255A
017			ALARM,PIEZO SK1	1	EA	MURATA ERIE PKB5-3B0
018			DISPLAY DS9	1	EA	HP HDSP5501
019			IC HP LED BAR GRAPH HDSP-4830 DS3-DS7	5	EA	HP HDSP-4830
020			LAMP,LED,RED DS1,DS2	2	EA	
021			DISPLAY BAR DISPLAY DS8	1	EA	HP HLMP-2685 BAR DISPLAY
022			LAMP, LED, RED DS10-DS12	3	EA	
024			DISPLAY,ALPHANUMERIC DS13-DS18	6	EA	HP HDSP-2112
026			SOCKET, 28 PINS .600 ULTRA/LOW DSX13-DSX18	6	EA	ADVANCE LS628-49TG
027			SPACER	1	EA	

FIND	PART NUMBER	DESCRIPTION	QTY.



NOTES

1. ⚠1 COMP. TO BE MOUNTED ON SOLDER SIDE.
2. [1] CLEARLY MARK ASSY REV IN INDELIBLE INK IN AREA SHOWN.

PART	DESCRIPTION

CAD GENERATED DOCUMENT
MANUAL CHANGES NOT PERMITTED

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EXCEPT AS AUTHORIZED IN WRITING BY VARIAN ASSOCIATES

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FABRICATION PROCEDURES QA 8000 AND/OR M-70000

FOR OTHER REVISIONS SEE ECO HISTORY FILE.

varian VACUUM PRODUCTS DIVISION

	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	APPROVED	DATE
	O.ANTONINI	10/87	M.BLANCHETTE		J.QUILTY	10/87	W.C.F	10/87

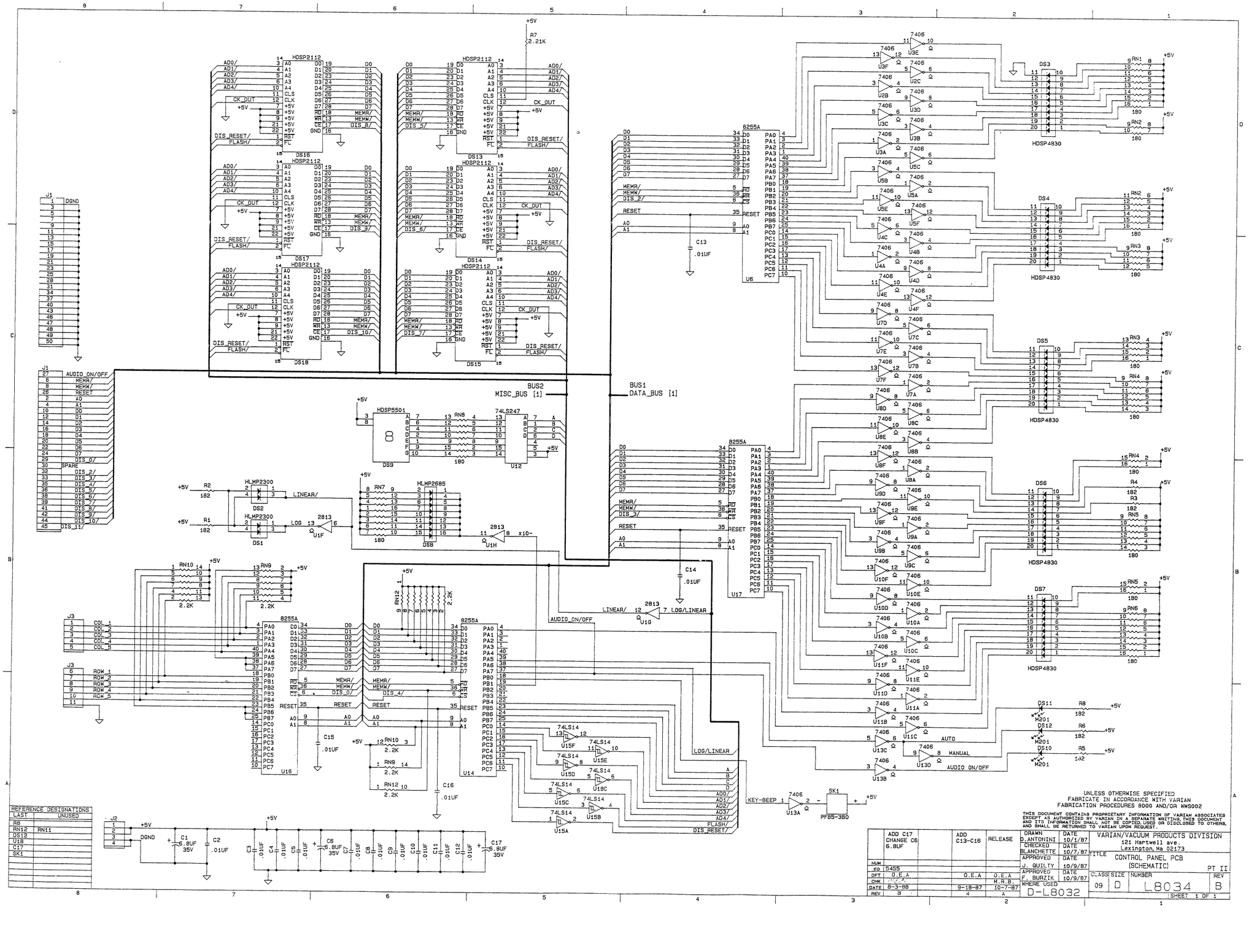
CONTROL PANEL ASSY PT2

6248	5800		6358	ECO
O.E.A.			O.E.A.	DFT
W.C.F.				CHK
11/30/89	1/30/89			DATE
D	0			REV

NOT OTHERWISE SPECIFIED
FRAC± 1/32 ANG±1/2
DEC.XX±.010 .XXX±.005
CONC .005TIR

D-L8015	D	L8032	E
NEXT ASSY	SIZE	DRAWING NO.	REV.
	SCALE	PROD.	SHEET 1 OF 1

DO NOT SCALE DRAWING


BUS2
MISC_BUS [1]
BUS1
DATA_BUS [1]
HDSP2112
HDSP5501
74LS247
8255A
HLMP2300
HLMP2685
HDSP4830
7406
74LS14
DS1
DS2
DS3
DS4
DS5
DS6
DS7
DS8
DS9
DS10
DS11
DS12
DS13
DS14
DS15
DS16
DS17
DS18
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
U17
J1
J2
J3
SK1
R1
R2
R3
R4
R5
R6
R7
R8
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
RN1
RN2
RN3
RN4
RN5
RN6
RN7
RN8
RN9
RN10
RN11
RN12
+5V
DGND
AUDIO_ON/OFF
LINEAR/
LOG/LINEAR
KEY-BEEP
AUTO
MANUAL
RESET
MEMR/
MEMW/
DIS_0/
DIS_1/
DIS_2/
DIS_3/
DIS_4/
DIS_5/
DIS_6/
DIS_7/
DIS_RESET/
FLASH/
CK_OUT
.01UF
2.2K
180
182
6.8UF 35V
PFB5-3B0
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FABRICATION PROCEDURES 8000 AND/OR WWS002
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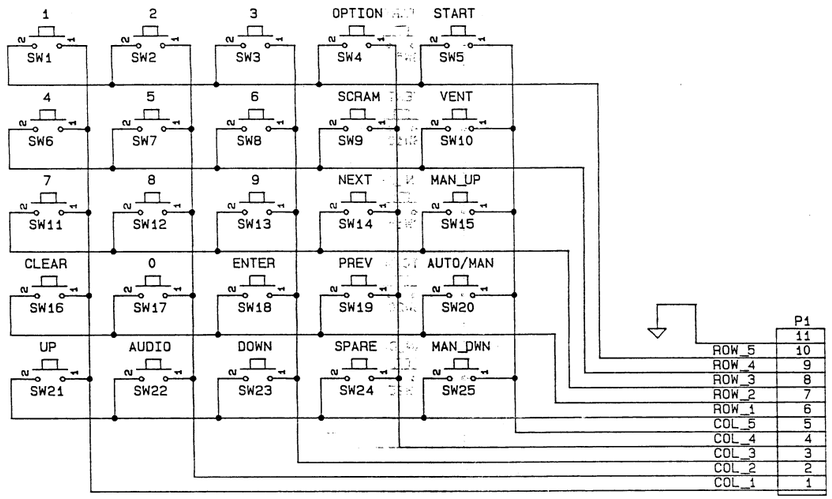
REFERENCE DESIGNATIONS
LAST UNUSED
R8
RN12 RN11
DS12
U18
C17
SK1
ADD C17 CHANGE C6 6.8UF
ADD C13-C16
RELEASE
DRAWN D.ANTONINI 10/1/87
CHECKED BLANCHETTE 10/7/87
APPROVED J. QUILTY 10/9/87
APPROVED F. BURZIK 10/9/87
WHERE USED D-L8032
VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173
TITLE CONTROL PANEL PCB (SCHEMATIC) PT II
CLASS 09
SIZE D
NUMBER L8034
REV B
SHEET 1 OF 1
NUM
EQ 5455
DFT O.E.A
CHK
DATE 8-3-88
REV B



REFERENCE DESIGNATIONS	
LAST	UNUSED

UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

COMPUTER GENERATED DRAWING

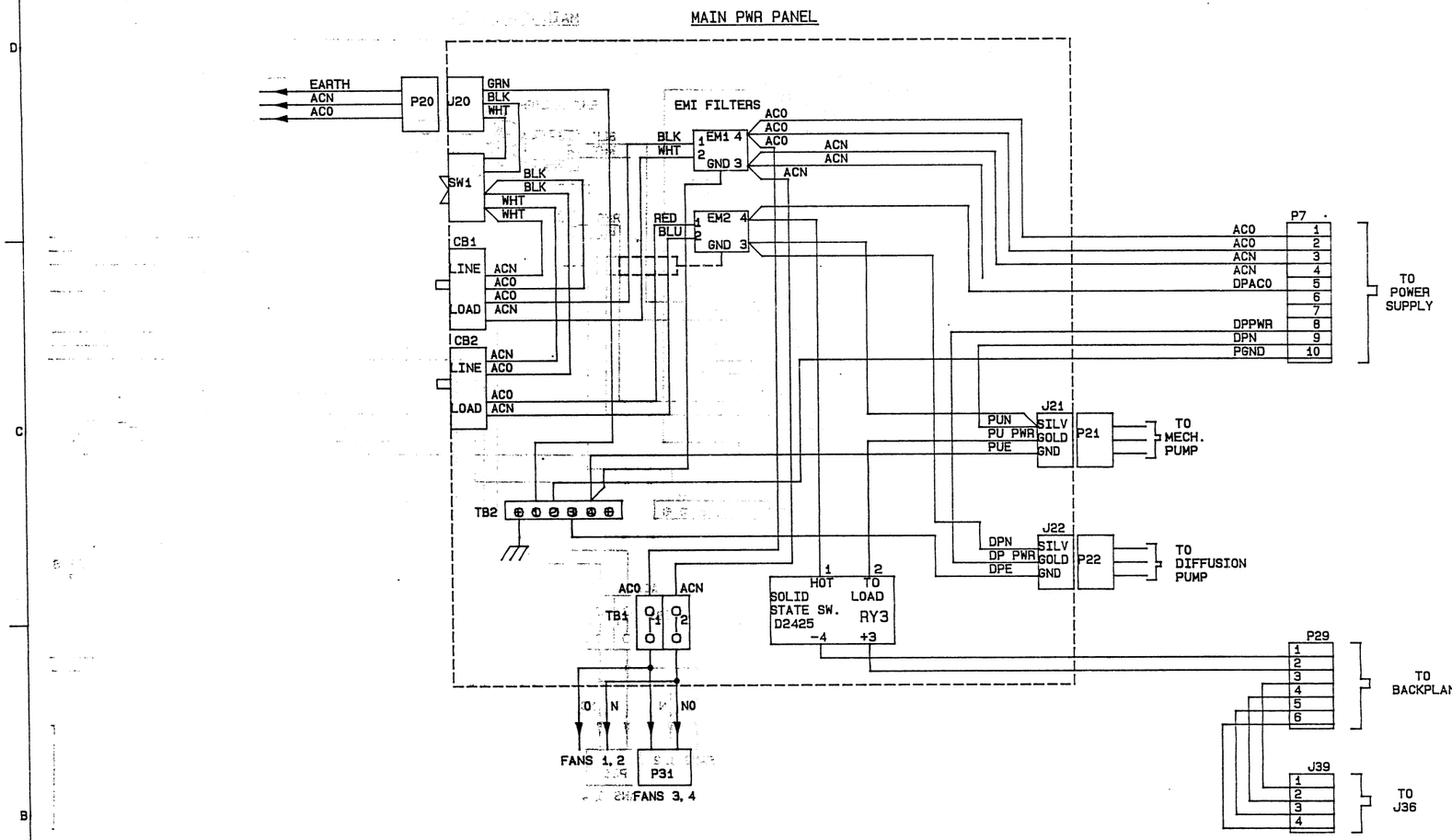
	INITIAL RELEASE				
NUM					
EO	R0021				
DFT	MRB				
CHK					
DATE	11/6/87				

DRAWN O. ANTONINI	DATE 10/1/87
CHECKED BLANCHETTE	DATE 11/12/87
APPROVED R. SUD	DATE 11/12/87
APPROVED	DATE 11/16/87
WHERE USED	

VARIAN/VACUUM PRODUCTS DIVISION
121 Hartwell ave.
Lexington, Ma 02173

TITLE: CONTROL PANEL KEYBOARD (SCHEMATIC) PT II

CLASS	SIZE	NUMBER	REV
09	C	L8345	A



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DIMENSIONS ARE IN INCHES

COMPUTER GENERATED DRAWING

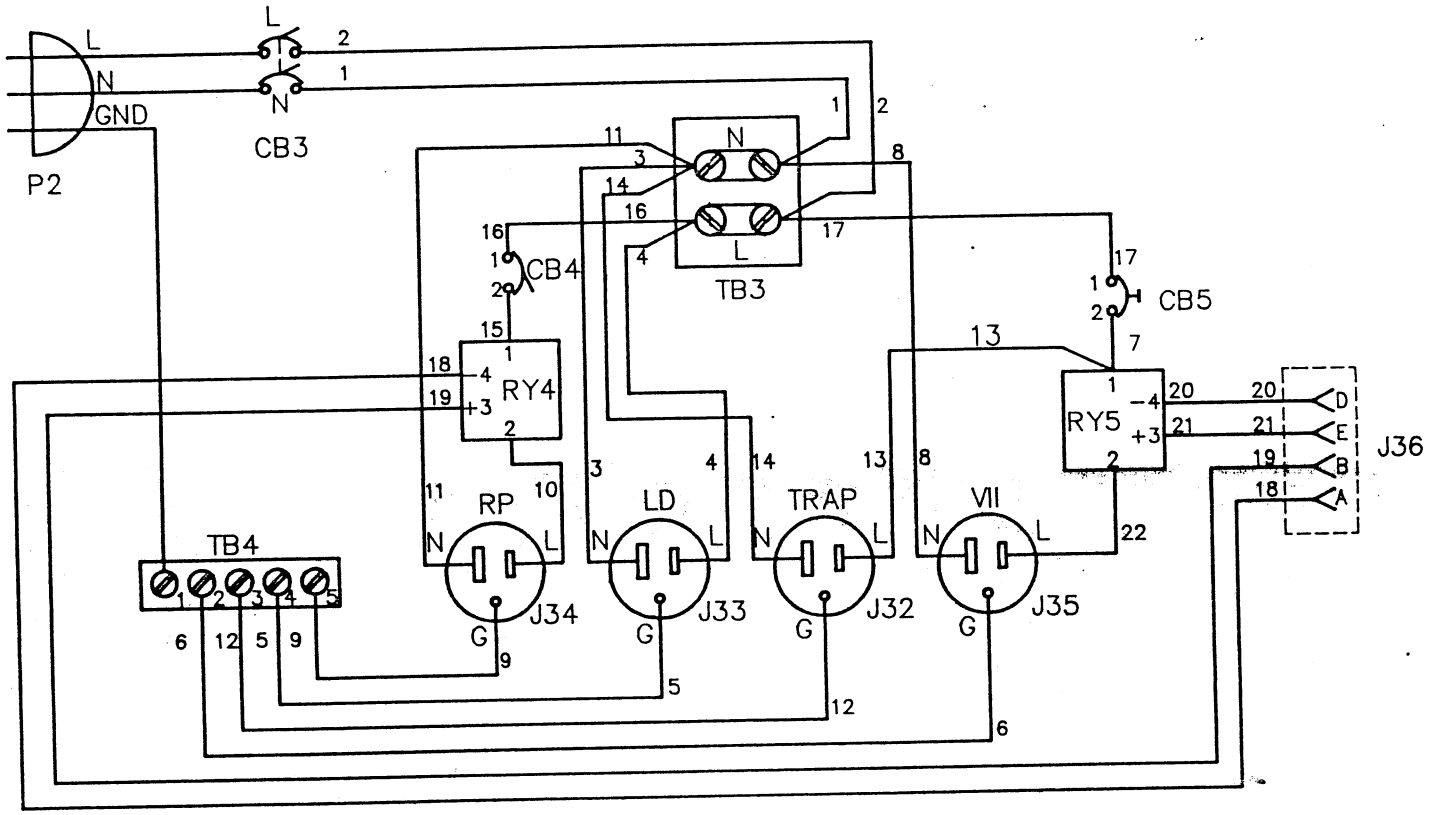
UNLESS OTHERWISE SPECIFIED
FABRICATE IN ACCORDANCE WITH VARIAN
FABRICATION PROCEDURES 8000 AND/OR WWS002

					DRAWN	O.ANTONINI	DATE 3/21/88
					CHECKED	M.R.B.	DATE 8/25/88
					APPROVED		DATE
NUM							
EO			6602		APPROVED		DATE
DFT			O.E.A	O.E.A			
CHK			M.R.B.		WHERE USED		

VARIAN/VACUUM PRODUCTS DIVISON
121 Hartwell ave.
Lexington. MA 02173

TITLE PLD MAIN PWR
(DIAGRAM)

CLASS	SIZE	NUMBER	REV
09	C	L8409	B



Cart AC Power Assembly Schematic Diagram

varian
VPD SERVICE OPERATION

RETURNED MATERIAL REPORT

THIS REPORT MUST ACCOMPANY all products returned for repair, replacement, or warranty evaluation. Full information regarding reasons for return of the product will expedite repair or adjustment. Please fill in all blanks below and furnish any other information which will help identify the nature and cause of failure.

REASON FOR RETURN (check appropriate box)

☐ PAID REPAIR ☐ ADVANCE EXCHANGE ☐ SHIPPING ERROR ☐ CREDIT

☐ WARRANTY EVALUATION ☐ LOANER RETURN ☐ SHIPPING DAMAGE

PRODUCT INFORMATION (use separate forms if more than one model no.)

Varian Model No. _____ Serial No. _____ Quantity _____

PART DESCRIPTION _____

PURCHASE INFORMATION (if product is being returned to warranty evaluation, show your original purchase order number and date purchased)

Varian Sales Order No. (if available) _____ MACHINE # _____

Original Purchase Order No. _____ Purchase Order Date _____

COMPANY NAME _____ CONTACT _____

ADDRESS _____

CITY/STATE/ZIP _____ TELEPHONE _____

FAILURE REPORT (describe in detail suspected cause or nature or malfunction)

_____

_____

_____

_____

_____

_____

RETURNED PRODUCTS

All products returned to Varian/VPD Service Operation for Warranty Evaluation must be sent PREPAID and Customer must comply with the WARRANTY REPLACEMENT AND ADJUSTMENT provision set forth in the warranty.

Ship directly to:

☐ VARIAN ASSOCIATES
VACUUM PRODUCTS SERVICE CENTER
121 HARTWELL AVENUE
LEXINGTON, MA 02173

ALL PRODUCTS SOLD BY VARIAN AND RETURNED BY CUSTOMER ARE SUBJECT TO VARIAN ASSOCIATES STANDARD TERMS AND CONDITIONS OF SALE, INCLUDING, BUT NOT LIMITED TO, THE WARRANTY AND DAMAGES AND LIABILITY PROVISIONS SET FORTH IN THE WARRANTY.